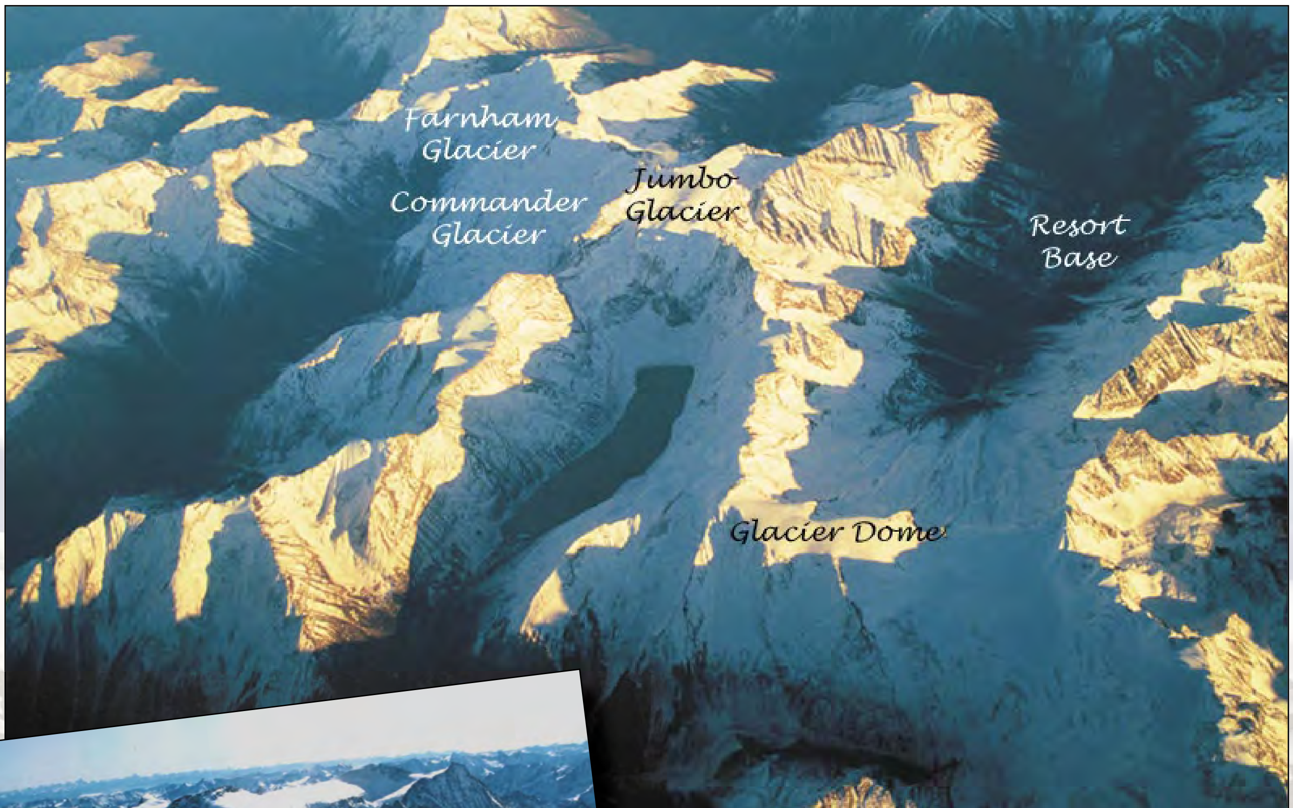
JUMBO GLACIER RESORT
MASTER PLAN



www.jumboglacierresort.com

Jumbo Glacier Resort
Master Plan

www.jumboglacierresort.com

Prepared by:

Pheidias Project Management Corp.
1660-1188 West Georgia Street,
Vancouver, BC V6G 2T3
(604) 662-8833

www.pheidias.ca
info@pheidias.ca

TABLE OF CONTENTS

LIST OF TABLES

LIST OF EXHIBITS

LIST OF SCHEDULES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

AAC.................. Allowable Annual Cut
ATV.................. All Terrain Vehicle
B.C. .... British Columbia
CASP .... Commercial Alpine Ski Policy
CBT.................. Columbia Basin Trust
CCC .... Comfortable Carrying Capacity
CODA .... Calgary Olympic Development Association
COFI .... Council of Forest Industries
CORE .... Commission on Resources and the Environment
CRTC .... Canadian Radio-television and Telecommunications Commission
DEM................. Digital Elevation Model
DFO .... Department of Fisheries and Oceans (Government of Canada)
DRAA................ Design Review and Approval Authority
EA Act............... Environmental Assessment Act
EAO .... Environmental Assessment Office
GDP .... Gross Domestic Product
JGRPAR .... Jumbo Glacier Resort Project Assessment Report
KKTC .... Ktunaxa/Kinbasket Tribal Council
KBLUP.............. Kootenay/Boundary Land Use Plan
LUCO................ Land Use Co-ordination Office
LWBC .... Land and Water British Columbia Inc.
MDA................. Master Development Agreement
MoF.................. Ministry of Forests
MoT.................. Ministry of Transportation
MSR................. Ministry of Sustainable Resources
N/A .... Not Applicable
OCP .... Official Community Plan
p/h .... persons per hour
PWC................. Purcell Wilderness Conservancy
R.C.M.P .... Royal Canadian Mounted Police
RDEK................ Regional District of East Kootenay
SAOT .... Skiers At One Time
SF..................... Single Family

SFP ....Slocan Forest Products

SNTC.................Shuswap Nation Tribal Council

TLC....................Land Conservancy of British Columbia

TSA ....Timber Supply Area

WMA..................Wildlife Management Area

1. INTRODUCTION

This Master Plan is the culmination of eighteen years of research, design, planning and study. It outlines the vision for what is designed to be the prime skiing and sightseeing destination in North America.

This plan was originally prepared in response to the Interim Agreement issued for the development of a ski resort in the Jumbo Valley in 1993. It was updated and modified in response to the information gathered during the Commission on Resources and the Environment (CORE) land use review process in 1995 and through the environmental assessment review process concluded in 2004.

It was re-issued in 2005 following the issuance of an Environmental Assessment Certificate by the Environmental Assessment Office of the Province of British Columbia and in fulfilment of the requirements of the *Commercial Alpine Ski Policy* (CASP) of British Columbia. It was updated again following a final review by approving authorities in 2007.

This Master Plan has evolved into a comprehensive document that covers all aspects of the project from an overall development planning point of view.

The Master Plan is divided into ten sections as follows:

- Section 1: Introduction
- Section 2: The Site
- Section 3: Environment
- Section 4: Ski Area and Resort Base Plan
- Section 5: Infrastructure Components
- Section 6: Socio-Economic and Market Analysis
- Section 7: First Nations
- Section 8: Planning Context
- Section 9: Governance
- Section 10: Conclusion

The following Schedules are incorporated into and form part of this Master Plan:

- Schedule A: Mapping Volume
- Schedule B: Design Guidelines

Supplementary and supporting documents that also form part of this Master Plan are included as Appendices. There are fifty-one appendices. Each appendix is numbered beginning with the Master Plan section number with which it is associated, followed by a letter identifier. For example, Appendix 4-A: Visual Impact Assessment, is the first appendix associated with Section 4: Ski Area and Resort Base Plan of the Master Plan.

1.1 A VISION FOR A COMPLETELY NEW MOUNTAIN ACCESS IN NORTH AMERICA

Recent history and numerous studies and policy documents, including the *BC Resort Strategy and Action Plan* have shown that there is a ready-made international market for a new year-round destination alpine resort in Western Canada. Such a resort must be of the highest skiable terrain quality, offering the skier and visitor year round terrain, favourable snow and weather conditions, and access facilities that match or surpass the best of Europe.

It must capture the vision and the promise that nurtured North American resorts such as Jackson Hole,[1] Wyoming, in the 1950's and infuse it with a more contemporary reality. Moreover, it must provide an experience of such a calibre that it will be spoken of with the same awe as heli-skiing in the Bugaboos or vacationing in Zermatt, Switzerland.

The proponent group is confident that by providing access to the natural beauty and splendour of British Columbia's high mountains in a unique manner for North America, Jumbo Glacier Resort will thrive, and will become another international winner for the local tourist industry. It truly has the potential of expanding the international exposure of British Columbia's mountains,[2] especially in view of the worldwide exposure that will accompany the 2010 Olympics.

1.1.1 Vision Statement

To provide the only North American lift access to high-alpine glaciers and mountains for year-round skiing and spectacular sightseeing via a boutique-sized, high quality resort designed in an authentic mountain character in accordance with sustainable development principles and designs, and supported by a First Nations heritage theme.

1.1.2 Origins and Interpretation of the Vision

The vision for the ski area was developed in concert with the attributes of the project site, namely: a favourable climate, high quality and abundant natural snow, access to high alpine glaciers for year-round skiing and sightseeing, and the largest all-natural snow vertical drop in North America.

The plan is to gain access to the best terrain for sightseeing and alpine skiing on the continent and to create a destination for year-round skiing and snowboarding with unique sightseeing experiences, including a superior ski and snowboarding school.

---

[1] Jackson Hole was the dream of a European ski resort transplanted in America; it was cared for by Austrian ace Pepi Stiegler in the 1950s. It had basically correct climatic and elevation choices and an aerial tram covering an optimal vertical drop was installed in 1966. The village nest was properly placed at the foot of the tram and the higher segment of ski runs included fabulous glacier quality skiing. It had tremendous success, but it has been frozen in the style and facilities of the fifties and sixties. It also was not planned for year round use.

[2] The project has already received unprecedented international media coverage for a proposed ski resort in British Columbia. It has appeared in the *New York Times*, *Skiing Magazine* (USA), *Ski Magazine* (USA), *Millionaire Magazine* (Italy), *Ski Canada Magazine, Outdoor Magazine* (USA), the *Globe and Mail*, the *National Post,* and numerous other national and regional media.

1.1.2.1 The Physical Components

The project consists of several interrelated components: a Glacier Dome Gondola and viewpoint, summer skiing and sightseeing at Glacier Dome and at the Jumbo-Commander-Farnham major glacier ski area, an integrated pedestrian oriented base area containing hotels, condotels, townhomes, condominium units, single family chalets, supporting commercial facilities (restaurants, retail outlets and tourist facilities), an interpretive centre and environmental monitoring station and a Guest Relations Centre.

1.1.2.2 Character

The resort will be designed with an authentic mountain style and character drawing from the tradition of the National Parks, with steep or snow-covered sloping roofs and small scale buildings emphasizing the use of natural materials, particularly stone and wood.

1.1.3 A Sightseeing Focus: The Glacier Dome Gondola and Teahouse

The Glacier Dome Gondola, together with the aerial tram to Jumbo Glacier, will be the centrepiece of the project. The gondola will rise to 3,000 metres (9,842 feet) to reach a stunning view of the mountains and of the Lake of the Hanging Glacier. Enclosed, modern cabins will provide a pleasant and efficient ride to the top. The gondolas will allow wheelchair access to the mountaintop and will be unique in offering the only view of glaciers from a 3,000 metre (9,842 feet) high mountain top in North America.

At the top of Glacier Dome, visitors will be able to stand behind a glacier parapet to enjoy a view of Jumbo Glacier and of the Lake of the Hanging Glacier immediately below it, as well as a spectacular 360 degree view of mountains and glaciers ranging from Starbird Glacier to the Macbeth Icefield to Horseshoe and Cauldron Glaciers to Red Top Mountain. A teahouse, similar to the one at the top of Kicking Horse Mountain Resort, will be located near the gondola arrival point. There will be no physically disabled accessible mountain viewpoint comparable to it in North America.

1.2 BACKGROUND

1.2.1 Project Origins

The project proposal has a substantial history – the proponent group recognized a shortfall in terms of year round international destination ski resorts in North America and initiated a study in 1989 to explore the possibilities for a new international calibre mountain resort. Resorts of this nature, such as Zermatt/Cervinia and Courmayeur/Chamonix,[3] have flourished in Europe for years (dating from the 1930s, and

[3] Zermatt is one of the oldest ski resorts in existence. It gained notoriety in the middle of the nineteenth century as the staging area for the first famous and dramatic ascent to the Matterhorn. It then developed as a mountain climbing and sightseeing centre. By the end of the 19th century, the railway to the Gornergrat, with a spectacular view of the glaciers of Monte Rosa was completed. Soon thereafter it developed as one

even earlier) and continue to draw a large international clientele including a considerable number of American and Canadian tourists and skiers.

For example, the Plateau Rosa, which is accessed from Zermatt and Cervinia, has hosted summer ski training for national teams from the entire world, including the U.S. and Canada. There is nothing comparable in terms of sightseeing and year-round skiing experience in North America.

While prime North American resorts such as Whistler Blackcomb have experienced dramatic growth and continue to draw tourists from distant and foreign markets, smaller regional resorts, especially in the United States, have seen the local ski markets level off or decline. In response to the increased sophistication and demands of the market, many smaller resorts are undergoing or have planned ambitious expansions. These resorts often lack the necessary basic criteria for a year round international destination resort. Many are also located in marginal climatic conditions. If current global warming trends persist, lower elevation resorts may not be able to continue operations in winter.

When the Japanese company that founded Glacier Resorts Ltd., Nikken Canada Holdings Ltd., visited Zermatt in November 1989 and then the Purcell Mountains in April 1990, it became convinced that the dream to bring unique mountain access and skiing to the public in North America was achievable, and it commissioned the study to create the prime mountain resort in North America that is at the origin of this project. It was Japanese investors that first saw the need to offer something special to the general public in terms of skiing on this continent.

It was noted in an earlier study of the British Columbia ski market that "at present the bulk of international skiing by Japanese is being directed towards the European resorts. Most of the North American destined Japanese tourists are presently going to Canada. However, our information was that they are not finding a fully satisfactory experience in Canada because the level of development does not sufficiently meet the quality standards of the Japanese skier."[4] As well, "the Japanese skier's expectation for winter sports indicates that 27% consider Switzerland, while 21% consider Canada and only 6% consider the U.S.A. While it is not possible to quantify the Japanese international ski market for North American destinations, it is apparent that Canada is perceived as a better winter destination than the U.S."

of the most famous ski areas in the world.

On the Italian side, the previously unknown village of Breuil was renamed Cervinia and equipped with some of the first long aerial tramways of the world in the 1930s. These lifts opened up skiing from the glaciers of the Plateau Rosa and of the Furggen at over 11,450 feet (3,480 meters) to Cervinia at 6,725 feet (2,050 meters). It became a European legend and for many years it held the longest downhill ski race (on the Ventina) ever run. Lift serviced glacier skiing was then introduced to the world.

Chamonix developed similarily to Zermatt. It was originally a staging area for the ascent to the Mont Blanc and for sight seeing, but it did not acquire the early notoriety and attraction of Zermatt, partly because its railways and lifts did not achieve a drama similar to that of Zermatt until the construction of lifts to the Aguille du Midi and across La Vallée' Blanche, providing a connection to Courmayeur, at the end of the 1950s.

Courmayeur also began as a staging area for climbing the Mont Blanc. It made a major step forward in the 1930s when trams reaching the Rifugio Torino (elevation over 10850 feet or 3300 meters) were built, providing access to the glaciers of Mont Blanc. The 1950s saw an influx of international tourism with the building of lifts across the glaciers of the Vallée Blanche, which provided a connection to Chamonix.

[4] Executive Summary of *A Study of the British Columbia Ski Areas and their Market Potential*

There are many different views on the status of the ski market. Some experts are concerned of a potential levelling off or downturn in demand. It is difficult to generalize, however, because a homogenous definition of "ski market" does not exist. There are so many radically different "ski markets" that the very notion of putting them together as if they were a single product or clientele is simplistic. Some of the statements that came out of the Mountain Resort Development conference held in Vail in 1992[5] are notable as well: "While, in my judgement, there is an overbuilding in the ski resort industry, skiers still beat a path to those ski areas that provide an outstanding experience. Thus 'real demand' cannot be separated from the 'quality' of the ski experience... I submit that even if skier-visits nationwide were declining, there is still a case for a new resort. Skier-visit statistics totally ignore that quality of the experience. If a new resort lifts the skiers' spirits to new dimensions, we must support the project.... I submit that for a multi-billion industry our knowledge of the skier-market is stone-aged. We have relied on others to measure our market, we jealously guard our individual statistics, and we embark on a multi-million dollar marketing program, based on targeting consumers who have the ‘profile of a skier.’"

Public appetite for new and better tourism experiences is well-evidenced by the rapid growth of Whistler market during the 1990s, a growth that paralleled major infrastructure investments. There are some who maintain that the future of skiing consists in expanding existing resorts, while others note that in British Columbia and in most areas of this continent, continuous expansion of existing resorts would not improve the quality of the experience because the availability of ideal climate, of major mountains and variety of high alpine terrain is lacking at many existing resort locations.

There is a consensus among experts, both in North America and overseas, that there is a strong demand for a new product that will combine skiing of the finest quality with spectacular sight seeing and enjoyment of nature, in the right climatic zone and on major mountains. The recent example of Kicking Horse Mountain Resort, the first new resort in western North America in the last twenty years, witnesses the need for the new generation of mountain resorts in the right climatic zone and with scenery capable of drawing the interest of the travelling public.

Having recognized a demand for development of a new, prime destination resort, the proponent group created by Glacier Resorts Ltd. initiated this project proposal study with the following aims:

a) to identify possible site locations for the ideal mountain resort project in North America (i.e. ones that meet all of the design criteria outlined in Section 2.1 of this Master Plan that are seen by the approving governmental bodies as being suitable for such a development and are located in an area where its effects on the surroundings can be satisfactorily mediated by proper design and planning); and

b) to initiate preliminary discussions with the appropriate Government bodies.

While some consideration was given to locations within the United States, the proponent group strongly favoured Western Canada and British Columbia in particular. This bias was based on their enthusiasm for the beauty of the Western Canadian mountain ranges, on their substantial knowledge of and experience with development in Canada (starting at

---

[5] *Mountain Resort Development – Proceedings of the Vail Conference April 18 – 21, 1991*, Page 204, Author, Ted Farwell

Whistler as early as 1972), and, especially, on the lack of accessible majestic glaciers outside British Columbia.

While there is no shortage of glaciers in North America, there are many factors that lead to a relatively small area for selection. The most desirable latitudes, where climate and sun angles are ideal for a ski resort, limits the choice to a relatively small fascia two to three hundred kilometres north and south of the Canada-U.S. border. In this fascia the coastal mountains are less than ideal for climatic reasons, while the majority of glaciers in the Rocky Mountains, and particularly those that are most accessible, are located in parks or conservation areas. Additionally, the glaciers in the Rocky Mountains are exposed to exceedingly cold and windy winter conditions.

The mountains that are in the best climatic zone are west of the Rocky Mountains, in the Purcell range of British Columbia, because they are protected from the arctic flows by the eastern ranges of the Rocky Mountains and protected from the moist air and stormy conditions of the Pacific by the dry areas of central B.C. and by the Selkirk Range.

Therefore, the study quickly focused on the detailed maps of British Columbia and of the fascia of mountains that lay west of the Columbia trench, the same area where heli-skiing was born, for the same reasons. These assumptions, and the fact that it would be futile to look elsewhere in North America, were confirmed by the expert community, but particularly by Peter Lev,[6] the renowned mountain guide from Jackson Hole, Wyoming, who was the original lead guide for Mike Wiegele and became a weather and avalanche forecasting expert and one of the original senior consultants for this study.

1.2.2 Tourism Growth in British Columbia

The proponent recognized that one of British Columbia's major strengths – and a prime contributor to the growth of its tourist industry – was its ability to offer visitors an immense expanse of land of incomparable beauty and variety. In the past thirty years, especially since the success of Expo 86 and being selected to host the 2010 Olympic Games, British Columbia's standing throughout the tourist industry has grown substantially. The number of tourist visits per year has grown rapidly. It is now estimated that tourism is the second largest industry of the Province, and its largest employer.

To accommodate and entertain the increasing numbers of visitors, great progress has been made in providing tourist facilities of all kinds. British Columbia can now boast a number of high quality hotels, golf courses, ski areas, etc. to serve a variety of requirements. However, relative to its landmass, and the scale of American and international tourism, British Columbia still has a paucity of tourist orientated facilities with

[6] Peter Lev is an important and enthusiastic backer of Jumbo Glacier Resort. He has been a mountain guide for 43 years and has had first ascents in the Tetons, Colorado, and Alaska, including the first ascent of the East Buttress of Mount McKinley and climbs on Half Dome and El Capitan. He is a veteran of seven Himalayan expeditions, including Dhaulagiri, Nanda Devi, Chulu, Nun, and Pik Lenin in the Pamirs. He is an avalanche and weather expert and has combined climbing with skiing in North America, Europe and Asia. Peter Lev in winter 2002 skied from Glacier Dome with Troy Jungen of Golden, B.C. a famous extreme skier. The event was noteworthy because Peter Lev was the first man to climb the north face of Mount Robson from the base of the mountain and Troy Jungen was the man who skied down the north face of Mount Robson. Peter Lev and Dan Griffith later in the same year skied Commander Glacier with Oberto Oberti, Alan Calder of the Environmental Assessment office and a group of photographers and filmmakers. Although Peter Lev is now retired, he still considers the skiing that will be provided by this project as the crowning achievement of his consulting career.

which to attract and satisfy the traveller. This will become even more obvious as we approach the 2010 Winter Olympics through which British Columbia will attract worldwide attention.[7]

In B.C., primarily three names capture most of the international clientele – Vancouver, Victoria and Whistler – and despite tourism growth in other regions such as the Okanagan and the Kootenays, only these locations can claim to attract a substantial out-of-country clientele. Banff and Lake Louise, Alberta, also attract a significant international visitors.

An alpine resort that is focused on year-round glacier sightseeing and skiing, combined with the nearby recreational activities available at Panorama and in the Columbia Valley, will add a new dimension to the British Columbia tourist economy. The sight of the Lake of the Hanging Glacier from Glacier Dome may even surpass Lake Louise in terms of beauty, and will be a new dramatic attraction on the B.C. tourist map.[8]

In Europe, the famous Mer de Glace is easily accessible by lift from both Chamonix in France and Courmayeur in Italy. In fact, it is possible to cross it and enjoy its incredible view suspended in the sky in tiny gondolas that are small enough to remain nearly invisible to the unaided eye from below. In Switzerland, the Jungfrau is accessible via one of the most famous underground railways in the world, which climbs the mountain inside a tunnel to open to a spectacular view of the Aletsch Glacier and surrounding peaks from the top station. In contrast, while B.C. has equally large and spectacular glacier sights, they are largely inaccessible to the average individual.

1.2.3 Skiing in British Columbia

The ski industry has been one of the more visible areas of tourist-related growth in British Columbia in recent years. Given the immense expanse of mountains and the length of the winter season, it is a natural and obvious catalyst for winter travel, helping to strengthen what had previously been a low tourist season. Through excellent press coverage of the many exciting skiing opportunities in British Columbia, the international skier is fast becoming aware of the opportunities that are available in our province.

With the exception of a couple of notable examples, namely Whistler Blackcomb (despite its low elevation and climatic challenges) and heli-skiing, British Columbia and North America in general still does not have a tourist product comparable to the best of Europe, in terms of year round alpine resorts.

Skiing is still a relatively new experience for North America when compared to Europe. International interest in skiing in British Columbia (as well as the growth of the tourist industry generally) can accelerate[9] because of its favourable location with respect to the

[7] In addition, the absurdity of continuing to train Canadian athletes on glaciers in Europe and South America, despite the abundance of glaciers in our own backyard, will likely become even more apparent to Canadian and international observers.

[8] The resort will not be visible from, and will not intrude into or provide access to the drainage of the Lake of the Hanging Glacier.

[9] There is a current debate on whether the skiing population has levelled off and whether the aging of the population in the industrialized world is having an effect on the number of active skiers and snowboarders. This is not a debate that would have an impact on the proposed resort since it would cater particularly to an

rest of the industrialized world. From an historical point of view, British Columbia enjoys a geographic position that is similar to Switzerland’s during the railway age. Tourism by railway started in industrialized Europe at the end of the last century and Switzerland is conveniently located in the centre of Europe. This was when the Gornergrat Bahn (a steep, narrow gauge railway from an elevation of 5,250 feet (1600 metres) to 10,800 feet (3,300 metres) of Zermatt was built. Current advances in airplane and airport technologies now position British Columbia's resorts with equal travel time to the world's population centres as the European train systems did for the Swiss Alps over a half century ago. This is a unique historical time for British Columbia.

North Americans still do not have a tourist product comparable to the best of Europe, in terms of year round alpine resorts. Only the inability to compare, due to lack of exposure by most people in North America, makes the loss appear to be less significant. It is true that the market success of Whistler appears unbeatable and it is not unusual to hear Europeans at Whistler ranking it proudly as the best in the world, but one has to meet the millions of visitors, and repeat visitors, at the top of the Gornergrat Bahn or of the Klein Matterhorn of Zermatt, for example, to truly compare.

In terms of numbers, to have a perspective of the market, the American market is estimated at some 55 million skier days per year. Colorado exceeds 11 million skier days. British Columbia, even though it has the greatest skiing potential on the continent, is achieves about 55% of Colorado’s skier visits. B.C. is also a net exporter of tourist dollars. There is not good reason why the ski industry should be larger in Colorado than in British Columbia. B.C. has better access, elevations and mountains, and the proposed project would help reverse the trend and create a better ski destination for B.C., offering the powder snow and the views that currently only heli-skiers can enjoy.

1.2.4 Summer Skiing

In summer, Jumbo Glacier Resort will provide up to 700 m. (2,200 ft.) vertical of skiing and access to four large glaciers.

Glacier Dome has a top station elevation of 3,002 metres (9,850 ft.) and provides a summertime skiable vertical drop of 518 metres (1,700 ft.). Commander Glacier has a top station elevation of 3,291 metres (10,800 ft.), and provides a summertime skiable vertical drop of 762 metres (2,500 ft.). Jumbo Glacier adjoins Commander Glacier, adds another 128 metres (420 ft.) of vertical drop, reaching 3,419 metres (11,217 ft.), and increases

international market niche that is not affected in the same manner as a regional ski resort.

However, it should be noted that the skiing population is primarily determined by three factors: 1) the population growth of the market area, 2) the economy of the market area, and 3) the development of new and more exciting facilities in the market area.

The third point is often overlooked. Skiers become tired of skiing always in the same places, of using aging facilities and generally of the lack of new and rewarding experiences. This may create a levelling off and even a decline in the use of lifts. It might be happening again even at Whistler, where especially for the local clientele the social life is becoming a stronger magnet than the downhill experience. Another factor is the large segment of strong intermediate skiers, especially among those getting older, who become tired of the icy moguls typical of so many established ski runs. This kind of skier would have no problem negotiating a wide open, packed but soft ski run, even if steeper. It is a point that is often forgotten when looking at statistical data. It may make the difference between keeping a large segment of the skiing population active or not, and it is one of the reasons why the better ski resorts are making large investments in grooming ski runs, even when fighting adverse climatic conditions.

the amount of skiable summer terrain.[10]

For residents of the West Coast, summer skiing opportunities presently exist at Blackcomb[11] and Mount Hood[12]. Both areas, however, suffer from low altitude, humid and variable West Coast climate and very limited skiable areas and facilities. The variable climate makes these resorts unattractive internationally, while the small size of the facilities makes the resorts easily saturated in terms of clients. Of these two locations, only Mount Hood operates throughout the summer. Blackcomb closes at the end of July. The success of both locations, despite their shortcomings, indicates that, even locally, there would be a stronger demand for summer glacier skiing if it were available at a more focused, glacier-orientated resort. In Europe one must look at the success of Passo Stelvio, in Italy, or of Les Deux Alpes, in France, to realize what can be offered for summer skiing. The models of Zermatt[13] (with summer skiing on the Plateau Rosa) and of Courmayeur (which offered summer skiing on La Vallée Blanche) are more in keeping with the smaller and more tasteful scale of alpine resort that is proposed for the Jumbo Valley and its mountains and glaciers.

1.2.5 Project Fundamentals

1. Tourism is an industry of great potential for immediate economic growth and job generation in B.C. The public has indicated that these are important provincial objectives.

2. Southeastern B.C.'s temperate climate and unique mountains and glaciers give it a competitive advantage for mountain-oriented tourism that is not replicated elsewhere on the continent.

3. Skiing is the most important area of future growth for commercial tourism in B.C. The province has a record of continuous growth of skier days, however, skier days in B.C. are still about one half (1/2) of what they are in Colorado, despite greater potential in terms of skiable terrain.

4. Skiing needs a location where the natural beauty of the mountains is an attraction, the

---

[10] As is evidenced by comparing these figures with those of Whistler Blackcomb (which offers a partial summer season) and Mount Hood (which offers limited, non-glacier summer skiing), the proposed summer season vertical drop would place the proposed resort in a class by itself in North America.

[11] At Blackcomb, Horstman Glacier, latitude 50 degrees 5', longitude 122 degrees 50', is reached after riding two quad-detachable chair lifts, a bus, and finally a third quad-detachable chair lift. Bad weather means riding chairs in the rain. Two T-Bar lifts, Showcase and Glacier, covering a vertical drop of 485 ft. (148 meters) and 672 ft. (205 meters) respectively, serve a small area of some 45 hectares (112 acres), cordoned into separate runs for the various groups holding training camps. The top elevation is 7,642 ft. (2330 meters) and the maximum useable vertical drop is less than 984 ft. (300 meters).

[12] Mount Hood features on-mountain accommodation with 60 rooms and an additional 9 bunk-bed rooms, near the base of the chair lifts. Two double chair lifts give access to Palmer Glacier, latitude 44 degrees 40', longitude 121 degrees 40', which ranges between an elevation of 8,544 and 7,013 ft. (2605 and 2138 meters), with a vertical drop of 1,532 ft. (467 meters).

[13] Zermatt has large ski areas extending above 9,840 ft. (3,000 metres) elevation. The huge winter skiable terrain ranges from Klein Matterhorn at 12,530 ft. (3,820 metres) to the village base at 5,314 ft. (1,620 metres). It is possible to ski into Italy, dropping from 12,530 to 6,724 ft. (3,820 to 2,050 metres), on the majestic glaciers of the Plateau Rosa, with a summer vertical drop of 2,890 ft. (881 metres) on the Swiss side and of 3,258 ft. (993 metres) to Cime Bianche (at 9,275 ft. or 2,827 metres) on the Italian side in early summer. Main access is by fast aerial trams. Latitude is 46 degrees.

climate is right and snowmaking in not a necessity.

5. Glaciers are an advantage because in the right climate and elevation not only do they guarantee snow in winter, but they also allow skiing in the summer, creating a year round season. The Jumbo Glacier Project is near the centre of a group of majestic glaciers at an elevation of 3,000 metres (9,842 feet) and above. Jumbo Glacier and Commander Glacier meet at a saddle at 3,400 metres (11,155 feet). The Canadian Alpine Ski Team has requested to train on these glaciers in summer.

6. Locations are limited because large areas of mountains and glaciers have been set aside for parks and conservation areas, often in the most scenic and accessible locations. It is necessary, therefore, to select a location that is not pristine and not designated for protection. In this context, it is important to understand that the C.O.R.E. provincial land use plan confirmed the project and designated the area as one that has "very high recreation and tourism" values.

7. Proximity to infrastructure is also necessary to keep costs within a manageable range and to allow a variety of activities in the region nearby. The proposed location was formerly a sawmill site and has an existing road. It is only 36 kilometres (22 miles) from Panorama, B.C.

8. The Jumbo Creek Valley is the only area in North America that fulfils all of these requirements. In addition, Jumbo Mountain and Glacier Dome are a world-class sightseeing destination.

9. Jumbo Glacier Resort will be unique in North America. Access to major glaciers is not offered anywhere on the continent except by means of helicopter. It will make access to glaciers affordable. This project will begin to modify the current situation where the majority of North Americans never see the spectacular scenery from the top of the western mountain ranges.

10. The Jumbo Glacier Resort concept is to achieve a year-round facility focusing on sightseeing and a different kind of skiing in the mountains, bringing a new experience of nature to the majority. Seeing the unique mountains while being on them will be the ultimate experience. Access by means of lifts to majestic glaciers in one location on the continent is the next threshold of mountain tourism experience. This project is the Jungfrau project of North America, one century later.

11. The project was described by the Executive Director and Deputy Minister of the Environmental Assessment Office as being "in the broad public interest in that it provides significant economic benefits to government and the region."[14]

1.2.6 Planning Context

This Master Plan is a result of a number of planning exercises and processes that span a period of more than fifteen years. It has achieved the following approvals and milestones:

- Acceptance of the Formal Proposal to pursue the project under the *Commercial Alpine Ski Policy* (CASP) of B.C. (1991);

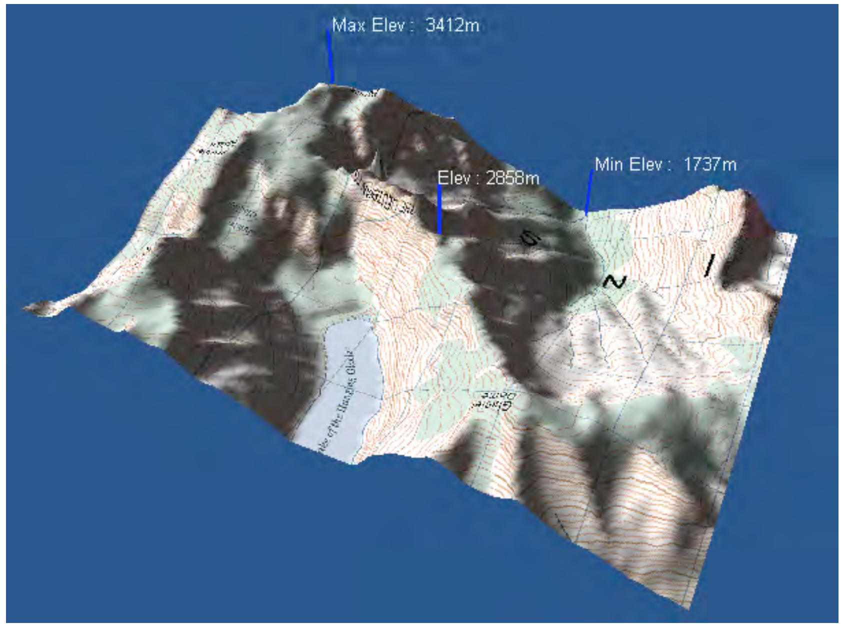
[14] See item 10 of the *Recommendations of the Executive Director and Reasons for Recommendations* (for an Environmental Assessment Certificate) included as Appendix 1-B.

- Signing of an Interim Agreement with the Province and achievement of sole proponent status in the area defined as the "Study Area"[15] following a public process and formal Proposal Call (1993);
- Completion of the Commission on Resources and the Environment (CORE) land use public review process which identified the Jumbo Glacier ski resort development as an acceptable land use of the upper Jumbo Creek valley (1995), subject to the EA Act;
- Submission of five volume report including summaries of studies and preliminary Master Plan (1995) prepared according to CASP as a formal application under the EA Act as requested;
- Official transition of the project proposal into the *Environmental Assessment Act* approval process (1995);
- Entry into the second and final stage of the *Environmental Assessment Act* review process (1998);
- Submission of a thirteen volume *Project Report* including a *Master Plan Concept* (2003) to the EA Office as required;
- Completion of *Environmental Assessment Act* (EA Act) review process (2004), and
- Attainment of a provincial Environmental Assessment Certificate under the EA Act for the project (2004).

For a detailed history of the project's planning and public consultation processes please see Section 8 of this Master Plan.

[15] Original "Study Area" map is included in Appendix 4-C.

2. THE SITE



This section of the Jumbo Glacier Resort Master Plan describes the site and provides a brief summary of the various investigations and studies undertaken to assess the physical, environmental and engineering characteristics of the site as part of the determination of the feasibility of this area as a high quality ski and outdoor recreational area, together with a comparison of the attributes and potential issues of this site with respect to other successful, existing resort facilities.

Factors considered in this evaluation include site location, access, climatic, geological, geotechnical and hydrotechnical conditions and possible hazards, including snow avalanche, landslide and flooding potential. None of these technical and economic considerations are identified as precluding or having significant impact on the feasibility of economic and practical development of the site.

2.1 SITE CRITERIA AND DETERMINATION

2.1.1 Planning, Design and Geomorphologic Objectives

In order to meet the design objectives, the site must meet the following criteria:

1) It must have easy access from local, regional and continental population centres, and be within reasonable proximity to a major airport, allowing for timely and cost effective connections.

2) The site should be located within a range of impressive, picturesque mountains blending the sporting experience with the sightseeing experience.

3) It must have lift access to glacier supported snow fields that can allow year-round ski runs. In British Columbia, this means glaciers located at an elevation of around 3,000 metres (9,800 ft.).

4) It must have superb climatic conditions, suitable for full operation of a ski resort in winter as well as glacier skiing in summer. The criteria for evaluating the suitability of the climate include:

- Exposure to wind;

- Exposure to fog cover on the mountains;
- Average number of sunny days;
- Temperature range, both winter and summer, and
- Type of precipitation and its frequency (rain or snow, and what kind of snow).

5) The skiable terrain must feature sufficient steepness of slope and vertical drop to allow a variety of challenging runs, while still accommodating a majority of beginner and intermediate runs.

6) The site should be located at an elevation where snow conditions from base to peak can be relied upon to provide excellent quality winter skiing without being augmented through the use of snow making facilities.

8) The site should provide a setting that can support and nurture development of a fully functioning resort base – a centre with its own character and style that would offer tasteful and quality amenities and a variety of overnight accommodation.

9) The site should be located within easy driving distance from the National Parks to provide tourists with additional nearby areas to explore.

2.1.2 Environmental Considerations

1) The site must be located in an area where the proposed modifications would not be so disruptive as to affect the ecological balance of the valley. This is essential for the success of the resort, for its natural appeal is a primary ingredient of its attraction. Again, this is also exemplified in Europe, where the delicate and incremental approach of many Swiss villages has substantially maintained the habitat and the ecology of the valleys. This is in contrast to other more radical and mass oriented developments, such as Sestriere/Cesana, in Italy, or some of the French resorts, which have profoundly altered even the appearance of the landscape, with negative results.

2) It is important that the proposed resort be designed as a "green resort"[1] to the greatest extent possible. This approach embraces the notion that a human settlement can be of a scale and of a design that can be in harmony with nature. It entails utilizing careful design methods to minimize environmental impact.

2.1.3 Community Considerations

A suitable site should have support from the community and from appropriate government bodies. The *Four Parks Management Plan* (*Parks Canada Policy*, 1979), the *South Slope Policy* (Alberta), and the *Alberta Provincial Park Policy* all but preclude ski resort development in the mountainous regions of Alberta. In British Columbia, the most desirable locations are ones that comply with long-standing government policy and have already been identified by government appointed researchers as being suitable, such as in *The British Columbia Rocky Mountain Tourism Region*, a study prepared under the auspices of the *Tourist Industry*

[1] From a technological point of view this is a new concept involving delicate techniques to maintain the ecological balance around a settlement. However, in this study we have made several references to the European Alps, and we should note that in Switzerland, Austria and in the Dolomites region of Italy, in particular, there are examples of small settlements that evolved over centuries while maintaining an enviable ecological balance.

Development Subsidiary Agreement (TIDSA) (see Section 2.7.3.1 of this Master Plan for more information), and more recently, in the East Kootenay Commission On Resources and the Environment (CORE) Report.

Community support and involvement is an important contributor to the long-term success of a prime tourist resort. Local inhabitants can create a positive atmosphere of friendliness and hospitality. While finding a location with overwhelming enthusiasm for a new resort proposal is sometimes a challenge in British Columbia (where N.I.M.B.Y. – "Not In My Back Yard" syndrome can be well entrenched), every B.C. resort seems to prove that over time the local community takes ownership of the project.

In part due to the legacy of Expo 86, the people of British Columbia have gained a worldwide reputation for friendliness and hospitality. This kind of welcoming spirit can contribute greatly to an international destination resort, where people from all cultures will congregate for an immersion in sky and snow. The 2010 Olympic Games effort will likely reinvigorate the positive and welcoming attitude of the people of British Columbia.

2.1.4 Site Determination

The regions within Canada and the USA capable of providing the above noted requirements tend to be in the interior of the Northwest of the United States (i.e., Idaho, Montana, Wyoming, Colorado, Utah) and in British Columbia and Alberta. The preliminary review, therefore, looked initially at these areas. It was obvious that a northern latitude favours Alberta and British Columbia in the availability of glaciers. Preliminary studies indicated the unavailability of accessible glaciers in the U.S.A that were not already in a park or conservation area.

Peter Lev, the renowned American mountain guide who is a weather and avalanche expert consultant for this project, confirmed that looking further for the appropriate accessible glaciers in the United States would be futile. This, along with preliminary evaluation and other factors eventually led to the elimination of the Northwest United States region from further consideration. Alberta and, particularly, British Columbia, are gifted with an immense mass of mountains, a large portion of which is crowned by glaciers.

In Alberta and in British Columbia, however, most of the areas gifted with glaciers and meeting the criteria set out above have already been set aside as National Parks, Provincial Parks or conservation areas. In fact, Alberta does not have any suitable glaciers outside the National and Provincial Parks. In British Columbia, after excluding all areas already covered by some protection designation, three potential regions were identified as meriting further examination. The three areas were:

1. The area surrounding Mount Waddington on the Northeast side of the interior of the Coast Mountain Range in British Columbia.[2]

Table 2.1: Summary of Assessment of Mount Waddington

Advantages	Disadvantages
-Tallest mountain and some of the largest glaciers in the heart of B.C. -Great beauty of scenery -Suitable climate on leeward side of the mountain	-Climate can be severe at higher elevations -Area almost inaccessible -Long and rough roads -Nearest commercial airport in Williams Lake -Major financial and environmental difficulties in providing infrastructure

2. The region surrounding Mount Sir Wilfred Laurier in the Caribou Mountains in British Columbia.

Table 2.2: Summary of Assessment of Mount Sir Wilfred Laurier

Advantages	Disadvantages
-Good glaciers in area -Great beauty of scenery -Suitable climate in selected areas -Accessible from Yellowhead highway	-Remote from population centres, long road access -Access by air too far, nearest commercial airports at Edmonton and Kamloops -Long and rough roads -Major financial and environmental difficulties in providing infrastructure

[2] Note: the Mount Waddington area has been recently placed in a conservation designation and will therefore never become available for a resort.

3. The area around Jumbo Mountain in the Purcell Mountains Range of British Columbia.

Table 2.3: Summary Assessment of Jumbo Mountain

Advantages	Disadvantages
-Good glaciers -Excellent climate -Great scenic beauty -Access practically in place -Airports presently located nearby -Already recognized by a 1982 study sponsored by the provincial and federal governments (TIDSA)	-Smaller glaciers than those noted above -Valley substantially logged and modified by human activities

After reviewing all three areas in the context of the essential requirements, the area centred on the Jumbo Mountain massif was determined as being not only the best to support the concept of the new resort, but also the only possible choice.

In summary, following many years of studies and continent-wide reviews, the area accessed from Jumbo Creek is the only one available in North America that offers:

1. An ideal microclimate, proven by thirty years of heli-skiing experience.

2. Accessible glaciers for unsurpassable sight seeing and year round skiing.

3. A well developed existing infrastructure, including roads, towns, other tourist facilities and airports within a reasonable distance.

The distance of approximately four hours by car from the nearest large city, Calgary, was considered an advantage, not a disadvantage, because this is the correct remoteness for a true destination resort. The experience of Aspen and of Jackson Hole in the United States, and locations such as Zermatt, St. Moritz or Cortina in Europe, demonstrates this point.

The area surrounding Jumbo Mountain subsequently became the sole focus of further study, and a detailed examination of all the drainages surrounding the most accessible glaciers was undertaken, with the conclusion that the Jumbo Creek drainage was the most suitable for the development of a resort.

The area has been under study for more than twenty-five years. It was also previously identified in *The British Columbia Rocky Mountain Tourism Region*, a study prepared under the auspices of the *Tourist Industry Development Subsidiary Agreement* (TIDSA) for the Governments of British Columbia and of Canada and printed in 1982. In the TIDSA study, development was recommended near the headwaters of Jumbo Creek and of Horsethief Creek. These areas are at the foot of glaciers that would provide superior skiing both in winter and summer (see Section 2.7.3.1 of this Master Plan for more information on the TIDSA study).

Another relevant study was one produced by Ecosign[3] in 1983 for Jumbo Glacier Skiing Ltd. of Invermere and sponsored by the Canadian Ski Association. The study focused on Farnham Glacier only. Lifts providing access to Farnham Glacier from Jumbo Creek were proposed primarily as means to achieve a summer skiing facility, catering to training camps for ski racers. The terms of reference of the study were such that it was focused on achieving a high quality summer training facility at minimum cost, and for this reason the concept of a year round destination resort was not explored, although the possibility of year round access for sightseeing and day skiing was kept open as an option. The base station was proposed in an area in the lower Jumbo Creek valley, achieving the shortest possible distance from Invermere and Panorama. This location, being at a lower elevation and in a burnt out area of forest, would be less desirable for a winter resort, in terms of amenities, snow, and access to ski runs than a location in the upper Jumbo Creek valley. Farnham Glacier provides optimum winter skiing conditions, however, and it is included as an important component of the final ski area plan for Jumbo Glacier Resort.

The use of Farnham Glacier[4] for training the national ski teams was proposed again by the Calgary Olympic Development Association (CODA), and summer ski training was initiated via helicopter in the summer of 2003. This renewed interest may create an opportunity for an opening phase on Farnham Glacier. Jumbo Glacier Resort will supply the lifts that will make CODA's objectives possible in the long-term.

In summary, after excluding the Bugaboo and the Purcell Wilderness Conservation areas and their likely expansions, and after determining that access into the Purcell Mountains from the western side (i.e., the Nelson side) was too long and lacked the population base of the Calgary-Edmonton corridor and international exposure (provided by access from Banff National Park), it became clear that the two drainages to study were Horsethief Creek and Jumbo Creek, just as the 1982 TIDSA study of the East Kootenay Tourism Region had concluded.

The Horsethief Creek access was studied, and it was determined that it would not be economically feasible for the following reasons: poor road conditions and high cost to improve it; greater length of road; severe avalanche conditions with slide or avalanche precipitation every year in four or five locations; less sun exposure; narrow valley in several important parts of the higher drainage; poor access to the Jumbo Creek ski area and to the view point of Glacier Dome limited ski runs to the potential resort site from Glacier Dome, and finally, potential controversy in terms of greater public access and proximity to the Lake of The Hanging Glacier. This Master Plan will further detail the numerous aspects that make **the Jumbo Creek Valley uniquely suitable for a year round alpine ski resort.**

2.1.5 Vertical Drop

The proposed site can accommodate a large variety of runs of significant vertical drop. The vertical drop from the top of Glacier Dome to the Jumbo Creek gondola lift base will be 1,128 metres (3,700 feet), while from Glacier Dome to the resort base it will be 1,341 metres (4,400 feet). The Glacier Dome vertical drop will be the longest in Canada with a single lift and without the use of snowmaking facilities.

The most significant vertical drop available for the project, however, is from Jumbo and

[3] Ecosign Mountain Resort Planners Ltd., Whistler, B.C.

[4] ibid.

Commander Glaciers to the Farnham Creek lift base. The proposed maximum vertical drop available from Jumbo and Commander Glaciers of 1,650 to 1,800 metres (5,415 feet to 5,900 feet), depending on ultimate design of top and bottom stations, **will not only be the longest in North America, but will surpass the best European ski runs** because of the high quality of snow due to the elevation at the base and the exceptional climate, offering powder snow from top to bottom. The base elevations, at 1,700 metres (5,577 feet) in the Jumbo Valley, and at 1,600 metres (5,250 feet) at the lowest potential lift base in Farnham Valley, explain the excellent snow conditions at the base from fall to late spring.

Climatically and statistically the proposed ski runs will rank with or surpass the most renowned runs in Europe, such as those of the Plateau Rosa in Cervinia, or of the Klein Matterhorn and of the Gornergrat area in Zermatt.

As previously noted, during summer months the skiable vertical drop would be in the order of 520 metres (1,700 feet) on the Glacier Dome and Mount Monica area, and 760 metres (2,500 feet) on Jumbo and Commander Glaciers. On Farnham Glacier the summer vertical would be in the order of 500 metres.

Gentle slopes generally represent the terrain of the area, although steep terrain can be found easily. This will facilitate development of a large variety of ski runs, with the emphasis being on runs of easy to intermediate difficulty.

For comparative purposes, the approximate vertical drops of various other ski resorts are included in Table 2.4 below.

Table 2.4: Vertical Drops – Various Ski Resorts

Ski Area	Vertical Drop
Aspen, U.S.A	3,267 ft. / 996 m.
Bariloche, Argentina	3,350 ft. / 1,021 m.
Blackcomb, Can.	5,280 ft. / 1,609 m.[5]
Cervinia/Valtournanche, It.	6,417 ft. / 1,956 m.[6]
Chamonix, Fr.	9,223 ft. / 2,812 m.[7]

[5] This vertical drop should be taken with reserve, since it includes 700 to 800 meters of terrain below the constant snow line during winter. Although snowmaking facilities are installed, the lower portion is so frequently exposed to rain and frost that it is mostly used as a ski-out only. The quality of the vertical drop is also affected by the number, type and connection of the lifts required to cover the distance. A combination of detachable quad chairs, gondolas and pony trails are required to reach the top. The summit requires a further transfer to a T bar lift. The lower part is also affected by the convergence of all ski runs to two base areas, creating serious congestion on the return to the base areas.

[6] It is the oldest and probably most famous resort giving access to truly skiable huge vertical drops and glacier ski runs, year round. It opened in the middle of the 1930's with three bold aerial trams, giving access to the glaciers of the Plateau Rosa (10,824 ft./ 3,300 meters) and to the Furggen (3,400) crestline. The vertical drop of approximately 4,600 ft. (1,400 meters) is still today one of the most skiable domains in the world. The 8 km (5 miles) gentle and boundless run on the Ventina glacier is still a legend today. In the summer of 1960, the writer met the U.S. ski team training on the run from Plateau Rosa to Cime Bianche. Faster aerial trams service the terrain today and the lifts extend down to Valtournanche, extending the vertical drop in winter.

[7] A record vertical drop served by connecting modern and fast aerial trams to L'Aiguille du Midi (12,464 ft./ 3,800 m.). It is in full view of the Mont Blanc (15,777 ft./ 4,810 m.) in a vast region with a variety of ski areas and multiple skiable vertical drops in the 1,000 m. range. This number refers to the vertical drop of La Vallée Blanche, probably the most renowned and visually spectacular glacier ski run in the world. It covers relatively easy terrain from top to

Courchevel/Val Thorens, Fr.	5,740 ft./ 1,750 m.
Courmayeur, It.	6,560 ft. / 2,100 m.[8]
Gstaad/Reusch-Diablerets, Switz.	5,347 ft. / 1,630 m.
Jackson Hole, U.S.A.	4,139 ft. / 1,262 m.[9]
Jumbo Glacier Resort, Can.	5,577 ft. / 1,700 m.
Kicking Horse Mountain Resort, Can.	4,133 ft. / 1,260 m.
Lake Louise, Can.	3,250 ft. / 991 m.[10]
Lake Tahoe, U.S.A.	3,600 ft. / 1,097 m.
Las Lenas, Argentina	4,035 ft. / 1,230 m.
Les Menuires, Fr.	5,085 ft. / 1,550 m.
Mount Bachelor, U.S.A.	3,100 ft. / 945 m.
Mount Hood, U.S.A.	2,500 ft. / 762 m.
Mount Washington, Can.	1,600 ft. / 487 m.
Portillo, Chile	2,487 ft. / 758 m.
Panorama, Can.	3,800 ft. / 1,160 m.[11]
Sestriere/Cesana, It.	5,905 ft. / 1,800 m.
Snowbird, U.S.A.	3,100 ft. / 945 m. [12]
Snowmass, U.S.A.	3,555 ft. / 1,084 m.
Sunshine Village, Can.	3,514 ft. / 1,071 m.[13]
St. Moritz, Switz.	4,750 ft./ 1,447 m.[14]

bottom, but because of the severity of temperatures at the top during winter, it is mostly skied during springtime. The bottom part of the run is rarely skiable, and during spring it is normally necessary to take the train down to Chamonix at Montanvers, near elevation 2000 meters.

[8] Refers to spectacular ski run down Toula glacier from Point Helbronner (10,922 ft./ 3,330 m.), also in view of the Mont Blanc; it is a vast but extremely steep ski run more often skied in winter and spring. Access is via three older, but conveniently connecting aerial trams.

[9] The most impressive true vertical drop in North America – it is serviced by a single tram lift and it starts at a glacier quality elevation above 3,000 meters. The entire terrain, vast and truly skiable, is above the snowline and to a great extent also above the tree line. The tram is of an older design and has a capacity of only 378 people per hour.

[10] The true vertical drop of the ski runs is in fact limited by notorious rocky conditions near the lower portion, only partially offset by snow-making facilities, and by the absence of a single enclosed lift system allowing a comfortable access to the entire vertical drop.

[11] A remarkable vertical drop, for North America, only limited by the type and multiplicity of the lifts providing access to the ski runs and by the lack of snow at the bottom, which is compensated by extensive snowmaking facilities.

[12] Probably the second best true vertical drop in North America after Jackson Hole (allowing for the fact that Lake Tahoe is not in powder snow country). A single fast and modern aerial tram provides access to superb ski runs with frequent excellent snow conditions from top to bottom.

[13] Almost half of the vertical drop is represented by the ski-out to the parking lot at the base of the gondola that transfers skiers to Sunshine.

[14] St. Moritz does not offer the most impressive numbers, but it offers a large number of outstanding runs served by fast and modern aerial tramway, connected by excellent horizontal transportation, including fast and convenient narrow gauge railways; because top and bottom altitude range mostly between 3,000 and 2,000 meters the skiing is excellent. Climatic conditions are also favourable for other traditional winter sports, such as outdoor skating. A criticism often heard of the Whistler/Blackcomb area is that outdoor skating is not possible,

Vail, U.S.A.	3,450 ft. / 1,052 m.
Val d'Isere, Fr.(	4,593 ft. / 1,400 m.
Valle Nevado, Chile	2,500 ft. / 762 m.
Whistler, Can.	5,006 ft. / 1,526 m.[15]
Zermatt, Switz.	7,216 ft. / 2,200 m.[16]

2.1.6 The Farnham Creek Alternative

The Regional Tourism Study prepared for the *Tourist Industry Development Subsidiary Agreement* (TIDSA) for the Governments of British Columbia and of Canada in 1982 not only identified Upper Jumbo Creek as an ideal location for a future destination ski resort for the development of the Kootenay region, but it also identified the headwaters of Horsethief Creek as another possible location. In reality, excluding the drainage of the Lake of the Hanging Glacier for conservation reasons, and the headwaters of Horsethief Creek, which are located in a very steep section of the drainage, are avalanche prone and unsuitable for a mountain resort, the drainage of Farnham Creek is the only feasible alternative. This drainage would allow access to a world-class destination ski resort with winter and summer skiing potential. This was recognized in the study produced by Ecosign in 1983, which studied the potential for summer skiing on Farnham Glacier and commented on the advantages and disadvantages of an access from Jumbo Creek or from Horsethief and Farnham Creek. Ecosign found that the access from Jumbo Creek was more economical and shorter. Their report favoured access from Jumbo Creek.

Pheidias also had an opportunity to study the area centred around Jumbo Mountain in the summer of 1984 for a Vancouver client and later, in the studies begun in 1989 that initiated the current project, the Farnham access was reviewed and discussed on an almost yearly basis.

The Farnham Creek alternative would have the following advantages:

1. It would provide immediate access to Commander Glacier, which we rate as capable of the best lift accessed ski runs in the world in winter and in summer for the available vertical drop.

2. It would give easy access to Farnham Glacier, which is the second best ski run in winter and would provide good summer skiing most of the time as well.

3. Jumbo, Commander and Farnham Glaciers would provide a formidable ski area that could stand as a world-class destination even without accessing the upper Jumbo Creek

because of the previously noted adverse climatic conditions.

[15] Access to the total vertical drop was greatly improved by the introduction of a detachable gondola system, with a mid-station, covering three quarters of the vertical distance. A long diagonal transfer to a detachable quad is still required, however, to reach the top. Still, the number of meters is deceptive, since, like Blackcomb, almost half the total vertical drop is situated below the permanent winter snowline.

[16] Zermatt is probably the ultimate prototype for a ski resort, with year round glacier skiing, glacier access served by fast and modern aerial tramways and probably the most skiable maximum vertical drop in the world. It is an area of immense beauty, that caters to substantial tourism by non-skiers/snowboarders as well. It boasts one of the most successful tourist narrow gauge railway in the world (the Gornergrat Bahn, built at the turn of the century), as well as one of the first underground cable cars.

and Glacier Dome.

4. Eliminating the Jumbo Creek and Glacier Dome portion of the project may eliminate the opposition of the Jumbo Creek Conservation Society (JCCS) and avoid the controversy generated by people who feel that the enjoyment of Jumbo Pass may be threatened or that the Jumbo Creek resort could be a Trojan horse for the creation of a Jumbo Pass road into the West Kootenays by B.C. Highways. It may also reduce or eliminate the controversy about the perceived intrusion into an area that some would like to see returned to grizzly bear territory, despite the Jumbo Pass hut and the road into the Jumbo Creek drainage.

5. The Farnham Creek drainage is a beautiful valley in a true alpine setting as is Upper Jumbo Creek, and logging has left less visible scars.

6. The view of Commander Glacier and of Jumbo Mountain from the valley base is awesome, similar to the view of the Monte Rosa glaciers from Saas Fe.

7. The Farnham Creek drainage was classified for “integrated use” at CORE.

However, it would also have the following disadvantages:

1. Access from the nearest development would be longer, by approximately fifteen kilometres.

2. The road through Horsethief Creek has been less developed and maintained than the road through Toby Creek and Jumbo Creek**Error! Bookmark not defined.** in the current state; and improvements would have to be much more substantial even in the initial stages. The shortest route to the Columbia Valley would require passage through private land as well.[17]

3. Unlike in the case of access to Jumbo Creek, which can utilize easy and existing road alignment s on both sides of the valley substantially avoiding most of the active avalanche exposures, the existing road along Horsethief Creek cannot avoid a considerable number of avalanche paths. with consequent high cost of monitoring and avalanche hazard prevention.

4. Road improvements, even for a 50km per hour design, would be much more costly as blasting would be required in many areas.

5. Instead of extending a power line from Panorama, the power would have to come from Wilmer and Invermere, a difference of at least some additional 15 kilometres.

6. Wilmer is a very small rural community that may oppose the notion of tourists driving through it, generating a whole new controversy.

7. While much of the work done for the Jumbo Creek project may be utilized to plan a resort base in Farnham Creek, it is possible that new revised studies may be requested according to the trend of Government agencies, delaying the project for another five years

[17] An improved forestry road is currently under construction and will be completed by the summer of 2005. The improved road is being built in order to facilitate renewed logging in the Farnham Valley and to provide easier access to Farnham Glacier for national team summer ski training by CODA.

and generating new costs that the investors would refuse to finance, effectively killing the project and generating an investor driven controversy.

8. Although at CORE, Farnham Creek was dedicated to “integrated use”, and it is slated for renewed logging, it was apparent that conservation interests and others at CORE considered it more pristine than Jumbo Creek, with the risk of an even more fierce controversy.

9. Unlike Jumbo Creek, where the resort can be located before the avalanche area of the . upper section of the valley in a protected and safe area, at Farnham Creek the resort would have to be located in a more exposed area and several avalanche paths would have to be crossed to reach the resort. Although this is an easily manageable problem that was overcome decades ago at resorts such as Snowbird, Utah, it may be difficult to start a project using designs techniques and technologies that are little known in B.C. and which could create additional controversies.

10. Foregoing access to Jumbo Creek and Glacier Dome would mean losing the viewpoint that affords a view of the upper side of the Lake of the Hanging Glacier drainage from up above, and of the icefall from Jumbo Mountain. This is a spectacular view that compares favourably with the best views of the Alaska cruises, with the glacier calving and falling into the lake most of the summer. This view would not be available from the top of Jumbo Mountain, even if it would still be a spectacular viewpoint for mountains and glaciers over a great distance.

The sum total of the pros and cons has led the project team to consistently advise that refocusing the project around a Horsethief Creek and Farnham Creek access would not be a desirable option, unless major Government support, both political and financial, were provided to get the project off the ground. However, from a technical point of view, if the Government covered the additional initial costs the alternative would be feasible. One should note that both the Garibaldi at Squamish. and the Cayoosh Creek project unlike the Jumbo Glacier Resort project seem to depend on Government financing for the project start and that Panorama benefited from Government support. On this basis the Farnham Creek alternative could be made feasible, if the Government chose this route.[18]

2.2 LOCATION

2.2.1 Site Location

The proposed site is focused on the Jumbo Mountain and Glacier Dome massifs, which are the best destinations in North America both for year-round skiing and sightseeing. Jumbo Mountain is located in the Purcell Mountains of British Columbia at latitude 50 degrees, 24 minutes and longitude 116 degrees, 34 minutes. Its elevation is 3,419 metres (11,214 ft). Glacier Dome is located at latitude 50 degrees, 26 minutes and longitude 116 degrees, 37 minutes. Its elevation is 3,000 metres (9,850ft).

Bugaboo Provincial Park is located approximately 35 kilometres (22 miles) to the North. In the

[18] The Farnham alternative has come into focus more recently because CODA has proposed an immediate start of glacier skiing from the Farnham Glacier side and Canfor has begun constructing a new road for logging in the Farnham Creek drainage, providing vehicular access with a new bridge into the drainage.

drainage immediately Northeast of the proposed resort, there is the Lake of the Hanging Glacier. Initially, this lake drew great attention and there was considerable interest in the concept of including it in a Conservancy or Park area. The proponent would support this concept. Although this lake was included in the East Kootenays' Protected Areas Strategy in 1993, it was not confirmed for conservation status in the CORE Land Use Plan and subsequent land use implementation strategies by LUCO due to the large percentage of the landmass of the Kootenays already included in conservation areas.

To the South of the upper Jumbo Creek drainage lies the Leona Creek drainage, and beyond that, the Purcell Wilderness Conservancy. The Purcell Wilderness Conservancy is accessed from the Toby Creek drainage, which leads to the Earl Grey Pass and Hamill Creek drainage in a straight East to West direction. Before the Earl Grey Pass, Toby Creek turns south towards the spectacular Toby Glacier and Mount Toby, to which mechanized access is prohibited. Surrounding the site there are other valleys leading up to a number of other glaciers, including those at Blockhead and Red Top Mountain from Leona Creek, Horseshoe and Cauldron Glaciers and the Macbeth Icefield from the Glacier Creek drainage and Starbird Glacier from the Horsethief Creek drainage.

Geothermal activity is evidenced by the hot springs on the Columbia Valley floor. Several faults produced by tectonic activity indicate the potential for other sources of geothermal energy and perhaps for other hot springs, but research in this regard has not been undertaken.

From the standpoint of engineering and amenity considerations, as well as for optimum lift access and servicing flexibility, the best location for the resort base site is near an abandoned sawdust and log pile, where a sawmill was located. This is situated within a previously logged area at the upper end of the road that leads into the Jumbo Creek drainage area.

Exhibit 2.1: Location Map

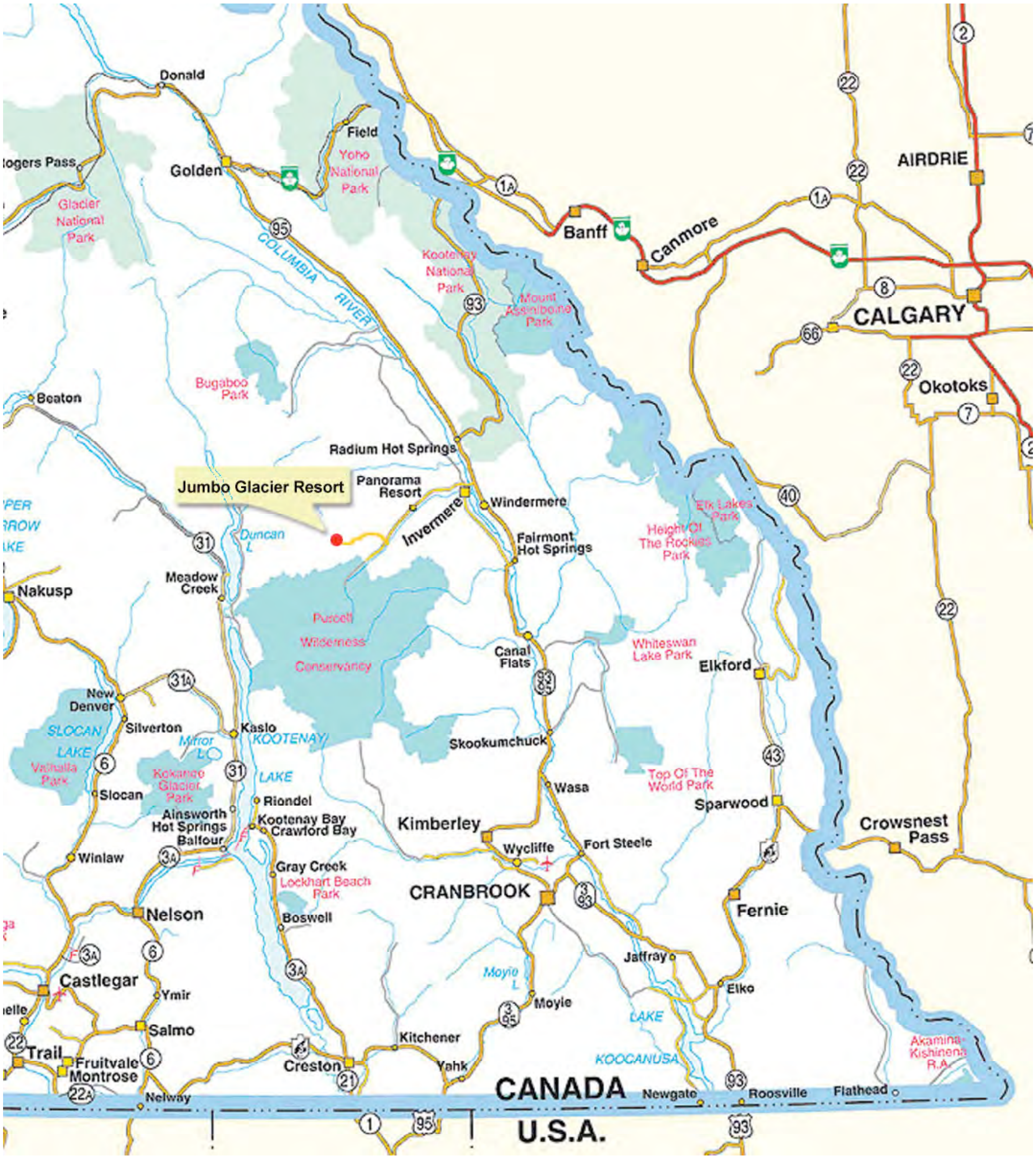
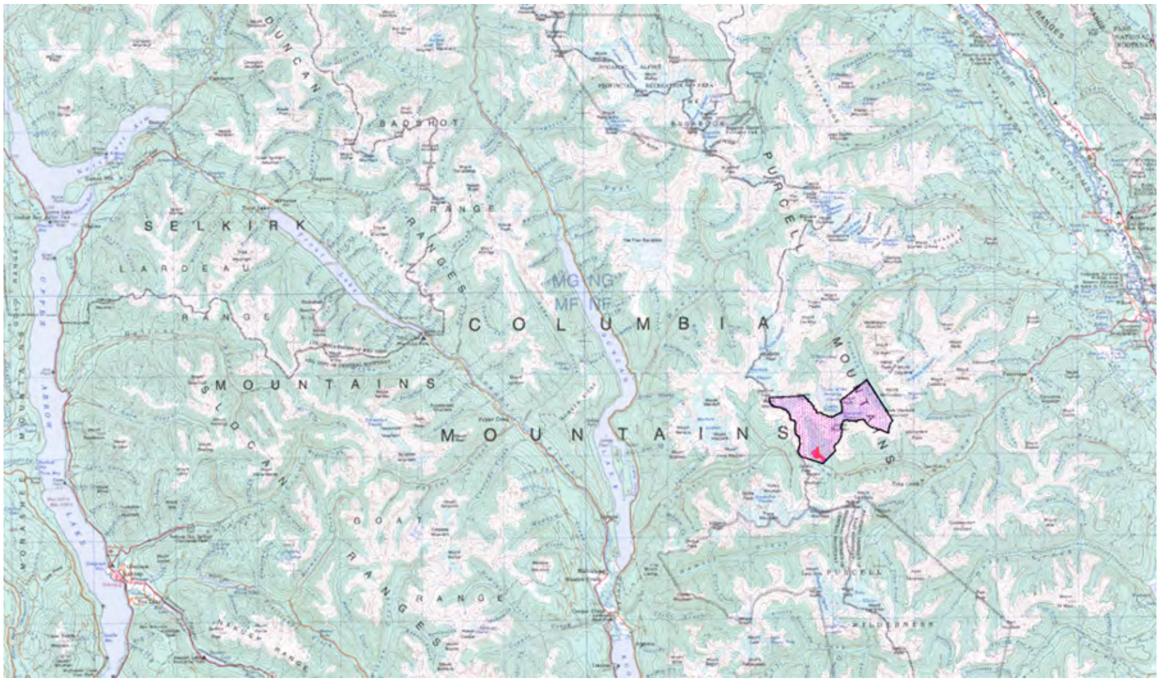


Exhibit 2.2: Study Area



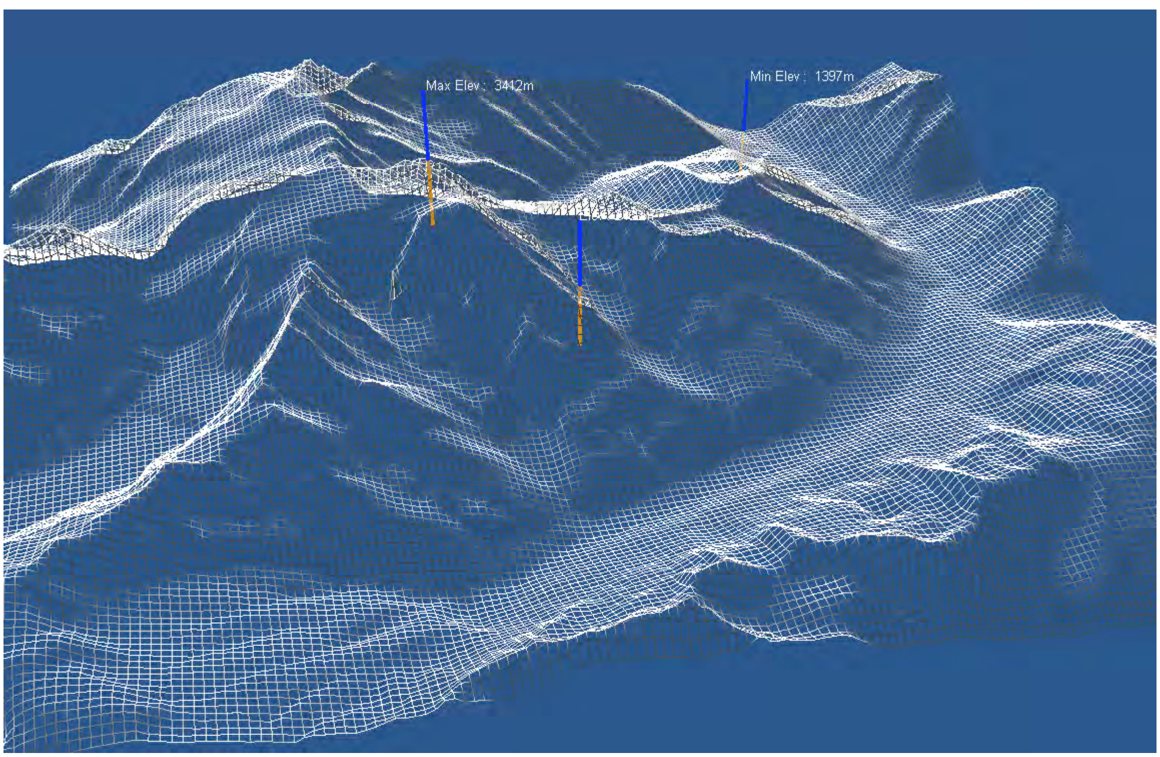


Exhibit 2.3: Study Area – Looking South

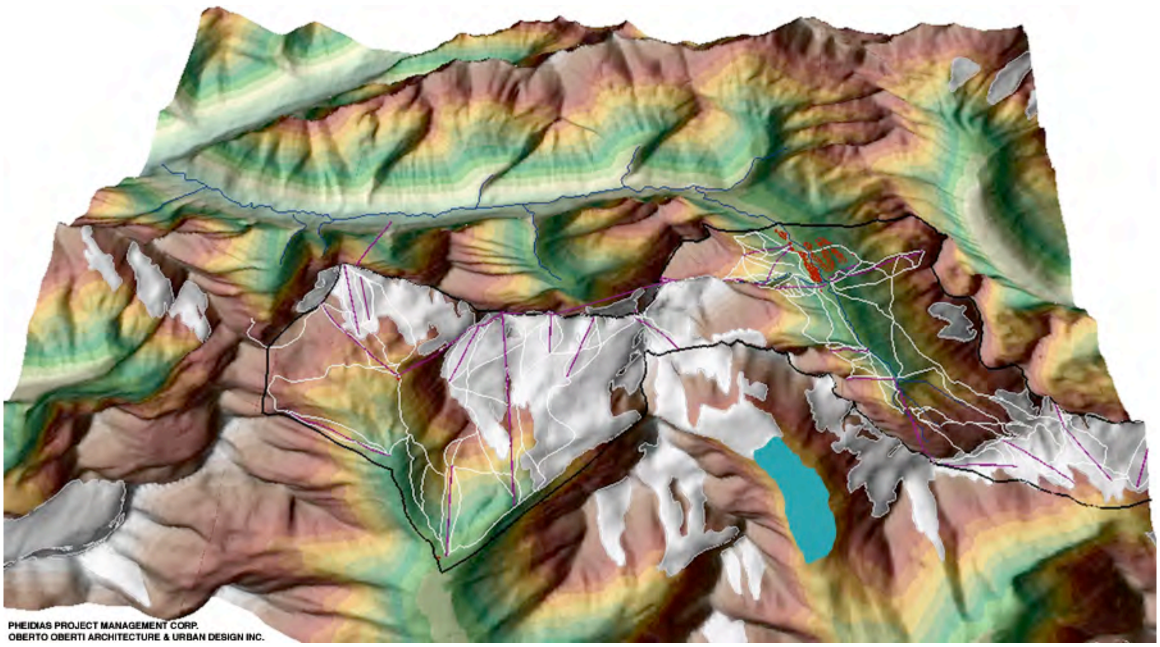


Exhibit 2.4: Study Area – Looking North

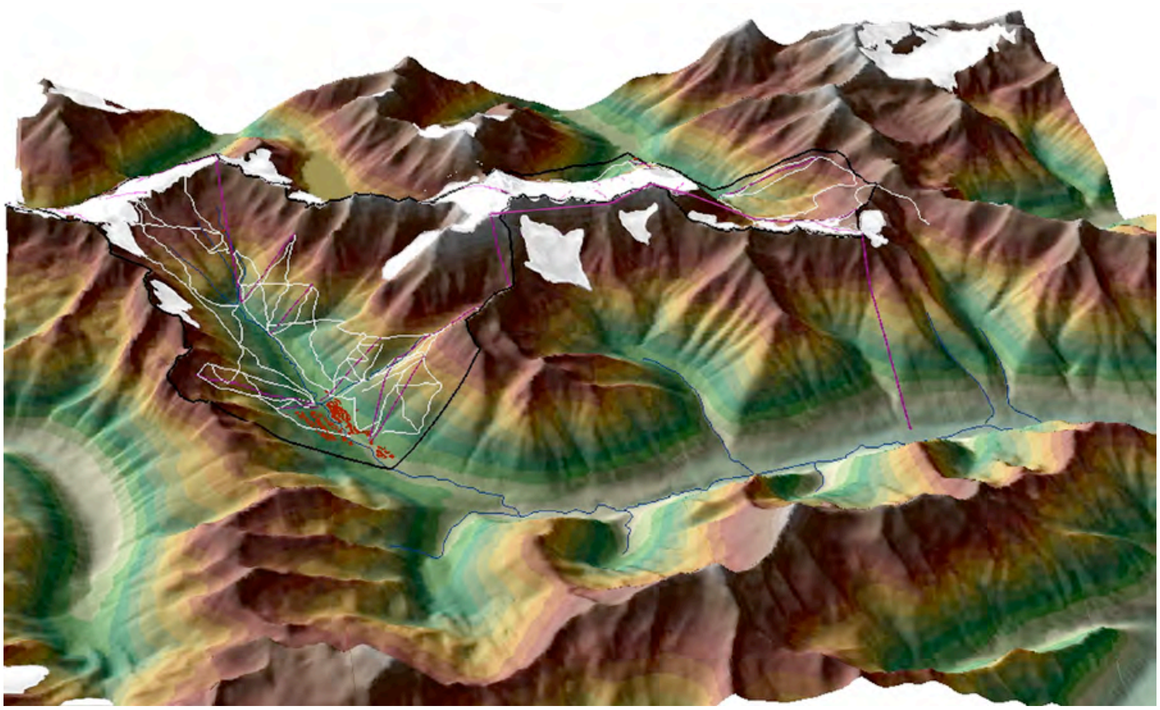
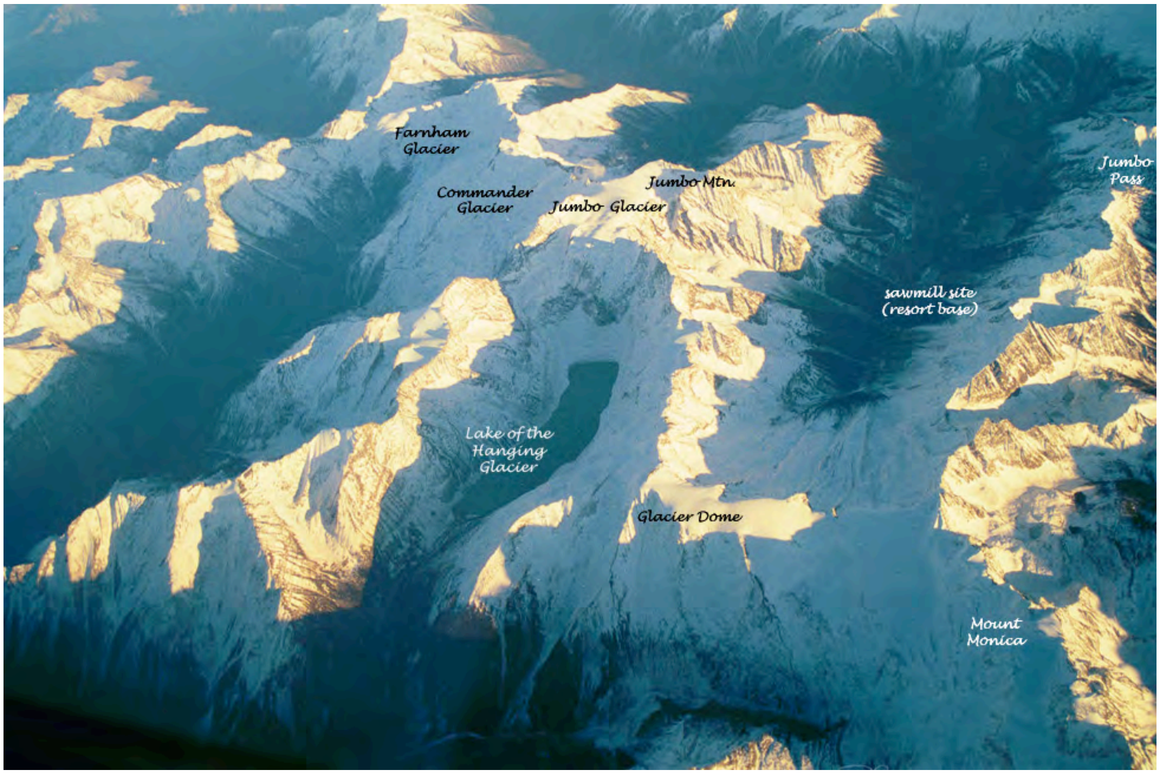
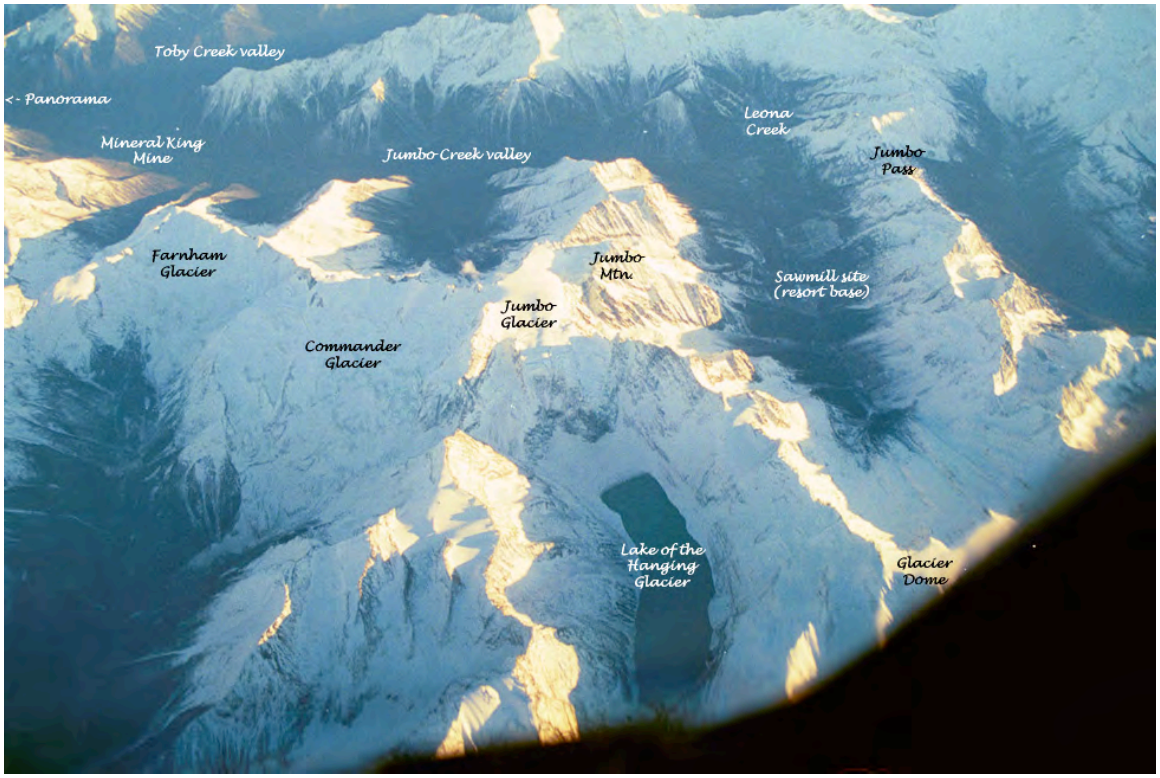


Exhibit 2.5: Study Area – Aerial Photos





2.2.2 Resort Base Location

The Jumbo Mountain massif can be accessed by way of two major valleys, Jumbo Creek valley (Jumbo Creek being a tributary of Toby Creek, which is in turn a tributary of the Columbia River) and Horsethief Creek valley (Horsethief Creek being a tributary of the Columbia River). Both valleys have been harvested in proximity to the site, and consequently both have forestry roads running through them.

The most favourable access route, however, is through Jumbo Creek, with a resort base located at the abandoned sawmill site in the upper Jumbo Creek valley. A few of the benefits associated with this location are as follows:

a) The proposed skiable terrain encompasses the areas accessed by both Glacier Dome and Jumbo Mountain. The Glacier Dome area will be an ideal initial ski development area, providing both skiing and sightseeing year round; it is also capable of making Olympic level summer ski training possible in Canada for the first time. The ultimate experience, however, will be offered by accessing Commander Glacier from Jumbo Mountain. The altitude and the view from the summit will be on a par with the most famous locations in the Alps, and will place the Purcell Mountains in British Columbia on the world tourist map. The Jumbo Mountain access into the Farnham Creek drainage would also provide easy access to Farnham Glacier to the East.

b) In order to properly service both Glacier Dome and Jumbo Mountain from the resort base (and thus create a synergy between activities within the resort and on-mountain activities), it is important that the resort base be within the Jumbo Creek valley. The existence of the well-developed road to Panorama, of the lesser-developed road to the Mineral King Mine site and of the improved forestry road to the proposed resort site, will facilitate easier access during the early construction stages, and will reduce the amount of new road construction required.

c) The proposed resort site will offer unique benefits to the existing resort at Panorama, which will soon reach its maximum bed base of 7,000 beds. It is often the case that two resorts along the same road become mutually supportive. This has become apparent in many cases, particularly in the Whistler and Blackcomb example.

d) The location on the south side of Glacier Dome, with a length of open valley floor stretching to the south will help the resort capture the greatest extent of summer and winter sunlight possible. From a resort planning perspective, a sunny southern exposure is ideal. Yet this situation is rare for a ski resort in North America. Many existing ski resorts are located at lower elevations and in poorer climates for skiing that preclude them from being located on the south side of mountains. In the upper Jumbo Creek valley, the south side is ideal, with proven outstanding skiing conditions and with two and a half to four metres of dry snow accumulation on the valley base in winter.

Exhibit 2.6: Resort Base Location

Exhibit 2.7: Resort Base Location – Sawmill Site

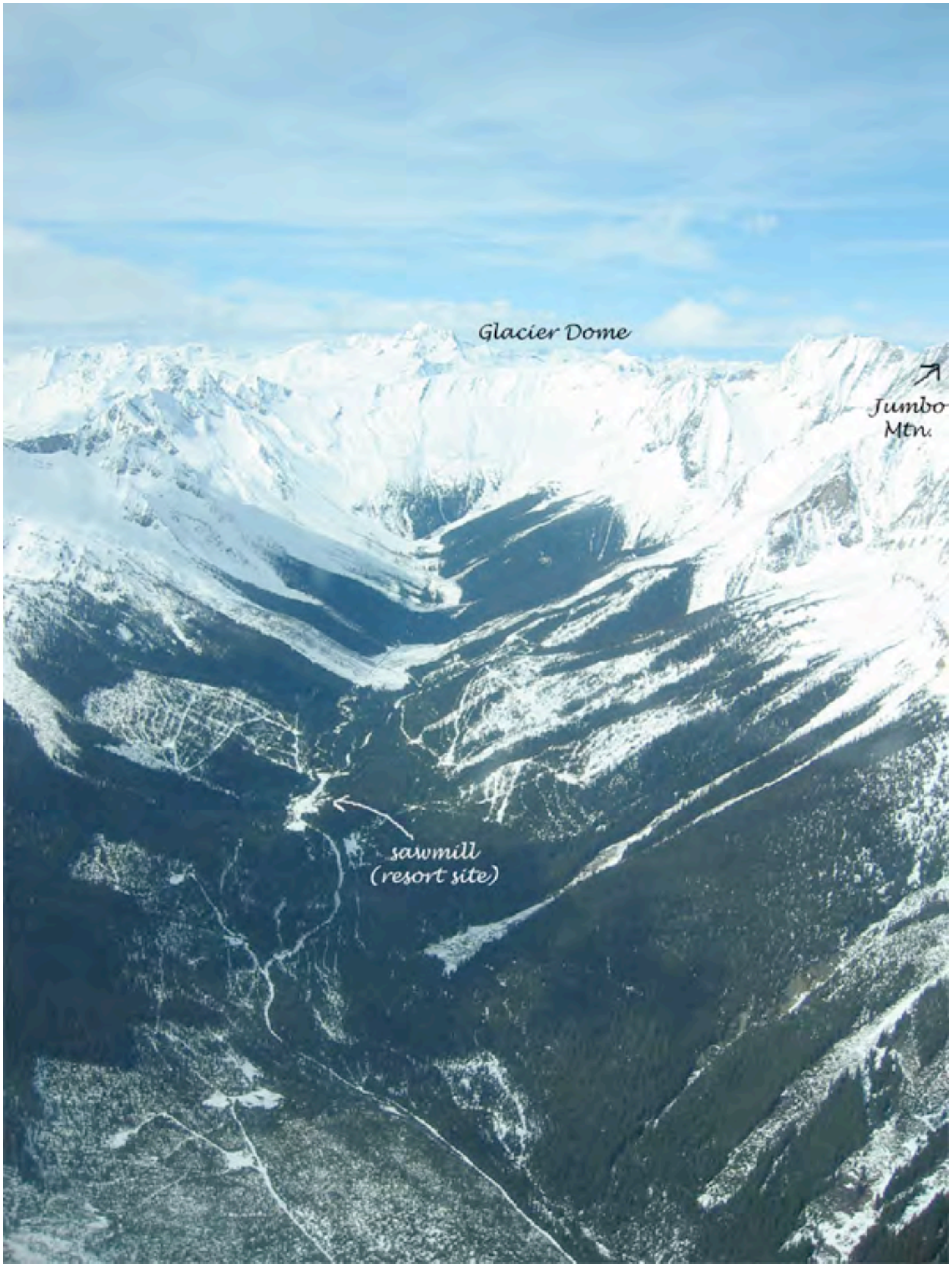


Exhibit 2.8: Sawmill Site – Overhead View

2.2.3 Base Elevation

The elevation of the resort base is approximately 1,700 metres (5,577 feet). This elevation, combined with the weather patterns in the area, helps to keep snow cover at the resort base site well into spring.

For comparative purposes, the approximate base elevations of other ski resorts have been shown in Table 2.5.

Table 2.5: Resort Base Elevations – Various Ski Resorts

Ski Area	Base Elevation
Aspen, U.S.A	7,900 ft./ 2,409 m.
Blackcomb, Canada	2,214 ft./ 675 m.
Cervinia/Valtournanche, It.	6,724 ft./ 2,050 m.
Chamonix, Fr.	3,378 ft./ 1,030 m.
Courchevel/Val Thorens, Fr.	5,412 ft./ 1,650 m.
Courmayeur, It.	4,015 ft./ 1,224 m.
Gstaad/Reusch-Diablerets, Switz.	3,608 ft./ 1,100 m.
Jackson Hole, U.S.A.	6,311 ft./ 1,924 m.
Jumbo Glacier Resort, Can.	5,577 ft./ 1,700 m.
Kicking Horse Mountain Resort, Can.	3,900 ft./ 1,190 m.
Lake Louise, Can.	5,450 ft./ 1,662 m.
Lake Tahoe, U.S.A.	6,500 ft./ 1,982 m.
Les Menuires, Fr.	5,904 ft./ 1,800 m.
Mount Bachelor, U.S.A.	5,800 ft./ 1,768 m.
Mount Hood, U.S.A.	5,834 ft./ 1,779 m.
Mount Washington, Can.	3,680 ft./ 1,122 m.
Panorama, Can.	3,600 ft./ 1,098 m.
Sestriere/Cesana, It.	6,675 ft./ 2,035 m.
Snowbird, U.S.A.	8,000 ft./ 2,439 m.
Snowmass, U.S.A.	8,220 ft./ 2,506 m.
Sunshine Village, Can.	5,440 ft./ 1,660 m.
St. Moritz, Switz.	6,088 ft./ 1,856 m
Vail, U.S.A.	8,200 ft./ 2,500 m.
Val d'Isere, Fr.(	6,068 ft./ 1,850 m.
Whistler, Can.	2,214 ft./ 675 m.
Zermatt, Switz.	5,314 ft./ 1,620 m.

2.2.4 Setting

The jagged peaks, the glaciers and the valleys surrounding Jumbo Mountain provide spectacularly beautiful scenery. This mountain majesty provides the kind of magical setting that is characteristic of so many fine European mountain villages. Nestled in the partially tree covered valley floor, the resort will be complementary to the surrounding beauty, and will give it a new dimension of character and excitement.

Jumbo Creek winds through the valley, carrying snowmelt and rainwater down to Toby Creek. It will provide visual amenity for the area and the noise of running water to the resort.

Vegetation in the valley is abundant, although a significant amount of the tree cover has been removed through logging operations, which resumed in the 1990s, and through forest fires. New growth has begun to take place, and the resort development will help stabilize the growth, providing for sensitive distribution and future care of the tree cover. It is important to note that it is in the obvious interest of the proponent to restore the Valley floor to "natural" conditions as soon as possible and to protect it from further visual impact.

The Mineral King Mine site at the junction of Toby and Jumbo contains an abandoned small village, partly overtaken by the forest, but with several house foundations still visible.

2.3 ACCESS

2.3.1 Road Access

Access to the site is gained from the Columbia Valley region. The valley supports a number of residential and recreational facilities, and therefore has a substantial transportation network in place.

The main traffic corridor through the region is Highway 95, which connects with Highway 3 from Vancouver to the south, and with Highway 93 to Calgary and Edmonton to the north. Highway 93 also provides access to Banff and Kootenay National Parks. Approximately 4,000 vehicles per day access Kootenay National Park from Highway 93 during a peak summer day. All three roads are part of a first class inter-provincial highway system. Calgary, the closest major city, is approximately 332 km (208 miles) from the proposed site.

Some consideration has been given in the past to opening a road between Calgary and Nelson that would pass about 4 km (2.5 miles) southwest of the resort base site, through Jumbo Pass. A policy document issued by the Ministry of Transportation and Highways of the Province of British Columbia before the proponent became involved with the project, entitled "A Transportation Overview for the Province of British Columbia," listed the Jumbo Pass road as a priority for both engineering and feasibility studies. There is considerable controversy about the Jumbo Pass road proposal, which seems to have support by some people in Nelson but to be strongly opposed by some communities near Argenta and in the West Kootenays.

The CORE Report specifically opposes a road linkage to Nelson through Jumbo Pass and a condition for its support of the approval process for Jumbo Glacier Resort was that no road linkage through Jumbo Pass is provided. The Jumbo Glacier Resort proposal and the Master Plan are based on the assumption that the Jumbo Pass road will not be built. Currently, the MoT has completely abandoned the project. Jumbo Pass and the Jumbo Pass road proposal have often been wrongly connected with the Jumbo Glacier Resort proposal, but it is important to emphasize that the two proposals have no connection, as confirmed by the Environmental Assessment Office in its project Specifications, and that a highway through Jumbo Pass as an alternative East/West connection for the Province would be very different, in terms of traffic, design and posted speed limit, from an improved forestry road to a destination resort that is proposed for Jumbo Glacier Resort.

A destination resort does not depend on a through road. In fact the argument is often made that a true destination resort should not cater to automobile traffic, and would benefit from a degree of seclusion, protecting its remoteness and its natural setting. Many famous Swiss resorts are not accessible by car, like Zermatt, or Wengen, which are only accessible by railway, and their remoteness has increased their appeal. Jackson Hole, in North America, although accessible by car, is perhaps the finest example of a remote resort on this continent.

A destination resort is designed to cater to longer-term clients rather than day skiers and gains greater appeal by not having an excessive influx of day skiers during weekends.

The distance from the proposed resort base site to Invermere is approximately 50 to 60 kilometres (31 to 37 miles). Table 2.6 gives approximate driving distances from the site to several major cities in both Canada and the United States and Table 2.7 shows comparative driving distances for resorts in British Columbia.

Table 2.6: Driving Distances from Major Cities

City	Approximate Distance
Calgary, Alberta	332 km / 208 miles
Edmonton, Alberta	627 km / 392 miles
Spokane, Washington	493 km / 308 miles
Seattle, Washington	1,152 km / 720 miles
Vancouver, British Columbia	845 km / 525 miles

Table 2.7: Comparative Driving Distances for British Columbia Resorts

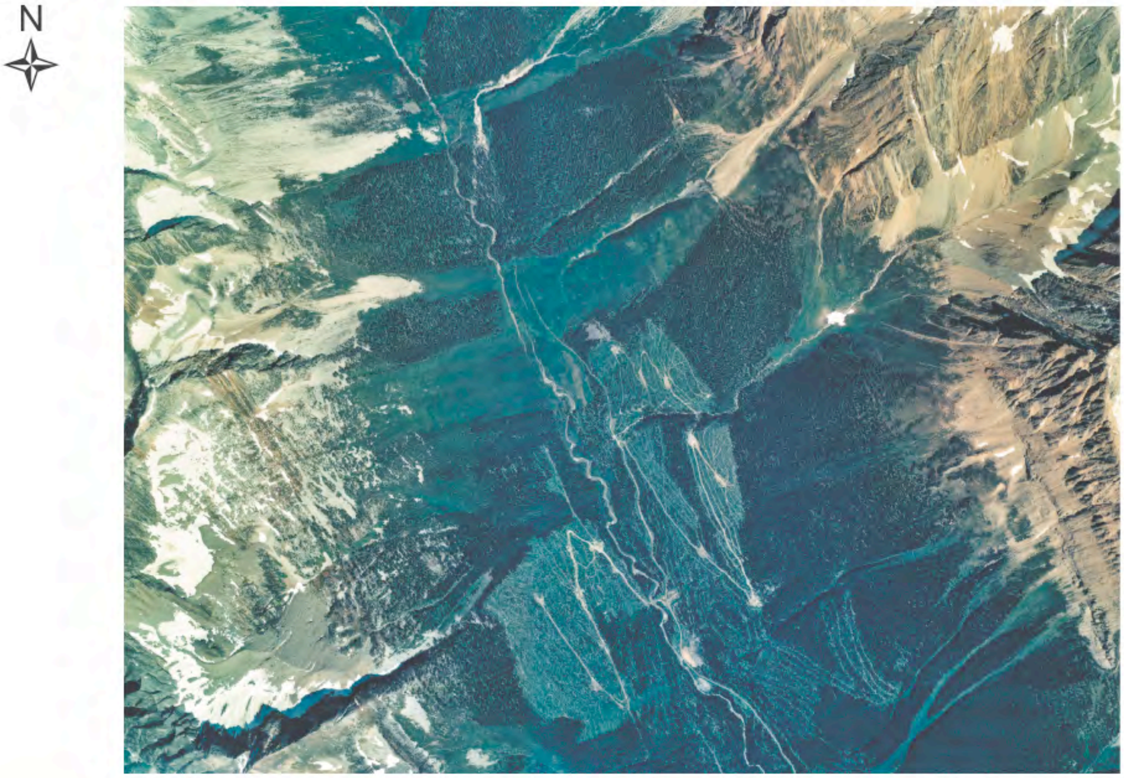
Resort	Nearest Town/ Distance	Nearest Major City/ Distance
Jumbo Glacier Resort	Invermere / 54 km	Calgary / 332 km
Apex	Penticton / 33 km	Vancouver / 400 km
Big White	Kelowna / 55 km	Vancouver / 440 km
Silver Star	Vernon / 22 km	Vancouver / 409 km
Sun Peaks Resort	Kamloops / 50 km	Vancouver / 370 km

2.3.1.1 Existing Access Road and Improvements

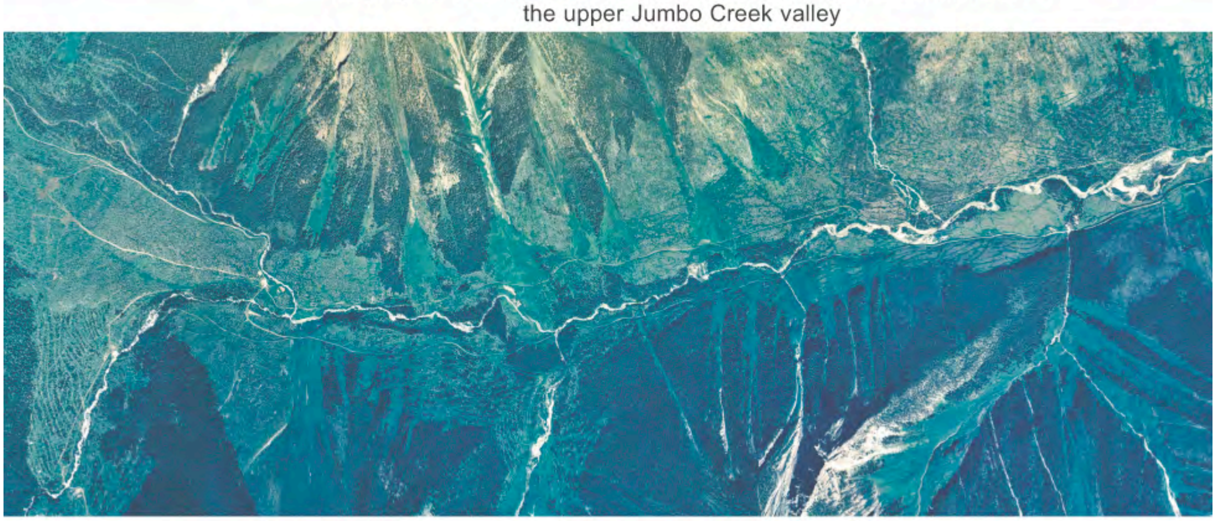
The sawmill site proposed for the resort base is approximately 54 km West of Invermere, which is approximately 2 km West of Highway 95. Existing access to the site is provided by an all-weather, asphalt, two lane, 60 km/h surfaced roadway to Panorama (approximately km 0 - km 18); an all-weather, gravel roadway to Mineral King Mine at the confluence of Toby and Jumbo Creeks (approximately km 18 – km 38); and by a forestry roadway to the proposed resort base site (km 38 – km 54), upgraded in the 1990s and now suitable for all vehicles.

Access road improvements are discussed in Section 5.2.

Exhibit 2.9: Aerial Overview of Existing Roads in Jumbo Creek Valley



The proposed resort base location is in an abandoned sawmill site in the upper Jumbo Creek valley



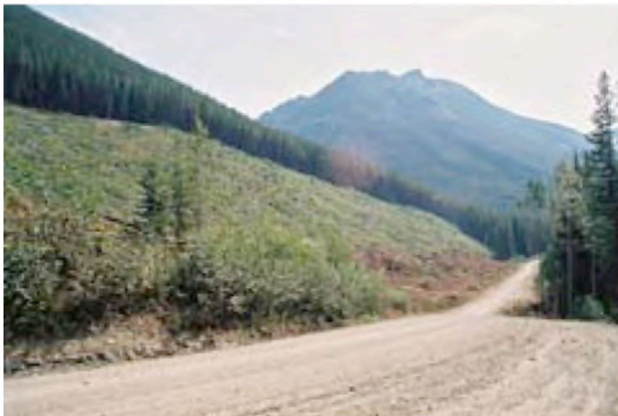
Aerial view of existing road alignments through the lower Jumbo Creek valley. Note the junction between Leona Creek and Jumbo Creek on the left hand side of the picture. Jumbo Creek turns North and Leona Creek turns South.

Exhibit 2.10: Sawmill Site and Roads in Upper Jumbo Creek Valley

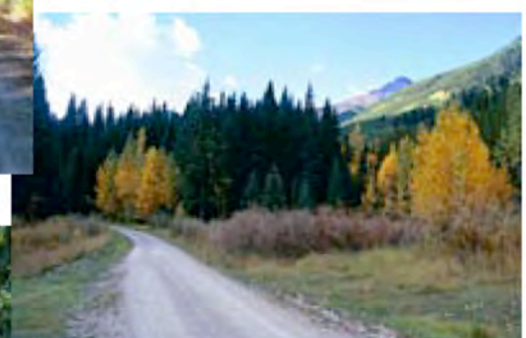
The abandoned sawmill site looking northwest in summer and early winter.

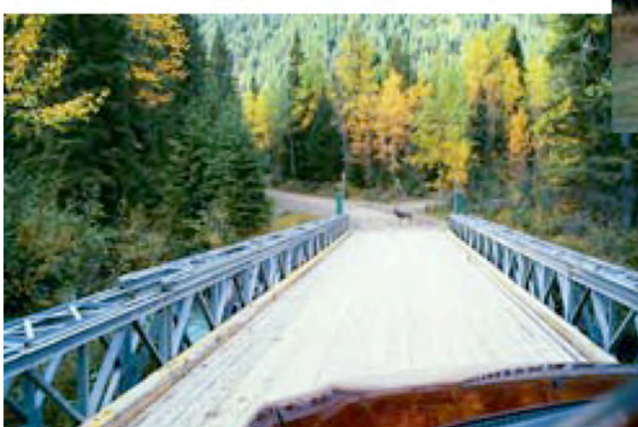
Looking in an east/ south-easterly direction. It is possible to see the turn into the Lower Jumbo Creek Valley on the right hand side of the picture. The sawmill site (the proposed resort base) is at an elevation of 1700m. No switchbacks are necessary in order to reach this site.

Exhibit 2.11: Existing Roads in Jumbo and Toby Creek Drainages



Existing road conditions in the Jumbo and Toby Creek drainages.





The bridges in the Jumbo and Toby Creek drainages were upgraded in the mid-1990s.

2.3.2 Air Access

The proposed resort can be accessed easily via the existing international and regional airways system. Transoceanic flights presently land in Vancouver, Seattle, Calgary and Edmonton. Calgary International Airport is the nearest international and transoceanic airport. Cranbrook , B.C. and Spokane, Washington are important regional airports in relative proximity to the site.

Travel times to and from other parts of the world from the study area are particularly quick. There are numerous non-stop international flights to and from Calgary. The lack of required connections is a real bonus for travellers as it saves time in baggage handling and possible misconnections of flights. The added advantage is that compared to most of the airports in the United States the international airport in Calgary is relatively small and efficient. From Calgary to the Jumbo Creek resort base location it will take approximately four hours by car through the Banff and Kootenay National Parks.

Although Calgary is an outstanding international airport and the drive through the National Parks is one of the most beautiful in the world, it is anticipated that with the expansion of the Cranbrook airport and the one at Fairmont, the region will soon see an expanded offer of new services, with direct flights to major North American cities. The proposed project will ultimately be served directly by these two airports, with travel time reduced to about two hours from Cranbrook and three quarter hours from Fairmont, although Fairmont is not expected to have more than one or two regional flights a day even in the longer term future.

Air Canada Jazz is presently servicing Cranbrook airport (approximately 130 km south of Invermere), with multiple daily scheduled flights connecting to both Vancouver and Calgary. The Cranbrook airport features two runways (16/34), the longest is 1,830 metres (6,000 feet). It is 150 ft wide at 3,082 ASL and features high intensity runway and approach lighting. Navigational aids include instrument landing system, nondirectional beacons VOR/DME, VOT and DF services. Communications consist of a 24-hour Flight Service Station providing landing/takeoff and safety advisories and a 24-hour weather program. The airport was transferred from Transport Canada to the City of Cranbrook on March 13, 1997. It is currently in a five-year contract with Vancouver Airport Services Ltd. to provide management, operation and maintenance services. The terminal building was constructed in 1974 and includes a licensed lounge, cafeteria, car rental agencies and Revenue Canada Customs are available as required. A major new maintenance facility was recently constructed. In 2001, Cranbrook airport handled 74,000 passengers and 15,000 aircraft movements. The airport also has a long history of hosting successful and popular air show events.

The Cranbrook Development Authority and Resorts of the Canadian Rockies are currently working on the development of an integrated marketing strategy to attract more traffic through the airport and into the regions' tourist establishments. Of particular significance are the recent attempts to attract Horizon Air into Cranbrook. If successful, a daily route between Seattle and Cranbrook would be established.

An ambitious expansion program for the Cranbrook Airport is currently underway and is expected to be completed in the near future. The runway will be lengthened to 9,000 feet from the current 6,000 feet to accommodate wide-body international charter flights. Ground handling capabilities will be enhanced accordingly and passenger amenities expanded considerably. The Cranbrook Airport is soon to become known as "Gateway to the Rockies International Airport."

Fairmont Hot Springs Airport, with a runway length of 1,830 metres (6,000 feet), is currently serviced only by private and charter flights. CAIR Western Airlines, a Vancouver based carrier, announced plans to commence passenger service in May 15, 1991, to this airport. The carrier planned to utilize an eighty-six seat BAe 146-100 aircraft. Connector flights would have been available to both Calgary and Vancouver on a full schedule service. Montair briefly implemented scheduled service to Vancouver during 2000, but abandoned scheduled services after about a year. The Ministry of Transport has indicated that they may provide customs services if there is a demand for foreign flights.

Invermere also has an airport, with a runway length of 915 metres (3,000 ft). Charter flights are available from Babin Air, which occasionally flies people from Panorama to Kicking Horse Mountain Resort for a spectacular moonlight dinner at the Eagle's Eye Restaurant at the mountaintop there. Invermere is currently a popular soaring or gliding centre and the Columbia Valley is reportedly one of the best mountain soaring sites in the world. A number of world record-breaking 1000 km+ soaring flights have been flown from Invermere.[19]

Approximate distances from the local airports to the proposed resort are shown in Table 2.8 below.

Air access to the resort base site is not proposed, but it could be provided by helicopter on a charter basis or on special occasions, since it is proposed and anticipated that the resort base will also serve as a new base for expanded R.K. Heli-Ski operations.

Table 2.8: Travel Distance to Local Airports

City	Approximate Distance to Resort Base
Cranbrook	200 km / 125 miles
Fairmont Hot Springs	79 km / 49 miles
Invermere	54 km / 35 miles

2.3.3 Train Travel

The world-renowned Canadian Pacific Trans Canada Railway, now serviced by The Rocky Mountaineer train, by Via Rail and by other private tour companies, has as its highlight a stop at Banff. Most tourists stop here for a taste of the Rockies. From this location travel time to Jumbo Glacier Resort would be approximately 3 hours. A tourist train circling the mountains from Calgary to Cranbrook and Golden has travelled through Invermere. If this route were to be successful a train may stop in Invermere, which is less than an hour away from the project site. A combination train and bus could become a successful access proposal for tour operators.

[19] Invermere Soaring Centre: *SoarTheRockies.com*

2.4 GLACIERS

The experience of standing in the rarefied air above the snow on mountaintop glaciers will be a unique feature characterizing this project, together with the views of the majesty of glaciated mountaintops. In addition to the sightseeing and the experience of being in a special and awe-inspiring environment, the snow covering the glaciers year round is of special importance to sports such as skiing and snowboarding.

Glaciers have survived to our day following the end of the last Ice Age because they are located in areas of greater snow accumulation than elsewhere, due to latitude, elevation and climate. Glaciers promise superior skiing conditions in winter, and the opportunity to ski substantial terrain also in the summer, creating a year round opportunity.

Due to their high elevation, the glaciers in the Purcells offer a sun experience and atmosphere that is similar to that of Colorado and Utah, and because of the permanent snow and challenging peaks, they also offer a true mountain top exhilaration that is missing in the more rounded landscape of the central U.S. mountains. In the summer, when the sun is almost vertical to the glaciers, the experience is often compared to that of a beach. The conditions are ideal for ski schools, and Olympic calibre ski training. Perhaps this is why in Euriope, Passo Stelvio, Les Deux Alps and the Austrian glaciers have become popular and even legendary summer destinations for skiing.

Ski resorts should ideally be located at high altitudes where natural snow is abundant – near glaciers especially. This safeguards against the possible impacts of short-term climate change at lower elevations and less favourable latitudes and mitigates the impact that many current resorts have on current energy consumption by eliminating the need for snowmaking.

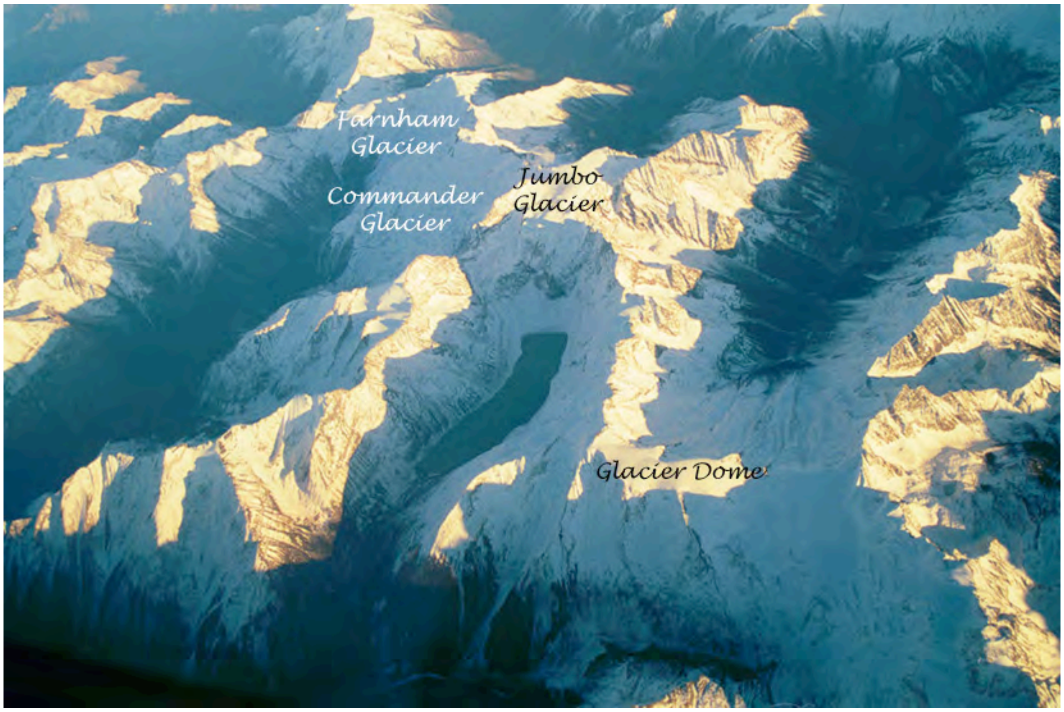
2.4.1 Access to Glaciers

Three glaciers, Glacier Dome, Jumbo Glacier**Error! Bookmark not defined.** and Commander Glacier can be accessed directly from the proposed resort base site. Access to a fourth glacier, Farnham Glacier is available from three directions and will be provided either at the beginning or at the end of the project depending on the interest of CODA and Alpine Canada Alpin for ski training, whether they desire it in the immediate future or later. All of these glaciers will eventually be reached by lifts from the resort base location, and will provide year round skiing opportunities.

As noted before, access to these glaciers will give the proposed development the distinction of being the only ski resort in North America that can compare favourably with European resorts with access to major glaciers, such as Zermatt, Chamonix or Courmayeur, and provide unsurpassable views.

In addition to giving access to the above noted glaciers by ski lifts, the development can function as an ideal base of operations for helicopter skiing. In fact, the existing heli-ski company has been considering moving its base of operations to this area, and in the past it has made an application for a heli-ski lodge in the Jumbo Creek valley. This would allow easy access to the other surrounding glaciers, thereby adding another exciting dimension to the recreational opportunities offered by the resort. The heli-ski activities and the proposed resort are ideally suited to complement each other.

Exhibit 2.12: Overview of Glaciers (1)



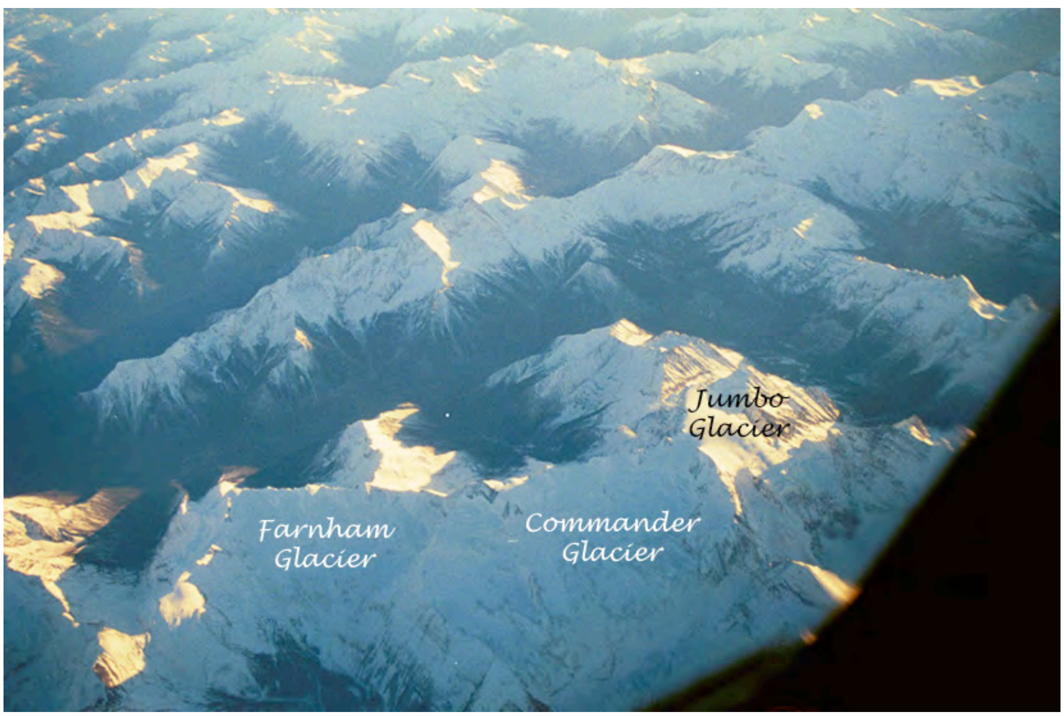
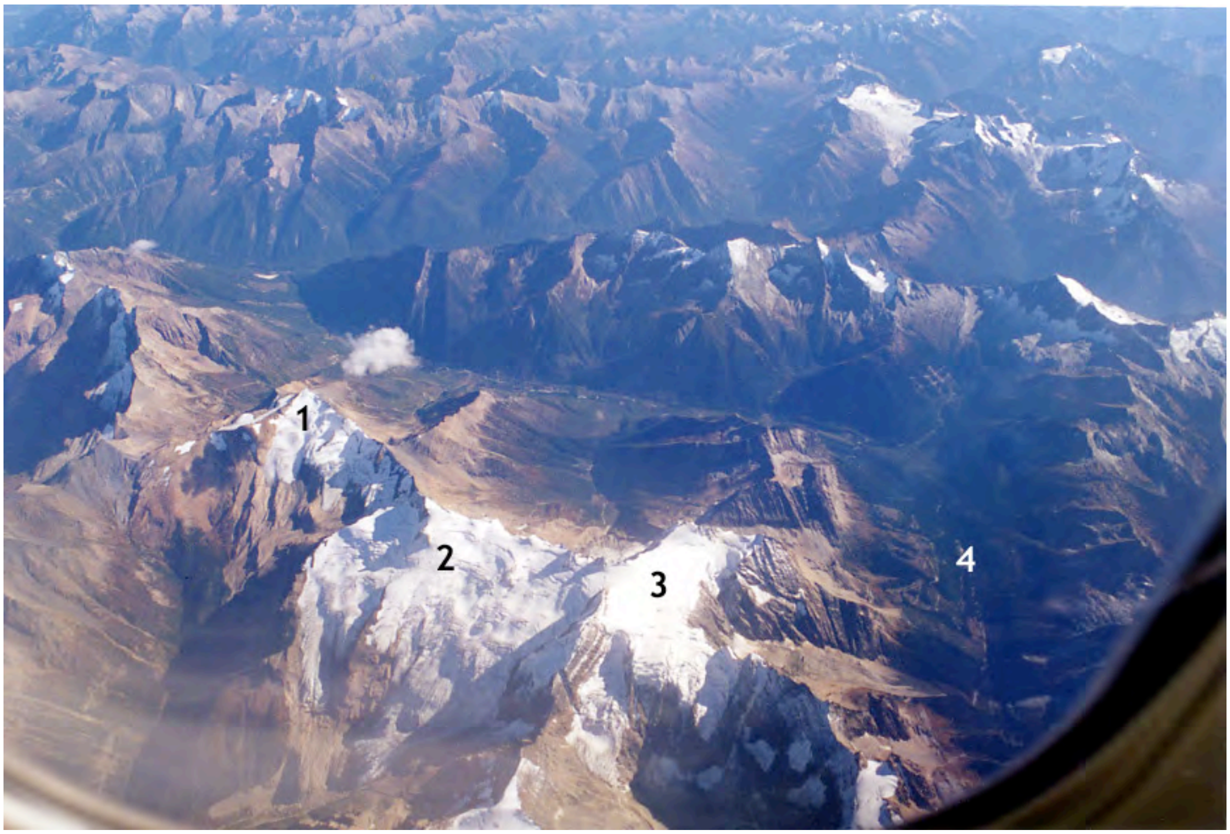


Exhibit 2.13: Overview of Glaciers(2)



1. Farnham Glacier, 2. Commander Glacier, 3. Jumbo Glacier, 4. Resort Base location (sawmill site).

Exhibit 2.14: Glacier Dome (1)

Exhibit 2.15: Glacier Dome (2)

Exhibit 2.16: Views from Glacier Dome

Looking northeast from the proposed Teahouse location near the top of Glacier Dome. The inaccessible end of the Lake of the Hanging Glacier is visible from this point. Jumbo Mountain and Jumbo Glacier are also visible.

Looking south from the top of Glacier Dome towards the proposed resort base location in an abandoned sawmill site in the upper Jumbo Creek valley. Jumbo Mountain is to the left of this picture.

Exhibit 2.17: Glacier Dome in Summer

Glacier Dome and Mount Monica in August.

The top of Glacier Dome in August. This vantage point is near the proposed Teahouse location. The Jumbo Creek valley opens to the left of this picture. Mount Monica is located directly ahead.

Exhibit 2.18: Jumbo Glacier

Exhibit 2.19: Jumbo Glacier in Summer

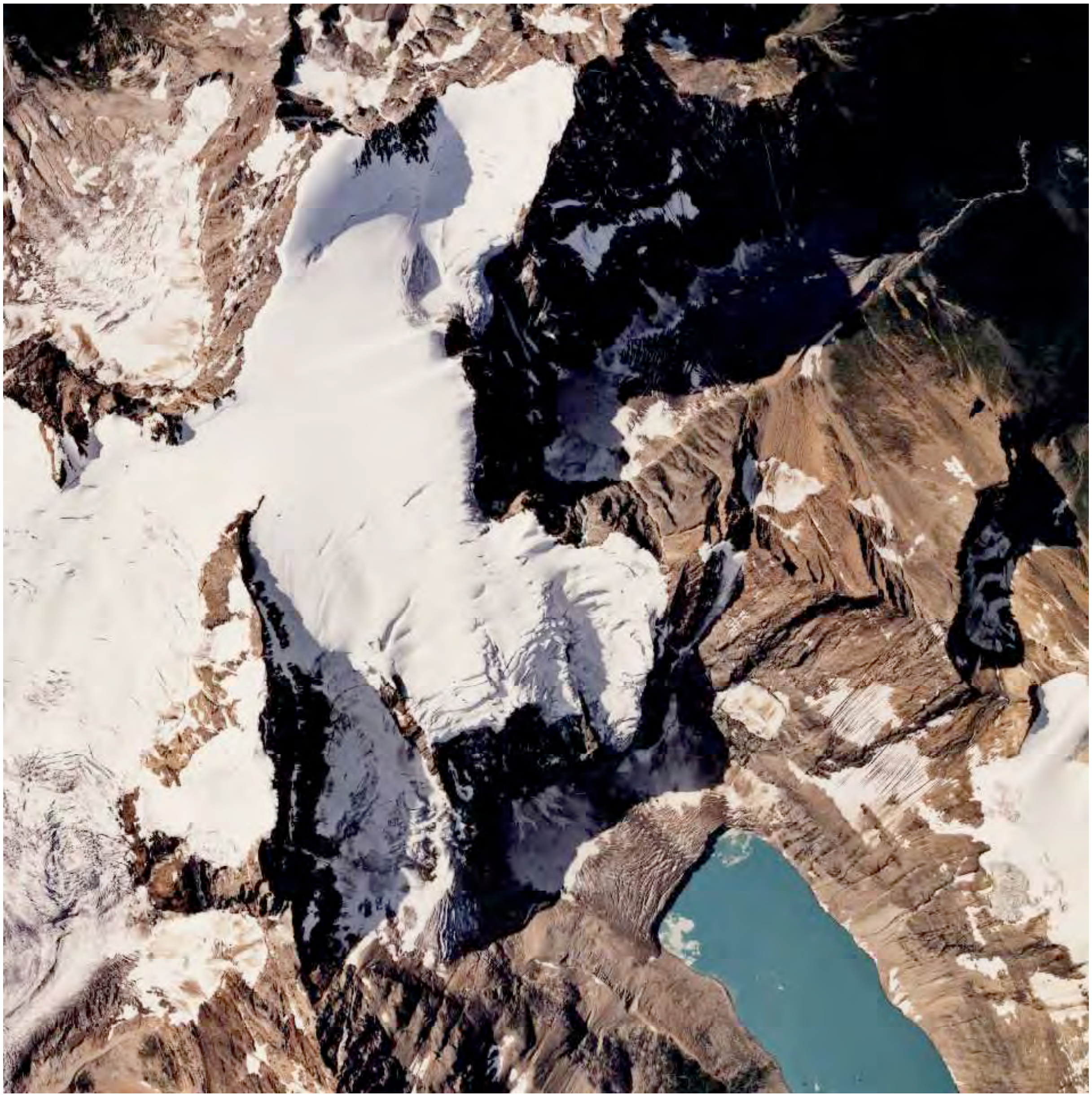


Exhibit 2.20: Commander Glacier (1)

Exhibit 2.21: Commander Glacier (2)

Exhibit 2.22: Skiing Commander Glacier

Exhibit 2.23: Farnham Glacier

Farnham and Commander Glaciers in summer. Farnham is on the left and Commander is on the right.

Farnham Glacier in winter as seen from a vantage point directly above Commander Glacier.

Exhibit 2.24: Farnham Glacier in Winter

Exhibit 2.25: Summer Skiing on Farnham Glacier (1)

Canadian national ski team training on Farnham Glacier in July 2003.

Exhibit 2.26: Summer Skiing on Farnham Glacier (2)

Canadian national ski team training on Farnham Glacier in July 2003.

2.4.2 Glaciology

A glacier is a mass of ice that has been formed by the recrystallization of snow, and that flows forward, or has flowed at some time in the past, under the influence of gravity. Glaciers form when more snow falls during winter than melts and evaporates in summer. The glaciers under consideration, Glacier Dome, Jumbo Glacier, Commander Glacier and Farnham Glacier, are "valley glaciers" which have visibly undergone considerable ablation in the past century. Jumbo Glacier is calving in a spectacular fashion into the Lake of the Hanging Glacier, presenting a "world class" view of a natural phenomenon for the observation of the traveller reaching an observation point on Glacier Dome.

Today we are transitioning out of an age of moderate glaciation which ended at the beginning of the 1800s. The behaviour of the glaciers under consideration has been observed by the heli-ski guides for over twenty-five years and has been carefully monitored by the consulting team in the last fifteen years. It is not anticipated that these glaciers will significantly vary their behaviour in the next half century (see also Section 2.4.3 below). Slow ablation will continue, but it is not anticipated to affect the resort and the skiable terrain in any significant manner.

Lower Jumbo Creek valley contains glacial deposits such as till and outwash sand and gravel. The valley floor also has recent alluvial fans and terraces as well as local rock fall debris and masses of weathered bedrock. There are a number of fans formed by a combination of glaciofluvial, alluvial, debris-flow and debris-flood processes. Maxwell and Ryder's mapping indicates snow avalanches have affected the valley floor historically.

Michael Maxwell has reported on the glaciers being examined at various times since 1992.

2.4.3 The Warming Trend and Glacier Retraction

From the Middle Ages to the end of the eighteenth century, glaciers expanded under a cooling trend. Glacier retraction is a reality that is evident throughout North America, including the Purcells. Anyone who has visited the Columbia Icefields in Jasper National Park, for example, can observe a retreat that is typical of most glaciers. However, visitors to the Columbia Icefields typically only see the toe of the glaciers, where the retraction is most visible and where the ice surface is exposed in the summer. Similarly most hikers visit glaciers in the summer and only see the bottom of glaciers where the growth of the moraines and the retreat of the ice are most visible. The part of the glaciers that is most interesting for skiing, however, is **the accumulation area, which is at the top and is covered with snow both in summer and winter**.

The health of a glacier is dependent on a balance between the snow that is falling in the accumulation area and the ice below that is melting from ablation. The growth or decrease of glaciers is more dependent on the amount and type of precipitation than from the general rise in temperature. In fact it is not clear whether the warming trend will continue and increase the retraction of glaciers in general, or whether it will increase precipitation to the point that glaciers may expand rather than contract. For example in the mountains of the Coastal Range of B.C. winter precipitation in the form of snow is so massive that glaciers continue to exist at elevations as low as 2,000 metres (6,562 ft.), like Horstman Glacier at Blackcomb, even if the climate is warmer than in the Purcell Mountain range, where glaciers are almost 1,000 metres (3,281 ft.) higher in elevation, ranging between 3,400 metres (11,155 ft.) and 2,600 metres (8,530 ft.). A warming trend could increase precipitation and snowfall in areas that are hard to pinpoint but that could easily include the higher elevations of the interior of B.C.

A major reduction in size, or the complete disappearance of the collection area of major high-elevation glaciers in B.C. would entail a cataclysm that is currently not foreseeable and not forecasted by scientists. Such a cataclysm would likely render every existing ski resort inoperable.

If one is to envision the most extreme and unlikely of scenarios where skiing would no longer be possible, the viewpoints offered by this project would surpass the Jungfrau in the Alps and would make the project worthwhile as a sightseeing experience of the mountaintops, and it would remain a unique experience that would be worthwhile to offer to the Canadian and North American public.

In addition, the notion that a formerly glaciated area is unskiable is not correct. On the contrary, the high elevation of mountains like Jumbo would replace the base of the ice mass with snowfields in winter and would make the area even easier to ski on, as it is where glaciers have already completely withdrawn (for additional reading on climate change and its impact on Jumbo Glacier Resort, please see Section 2.5.5, below).

In summary, for the proposed Jumbo Glacier Resort project, glaciers are not only an opportunity to have unparalleled views from the mountaintops, but also evidence of the abundant snowfall that makes the area the best ski area in the continent. It is only reasonable to be concerned with the retraction of the glaciers, but unless there is a catastrophic change in climate, the collection area will not change substantially in the foreseeable future, and this has been confirmed by the expert advice that the proponent has received from Dr. Michael Maxwell and from Peter Lev, among the many qualified members of the project consulting team.

See also Appendix 2-C: Climate, Water and Glaciers Fact Sheets.

2.4.4 Crevasses

The project studies focused on four glaciers, Glacier Dome, Jumbo Glacier, Commander Glacier and Farnham Glacier. They are different glaciers, which move differently and have different crevasse areas.

Glacier Dome is a very easy to ski glacier, working mostly in compression and with narrow crevasses over which it is possible to walk across even in the summer when they are most open. Farnham Glacier is also a relatively easy glacier on which to map ski runs, and has been repeatedly proposed for summer training by Alpine Canada Alpin. Commander Glacier is at the opposite end of the spectrum, with a mid range icefall of crevasses reminiscent of the Vallée Blanche in the Mont Blanc area of the Alps. It is a beautiful glacier that will provide the most spectacular winter ski runs in the world, according to many experts and particularly according to Peter Lev, who explained this point to the Project Committee in 1995. The crevasses of Commander Glacier can look like a formidable and frightening area to cross, just like La Mer de Glace of the Mont Blanc area.

Roger Madson and the guides of R.K. Heli-Ski skied the runs of Commander Glacier by helicopter only occasionally, when the snow bridges were at their best. Peter Lev and Dan Griffith have studied the glacier when crevasse areas are wide open, and identified two runs, and probably a third run, that could be skied in winter with reasonable expectations of solid snow bridges over the crevassed areas. These runs would be marked by the ski patrol and the natural snow bridges made stronger by normal compaction done by snow groomers when grooming the ski runs. Groomed ski runs and ski patrol monitoring would eliminate most of the dangers that have to be assessed by the heli-ski guides in virgin terrain when selecting a downhill run. In those winters when the largest crevasses would not be bridged by the snowfall, as it may occasionally happen, logs or wooden rafts would provide the bridging necessary for the snow to accumulate. The mid range icefall of Commander Glacier is an almost impassable barrier in the summer even for experienced climbers. In the summer, skiing occurs only at the higher elevations where perennial snow provides abundant bridging year round.

On Jumbo-Commander Glacier there are more than 700 metres (2,300 feet) of vertical drop available for summer skiing, starting from elevation 3,400 metres (11,150 feet). In comparison, at Horstman Glacier, where Blackcomb provides summer skiing, the elevation is between 1,900 and 2,200 metres (6,230 to 7,200 feet), and in August summer skiing must be closed.

The Jumbo/Commander Glaciers would provide summer skiing at elevations not accessible anywhere else in North America. Jumbo Mountain is roughly 50% higher than Blackcomb.

2.5 CLIMATE

Among the site selection criteria, climate is of critical importance. Climatic conditions in the area are very favourable for both skiing and sightseeing – in summer and in winter. According to the Cranbrook Chamber of Commerce, nearby Cranbrook "enjoys being in the centre of a four season area, and is reputed to have the most sunshine hours in all of British Columbia."[20] Heli-ski operations have been established here because of the exceptional microclimate. The local operators report that on average they experience only six days per winter of closure for heli-skiing due to bad weather conditions. In addition, Jumbo Glacier Resort will be one of the few resorts in British Columbia able to offer outdoor skating in natural conditions for the entire winter season.

As a comparison, bad weather data from resorts such as Whistler is not published, but one would estimate the days of heavy precipitation or poor visibility may approach half of the season for the Whistler region.

The Pacific Coast has a generally moist climate and has a large number of days with heavy weather disturbances. At the other extreme, the plateau leading from Alberta to the Rocky Mountains is generally dry, wind swept and may be extremely cold. However, Alberta is called "sunny Alberta" because of its large number of days with clear or partially clear skies. Jasper and Banff National Parks, which are on the mountainous border between British Columbia and Alberta, receive a fair quantity of snow in proportion to their altitude but are closest to the dry and windswept Alberta climate. The Columbia River Valley is again relatively sunny and dry. However, by moving westward into the Purcells, one enters into a glacier and snow country that has the best of both worlds. The Purcells receive the last large precipitations originating from the Pacific Ocean but iare protected from the bitter cold winds from the northeast and Chinook winds from the south while still having a large number of days with clear or almost clear skies.

The subject study area focuses on the valleys of Jumbo Creek and of Horsethief and Farnham Creeks, which are in an ideal location for skiing. As indicated above, these valleys are in the last mountain ranges that receive heavy snowfalls from Pacific storms, are in a drier climate than the coastal ranges, are protected from the bitter cold of the Rockies and enjoy the clear skies that are so typical of Alberta, without being subject to devastating (for skiing) Chinook winds. Only a few kilometres to the east snow precipitation substantially decreases.

---

[20] STATS CAN pamphlet, a publication of the City of Cranbrook and the Cranbrook Chamber of Commerce

2.5.1 Unique Features

Geographically, the area is rich in beautiful mountains and is endowed with numerous large high altitude glaciers. Its latitude and high elevations result in a climate that is generally similar to that of the Alps in Europe, but with less exposure to the northern cold and southern warm disturbances affecting the Alps.

Isothermal and other climatic curves indicate why this is the ideal mountain range, as shown below:

January temperatures indicate that the area is just inside the frost line at theoretical sea level in this region, while the entire Coast Range is above the frost line, clearly indicating the effect of the ocean's humidity.

July temperatures at theoretical sea level, however, show the same temperatures as California, indicating a sunny and warm summer season, while the coastal range shows summer temperatures almost similar to those of Alaska, again indicating the small average temperature difference between winter and summer on the coastal range at theoretical sea level.

Air mass studies and isobaric curves show that the Purcell Mountains belong to the interior dry air region.

The distribution of annual precipitation and the map of climatic regions confirm that the area is in a milder zone of drier weather patterns. Experience indicates that this is one of the healthiest climates available. This is what makes the Columbia Valley already a well-known retreat for Albertans.

From an orographic perspective, the Purcell range is protected by huge mountain ranges on both the east and the west side, which restrain air movement and extreme temperature changes. On the east side, the Canadian Rockies form an effective barrier against cold Arctic air. On the west side the Coast Mountains receive the heaviest discharge of the Pacific Ocean humidity and storms; the air is then dried over the desert interior and slowed by the Selkirk Mountains. On a continental map, Peter Lev[21] considers the choice of the area ideal from a climatic point of view. It was carefully chosen by the original heli-ski operators for its climate.

2.5.2 Region

The study area lies within the Columbia Mountains climatic region in which the Purcell Mountains to the west of the site have a pronounced influence on the climate of the area. Moist eastward-moving maritime air from the Pacific Ocean rises against the western slopes of these ranges, releasing most of its precipitation. In general, the precipitation within the region increases northward and with elevation.

The key factor affecting local climate in the East Kootenays is elevation. Precipitation, for

[21] Peter Lev is a world-renowned mountaineer, a skiing and climbing instructor at Montana State University, and a co-owner of the highly-regarded Exum Mountain Guides. He has been a mountain guide for 43 years and has had first ascents in the Tetons, Colorado, and Alaska, including the first ascent of the East Buttress of Mount McKinley and climbs on Half Dome and El Capitan. He is a veteran of seven Himalayan expeditions, including Dhaulagiri, Nanda Devi, Chulu, Nun, and Pik Lenin in the Pamirs.

example, is predictably higher and average temperature cooler in the Elk River Valley than in the lower valleys of the Rocky Mountain Trench.

The Region's climate can be broadly characterized as continental and semi-arid in nature with extreme temperature ranges and low precipitation in the main valleys. The North-South oriented mountain ranges allow for Southerly flows of cold arctic air. With low humidity and clear evening skies, frosts are known to occur in all months.

The Northern communities of the Rocky Mountain Trench average about 2,000 hours of sunshine annually. The average increases to around 2,200 hours annually in the Southern parts of the Region.

Prevailing winds throughout the Southern part of the Region are from South and West, with Northerly winds becoming more frequent in the winter months. In the Invermere area, northwesterly winds dominate. Average wind speeds in the settled valley floors are moderate with typical wind speeds at Cranbrook under 11 km/hour for 55% of the time.[22]

> The Selkirk and Purcell Mountains have a pronounced influence on the climate in the Lardeau map area. The rugged topography ranges in elevation from 1,400 feet (427 metres) in the Southwest near the Columbia River to peaks over 10,500 feet (3,201 metres) in the Purcell Mountains. The moist, Eastward moving maritime air from the Pacific Ocean rises against the western slopes of these ranges, releasing most of its precipitation. In general, the precipitation increases Northward and also increases rapidly with elevation. In the Arrow Lakes Valley, the annual precipitation varies from 22.6 in/yr near Fauquier to 43.2 in/yr near Revelstoke.
>
> The East Kootenay region is situated in the lee of the Purcell Mountains and has lower annual precipitation. The trend, however, toward increased moisture conditions northward is also apparent here (Brisco 16.54 in/yr, Golden 18.60 in/yr).
>
> Throughout most of the lower elevations, 30 to 40 % of the annual precipitation falls as snow. For example, 65% of the 59 in. of annual precipitation at Glacier (4,094 feet elevation) falls as snow.
>
> Mountain ranges and large lakes influence temperatures within the map area. Though temperatures usually decrease with increasing elevation, cold upslope air may be funnelled down narrow valleys (cold air chutes) to the main valley floor effectively reducing the frost-free period. In contrast to the extremes created by cold air chutes, large lakes such as the Upper Arrow and Kootenay exert a moderating influence on the local climate.[23]

The following are Climate Normals for Cranbrook, British Columbia (Latitude: 49º 36’ N Longitude: 115º 46’ W Elevation 939.4 m) approximately 125 kilometres south of the proposed resort:[24]

---

[22] Page 3, *ECONOMIC PROFILE, PEOPLE AND RESOURCES*, 1989, The Regional District of East Kootenay

[23] Excerpts from *SOIL RESOURCES OF THE LARDEAU MAP AREA*, Report No. 27, page18, British Columbia Soil Survey, Wittneben, Kelowna 1980.

[24] Environment Canada, *CANADIAN CLIMATE NORMALS, TEMPERATURE AND PRECIPITATION, 1971 -2000*

Table 2.9: Cranbrook Temperature Averages (1971-2000)

Temperature Range	Deg. C.	Deg. F.
Mean Daily Temp.	-7.5 to 18.3	18.5 to 65
Mean Daily Max.	-3.2 to 25.6	26.2 to 78.1
Mean Daily Min:	-11.8 to 10.9	10.8 to 51.6
Hours of Sunshine		
Average Monthly Range		60.4 to 321.6 hours
Annual Total		2228.6 hours
Total Precipitation		
Mean Monthly Range		18.4 to 52.8 mm
Annual Total		383.4 mm

2.5.3 Valley Microclimate

The proposed site location has been carefully selected for its extraordinary climatic conditions in terms of snowfall, sunshine and predictability.

The upper Jumbo Creek valley is a closed-ended south facing alpine valley. Its southern exposure results in a maximum possible number of winter sunshine hours. The majority of ski resorts in British Columbia, including Panorama, Kicking Horse and Whistler Blackcomb are situated in north or northeast/northwest facing valleys, resulting in fewer winter sunshine hours.

The Columbia Valley is in a dry area that accumulates minimum amounts of snow in winter. Invermere and surrounding area, even when the lake freezes, seldom has more than a dusting of snow on the ground. Panorama is also in a dry zone and depends heavily on snowmaking for its operations.

Moving westward from Panorama into Toby Creek, snow accumulation begins to appear at the confluence of Jumbo and Toby Creeks, at the old Mineral King site. This is also the chosen point for helicopter pick up for heli-skiers, because this is the point where road clearing terminates in winter. Ground snow accumulation in this area is typically in the half-metre range in winter.

This is roughly the boundary line of the glacier geographic area if one were to mark such a line on the map. Travelling west along Jumbo Creek, snow accumulation increases gradually up to the point where the valley turns north into what is known as the upper Jumbo Creek valley. Here precipitation increases to the point that in bad weather the heli-skiing helicopter has to turn back. Snow accumulation on the ground rises to two-and-a-half metres (8.2 feet) and goes up to four metres (13 feet) in the upper portion of the valley. The existence of glaciers at this location gives a clear historical indication of the snowfall pattern: precipitation arrives from the west and climbs over the Purcells as the last mountain range; glaciers are located at the eastern boundary of snow accumulation. Beyond the glacier boundary line precipitation quickly decreases and then disappears. The confluence of Jumbo and Toby Creek is near the glacier boundary line.

Detailed weather analysis has been derived from the nearest weather stations by interpolation according to reasonable assumptions. Further information is available through reports of local staff of forestry and ranger stations, and from the guides and the heli-skiers that have been exposed to the area for over twenty years. The site has been even more closely monitored since 1990, with frequent inspections by Pheidias Project Management Corp., Alpentech Inc., R-Dac Group, Golder Associates, and other consultants.

From these reports, it is clear that skiing conditions from the top of Glacier Dome to the valley base of Jumbo Creek allow a winter season from late October to the beginning of May with a snow base that may range between a low of fifty centimetres at the beginning and near the end of the season to a high of up to three metres or more at peak season. Average packed snow accumulation through the winter, as reported by the forestry office in Invermere, is between three to four metres near the top end of the valley and one-and-a-half to two-and-a-half metres at the lower end of the valley base.

Even late spring conditions allow skiing to the valley base. For example, on May 29, 1995, three skiers, including a member of B.C. Government staff, covered both the north and the south face of Glacier Dome, on an unseasonably warm afternoon, and observed good spring skiing conditions to the valley floor of Jumbo Creek. Skiing is available for the summer season on the upper elevations, on the glaciers, roughly at elevations between 2,600 and 3,300 metres (8,528 and 10,824 ft). The peaks of Karnak Mountain and of Jumbo Mountain are at the 3,400 metres (11,152 ft) elevation, giving access to the highest glaciers in the area. Base snow levels ranging from 2.5 to 4 metres (8 to 13 ft) are normal in the Upper Jumbo Creek Valley. R.K. Heli-Ski reports an average annual snowfall of 7.5 to 11 metres (25 to 36 ft).

Snow conditions are reportedly fairly constant and have a generally superior nature. Poor weather is less frequent and less stormy in this region than along the Pacific Coast, but when clouds arrive they still discharge a generous snowfall. When the weather clears conditions are prevalently calm and dry allowing for renowned powder snow conditions, which may remain undisturbed for a large portion of the season. In locations subject to sudden warming and cooling, such as Fernie and Whistler, powder conditions may last only a few days, as there is a continuous cycle of warming and cooling, with even rain and subsequent frost following a snowfall and sunny days. In the Jumbo Creek drainage snowfall normally occurs in light increments of similar snow, allowing for stable slope conditions on which snow packs form gradually and consistently. Temperature variations are normally small and less likely to produce cleavage planes that generate avalanche conditions. The weather pattern in the region allows generally easy flying conditions up to the tree line for helicopters even in snowy conditions.

There are a number of regional climate stations operated by Environment Canada that may be used to further verify climatic conditions in the study area.

2.5.4 Snow Studies

As snow conditions are an important consideration in the development of a winter sports facility, in addition to the abundant information available from the local heli-ski company and its senior guide, Dan Griffith, Norecol Environmental Consultants Ltd. (Norecol) conducted a regional study to provide preliminary comparative estimates of snow conditions in the Jumbo Creek study area. To help clarify the study results some of the terms used in defining snow conditions are outlined as follows:

Snowfall (cm) - refers to the depth of freshly fallen snow as measured by a ruler. Snowfall is usually measured at climate stations twice daily. Typical densities of freshly fallen snow vary from 50 Kg/m^3 (dry-snow) to 150 Kg/m^3 (wet snow). Climate data usually uses a density of 100 Kg/m^3 so that 1 cm of snow has a water equivalent of 1mm.

Snowcover or snowpack (cm) - is the net result of the accumulation and ablation of old snow on the ground up to the time of measurement. Usually snowcover is considerably less than total snowfall due to compaction, metamorphosis and ablation. Snowcover is measured at snowcourse stations on a monthly basis. Typical densities of snowcover vary from 200 Kg/m^3 in the early winter to over 400 Kg/m^3 in the late winter.

Water Equivalent (mm) - is the depth of water that results when the snowcover is melted, and is measured at snowcourse stations.

Information on the variation of snowfall and precipitation through the region was derived from a review of the total December to March snowfall and the total mean annual precipitation for regional climate stations operated by the Atmospheric Environment Service (1982). Stations which were considered include nine stations in the northern part of the Columbia Valley (Spillimacheen, Bugaboo Creek Lodge, three stations in Kootenay National Park, two Invermere stations, Brisco, and Canal Flats Ranger Station), six stations in the Cranbrook area (Wycliffe, Kimberley A, two Cranbrook A stations, Marysville, and Kimberley), and four stations in the Kootenay Valley (Crawford Bay, Duncan Lake Dam, Lardeau, Kaslo).

Data on winter snowfall from nine regional snow course stations was also examined. Stations reviewed included Bugaboo Creek, Vermont Creek, East Creek, Invermere, Sandon, two Gray Creek stations, Duncan Lake, and Mt. Templeman (Ministry of Environment 1985). General conclusions from the regional review are as follows:

1) Snowfall, snowcover and precipitation increases with elevation in both the Columbia Valley and the Kootenay Valley;

2) Snowfall and precipitation increases as one moves northwest up the Columbia Valley;

3) Snowfall, snowcover and precipitation is higher on the windward eastern slopes of the Kootenay Valley than on the leeward western slopes of the Columbia Valley due to the "rain shadow" effect of the Purcell Mountains.

Bugaboo Creek Lodge, which is located about 40 km north of the Jumbo Creek area, has over 17 years of both snowfall and snowcover data and is the station most likely to have a snowfall regime similar to that of the Jumbo Creek area.

Snow conditions at two elevations in the Jumbo Creek area were extrapolated from the data at Bugaboo Creek Lodge (Coatta pers. comm. and Ovie pers. comm.) using a snowcover water equivalent (mm) versus elevation (ft) relationship. This relationship was developed by doing a simple linear regression of April 1 water equivalent (mm) and elevation using 11 data points from regional stations. The data which was in the analysis include: the water equivalent (mm) of the mean December to March snowfall for the previously mentioned nine snowfall stations in the northern part of the Columbia Valley and the April 1 water equivalent data for the two regional snow course stations (Bugaboo Creek, Invermere). The "R squared" value of the regression was 0.86 indicating a good correlation and showed that the April 1 water equivalent of the snowcover increased 12 mm for every 100 ft increase in elevation.

Using the above relationship the snow conditions at two elevations in the Jumbo Creek area were estimated. The Jumbo Creek Ski base (elevation 6,850 ft or 2,090 m) and the Jumbo

Creek Ski area (elevation 8,500 ft or 2,590 m) were estimated to receive 160 percent and 212 percent, respectively more snow than Bugaboo Creek Lodge. The snow cover or "base" in the proposed ski area is expected to range from a low of 1.5 m on January 1 (data prior to January 1 not available) to a high during March of over 2.5 m. During the 1991 winter the high during March reached 3 m. For comparison the snow cover or base at Whistler Mountain averages 1.1 m on January 1 and reaches a peak of just under 2.0 m on April 1. This comparison needs to be qualified by noting that this is a snow cover on the higher elevations of the skiable terrain (snow at the valley base is practically absent for most of the season) of the Whistler-Blackcomb area and needs to be further qualified by the seldom noted, but important point, observed by long time Whistler residents, that the snow cover in the Whistler-Blackcomb area is affected by occasional heavy precipitation in the form of rainfall every winter. There is no report of winter rain ever in the subject study area, and none can be inferred by analytical data, as temperature ranges remain constantly below zero degrees centigrade.

2.5.5 Climate Change & Global Warming

Climate change may be one of the most compelling reasons for this project. Recent statistical data on temperature in the Northern Hemisphere and in Western Canada tend to confirm a climatic warming trend and potentially an acceleration of this warming trend, now being discussed particularly as a concern in the urbanized areas of Western Europe. It is difficult to predict the consequences in detail for Western Canada and for the microclimate of the Columbia Valley and of the Purcell range. The potential effect of the warming trend is discussed also in the glaciology section (see Sections 2.4.2 and 2.4.3) of this Master Plan report.

The most significant aspect of a warming trend for the Jumbo Glacier Resort project is that a change of a few degrees may substantially alter the conditions of the ski industry in Western Canada. It may render snow making uneconomic or ineffective and force skiing to occur only at higher elevations. If ski resorts at lower elevations were to become inoperable, a project like Jumbo Glacier Resort, with a base elevation of 1,700 metres and a top elevation of 3,400 metres, could become the only place in B.C. where it will be possible to ski on a consistent and economical basis.

The United Nations sponsored a World Conference on Sport and the Environment, in Turin, Italy, on December 2 and 3, 2003 at which it was stated: “The call for ski resorts with snow reliability is the main argument for the current boom in concept studies to open up high mountain regions, or, in other words, climate change is the reason for opening up high mountain regions for tourism.”

Most ski resorts in B.C. already depend on snowmaking and are at 1,200 metres elevation or lower. This is too low to be assured of good quality snow and the avoidance of rain in winter.

See also Appendix 2-C: Climate, Water and Glaciers Fact Sheets.

2.6 GEOTECHNICAL CONSIDERATIONS

2.6.1 Geotechnical Engineering Assessment

2.6.1.1 Area Description

Physical characteristics of the area are described in British Columbia Ministry of Environment, Resource Analysis Branch Bulletin 15 (1980). The proposed development area is in the upper basin of the Columbia River in the Purcell Mountains of British Columbia. Development interest is concentrated in the alpine basin of Jumbo Creek at the headwaters of Toby Creek and in the high alpine area of the Commander Glacier that drains northward into Horsethief Creek. Toby and Horsethief Creeks flow east to the Columbia Valley. Both Thurber Engineering (Bob Gerath) and Golder Associates (John Balfour, Tony Rice and Michael Maxwell) have carried out preliminary investigations of the valley, with most of the site visits by Golder Associates personnel.

2.6.1.2 Geology

The area bedrock consists of folded and faulted sedimentary and metamorphic rock (Holland, 1976). Photo study and field reconnaissance indicates that the bedrock is generally massive and strong.

Bedrock cross joints and fractures are noted in several alpine areas. Some of these joints appear to affect occurrences of rock fall. Joint sets on precipitous slopes on the south side of Mount Karnak, Jumbo Mountain, The Guardsmen and The Cleaver are worthy of further attention to determine their possible effect on slope instability.

Sackung ("sagging") features occur at several locations. These apparently indicate rock mass stress relief after the local valleys were deglaciated.

Terrain and surficial geology are mapped at 1:50,000 scale by Maxwell and Ryder (1988). Their map shows widespread bedrock and colluvium (soils affected by downslope movement). Geomorphic processes such as snow avalanches, gully erosion, landslides (including possible rock fall and other activity) and alpine soil processes (including frost heave and soil creep) are also mapped.

Alpine areas have been shaped by extensive glacier erosion in earlier geological periods. Larger remnant glaciers persist in high north-facing locations; portions of these glaciers are heavily crevassed. The alpine glaciers are retreating from maximum positions of about 100 years ago. There are a number of remnant glacier moraines that are likely ice cored. The glaciers probably have negative mass balances and will continue their slow retreat in the foreseeable future. Their slow retreat does not constitute a significant factor for the project. Various on site reconnaissances by Michael Maxwell and Peter Lev reviewing glacier and weather patterns have confirmed the predictable behaviour of glacier masses.

2.6.1.3 Engineering Properties of Soil and Rock

With the present level of study, the geotechnical engineers expect generally favourable soil and rock properties in the project area. The local bedrock should provide adequate bearing capacity and there is a local abundance of granular soil, suited for a variety of construction purposes.

Till occurs on the lower to intermediate valley sides. We expect this material will be a dense, silt-sand rich and bouldery soil (ML fines in the Unified Soil Classification). The till may be highly erodible when disturbed. The till should provide good bearing capacity and may be suited for some construction purposes such as common fill when placed and compacted under controlled conditions.

Valley-floor alluvial/colluvial fans offer geotechnical opportunities including low to moderate surface gradients, sources of granular construction material and comparatively good subsurface drainage. These favourable siting characteristics may be offset by local occurrence of snow avalanches, debris flow and debris floods in the highest valley elevations. The positioning of buildings and services will take that into account.

2.6.1.4 On Site Reconnaissance of Rock Formations

Types of rock found at the top of Glacier Dome indicate schists comprising muscovite, quartz and some feldspar. Rocks found on the south face of the Cleaver indicate quartzose schists with disseminated muscovite, limestone and quartz and feldspar layers.

2.6.2 Geotechnical Hazard Assessment

2.6.2.1 General

Geotechnical hazards are phenomena or conditions such as snow avalanches or areas of soft soils that may constrain the proposed development. Preliminary hazard assessment was based on study of stereoscopic aerial photos, terrain mapping by Maxwell and Ryder (1988), and avalanche path mapping by Alpentech Inc. (1990a). Additional avalanche studies have been undertaken through photographic surveys and on site reconnaissance by a team of experts including Peter Lev, Michael Maxwell, Geoffrey Schmock, Peter Schaerer and Dan Griffith. Karl Ernst has provided special expertise regarding mitigation and prevention measures. Mountain resort planning requires the review of a number of hazard exposures that are not known to other types of resort and urban developments.

2.6.2.2 Snow Avalanche Occurrence

There are several snow avalanche paths near the project area; those in upper Jumbo Valley have been mapped and named by Peter Lev. Some tracks in Jumbo Creek valley run up onto the opposite valley side. The Ministry of Transportation and Highways of the Province of British Columbia has compiled a "Snow Avalanche Atlas" for Toby Creek. The consulting group has reviewed this information. Reports from

Peter Schaerer on expected avalanche occurrences are attached as Appendix 2-A.

It is expected that there will be avalanche occurrences in the mapped high alpine areas. It is more difficult to assess the historical avalanche limits in alpine areas or on glaciers where there is no tree cover to record trim lines, and the run out limits of some avalanches in the lower Jumbo Creek Valley are obscured by extensive logging or forest fires. Ice falls are related hazards that may occur in steep areas of crevassed glacier ice, but these would be localized only in certain regions on the North side of the mountains, on the opposite face to that of the proposed resort base location. Peter Lev and Peter Schaerer have reviewed the avalanche hazard in the ski area and the access route and provided advice to the consulting team during the on going design and review process.

The location and occurrence of the snow avalanches and its study has influenced various aspects of the access route and of the resort base design. During the five years prior to 1995 in the Jumbo Creek drainage there is the record of only three avalanche paths that were actually run by a snow slide reaching the valley floor in Jumbo Creek. Bent vegetation marked these locations. In the winter of 1995, an avalanche from Mount Karnak was observed for the first time, however, it did not reach the bottom of the valley. Avalanches were monitored also in the following years. Of particular note was a large avalanche opposite to Mount Karnak, which reached the valley bottom, and which was slightly larger than previous avalanche tracks.

2.6.2.3 Landslide Occurrence

Rock fall appears to be the most common landslide hazard and occurs along cliff faces throughout the area. These occurrences are indicated by sheets, cones and fans of bouldery debris (colluvium) below many cliffs.

One possible rock fall in the upper Jumbo Valley may have fallen 1,300 ft. (400 m) and run out a distance of about 2,000 ft. (600 m). Snow avalanches might also carry considerable amounts of rock debris, when they occur.

Boulder covered slopes on the west side of upper Jumbo Valley are noteworthy features. Much of this material is rock fall debris but its large volume seems to exceed the proportional small size of low (but broken) cliffs above. Some of the boulders were probably eroded or dumped from the cliffs by formerly larger glaciers above. Snow avalanches also contribute debris to these slopes.

The consulting team studied the Valley with specific site reconnaissances by Golder Associates personnel and observed no evidence of imminent large landslides that may reach the valley floors. There may be an ancient bedrock slide on the west slope of upper Jumbo Valley. Its features are enigmatic and its explanation would require further investigation in order to determine its history.

2.6.2.4 Debris Flows

Debris flows are potentially damaging stream discharges of cobble to bouldery debris with logs and other organic material. Large amounts of glacial and other coarse sediment can be mobilized by extreme storm or snow melt activity in the upper basins of tributary creeks. The aerial photos indicate most of the alluvial/colluvial fans in the area are, to some degree, affected by these processes. Many alluvial/colluvial fans are also sites of potential snow avalanche run out.

2.6.2.5 Flooding

The only stream that could affect the project is upper Jumbo Creek and its tributaries. McElhanney Consulting reviewed the 100 year and the 200 year return instantaneous discharge for the basin under consideration and concluded that conservative estimates indicate that the level and width of the discharge would be easily contained within the riparian area. The surface width for the 100 year return discharge has been estimated at 14.5 metres and the 200 year return discharge at less than 16.5 metres.

UMA KPA Engineering, Golder Associates and McElhanney at various times between 1990 and 2002 have reviewed the geotechnical and hydrotechnical conditions of the Jumbo Creek drainage and its flooding potential.

Engineering reviews of upper Jumbo Creek and its tributaries indicate that the precipitation collection area upstream of the sawmill site, covering a valley length of approximately 4 km, and a total basin of approximately 10 square km. Calculations of a 200 year flood potential occurrence indicate that the creek at maximum would swell into the designated 15 metre riparian area.

Mapping showing 200 year potential flood zones is included in Schedule A (Map P6).

Flooding at the project location is not considered a potential hazard for the following reasons:

1. There are no records and there is no evidence of flooding in recent geological history in the Upper Jumbo Creek area.

2. Upper Jumbo Creek, where the resort will be located, is a valley with a steady slope which shows no evidence of flooding in earlier times.

3. The valley has an effective natural drainage with a fast flowing creek bed and flooding could only occur by a large blockage of Jumbo Creek by landslide or snow avalanche debris or by beaver activity which have not occurred in the known history of the drainage and are not expected to occur in the future.

4. Logging debris and abandoned bridges have provided a number of obstructions, but the creek flow has not been interrupted.

5. The only possible natural blockage would have to occur North and upward of the proposed resort site, where uncontrolled avalanche discharges or rockslides could potentially block the flow of the creek. This would have no effect on the resort site, and would also be an unlikely event following the creation of the resort.

6. The project is located in an area that is protected from avalanches or slides, and following the project start an avalanche monitoring and controlled discharge program would be in effect (see Section 4.2.4 of this Master Plan), as well as slope stabilization produced by compaction due to skiing. This would make most unlikely the occurrence of the kind of massive avalanche and debris flow that would be required to block the creek.

7. The resort site and the area below for approximately three kilometres are not

subject to avalanches or mountain slides that could block the creek, providing an elevation difference of hundreds of metres above the nearest locations of potential blockage of the creek by debris.

8. The potential for flash floods caused by sudden water basin release or by release of water by the glaciers is negligible as there are no major collection areas that may release water in a major wave above the proposed project location. The glaciers overlooking the drainage are free draining over steep slopes and the slopes have no collection areas.

The consultant team's conclusion is that there is no historic or geological evidence of significant risk of flooding at the resort and in its proximity around a radius of two to three kilometres under the current and previous natural conditions.

2.6.2.5.1 RDEK Floodplain Management Bylaw Requirements

The Floodplain Management Bylaw (Bylaw No. 1034) for the Upper Columbia Valley of the Regional District of East Kootenay states that where floodplain mapping is not available the flood construction level is "1.5 metres (4.9 feet) above the natural boundary of any other watercourse, lake, marsh, or pond," [4.02(1)(g)] and that the Flooplain Setback is "15 metres (49.2 feet) from the natural boundary of a lake marsh, or pone." [4.02(2)(c)].

The preliminary design of the resort confirms compliance with these requirements.

2.6.2.6 Limiting Geotechnical Conditions

The above noted hazards are typical of alpine environments where many ski resorts have been developed. It is reasonable to assume that the alpine region may be affected by conditions which are common in similar settings and that these conditions will have to be taken into account in the design process. These may include deep frost penetration, frost heave, icings in areas of soil and rock cut, degrading ice masses beneath alpine moraines, shallow soil over bedrock which would impede surface drainage, the possibility of unmapped soft, fine-grained (silt and clay) soil and adverse construction weather. Building locations are selected in order to avoid or to respond to these conditions.

2.6.3 Geotechnical Review

2.6.3.1 General

Several engineers contributed to the preliminary geotechnical review, started initially with Bob Gerath of Thurber Engineering, and continued with Brian Dennison, John Balfour, Max Maxwell and Tony Rice of Golder Associates contributing most of the preliminary observations and investigations. The area does not present any particularly unusual features relative to the region, the elevation and the climate where it is situated. Detailed but normal on site investigations will be sufficient to assess specific engineering design requirements.

2.6.3.2 Geotechnical Considerations for the Access Road.

An improved access road is proposed from Panorama and from the junction of Toby and Jumbo Creeks to the proposed resort base in upper Jumbo Valley. Peter Schaerer's review indicates road access is feasible if there is avalanche control work by safety personnel and road closures during times of high seasonal hazard. He gives guidance on optimizing the alignment by locating it as far down an avalanche path as possible, avoiding through cuts in avalanche areas, and an extra wide ditch in areas of steep slopes and cuts.

Peter Schaerer has provided estimated frequencies for avalanches along the proposed road alignments in Jumbo Creek and general comments on the Toby Creek Valley. He notes the anticipated snow avalanche hazard to a road on the north side of Jumbo Creek (west of the mine site) is expected to be low because of the moderate number of avalanche paths, their wide spacing and a probability that most snow will stop above the road. His review indicates a Jumbo Creek road can avoid also some avalanche paths on the north side of the valley with a south sided location in the area of Leo/Leona Creek about 11 km (6.8 miles) west of the mine site, although this is an area that may not require a change to the alignment proposed by the engineers in the *Route Study*, as the avalanche activity in this location can also be monitored and controlled by discharge. His preliminary assessment has been proven correct by the experience of the last fifteen years and has been utilized by the civil engineers in the determinations of the *Route Study*.

Peter Schaerer noted that part of the existing road below the mine site (in the Toby Creek drainage) will have more potential avalanche occurrences because of its closer proximity to avalanche paths and the closer spacing of individual tracks. However, the actual frequency is reduced by the low snow accumulation normal on the mountains flanking the lower Toby Creek valley.

The proposed road improvements and the *Route Study* are discussed in Section 5.2.

2.6.3.3 Five Year Avalanche Review

Avalanche mapping for the Jumbo Creek drainage was produced by Peter Lev in 1990. Information on the Toby Creek drainage is available from the Ministry of Transportation and Highways.

Visual reconnaissance by Pheidias Project Management Corporation, by R-Dac Group, by Alpentech Inc. , by Peter Schaerer, and by Dr. Michael Maxwell, and discussions with the local trapper, the heli-ski guides and others in the five years prior to 1995, documented by extensive aerial photography, indicated that snow slide or avalanche activity in the entire Toby Creek and Jumbo Creek drainage in the five years between 1990 and 1995 has been moderate, as noted below:

1. In the 1990/91 winter season a snow slide occurred in the Jumbo Creek drainage, coming down to the old logging road approximately 500 metres East of the confluence of Leona and Jumbo Creek. The slide came in early Spring. The new road, on the opposite side of Jumbo Creek, in an area void of avalanche tracks, was not affected. It is reported that snowfall and lack of equipment closed the access to Panorama one day in winter and that in April a mud slide closed again access to Panorama for a day. It has been noted also that the 1990/91 winter was a season of heavier than usual

snowfall, with a ground cover of approximately three metres at the proposed resort base location. Thaws causing snow avalanches with tragic consequences occurred in other valleys with similar climate, located in the Bugaboos. The road from Panorama to the Mineral King Mine site was kept open all winter and it was used by a shuttle bus run by the local heli-ski operator.

2. In the 1991/92 winter season no major avalanche runs were recorded. A mud and snow slide occurred in the Toby Creek drainage approximately half a kilometre past the 16 kilometre mark, but the road was kept open through the winter. It was a year of lower than usual snow accumulation, but the Jumbo Creek valley had a more than adequate coverage of about a metre and a half at the base.

3. In the spring of 1993, a snow slide covered the road in the Jumbo Creek drainage at approximately kilometre 7 with almost a metre of snow.

4. In the spring of 1994 and of 1995 a small snow slide near kilometre 8 covered the road in the Jumbo Creek drainage with approximately a half metre of snow.

Small slides in the steep alpine terrain occur every year, particularly in the late spring, and the areas affected are well defined. They do not represent a significant hazard for the planned development or for the proposed ski runs, which will be monitored by the ski patrol according to the ski area Safety Plan that will precede the ski area opening.

A study of visual reconnaissance and photography from the 1989/90, the 1990/91, the 1991/92, the 1992/93, the 1993/94 and the 1994/95 winter seasons, confirmed the low frequency of major snow avalanches in most locations of the proposed access route and in the Jumbo drainage area. From the available information and experience it appears that snow avalanche hazard monitoring techniques and control of snow discharge will be adequate to protect the selected access route and the proposed ski runs.

2.6.3.4 Geotechnical and Hydrological Review

A review and summary has been prepared by Golder Associates and is included as Appendix 5-F to this Master Plan. Additional discussion on hydrology can be found in Section 5.3.2.5 of this Master Plan.

2.7 LAND USE[25]

2.7.1 Existing Land Use

The present condition of the land in the Jumbo Valley is that of a substantially logged valley, showing traces of mining, of sawmill activity and of major forest fires. It has a wild and rugged scenic character, with many views of majestic mountain peaks. It is Crown land within the Windermere Provincial Forest and is within a "Rural Resource Zone." Available information, however, indicates that due to high elevation climatic conditions, it has little or no agricultural

[25] For Traditional Use and First Nations information, please see Section 7: First Nations of this Master Plan.

value.

Discussions with Ministries of Forests and Parks staff, as well as fifteen years of monitoring, confirmed that lands in the general vicinity of the proposed development have high recreational potential and are currently used for a variety of activities. Farnham Creek has recreational value due to the presence of accessible glaciers, climbing areas (Farnham Wall and Farnham Tower) and as a ski touring area (Seefeldt 1990). Primary access to the Lake of the Hanging Glacier is obtained through Horsethief Creek Valley. Experienced hikers also use a secondary route up Jumbo Creek Valley and hike to the Glacier Dome saddle and into Horsethief Creek.

Three areas designated as *use, recreation and enjoyment for the public* (UREP) are found near the proposed resort. The lands around the Lake of the Hanging Glacier are designated as such. A second UREP exists on Farnham Creek. The confluence of Jumbo and Toby Creeks is designated as a map reserve because of its role as an access point to a large area with recreational potential, particularly near Earl Grey Pass and at the headwaters of Toby Creek. Toby Glacier is one of the most impressive areas in the region, in the heart of the Purcell Conservancy. For the majority of British Columbians, however, Toby Glacier and surrounding areas are not accessible. Their remoteness would require a major expedition for urban dwellers.

Lands in the vicinity of the Lake of the Hanging Glacier and Horsethief Creek are one of the areas being considered as a Provincial Park through the Ministry of Parks, Parks Plan 90 project. (Van Delft, pers. comm. 1990). Public review of areas being studied in the East Kootenay began in February 1991. The lands under consideration lie to the North of the proposed resort base site and of the proposed ski runs. It should be noted that **the proposed ski resort and base development concept excludes the entire drainage of the Lake of the Hanging Glacier.** The Lake of the Hanging Glacier was also proposed for protection under the Protected Area Strategy initiated in 1993, but CORE did not endorse the designation.

Present uses of the land in and around the Jumbo Creek drainage, in addition to mining exploration interests and some on going logging activity, include general recreation, hiking, heli-skiing, snowmobiling, ski touring, guide and outfitting, and trapping. The proposed land use will add skiing in designated locations, tennis and a highly compact resort base, which will comprise hotels, ancillary commercial facilities, vacation apartments, townhouses and single family chalets.

2.7.1.1 Heli-Skiing

A heli-skiing operation is managed by R.K. Heli-Ski Panorama Inc. (Radium Hot Springs Glacier Skiing Ltd.) from a base in Panorama over the entire area under study. It is understood that this company has been proposing at various times to expand its facilities with a lodge near the junction of Leona and Jumbo Creeks and with other improvements, particularly to permit more and safer skiing in bad weather. The resort plan includes a proposed location for a new base for heli-ski operation and a lodge in Jumbo Creek, in a location that should help both the heli-skiing and the resort operations and keep it away from the Jumbo Pass trail.

The area under consideration is entirely Crown land that is owned by the Province of British Columbia. As in most of North America, Government land is subject to a multiplicity of existing controls and uses, and any new project raises very complex land use issues. This is one of the reasons why new projects, in most of North

America, are not proposed. In British Columbia, CASP was established to create a system whereby the Province facilitates the creation of new projects.

The proponent has been invited by five different provincial Governments and the Province has long standing policies inviting multiple use of Crown land by the public and by license holders. Overlapping of tenures under different provincial policies is not a novelty and is encouraged by the Province, which acts in a similar fashion to a landlord. Where compatibility is not achievable the Province regulates the separation of uses and if compensation becomes an issue it is expected to be fairly arbitrated according to real economic data. The proponent has discussed future operations with the license holders since the beginning of the application in 1990 and it expects that the Province will provide for a fair arbitration if an agreement cannot be reached. It is the proponent's stated objective to cooperate with the license holders to enhance their business, and this topic has been discussed at various times particularly with the heli-ski operator.

It is the proponent's objective to offer mutual advantages by the creation of a new base of operations and a lodge near the proposed resort in the Jumbo Creek valley, which is near the centre of the expanded heli-ski tenure, thus reducing considerably the cost of helicopter time and allowing to judge the weather on site. Concerns have been raised by the heli-ski operator over the loss of bad weather terrain in the Jumbo Creek Valley, as well as the use of Farnham Glacier. To help mitigate these concerns the tenure of R.K. Heli-Ski was substantially enlarged following the issuance of the Interim Agreement by the Province, with the support of the proponent. It is the proponent's understanding that this area, which is larger than Leona, Jumbo and Farnham Creek drainages combined, would more than compensate R.K. Heli-Ski for the loss of the area involved in this proposal. The expanded R.K. Heli-Ski terrain appears to have areas that are excellent for gladed tree skiing in bad weather and would be more easily accessible if operations are to be staged from Jumbo Creek with cooperation from the resort.

The area given by the Province to the heli-ski company when the Interim Agreement was granted to the proponent is a much larger area than the one offered by the Province to the proponent for lift serviced skiing.

Table 2.10: Comparative Analysis of R.K. Heli-Ski Tenure and Expansion

Tenure/Application	Size
R.K. Heli-Ski Tenure	127,392 ha
Exploration Permits:	
Howser Creek	4,014 ha
Glacier Creek	22,615 ha
Total R.K. Heli-Ski Expanded Territory	**26,629 ha**
Total R.K. Heli-Ski Territory	**154,021 ha**
Total Controlled Recreation Area for Jumbo Glacier Resort	**5,961 ha**

The Government policy[26] regarding heli-ski operations is as follows:

Goals:

To make Crown Land available for the commercial mechanized ski guiding industry in British Columbia; to provide that such land remains available for other uses; and to ensure that Crown Land committed to this use does not include environmentally sensitive areas.

Objectives:

3) To provide security over Crown Land required by the industry to finance business development;

2) To balance administrative efficiency with the need to retain long term options over the use of Crown Land; and

3) To provide a fair return to the Crown for the use of public land for commercial mechanized ski-guiding operations.

A review of the impacts of R.K. Heli-Ski and an outline of the discussions the proponent has held with the owners is further discussed in Section 6.3.7 of this Master Plan.

2.7.1.2 Snowmobiling

Prior to the 1990s, snowmobiles, ski tourers and heli-skiers coexisted in the study area without significant conflicts in their areas of use. In fact, the bowl formed by the upper end of the Jumbo Creek valley has such gentle terrain that in winter, snowmobile excursionists often climbed all the way to the top of Glacier Dome.

However, overlapping of areas of use raised issues of safety, compatibility and land allocation, especially since in recent years more powerful snowmobiles have been able to reach remote backcountry areas that used to be the exclusive winter domain of heli-skiers and advanced ski tourers.

Over a two-year period in the early 1990s, the Invermere Forest District held several meetings by local stakeholders and agencies to address winter conflicts and issues. Agreement was reached by local user groups to designate 20 areas for joint use (primarily snowmobile

The Upper Jumbo Creek Valley has been closed to snowmobiles above kilometre 14 since 1996. Snowmobiling areas are well-marked; the above sign is on the road leading towards Glacier Dome and the proposed resort base site.

[26] *COMMERCIAL HELI-SKI AND CAT-SKI GUIDING*, Crown Lands, Land Use Policy

use), and 18 areas for heli-skiing and ski touring. When resolution could not be reached in 2 areas, Catamount Glacier and Upper Jumbo Creek, the District Manager personally met with all user groups and concluded that Section 105 closures (under the *Forest Practices Code of BC Act)* restricting snowmobile use were necessary. These two patrolled closures became effective January 1, 1996. The restrictions for the Upper Jumbo Creek Valley are as follows: "Upper Jumbo Creek - # 2, # 4 - No snowmobiling above km 14 including all gladed ski runs and the Leona Creek drainage. Snowmobile use in the lower valley, and along the valley bottom road to km 18, is permitted."[27]

The Invermere Forest District[28] produces a map brochure called *Winter Recreation* which lists and keys existing snowmobiling routes and trail numbers. The brochure depicts local area agreements, zones of use, and legal closures that affect recreational snowmobiling in the Purcells.

Amongst the numerous snowmobile routes and trails in the region, three notable "play areas" in the general vicinity of the resort are detailed and described by the Invermere Forest District as follows:

> <u>Paradise Mine</u>
>
> An old mine road switchbacks for 11 kms to a scenic alpine basin and open ridges. Impressive views of Mt. Nelson, Panorama Mountain Village and the Columbia Valley are presented. The Windermere Valley Snowmobile Club has established a cabin at the old mine site which is available by request. Depending on snow conditions, access over the ridge to Bruce Creek is possible. The Paradise mine area is popular with both public and commercial users. Respect the private land along the access road.
>
> Access - Park along the Toby Creek Road just east (downstream) of Panorama Mountain Village.
>
> <u>Brewer Creek</u>
>
> Moderate alpine riding beyond km 26. Local use establishes the route that generally follows Brewer Creek to open meadows and Mineral/Brewer Pass. A variety of tree lined routes in open larch forest and meadows are available.
>
> Access - Drive south 17 kms from Invermere (or 8 kms north from Dutch Creek Hoodoos) along Westside Road turning onto Hawke Road. This takes you through an old burn area at km 8 where you stay right. Park at km 10. Snowmobile the main road along Brewer Creek FS Road staying right at the km 11 mark and left at the km 12.3 mark. Road's end is at km 26.

---

[27] Invermere Forest District website, "Snowmobile Regulations and Closures", www.for.gov.bc.ca/nelson.district/invermer/Recreation/

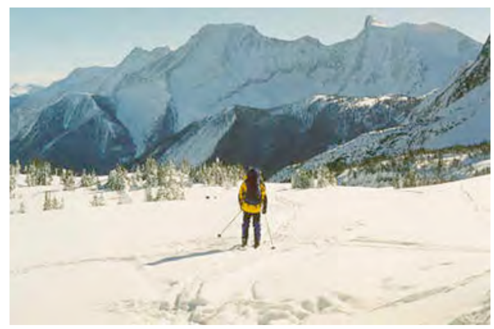
[28] Now the Rocky Mountain Forest District

McDonald Creek

Less explored road riding to alpine basins. Later season riding is suggested due to one unbridged creek crossing.

Access - Leave Radium, drive past the Slocan mill, and head west along the Horsethief Forest Service Road. Access from Invermere is through the hamlet of Wilmer along Westside Road turning left onto the Horsethief FS Road after 16.4 kms. Parking will vary depending on snow conditions. Snowploughing may end after km 14. The McDonald Creek turnoff is at km 35.5.

2.7.1.3 Ski Touring



Ski touring in Jumbo Pass with a view of Redtop Mountain. The resort is located a few kilometres to the left of this picture. The resort, and the entire Upper Jumbo Creek Valley, is ***not visible from Jumbo Pass****.*

Image Source: Invermere Forest District

According to the Invermere Forest District (now Rocky Mountain Forest District), "Quality opportunities for winter recreation can be found in many backcountry areas of the Invermere Forest District. The Rocky Mountains in the eastern portion of the Forest District are less popular for winter recreation than the Purcell Mountains to the west due to less consistent snowpack and fewer accessible open alpine areas. The Purcell Mountains have a unique combination of geography, alpine scenery and snow conditions that provide exceptional recreation opportunities. Hundreds of kilometres of unploughed roads, old mining roads and recreation trails are available in the winter months to snowmobilers and ski tourers... …Almost all ski touring in the Invermere Forest District takes place in mid to upper valley locations within the Purcell Mountains north of Invermere. For the most part snowmobile assisted access is necessary."[29]

The closest ski touring destination near the resort area is the recently renovated B.C. Forest Service cabin in Jumbo Pass. It is important to reiterate, as this has been an issue that has caused confusion, that **the resort is not on Jumbo Pass** (it is a couple of kilometres to the northeast in the upper Jumbo Creek valley) and will not interfere in any way with current recreational uses of the pass.

In order to access the Jumbo Pass cabin in winter, most skiers snowmobile from the parking lot, at the end of the Toby Creek road, to the trailhead.[30] That road is ploughed by B.C. Highways for the heli-ski company and is accessible by car. It is a full day (and 21.5 kms) to ski the unploughed Jumbo Creek road, then trail, and reach the cabin.

---

[29] Invermere Forest District website, "Winter Recreation", www.for.gov.bc.ca/nelson/district/invermer/Recreation/

[30] Invermere Forest District website, www.for.gov.bc.ca/nelson.district/invermer/Recreation/

The Jumbo Pass cabin sits at an elevation of 2,350 metres (7,710 feet) and was newly constructed in September 1997 by the Columbia Valley Hut Society, with Forest Renewal BC funding. The eight person capacity cabin replaced a 30-year-old hut, which had deteriorated and become unsafe. Reservations are required.

"The facility sits on the ridge, along the Purcell divide, about 0.5 km north of the actual pass. Quality hiking, scrambling (Bastille Mountain.) and ski touring is available, but not too extensively, in this small alpine locale. Superb views are extensive and include Karnak and Jumbo Mountains (NNE) and Cauldron/Horseshoe glaciers (SW). The outhouse even sports a picture window! A nearby tarn, immediately east, is the drinking water source."[31],

The upper Jumbo Creek valley and the resort base location are not visible from Jumbo Pass.

The British Columbia Ministry of Sustainable Resource Management's Tourism Opportunity Study[32] makes the following statement on ski touring:

> Statistics are not readily available on the ski touring sub-market. There are a few publications directed to the ski touring/mountaineering market and several clubs or organizations exist for those who engage in ski touring. Generally, ski touring is a "club niche" sport. It appears to draw a variety of people, in particular those who engage in mountaineering activities, nordic skiers seeking off-track experiences, and seasoned alpine skiers looking for more solitude.
>
> In BC, there are over 40 public backcountry huts available to ski tour recreationists for free, upon donation, or for a small sum. BC Parks, local alpine clubs or societies operate most. There are several others that are privately owned and run on a commercial basis, for example Wells Gray Chalets near Clearwater.
>
> There are conflicting opinions about the demand trend for ski touring. Enthusiasts in this sport claim that the interest is growing, although no statistics are available to support it. However given the high level of energy required for this sport, and the time required to engage in ski touring, its attractions are offset to some degree by the practical considerations of aging recreationists, who are generally short on time. Most likely the demand for ski touring products will remain strong within small niche groups who reside in or near alpine settings and who have the time and energy to make this sport a priority.

Six prominent ski tour destinations in the vicinity of the resort are described as follows by the Invermere Forest District (now the Rocky Mountain Forest District):

Brewer Creek

Treeline meadows and alpine ridges at the upper headwaters provide

[31] Invermere Forest District website, "Jumbo Pass Cabin", www.for.gov.bc.ca/nelson/district/invermer/Recreation/Recreation%20Huts/Jumbo_pass_cabin.htm

[32] www.srmwww.gov.bc.ca/dss/initiatives/tourism/

excellent skiing opportunities. It is 5 kms from the trailhead to the Brewer/Mineral Pass.

Access - Drive 17 kms south from Invermere (or north 8 kms from Dutch Creek Hoodoos) along Westside Road turning onto Hawke Road. This takes you through an old burn area at km 8 where you stay right. Park at km 10. Snowmobile the main road along Brewer Creek FS Road staying right at the km 11 mark and left at the km 12.3 mark. Road's end is at km 26 where the recreation trail leads to upper meadows.

Delphine Creek

A quiet valley bottom route on unploughed roads. Popular with visitors from nearby Panorama Mountain Village. Recent road improvements due to logging. Park on the Toby Creek Road.

Jumbo Pass

A scenic 4.5 km ski leads to big snow, alpine and tree skiing usually done in conjunction with overnight use of the Jumbo Pass cabin. Reservations required. See *Jumbo Pass Trail* for details. The ski route follows the general route of the summer hiking trail.

Access - Drive 20 kms past Panorama Mountain Village along Toby Creek Road. This section of road is infrequently ploughed and occasionally closed due to high avalanche hazard. Ski or snowmobile on the Jumbo Road to the km 16 trailhead.

Catamount / North Star Glacier

An outstanding high elevation area for ski mountaineering. Zoned as a ski zone in the areas of Catamount and North Star Glaciers (no snowmobiling south of the Forster Creek meadows). Please refer to the posted signs and the *Winter Recreation 2000* map / brochure for details on local user group agreements and legal closures that affect this area. Use Olive Hut at 2,850 metres as a base (reservations required).

Access - Accessible by helicopter from Invermere or by snowmobiling to the upper Forster Creek meadows. Parking is available at the km 21 junction of the Westside and Dogleg Lake Roads northwest of Radium Hot Springs. Alternate parking is located at the water reservoir intake at km 18 on the Forster Creek FS Road (access from km 14 on the Horsethief FS Road).

Welsh Lakes

Advanced touring in alpine lake basins that starts from km 36 on the unploughed Forster Creek Forest Service Road. See *Welsh Lakes Trail* for details on the summer hiking trail.

Access - Parking is available at the km 21 junction of the Westside and Dogleg Lake Roads north west of Radium Hot Springs. Alternate parking is located at the water reservoir intake at km 18 on the Forster Creek FS Road (access from km 14 on the Horsethief FS Road).

McMurdo / Spillimacheen Glacier

Long unploughed access to bowl and glacier skiing. Although the Silent Pass area has become busier with snowmobilers, adjacent areas immediately south have been zoned as ski zones. Use McMurdo cabin as a base (reservations required by contacting the Invermere Forest District). Through local user group agreements the area south of the McMurdo cabin has been zoned as a ski tour zone. No snowmobiling is permitted beyond the cabin or onto Spillimacheen Glacier. Ski zones also exist in the Caribou Creek drainage and the Bald Mountain area to the northwest. Please refer to the posted signs and the *Winter Recreation 2000* map/brochure for details.

Access - Accessible by snowmobile or helicopter from Golden. Drive the main Spillimacheen Road which travels west from the hamlet of Parson. Usual parking is at km 21 or 27 on the Spillimacheen North Road. Depending on snow conditions 38 kms of road riding is required. Turn left onto the McMurdo Creek Road at km 46. Road's end is km 58.5 where the 4.5 km long trail to Silent Pass begins. McMurdo Creek cabin is reached by turning left onto a spur road at km 57.

Some have expressed the notion that "anyone, with a little effort, can currently ski Jumbo Glacier for free," but reality simply does not bear out this argument.

The majority of Canadians do not have the skill, training, physical capability, equipment and budget to undertake such expeditions. The proponent is not aware of anyone who has recently successfully accessed the top of Jumbo or Commander Glaciers and skied them without expensive mechanized assistance (i.e. helicopter). The experience of these locations remains the exclusive domain of the privileged few.

A quick survey of the Alpine Club of Canada's mountain adventures also gives a clear indication that high alpine mountaineering is neither easy nor free and does not allow the possibility for large segments of society, including children, the elderly and even the moderately disabled, to experience the vast and spectacular high alpine terrain in our own backyard.

As a comparative example to the calibre of experience which would be available at Jumbo Glacier Resort, in 2003, the Alpine Club of Canada offered a ski camp tour in the Mt. Waddington area (which incidentally was one of the areas originally assessed for this proposal – see Section 2.1.4 above). The 9 day camp cost $3295 + GST per person (it included some helicopter transport), and was limited to 9 participants who "must have a very good level of fitness and be intermediate or advanced skiers with experience in glacier travel and winter camping"[33] Some of the mandatory equipment that was listed for the trip included:

Glacier Gear:

- Climbing harness – either sit- or full-body style
- Crampons (pref. mountaineering-style, w/ anti-snow-collecting sole plates)
- Ice axe - approximately 70 cm. (27") length, with wrist loop
- Climbing helmet

[33] www.alpineclubofcanada.com/activities/winter.html

- Two locking carabiners - at least one Münter (pear shape)
- Two non-locking carabiners
- One 3-meter (120”) webbing sling
- One Prusik cord - 5 metres (6 yards) long, 6 or 7 mm diameter
- One Prusik cord- 1.5 metres (60”) long, 6 or 7 mm diameter

Ski Equipment:

- Mountain skis (AT, telemark, or split-snowboard system)
- Ski boots
- Poles (probe type poles are good but not essential)
- Skins (full width, properly fitted to skis, and well glued)
- Ski crampons – fit and tested on bindings and width of skis
- Avalanche transceiver (457 kHz) with spare batteries
- Snow shovel
- Avalanche probe (if you have one)
- Skin wax (e.g. Glop Stopper)
- Repair kit - extra parts and tools that are specific to your gear
- Ski tie strap

Other tours offered by the Alpine Club of Canada in 2003 included a Campbell Icefields Powder Week (8 days - $1495), the Fairy Meadow Ski Extravaganza (8 days - $1750), Hallam Peak Ski Camps (8 days - $1625), and the Wapta Traverse (7 days - $1250), all requiring a high level of fitness, good downhill skiing ability and an extensive list of equipment.

Clearly, ski touring/mountaineering is not free, nor is it accessible to the majority of Canadians. This is especially true when compared to the Jumbo Glacier Resort proposal, which would make it possible for a retiree to experience high alpine glaciers for the first time in his or her life from the safety and comfort of an enclosed gondola at the cost of a competitively priced lift ticket.

2.7.1.4 Hiking

Like ski touring, hiking in the summer months is focussed on the recently renovated Jumbo Pass cabin (see above). According to the Invermere Forest District, the Jumbo Pass Forest Service Recreation Trail is actively managed but primitive. It has one steep and one rocky section, and then becomes an easy-to-follow, blazed route in the larch meadows.

Hiking time to Jumbo Pass is 2 1/2 to 3 hours one way. The length of the trail from the trailhead (in Jumbo Creek) is 5.2 km. The elevation gain is 670 metres.

The Jumbo Pass Forest Service Recreation Trail is a steep path that leads to Jumbo Pass and begins in Jumbo Creek along an abandoned Forestry road starting from the existing road. The bottom portion of the trail is in a forest cover that eventually thins breaking into a large avalanche path at the base of a vertical rock face, the northern flank of Bastille Mountain. This is the halfway point, where a view of the Jumbo Creek Valley begins to unfold. Old logging blocks, older burn areas and more recent heli-ski glade openings are visible as well as the creek’s Glacier Dome headwaters. The abandoned sawmill site and the resort base are not visible. No trail tread has been cut beyond the halfway point. The trail therefore becomes less distinct and is identified by orange blazes and flagging. The route travels over several rock bands, through larch forested alpine meadows, and past small lakes as the pass is approached. Here the views are expansive, stretching to the West Kootenay valley and east towards the Columbia Valley. To the west lie the impressive glaciated peaks of Mount MacBeth and Mount Lady MacBeth, and to the south, Cauldron, Truce and Covenant Mountains are viewed. The Jumbo Pass cabin, a B.C. Forest Service recreation facility, is located 500 metres (1640 ft.) north of the pass. The cabin sleeps eight people and reservations for overnight use are made through the Invermere Forest District office. It is managed by the Invermere Forest District and maintained in conjunction with the Columbia Valley Hut Society.

It is important to reiterate that the resort is not in or on Jumbo Pass. The resort will be located in the upper reaches of the Jumbo Creek valley, a few kilometres to the northeast of Jumbo Pass.

The recently rebuilt forestry cabin on Jumbo Pass. Reservations for overnight use are made through the Invermere Forest District.

The nearby Horsethief Creek drainage also provides some recognized hiking trails and destinations. Horsethief Creek is in the adjacent drainage to Jumbo Creek. It is beyond the visible, audible and accessible range of the resort (except for a multi-day hike over Jumbo Pass).

According to the Invermere Forest District, the Lake of the Hanging Glacier is the most popular trail in the area. The first portion of the trail follows an old roadway for two kilometres. The trail then narrows and ascends before crossing a footbridge over Hell Roaring Creek. The footbridge is installed for the months of July through September only. Crossing when the creek is not bridged is considered treacherous. A second bridged crossing takes you over Horsethief Creek and then through mature forest gaining elevation over 13 moderate switchbacks. Detouring above a small slough, the trail continues a gradual climb to alpine meadows. Open camping and a toilet are available on the meadows. The lake and trail's end are a further 800 metres through open meadows. The sharp glacier tongue is some 2.5 kms from the north shore. A spectacular panorama of rugged peaks encircles the lake, however, the top of Glacier Dome, the arrival point of the proposed gondola, is not visible from any point of the trail or from the trailhead where it reaches the lake. In order to see the top of Glacier Dome it is necessary to reach the south end of the lake, under the icefall.

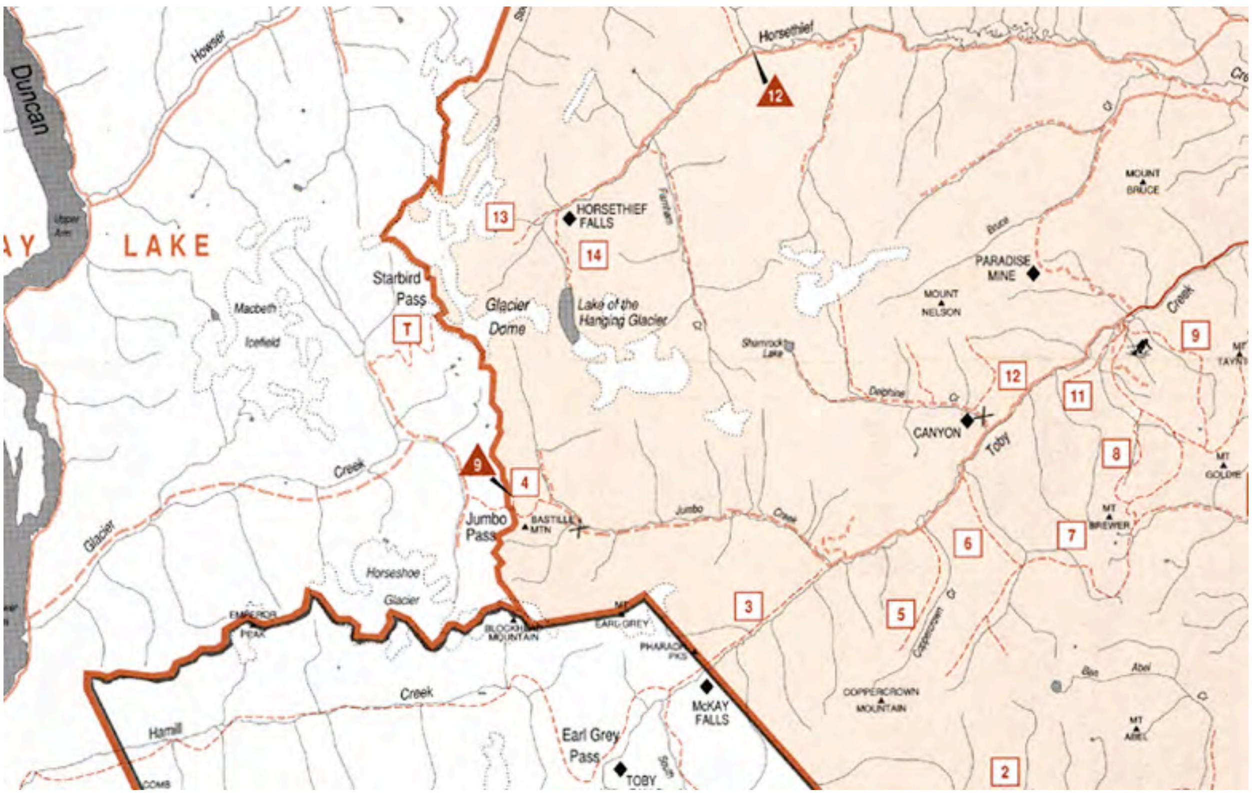
Another nearby hiking destination is the Monica Meadows Trail, which is also beyond the visible, audible and accessible range of the Jumbo Creek drainage and of the proposed resort.

The Monica Meadows trail, accessed from Glacier Creek, provides access to an alpine plateau with spectacular views of the surrounding peaks. While the alpine plateau is intended for day-use only, primitive campsites are provided at the end of the trail below the plateau. The area provides good hiking, camping, excellent viewing, and nature study opportunities.

A number of adventure groups and companies organize hiking and backpacking tours in the region. For novice hikers and extra-regional visitors in good physical shape, these companies provide good service in providing access to the lower elevation portions of the backcountry. Like ski touring, however, these tours do not provide the accessibility of a mountain resort. As a point of reference, the Great Canadian Adventure Company offers an interesting backpacking traverse of Earl Grey Pass. The six-day camping tour is advertised at $1,235.00 per person (+ G.S.T).[34]

In conclusion, Jumbo Pass is the popular hiking destination from the Jumbo Creek drainage. Some hikers use the mining road to access the top of Farnham Glacier. There are no other trails and hiking in the rest of the valley is made difficult by natural obstacles and forestry operations debris.

Exhibit 2.27: Invermere Forest District Hiking Trails



Detail of the Invermere Forest District (now Rocky Mountain Forest District) Hiking Trail map. There are no established hiking trails within the Jumbo Glacier Resort CRA.

[34] www.adventures.com/gasnet/1347-1.htm

Exhibit 2.28: Jumbo Pass Cabin Usage Statistics 1994 - 1998

Jumbo	1994			1995			1996			1997			1998		
Cabin	Parties	Users	User Days	Parties	Users	User Days	Parties	Users	User Days	Parties	Users	User Days	Parties	Users	User Days
January	4	13	33	-	-	-	2	5	16	3	8	30	-	-	-
February	1	4	8	2	9	18	3	13	39	3	8	26	8	21	36
March	N/A	N/A	N/A	3	11	17	2	5	14	5	13	35	6	19	43
April	N/A	N/A	N/A	1	2	2	-	-	-	-	-	-	4	10	43
May	-	-	-	-	-	-	-	-	-	-	-	-	1	2	4
June	1	3	9	2	4	8	1	4	12	-	-	-	5	16	46
July	9	25	35	22	91	129	7	18	25	14	48	51	27	77	129
August	13	38	72	23	70	119	31	107	142	37	269	348	46	146	189
September	9	30	46	21	59	65	16	45	60	15	47	129	54	171	304
October	1	8	24	6	13	13	1	4	12	17	20	20	7	20	-
November	-	-	-	-	-	-	-	-	-	14	34	76	3	12	-
December	-	-	-	2	8	18	-	-	-	5	22	36	2	6	-
Total	38	121	227	82	267	389	63	201	320	113	469	751	163	500	794

Source: Ministry of Forests

Table 2.12: Jumbo Pass Cabin Usage Statistics 2000-2002

	2000			2001			2002		
Month	**Parties**	**Users**	**User Days**	**Parties**	**Users**	**User Days**	**Parties**	**Users**	**User Days**
January	3	12	12	3	9	7	5	23	18
February	4	16	14	5	19	15	3	12	16
March	2	8	6	6	27	11	4	20	13
April	1	5	3	1	2	1	2	4	6
May	N/A	N/A	N/A	N/A	N/A	N/A	1	6	2
June	2	6	6	N/A	N/A	N/A	N/A	N/A	N/A
July	3	14	6	5	26	12	11	52	27
August	19	71	45	18	69	44	10	60	26
September	15	59	40	7	31	21	4	24	10
October	4	18	9	6	25	15	N/A	N/A	N/A
November	N/A	N/A	N/A	1	2	2	N/A	N/A	N/A
December	4	13	15	3	12	12	N/A	N/A	N/A

Source: Ministry of Forests

2.7.1.5 Mountaineering

Due to its beautiful alpine scenery and easy access, the Jumbo Creek Valley has experienced moderately high mountaineering activity in the past century.

Rock climbing in the area is not recommended because of the rock conditions. Except for Glacier Dome, the mountaintops are particularly dangerous to access except for very experienced mountaineers because of the high alpine environment, including the need to traverse crevassed glaciers.

The Alpine Club of Canada has held its yearly General Mountaineering Camp in the vicinity of the study area on the following occasions:

1928 Lake of the Hanging Glacier
1971 Farnham Creek
1975 Farnham Creek
1987 Farnham Creek
1991 Farnham Creek

Mt. Farnham, Mt. Peter and Farnham Tower, which are beyond the visible, audible and accessible range of the Jumbo Creek drainage and of the resort, have been noted as particularly popular mountaineering locations. Other popular locations are Jumbo Pass, the Lake of the Hanging Glacier (including Mount Maye on occasion) and the Starbird Icefield. These locations are all outside the resort study area, and with the exception of Jumbo Pass (which is nevertheless beyond the visual range of the resort and is 3 kilometres away from it), all are inaccessible from the resort area.

Commander Glacier, Jumbo Glacier and Mountain, Karnak Mountain, The Cleaver and The Lieutenants have also been mentioned (although with much less frequency than the Mt. Farnham area) as mountaineering destinations. These locations are within the proposed resort study area and would be accessible by means of mechanical lifts.

Like ski touring and hiking, there are a number of adventure groups and companies that organize guided mountain climbing tours and expeditions in the region. These tours are targeted to a select, well-equipped, and physically proficient clientele. The Great Canadian Adventure Company, for example, offers a Mountain climbing expedition to Mt. MacBeth and Glacier Creek. The five-day expedition is advertised at $1300.00 per person (+G.S.T).[35] Mountaineering knowledge, excellent physical stamina, and comprehensive mountaineering gear including rope, carabiners, prussiks and an ice axe are required for this expedition.

2.7.1.6 Guide and Outfitting[36]

Management of the wildlife resources is a responsibility of the Ministry of Sustainable Development, and Water, Land and Air Protection, which issues licenses for commercial angling and guide outfitting. These licenses, however, provide only the right to harvest specific wildlife resources.

A Guide Outfitters Certificate, 18 (1A) Management Area 4-26, Region 4, authorizes the licensee, Mr. Lyle Barsby of Toby Creek Outfitters, to provide guiding services to non-residents for the purposes of taking game. Big game animals included in this Certificate are: elk, deer, moose, goats, black bear, grizzly, and cougar. The territory to which this Certificate applies is defined as follows:

"Commencing at the confluence of Toby Creek and the Columbia River; thence westerly following the northerly height of land of Toby Creek to the height of land between the Columbia River drainage and the Duncan River drainage; thence

[35] www.adventures.com/gasnet/1347-2.htm

[36] Ministry of Environment, Fish and Game Branch, *WILDLIFE ACT AND MINISTRY OF CROWN LANDS, COMMERCIAL LAND USE AND HUNTING*

southerly and easterly following the westerly and southerly height of land of the Toby Creek drainage to the height of land between Mineral Creek, Laundry Creek and Ben Abel Creek; thence easterly following the southerly height of land of Brewer Creek to its confluence with Dutch Creek; thence easterly following northerly height of land of Dutch Creek to Columbia Lake; thence northerly following the west bank of Columbia Lake, the Columbia River, Mud Lake and Windermere Lake to the point of commencement including all intervening territory excepting private property, Provincial and Federal Parks."

Licence holders must obtain Land Act tenure from the Ministry where land is required to construct and maintain associated cabins, lodges, permanent improvements, etc., within a harvesting area.

The Ministry of Water, Land and Air Protection, under its *Commercial Hunting and Fishing Policy*, has the following strategies and objectives:

1) To establish policy which prescribes the conditions under which Crown Land may be provided for commercial fishing and hunting facilities.

2) To retain the Ministry's long term options over the use of Crown Land allocated to commercial fishing and hunting facilities.

3) To encourage efficient and coordinated administration among resource agencies responsible for commercial fishing and hunting operations.

4) To establish pricing for Crown Land uses for commercial fishing and hunting facilities which provides a fair return for the Crown and is equitable to commercial operators.

5) To minimize potentially adverse land use and environmental impacts of commercial fishing and hunting facility development.

The previous licensee listed his licence and business for sale in 1993 and in 1994 with two different real estate agents, at a price near $450,000. A sale finalized and a new license holder, Mr. Lyle Barsby has since operated the tenure until 2001, when it was sold again. At the time of preparation of this document Mr. Barsby was still listed as the tenure holder because the new owner, Mr. David Schneider, has not yet registered the tenure in his name.

Mapping of guide/outfitter license areas is included in Schedule A: Mapping Volume (see map LU5).

2.7.1.7 Trapping

There is an existing active trap line in the drainage of Jumbo and South Toby Creeks. The present licensee, trap line number ATN 0426T004, is authorized to trap fur-bearing animals in accordance with the Wildlife Act. The proponent group has had on going contact with the licensee, who is also proving to be a valuable source of information on the Jumbo Creek valley during the winter months.

The trap line has been registered to Don Rozelle and Jeanie Futa with assistant trappers Roger Madson and Troy Rad, since the project start.

Chief Paul Sam of the Shuswaps during the 1990s explained to the project consultants that a trapline of the Shuswaps existed through Panorama up the Toby Creek Valley and into Jumbo Creek.

Mapping of trapline operator licenses and territories is included in Schedule A: Mapping Volume (see map LU6).

2.7.1.8 Forestry

The majority of lands within the upper Jumbo, Horsethief and Farnham Creek watersheds are situated within Slocan Forest Products (Radium) Ltd. Forest Licence A18979 Charts 5 and 9 (Konkin, pers. comm. 1990). Higher altitude areas between these watersheds centred on Lake of the Hanging Glacier and Commander Glacier are not within a licensed area. Helicopter ski operations have licenses to cut runs within the Jumbo Creek Valley. Some of the logging operations pursuant to the above noted licences took place in the 1990s, with most of the ski runs leading into Jumbo Creek and Leona Creek being cut. This was not done for the runs in the Glacier Creek drainage.

According to Ministry of Forests mapping, nearly 50% (about 45,700 ha) of the forest cover in the Jumbo Creek Valley is classified as Newly Logged or Young Forest. The proposed resort base site is completely contained within a recently cut area and is situated on an abandoned sawmill site.

Mapping of the forest cover and forestry operator licenses is included in Schedule A: Mapping Volume (see maps LU1 and LU2).

Please refer to Section 6.3.9.1 of this Master Plan for further information on the project's impacts on forestry.

2.7.1.9 Mining[37]

There are 10 Mineral Titles/Claims in good standing on or around the confluence area of Jumbo and Toby Creek, (near the Mineral King Mine site). Mapping of Mineral Titles and Reserves is included in Schedule A: Mapping Volume (see Map P8). The status of these claims is as follows[38]:

Table 2.13: Mineral Claims Within or Adjacent to Jumbo Creek

Claim Name	Tenure No.	Commenced	Status	Owner / Locator
Jumbo 1	315376	1993.01.29	Good Standing 2004.01.28	Chris Graf / Glen Rodgers
Jumbo 3	315378	1993.01.29	Good Standing	Chris Graf / Glen Rodgers

[37] Ministry of Energy, Mines and Petroleum, Res, Nelson Office.

[38] NOTE: The data in this section was compiled at the time of submission of this Master Plan to the approving authorities. Some data may be out of date, but remains included here for reference purposes. Current information can be found on-line at: www.mtonline.gov.bc.ca

			2004.01.28	
Jumbo 5	315380	1993.01.29	Good Standing 2004.01.28	Chris Graf / Glen Rodgers
Jumbo 8	315454	1993.02.04	Good Standing 2004.01.28	Chris Graf / Glen Rodgers
Black Diamond 1	391853	2002.02.12	Good Standing 2004.02.11	Eagle Plains Resources Ltd. / Tim Termuende
Black Diamond 2	391854	2002.02.12	Good Standing 2004.02.11	Eagle Plains Resources Ltd. / Tim Termuende
Shaft No. 1	393610	2002.06.02	Good Standing 2007.06.02	Jimmie Panattoni / Jimmie Panattoni
Shaft No. 2	393611	2002.06.02	Good Standing 2007.06.02	Jimmie Panattoni / Jimmie Panattoni
Shaft No. 3	393612	2002.06.02	Good Standing 2007.06.02	Jimmie Panattoni / Jimmie Panattoni
Shaft No. 4	393613	2002.06.02	Good Standing 2007.06.02	Jimmie Panattoni / Jimmie Panattoni

Source: Ministry of Sustainable Resource Management

Please refer to Section 6.3.9.2 of this Master Plan for further information on the project's impacts on mining.

2.7.1.10 Purcell Wilderness Conservancy[39]

In April of 1974, the Purcell Wilderness Conservancy[40] was established because of a strong demand that the area's special wilderness qualities be preserved under a distinct designation. The effort was spearheaded by a number of environmental organizations and was inspired in particular by Art Twomey, a photographer who homesteaded in the area at the time. Much of the area had been and continues to be almost entirely undisturbed by the extensive roading, logging and mining that has occurred throughout much of the region. However, in the Jumbo Creek valley, the proposed resort site and access routes have been previously logged, and existing logging or upgraded roads are already in place. Consequently, the proposed development of the site as a resort facility will not result in appreciable disturbance or disruption of existing conditions.

The Purcell Wilderness Conservancy, including the east and west additions of 1996 totals 198,183 hectares (489,721 acres) and is now the largest protected area in southern B.C. Unlike the National Parks nearby, the Purcell Wilderness Conservancy is open to hunting.

The following are excerpts from an Environment and Land Use Act Order-In-Council Statement:

[39] Purcell Wilderness Conservancy Provincial Park Plan (draft) April, 1990

[40] Purcell Wilderness Conservancy Provincial Park Plan (draft) April, 1990

"The Purcell Wilderness Conservancy will be maintained as a roadless tract in which both natural and ecological communities are preserved intact and progression of the natural systems may proceed without alterations. No exploitation or development, except that necessary for preservation of natural processes, is permissible.

Use of recreational wilderness shall be limited to activities that do not detract from or disturb the area. These uses include hiking, climbing, camping, trail riding, nature study, fishing and hunting. Within the Conservancy the commercial activity of non-motorized recreational guiding and trapping, and guide outfitting, is permitted. All other forms of commercial activity as well as the use of combustible engines for recreational purposes shall be prohibited.

Any improvement or development will be limited to that which is required to protect the environment and to ensure the safety of the visitor. Parks Branch is authorized to manage and administer the said lands and the Park Act regulations thereto shall apply as though the lands were a "park" as defined in the Park Act."

The Conservancy[41] straddles the crest of the Purcell Mountain Range taking in the top ends of the drainage of Toby, Dutch, Findlay, Skookumchuck and Dewar Creeks and the St. Mary River on the east side and major portions of Hamill, Carney and Fry Creek drainage on the west side.

In June 1990, a draft copy of the Purcell Wilderness Conservancy Master Plan was released to the public for review. The draft Master Plan confirms "the original intent for establishing the Purcell Wilderness Conservancy - to provide a recreational wilderness and to preserve natural and ecological communities of the Purcell Mountains. On this basis, the Conservancy represents the epitome of 'wilderness recreation opportunities' in the southern interior of British Columbia."

In order to meet with the objectives of the draft Master Plan, a list of "actions" have been defined. One of these actions is as follows:

> iii. Upon completion of the boundary review, or no later than 1993, designate lands retained as Class A Park under Schedule A of Section 5 of the Park Act to ensure that the Park's area cannot be reduced except through review by the Legislature.
>
> Upon completion of the boundary review, designate any lands added to the Conservancy as Recreation Areas under the Park Act to allow for appropriate mineral resource assessment.
>
> Cooperate closely with other agencies through established coordinated management processes to obtain support for park resource and access interests on lands surrounding the Conservancy.

CORE expanded the Conservancy area to the east and to the west. Relevant sections of the CORE East Kootenay Land Use Plan Report of October 1994, which can be easily obtained from Government offices, outline the expanded area.

[41] Purcell Wilderness Conservancy Provincial Park Plan (draft) April, 1990

2.7.1.11 Park Use

2.7.1.11.1 Horsethief Creek Drainage[42]

A park study area consisting of all of the Horsethief Creek drainage upstream of a point of 300 metres below Horsethief Falls was excluded from the Provincial Forest in the 1981 Deferred Planning Area program and was placed under Land Act Reserve against alienation in consideration of its importance for recreation. The area was confirmed as a future component of the Provincial Park System in a 1985 Cabinet submission and was further confirmed as a park candidate in the 1987 East Kootenay Wildlife Use Study.[43] It was expected to be among the next group of park system candidates to be considered by Government in the process of completing the Park System, but CORE did not support it. The development of the Site as a low impact, limited access resort is compatible and in keeping with the desire of the community, First Nations and the proponent to maintain and enhance the environmental beauty and recreational resources of the area.

2.7.1.11.2 East Kootenay Wildlands

The Ministries of Forests in May of 1987 commenced the East Kootenay Wildlands Use Study Phase 1 Report - Identification and Analysis of Potential Wildland Areas. The purpose of this study is to provide an overview of the present system of wildland preserves in the East Kootenay and to recommend any changes or additions to the system to meet wilderness tourism recreation, wildlife and aesthetic requirements.

The study consists of an inventory of the most important areas, a summary of the resource values present, and proposes several scenarios for discussion. Public review and comment is encouraged.

Nineteen potential areas are identified. Resource values for each were accessed by an inter-ministerial committee, based on existing resource inventory information and local knowledge.

The following specified areas, if the recommendations of the study were to be implemented, would have impacted the proposed Jumbo Glacier Resort:

a) Jumbo
b) Farnham
c) Lake of the Hanging Glacier
d) Monica Archduke

However, CORE did not consider the study and the regional plan was completed with a new outlook regarding land use strategies.

2.7.1.11.3 Provincial Parks

One of the goals of the British Columbia Parks System is "to protect British

[42] Purcell Wilderness Conservancy Provincial Park Plan (draft) April, 1990

[43] Ministry of Forests, *East Kootenay Wildlife Study Use*,(7) 1987

Columbia's key recreation settings and most outstanding scenic features, so that the park system contains a wide selection of the best outdoor spots, features, wilderness areas - our highest peaks, our best beaches, our highest waterfalls, and our rarest wildlife."

"British Columbia Parks wants to become an international leader in providing inspiring outdoor recreation experiences. Parks' long-term vision is to contribute toward British Columbia's ability to achieve a provincial and international reputation for providing:

a) World class tourism travel routes along our major highways, our coast and on our major lake systems, by providing park attractions and services that enhance the major routes of the province.

b) Natural areas holiday destinations by protecting and managing the province's most important outdoor recreation lands as public parks;

c) Superlative backcountry recreation by protecting and managing the province's most outstanding back country/wilderness recreation settings; and

d) All residents of the province with the assurance of having reasonable access to local outdoor recreation opportunities, by planning park lands to serve local needs.

In evaluating our ability to provide outstanding backcountry adventure recreation experiences throughout the province, we identified 50 suitable provincial parks and recreation areas. There are, however, many other areas in the province which offer provincially or nationally significant backcountry recreation opportunities."

Two of the significant backcountry recreational settings identified in the list are: Lake of the Hanging Glacier (B-18) and Purcell (east side) (B-20). Both these areas are in close proximity to the Jumbo Creek drainage, but have no direct link to it.

2.7.1.12 Overview of Existing Land Tenures

2.7.1.12.1 Commercial Recreation

Current commercial recreation tenures in the areas within and adjacent to the study area are as follows:

Table 2.14: Commercial Recreation Tenures

Licensee	Tenure	Area (m^2)	File No.	Activity	Ren. Date
Radium Hot Springs Glacier Skiing[44]	License of Occupation	1233021184	4492087	Heli Skiing	03/15/2011
CMH-Bugaboos	License of	1013815488	4492085	Heli Skiing	12/01/2010

[44] also known as R.K. Heliski

	Occupation				
475335 BC Ltd.	License of Occupation	1363288	4403214	Multiple Use	05/01/2022
Intrawest Corp.	License of Occupation	2185676	4403386	Nordic Ski	08/01/2019
Lyle Barsby[45]	License of Occupation	11502	0315848	Multiple Use	07/01/2004
Calgary Olympic Development Association	License of Occupation	8418617	4404058	Multiple Use	01/05/2004
R.K. Heli-Hiking	License of Occupation	40897636	4403297	Heli-Hiking	11/01/2020

Source: Land and Water British Columbia (LWBC)

Mapping of commercial recreation tenures is included in Schedule A: Mapping Volume (see Map LU3).

2.7.1.12.2 Crown Land

Current Crown land tenures in the areas within and adjacent to the study area are as follows:

Table 2.15: Crown Land Tenures

Location	File No.	Area (ha)	Purpose	Type	Expiry
Panorama	4402573	1.96	Alpine Skiing	Statutory Right of Way	2033/02/15
Hanging Glacier	0160300	6,451.42	Environment, Conservation & Recr – UREP/ Recreation reserve	Map Reserve; UCL vicinity Hanging Glacier Lake and Horsethief Creek	9999/12/31
Golden – Invermere	4420135	15,600	Communication sites	Unalienated Crown Land, K.D. Invermere-Alpine Trans. Line	9999/12/31
Panorama	4403857	0.06	Communication sites	Licence of Occupation	2006/12/01
Jumbo Creek	4401835	11,380	Alpine Skiing	Licence of Occupation	2004/07/12
Panorama	4420495	10.4	Alpine Skiing	Statutory Right of Way over District Lot 4596	2033/02/15
Copper-crown Cr.	0206227	4.09	Environment, Conservation, Recreation	Map Reserve, District Lot 4596	9999/12/31
Panorama	4404033	0.0216	Communication	Licence of Occupation,	2032/12/01

[45] Licence has been sold to David Schneider

				combined uses	
Taynton Creek	0327842	900	Environment, Conservation, Recreation	Map Reserve	9999/12/31
Panorama	4403246	6	Alpine Skiing	Interim Licence	2033/02/15
Horseshoe Creek	0336007	0.22	Electric Power Line	Statutory Right of Way	9999/12/31
Panorama	4404033	0.0225	Communication	Licence of Occupation	2032/12/01
Clearwater Creek	4403854	0.07	Communication	Map Reserve	9999/01/08
Horsethief Creek	4420558	11.33	Quarrying – Sand and Gravel	Map Reserve	9999/12/31
Farnham Glacier	4401666	2129	Planning/ Marketing/ Develop. Projects	Notation of Interest	9999/12/31
W. of Invermere	4402163	530	Alpine Skiing	Licence of Occupation	2033/02/15
Mouth Jumbo Cr.	0205341	1.82	Environment, Conservation & Recr.	Map Reserve – UREP/ Recreation reserve	9999/12/31
Horsethief Creek	0332404	12.15	Environment, Conservation & Recr.	Map Reserve – UREP/ Recreation reserve	9999/12/31
Panorama	4420512	0.02335	Alpine Skiing	Licence of Occupation – Pt. of bed of Toby Creek	2033/02/15
Toby Creek	4420336	156	Environment, Conservation & Recr.	Map Reserve – Forest Management Research	9999/12/31
Fairmont	4400736	236	Alpine Skiing	Licence of Occupation	2014/06/30
Panorama	4420513	0.04	Alpine Skiing	Statutory Right of Way	2033/02/15
Toby Creek	4403660	0.042	Transportation	Roads & Bridges – Bridge crossing over unsurveyed crown foreshore being part of the bed of Toby Creek	2009/11/01
Panorama	4403839	0.06265	Alpine Skiing	Licence of Occupation – Day skier facility	2033/02/15
Panorama	4404033	0.0245	Communication	Licence of Occupation	2032/12/01
SW of Invermere	4400938	2	Alpine Skiing	Licence of Occupation	2033/02/15
Toby Creek	4403552	0.147	Transportation	Roads & Bridges	2009/11/09
Invermere	4420493	3.8877	Alpine Skiing	Statutory Right of Way	2033/02/15
Farnham Creek	0332405	4.5	Environment, Conservation &	Map Reserve	9999/12/31

			Recr.		
Panorama	4403279	1.8	Alpine Skiing	Interim Licence	2033/02/15
Bruce Creek	4404130	0.25	Commercial	Notation of Interest – Trapline Cabin	9999/12/31
Witness Cr. West	0333886	0.09	Communication	Map Reserve	9999/05/09
Invermere	0315280	1019.83	Miscellaneous Land Uses	Designated Use Area – Planning/ Marketing/ Develop. Projects	9999/12/31
Ben Able Lake	4401991	220.7	Environment, Conservation & Recr.	Map Reserve	9999/12/31

Source: Land and Water British Columbia (LWBC)

Mapping of crown land tenures is included in Schedule A: Mapping Volume (see Map LU4).

2.7.2 Regional District

The lands for the proposed development are situated in areas F and G of the Regional District of East Kootenay (RDEK). The RDEK is one of twenty-nine regional government units formed by the Province of British Columbia to provide local government services to unincorporated areas. The RDEK occupies the Province's southeast corner, sharing boundaries with Alberta and Montana. The northern boundary of the Region falls between the community of Spillimacheen and the Town of Golden and borders on Kootenay National Park. The Region occupies 17,092 sq.m (27,568 km^2) which represents 3.2% of the Provincial land area.

Much of the Regional District is divided into land use designations or zones. Zoning Bylaws contain regulations for land use, in order to guide development in an orderly way, having due regard to:

- the health, safety, convenience and welfare of the public;
- the prevention of overcrowding of land and the preservation of the amenities of an area;
- the security of adequate light, air and access;
- the character of areas and their buildings; and
- the conservation of property values.

Zoning is a classification of land according to permitted uses.

The present zoning of the proposed development lands is "Rural Resource Zone" (A-1). This zone permits agricultural uses and allows for one single family dwelling per lot. Each lot shall not be less than 65.0 hectares (160 acres) in area.

To change the use of land to uses other than those permitted in the zoning bylaw, application must be made to the RDEK. The intent of this process is to ensure that the development is in the best public interest, and it is a process that is not designed to follow CASP, CORE and the EA Act process, which are similar in intent, but in greater depth. Approval of an application to change a land use is done, following receipt of a report by the Planner of the RDEK, by the passing of a by-law, after a required Public Hearing.

The present zoning would probably have to be amended to a combination of the following:

- Resort Recreational Zone (Res-2)
- Resort Lodge Zone (Res-3)
- Resort Core Zone (Res-4)
- Public Institutional Zone (P-1)
- Public Parks and Open Areas (P-2)
- Watershed Protection (W-1)

Alternatively a new comprehensive development zone or combination of new zones will have to be created. Development of the proposed alpine resort would be dependent upon approval of the noted changes or on the creation of a Mountain Resort Area adopting the Master Plan as the Official Community Plan and zoning regulatory document.

2.7.3 Provincial Land Use Planning

2.7.3.1 The TIDSA Study

The project area has been under consideration and study for more than twenty-five years. Its tourism and ski resort potential was also previously identified in *The British Columbia Rocky Mountain Tourism Region*, a study prepared under the auspices of the *Tourist Industry Development Subsidiary Agreement* (TIDSA) for the Governments of British Columbia and of Canada and printed in 1982 (see Appendix 2-B). The following extract is significant:

> [6.4.2.6.] Purcell Mountains International Class Alpine Destination Resorts:
>
> Many of the mountains in the East Kootenay and other parts of the province developed by private clubs for alpine skiing are located in close proximity to communities and have good highway access. Because of the high capital investment, facilities have not been developed on many of the mountains most suited to alpine skiing.
>
> It is proposed that feasibility investigations be undertaken to determine the suitability of the terrain in the Stockdale and Jumbo Mountain areas in the upper reaches of Toby and Horsethief Watersheds for the establishment of two international class alpine ski resorts.
>
> These resorts would be established following the substantial development of Panorama and after appropriate market investigations are completed. Should the terrain and other factors prove the sites to be feasible, these mountain destination resorts would be designed to compete with the well-known alpine resorts in Europe and North America. Although these developments are considered for the future, it is important to reserve the future use of these crown lands for ski developments and, therefore, reduce multiple-use resource conflicts; and to guide the development of Panorama so that regional development objectives are realized.
>
> Major elements of these destination resort communities are as follows:
>
> 1. Examine in detail the feasibility of establishing two international class

alpine ski resorts on the upper reaches of Toby and Horsethief watersheds capitalizing on the market awareness of Panorama and other Canadian Rocky Mountain ski resorts, in particular, the Bugaboo Area.

2. These resorts would be planned to provide quality food, accommodation and services to a high-expenditure international market. Opportunities for summer recreation would require special investigation, but consideration of high alpine vacations tied to interpretive values of the area are proving to be an emerging market.

3. Examine the potential of establishing remote lodges adjacent to the resort communities capitalizing on the remoteness and elevation of the area. Restricted auto access would be permitted during the summer; winter access would be by means of aerial passenger way as in the case of Sunshine Village in Banff National Park. These two resorts would be designed to accommodate "exclusive" clientele interest in high altitude skiing. There would be limited second-home ownership in these resorts since emphasis would be on developing commercial accommodation.

4. It is proposed that parts of the resorts and lodges could be initially developed as heli-ski remote base areas, and therefore could be considered for development within the very near future.

In the TIDSA study, development was recommended near the headwaters of Jumbo Creek and of Horsethief Creek. These areas are at the foot of glaciers that would provide superior skiing both in winter and summer.

2.7.3.2 The CORE Land Use Review and East Kootenay Land Use Plan

The B.C. government established the Commission on Resources and the Environment (CORE) in 1992 to develop a land use strategy for the province. The CORE land-use review process was set in motion for the Kootenays in 1993 and consideration of the Jumbo Glacier Resort project under the *Commercial Alpine Ski Policy* (CASP) was postponed at that time pending the completion of the CORE commission's land-use plan for the Kootenay region.[46] Members of the Jumbo Glacier Resort project team participated in the Commercial Tourism caucus at the East Kootenay CORE Table and a representative of the proponent was named as a member of the Land Use Designation Committee.

CORE was a structured public process, during which the Jumbo Creek project was specifically discussed several times; at one point Local Government Table members put forward a motion, unanimously carried, in support of the future processing of the application when it appeared that a potential definition of settlement could block the application.

The CORE *East Kootenay Land Use Plan* resolved the land use issue by clearly

[46] The de-facto moratorium was contrary to policy. The proponent was advised that the project could continue through the CASP approval process only if a favourable CORE decision would occur. The project team was encouraged to participate as an observer at CORE and to continue to undertake planning and environmental studies for the Master Plan process at its own risk. For a review of the history of the project's approval process, please refer to Section 8.5.1 of this Master Plan.

permitting the use of the valley for the type of resort proposed subject to the *Environmental Assessment Act* review process.

On October 31, 1994, following eighteen months of public meetings, a formal favourable response to the land use question was given by CORE in the *East Kootenay Land Use Plan*.[47] Specifically, recommendation 75 reads:

> The commission recommends that:
>
> 75. The approval process for a resort development in Jumbo Creek include an environmental assessment under the provincial Environmental Assessment Act.
>
> This assessment should identify potential impacts and mitigative measures to address impacts prior to development approval. The process should also include public involvement to ensure that all values and perspectives are fully considered in a final decision. If this development proposal is approved, it should include a condition that no road access linking the East and West Kootenays through Jumbo Pass will be permitted."[48]

A meeting of the proponent with Commissioner Stephen Owen confirmed the recommendation and clarified that the Commissioner did not want to cause any delays waiting for the *Environmental Assessment Act* to be proclaimed or a new process be put in place, and that an equivalent process such as CASP was equally acceptable.

Following the proponent's objection[49] to the recommendation regarding the introduction of the new EA Act process, Commissioner Owen promptly wrote a letter (on December 13, 1994 – see Appendix 8-L) to the Minister of Environment, Lands and Parks and to the Minister of Employment and Investment, clarifying that a public process such as CASP would be considered equivalent and that the Commissioner did not intend to require a new process. The Commissioner wrote:

> This recommendation assumes that the environmental assessment process under the *Environmental Assessment Act* will be:
>
> - Imminently available to begin reviewing proposals
> - Efficient in providing a one-window review within strict time limits, and
> - Effective in providing public participation and the consideration of the full range of values that may be affected by the proposed development.

---

[47] The *East Kootenay Land Use Plan Summary Report* published by CORE in October 1994 is included in Appendix 8-J.

[48] Page 110, *East Kootenay Land Use Plan*, CORE, October 1994. See Appendix 8-K.

[49] In September 1993 the proponent had requested and obtained assurance in writing from the Province that should the CORE process result in a favourable land use decision, the proponent would be allowed to resume and complete the CASP process without delay, and the project would not be subject to any new and untried review processes. Further discussion of the history of the approval process during this time period is found in Section 8.5.1 of this Master Plan.

> We have since been advised that the design and detailed operational procedures of the environmental review process have not yet been finalized and that the recommended EAA assessment for the Jumbo Creek development proposal would not likely commence for some time. **In the circumstances we would have no objection with the assessment of this proposal proceeding under existing project review processes, so long as they met the conditions of efficiency and effectiveness mentioned above.**
>
> [emphasis added]

The proponent also noted that the CORE report was incorrect in stating that the proponent had hoped to have an outright approval from CORE, because the proponent was aware that the application can only be processed through B.C. Lands and that CORE did not have a mandate to make site specific reviews and to provide for project approvals. However, the proponent welcomed the site specific reference to its project by CORE, even if this was beyond CORE's terms of reference, because there had been so much reference to the project during the East Kootenay Table CORE process and expectations were so great that a specific reference had been hoped for and was very much needed. The Government of British Columbia accepted the recommendation by CORE regarding the Jumbo Creek project proposal and announced it with the joint news release by the Minister of Employment and Investment and by the Minister of Environment, Lands and Parks on April 10, 1995.

2.7.3.3 Coalition for an East Kootenay Solution Land Use Plan

CORE was an innovative and controversial planning process that was supposed to be driven by public consensus, but that did not satisfy the majority of participants because it appeared to give a slanted view of public input favouring minority advocacy groups.

A majority of the East Kootenay CORE Table participants were unhappy with the process and with the conclusions drawn from the deliberations, where the voice of the majority was not heard unless a unanimous conclusion was achieved. Indeed, there were a number of participants who believed that the views of the majority at the East Kootenay Table did not appear to be taken seriously by the Commissioner. Effectively, minority special interests dominated the agenda.

As a consequence an alternative report that documented their opposition was prepared. This report was presented as the *Land Use Plan by The Coalition For An East Kootenay Solution*, published in March 1995.

The report confirmed the decision at the East Kootenay CORE Table that the Jumbo valley should not only be designated for tourism resorts as highest potential value, but that it should be designated for Integrated Use as well.

2.7.3.4 Kootenay/Boundary Land Use Plan – Implementation Strategy

Following the conclusion of the CORE land use process, the CORE Commission's Land Use Plan became the basis for the work of the Land Use Coordination Office (LUCO). LUCO prepared the June 1997 *Kootenay/Boundary Land Use Plan – Implementation Strategy* that was taken as the reference for the Project Specifications issued by the Environmental Assessment Office for the Jumbo Glacier Resort Project.

LUCO was in contact and had meetings with the proponent’s consultants at the beginning of its work in 1995 and 1996. Its subsequent work was concentrated on the impacts that may be generated by the forest industry and there was no evaluation of the abundant information available regarding the environmental data collection on the Jumbo Creek drainage and on the tourist industry potential of that drainage.

In the *Implementation Strategy*, the management objectives for the Jumbo-Upper Horsethief SRMZ are specified for the following values: commercial tourism; access management; recreation; general biodiversity; and ungulates. A ski resort development would be acceptable provided it is compatible with other recognized values. These values were reviewed during the Environmental Assessment Act process which resulted in an Environmental Assessment Certificate for the project.

2.7.3.5 Kootenay Boundary Higher Level Plan

The *Kootenay Boundary Higher Level Plan* serves as a basis for the implementation of the Forest Practices Code. The *Higher Level Plan* “brought into force ten legal objectives that provided direction on biodiversity emphasis, old and mature forests, Caribou, Green-up and patch size, grizzly bears and connectivity corridors, consumptive use streams, enhanced resource development zones (timber), fire maintained ecosystems, visuals and the forest economy.”[50] The *Higher Level Plan* provides direction to the *Implementation Strategy*.

The *Higher Level Plan* contains little information regarding the resort industry and tourism, which could complement forestry and mining as a vital and sustainable industry for the Province. An example of this inadequacy is map 9.1, *Scenic Areas*, which might have some use for the forest industry, but is useless for the tourist industry. It excludes all scenic areas that include high mountains, which are one of the biggest attraction of the Purcell Mountains, currently accessed primarily by helicopter and consequently little known to the general public.

This Master Plan reflects a level of planning and information that greatly augments the generic statements of the *Kootenay/Boundary Land Use Plan – Implementation Strategy* and *Kootenay Boundary Higher Level Plan*.

2.7.3.6 Resort Policy: CASP and the BC Resort Strategy

In addition to being confirmed by the CORE land use review process and being in compliance with existing land use policy, as discussed above, this Master Plan also responds to provincial environmental, economic, and tourism policy including the *Commercial Alpine Ski Policy* (CASP) and the *BC Resort Strategy.* The project’s response to policy and the *BC Resort Strategy* is discussed in Section 8.4 of the Master Plan.

[50] http://srmwww.gov.bc.ca/kor/hlp/main.htm

3. THE ENVIRONMENT

3.1 INTRODUCTION

This section of the Master Plan outlines the proponent's commitment to sustainability and includes a summary of the full audit of environmental issues, including a description of baseline environmental resources, an environmental impact assessment and mitigation measures, and a proposed monitoring program to reduce any potential impact during construction and operation of the resort. Comprehensive Environmental Management Plans (see Section 3.4 for a list) are also included in this section of the Master Plan.

Detailed descriptions of baseline aquatic and wildlife resources, potential impacts and mitigation measures are provided in the appendices and reports prepared by ENKON Environmental Ltd., Norecol, Dames and Moore Inc., and AXYS Environmental Consulting Ltd., including:

- Biophysical Habitat Mapping (Appendix 3-A)
- Wildlife Resources (Appendix 3-B)
- Fisheries Resources (Appendix 3-F)
- Grizzly Bear Population Survey In the Central Purcell Mountains, British Columbia (Appendix 3-E); and
- Grizzly Bear Cumulative Impact Assessment (Appendix 3-D).

3.1.1 A Commitment to Sustainability

Tourism is the largest and fastest growing economic sector in the world and has significant environmental, cultural, social, and economic impacts, both positive and negative. If undertaken responsibly, tourism can be a positive force for sustainable development, conservation and environmental protection, and can provide unique opportunities for awareness raising and enhancing support for conservation. If unplanned, tourism can be socially, culturally and economically disruptive, and have a devastating effect on fragile environments.

The proponent is committed to incorporating sustainable economic, social, environmental and inclusive practices in the planning, construction and operation of the proposed Jumbo Glacier Resort. The proponent embraces sustainability because it is integral to the vision of the proposed resort, it is a global reality, local community visions have incorporated it and the citizens of British Columbia expect it.

The proponent has placed priorities on minimizing waste, conserving water, ensuring efficient use of energy, and developing facilities with environmental sensitivity in mind. It has committed to embracing the economic and social components of sustainability in order to ensure balanced decision making, a long-term view of the area, community inclusiveness, equity and a healthy community. Sustainability will be integrated into all aspects of the resorts operation through its commitment, planning, implementation, monitoring and reporting.

The approach to sustainability is based on six key principles. The principles define the values and beliefs that form the basis of Jumbo Glacier Resort's sustainability.

3.1.1.1 Sustainability Principles

- **Ecological Limits** – Society must live within the earth's capacity to sustain life.
- **Interdependence** – Economic and social prosperity are dependent upon one another and the natural environment.
- **Long-term view** – Today's decisions and actions must not compromise the choices available to future generations.
- **Inclusiveness** – Participation by all people must be promoted and decisions must be based on input from key stakeholders.
- **Equity** – People must be empowered to live sustainably and resources must be used fairly and efficiently in order to meet basic human needs.
- **Healthy Communities** – Community health and quality of life is integral to global and local sustainability.

The proponent intents to meet this commitment to sustainable environment, economic and social practices through the following:

Environmental Stewardship

- Conserving resources
- Preventing pollution
- Protecting and enhancing natural systems

Economic Opportunity

- Maximizing economic opportunity
- Supporting international trade and investment
- Advancing social equity through economic opportunities
- Strengthening community and stakeholder partnerships

Social Responsibility

- Communicating openly and consulting with stakeholders
- Promoting diversity, community involvement and cultural heritage
- Helping to increase the public's understanding of sustainability

The proponent will conduct further detailed environmental studies as required (e.g., as part of the design and approval process). Some of the attributes of the overall environmental program and resort design will include:

- Compact facility plans;
- Facility design and construction practices that incorporate environmentally-friendly practices;
- Policies to minimize Green House Gas emissions in accordance with Canada's commitment to the Kyoto Protocol;
- A solid waste management policy which strives to minimize resort wastes; and
- Environmental education to raise awareness for staff, suppliers, residents, and visitors.

3.2 ENVIRONMENTAL BASELINE

3.2.1 Physical Environment

3.2.1.1 Project Setting

Various ranges of mountains sprawl across British Columbia between the Rockies, which mark its easternmost boundary, and the Coast Range, which edges the Western coast. The Purcell Range, in which the Jumbo Valley is located, is the Easternmost of these. It faces the Rockies across the long Rocky Mountain Trench.

The Purcell oblong is approximately 60 miles (90 km) wide and 225 miles (360 km) long. The most interesting part for recreation is the 175 mile (282 km) Canadian section. South of the border, where Kootenay is spelled "Kootenai," the Purcells have shrunk to foothills and the main recreational interest is fishing. Farther north, the land has been called "a most formidable tract where even the banks of the rivers are cloud capped mountains."

The Purcells are many millions of years older than their neighbouring Rockies, having been the original line of demarcation along the Cordilleran syncline. The range's age shows in its rock forms: its mountains are composed mainly of sedimentary rocks, including argillites, sandstones and limestones which contain fossil stromatolites. In fact, the Purcells expose the oldest rock to be found on the North American continent, save in the Grand Canyon.

3.2.1.2 Bedrock Geology and Surficial Geologic Deposits

The bedrock in the study area (eastern side of the Purcell Mountains) consists mainly of quartzite, argillaceous quartzite, argillite, and some limestone of Proterozoic and Lower Palaeozoic ages. Cretaceous intrusions of quartz monzonite and granodiorite, such as the Horsethief batholith are found in localized areas. Numerous faults control the predominant northwest - southwest trend of individual mountain ranges.

The dominant surficial deposit in the study area consists of thin soil (10 cm or less) over bedrock, or exposed bedrock. In addition, significant portions of the site, within the proposed expansion area in particular, are covered by glacier ice or permanent snowfields at higher elevations.

At lower elevations, along the banks of Jumbo Creek and Farnham Creek, colluvial deposits of varying thicknesses occur. These are the product of mass wasting (movement downwards induced by gravity). Lower reaches of the creek valleys tend to have thicker covers of colluvial deposits, which partly smooth out irregularities in the underlying bedrock surfaces. The texture of this colluvium depends on source material and degree of weathering in the area; stony, coarse-textured deposits are probable. Soils developed on these deposits are generally associated with steep topography.

Preliminary soil investigations and soil testing indicate the existence of areas of good sedimentation, with appropriate range of compacted fine and medium coarse material which have good potential for dispersion fields for effluent of liquid waste treatment plants.

3.2.1.3 Soils

The soils component of the environmental studies were initially restricted to a review of the information contained in the most recent published soils mapping (Wittneben 1980) and aerial photograph interpretation. Later, on site soil investigations were undertaken. Each map unit indicates the soil association component(s) present, in the approximate proportions. A soil association refers to a group of closely interrelated soils developed on similar parent (geologic) materials under similar climatic conditions.

The majority of the initial ski area is described by the map unit $RO^7RA1^2YK2^1$, suggesting that approximately 70% of the area is characterized by exposed bedrock and/or poorly developed thin soils.

As indicated earlier, the majority of the study area is either covered by ice or consists of exposed bedrock with very thin soils. This area generally occurs above the alpine tundra vegetation zone.

The largest map unit within the potential expansion area is RO^7 $B53^2$ $YK2^1$, which suggests that up to 70% of the area may be occupied by exposed bedrock (RO). Bodshoz soils (BS3) are relatively thin soils developed on shallow, medium-textured colluvium overlying calcareous bedrock. They have relatively poor forest growth potential, primarily due to cold temperatures and limited rooting depth to bedrock. Yahk Creek soils (YK2) are described above, for the initial ski area.

A small portion of the northeast end of the area contains Bunyon soils (BP4), which occupy the upper reach of Farnham Creek. Bunyon soils are coarse to medium textured forest soils developed from colluvial materials on generally steep slopes; the dominant vegetation is usually Engelmann spruce and sub-alpine fir.

Radium soils (RA1) are high-elevation soils developed from colluvium (generally less than 90 cm deep) overlying bedrock. These soils have been subject to less intensive chemical weathering processes than is observed at lower elevations. In addition, cold temperatures, moderately deep snowfall and strong winds result in the dominance of alpine forest and grass vegetation. Radium soils are generally not forested and occupy the Alpine Tundra vegetation zone.

Yahk Creek (YK2) soils generally occur on steep, non vegetated slopes and are characterized by talus and very steep landforms. The soils are thin and poorly developed, likely due to mass wasting and slope instability, which provide little opportunity for vegetation or soil horizons to develop.

Most of the proposed resort base area is mapped as $BP4^7CN2^3$. These soils (70% Bunyon, 30% Conrad) are characteristic of the upper reaches of creeks, and are developed from colluvial materials of varying thicknesses. Conrad soils are generally deeper and more developed than Bunyon, and are very steeply sloping. This map unit occurs in the Subalpine Engelmann spruce-alpine fir vegetation zone.

3.2.2 Aquatic Resources

In September 1992, February, April and May 1993, Norecol, Dames and Moore conducted field studies to describe hydrology, water quality, aquatic habitat and fish populations in Jumbo and Toby Creeks. The data collected during these baseline studies were sufficiently comprehensive to address the Ministries' concerns. In addition, ENKON Environmental Limited used this information to identify project impacts and provide mitigation measures to reduce project impacts to the fish resources of Jumbo Creek. Norecol's data and ENKON's interpretation are included within this report (Appendix 3-F).

3.2.2.1 Hydrology

Stream flows were measured at three sites on Jumbo Creek. The September 26, 1992 flow measurements showed discharge rates at the upper, mid and lower stations of 0.57, 1.73 and 3.28 m^3/sec respectively. The May 20-23, 1993 stream flow measurements in Jumbo Creek showed discharge rates at Stations 1, 2 and 3 of 1.1, 3.5 and 5.4 m^3/s, respectively. These rates are comparable to the fall 1992 data and represent moderate flow conditions. High flows in Jumbo Creek would likely be 2 or 3 times these values based on field observations of flood signs in the stream channel. Please see Section 5.3.2.5 for a more complete hydrology assessment.

3.2.2.2 Water Quality

Water quality samples were collected at three sites on Jumbo Creek and two sites on Toby Creek. The results of the 1992 and 1993 water quality analyses showed that Jumbo and Toby Creeks have clear, somewhat alkaline water with generally low levels of metals and nutrients (nitrogen and phosphorus compounds). All water quality parameters except iron were well within the British Columbia guidelines for the protection of aquatic life. Water for the development is planned to be taken from groundwater and test results will confirm the water quality following the well drilling program.

3.2.2.3 Benthic Invertebrates

Benthic invertebrates were collected at three sites in Upper Jumbo Creek. The results of the 1992 and 1993 benthic invertebrate data show high proportions of the sensitive Ephemeroptera, Plecoptera and Trichoptera. The benthic invertebrate community in Jumbo Creek is typical for an unstressed stream in north temperate latitudes.

3.2.2.4 Fisheries Resources

Carswell (1979) conducted an inventory of Toby Creek mainstem and tributaries including Jumbo, Delphine and Coppercrown Creeks from May 25-June 12 and from August 8-18, 1978. Carswell (1979) found cutthroat trout as far upstream as the washed out bridge in middle/upper Jumbo Creek, but did not observe or capture Dolly Varden char (i.e. bull trout) in upper, middle or lower Jumbo Creek. However, Carswell did comment that Dolly Varden char (bull trout) presence is thought likely throughout Jumbo Creek.

Aquatic Resources (1993) conducted fisheries surveys of Dutch, Toby and Horsethief Creeks and tributaries from August 12-September 29, 1992 as part of the Mica Compensation Program. Aquatic Resources (1993) found bull trout throughout Toby Creek, mountain whitefish in lower Toby Creek and rainbow trout in Neave Creek a tributary to lower Toby Creek. Kokanee salmon were also observed spawning in lower Toby Creek. Cutthroat trout were only found in middle to lower Jumbo Creek within the Toby Creek system, while bull trout were only found at the confluence of Jumbo/Toby Creek. The electrofishing and trapping efforts produced very few fish in Jumbo Creek, all of one species (cutthroat trout) and all in the lower reaches. No fish were caught or seen in Jumbo Creek upstream of about km 10 as marked on the access road.

During Norecol's September 1992 and May 1993 fisheries study, few fish were caught or observed. Several cutthroat trout (Oncorhynchus clarki lewsi) were caught/observed in Reach C and D of lower Jumbo Creek during September 1992, while several more cutthroat trout were captured/observed in the lower section of Reach B near Leona Creek and in Reaches C and D in lower Jumbo Creek. The upstream limit of fish presence in Jumbo Creek was found by Carswell to be just below the bridge near the upper end of Reach B. The farthest upstream sighting of a fish by Norecol was also in the upper part of Reach B at Leona Creek a west- side tributary. No fish were caught by Carswell (1979), Norecol (1992 and 1993) or Aquatic Resources (1993) above the waterfall at the division point between Reach A and B.

It is of interest to note that during Aquatic Resources study from early August to late September 1992 with the exception of the confluence of Jumbo/Toby Creek, bull trout were not captured or observed in any tributary stream of the Toby (upper, middle or lower Jumbo, Neave and Delphine Creeks) or Horsethief (Andreen, Bruce, Law, Grottos tributaries, Gopher, McDonald, Stockdale or Farnham Creeks) Creek systems. Based on the three fisheries research projects conducted in Jumbo Creek, there is no evidence to suggest bull trout utilize Jumbo Creek.

Based on sampling conducted by Norecol (1992 and 1993), Carswell (1979) and Aquatic Resources (1993) few fish were found in Jumbo Creek, suggesting that there are one or more limiting factors to fish production in Jumbo Creek. The most likely factors are

1. Limited habitat in winter, perhaps a few deep (1 m+) pools;
2. "Flashy" flows from glacial meltwater creating instability in the benthic community and limiting fish rearing areas;
3. High suspended sediments (glacial flour) in spring flood flows reducing primary; and secondary production;
4. Low phosphorus levels limiting algal growth (primary production); and
5. Limited access to Jumbo Creek due to steep gradients and fast flows in reaches B and D.

3.2.3 Forestry Resources

Most of the study area is within Glacier/Icefield or Alpine Tundra zones, the latter supporting some open canopy conifer forest and low growing alpine vegetation. The treeline is at about 2,135 metres (7,000 feet) and below this elevation the Engelmann Spruce - Subalpine Fir (ESSF) zone occurs extending downwards to approximately 1,525 metres (5,000 feet). To the south and east the valley floors of the main drainage descend into the Montane Spruce (MS) zone and to the west into the Interior Cedar Hemlock (ICH) zone. Neither the MS or ICH zones occur in the study area, but the former is found on the access route along Jumbo and Toby Creeks.

The main tree species within the ESSF zone are Engelmann spruce, subalpine fir and larch with some whitebark pine and lodgepole pine. Douglas fir, hemlock and western white pine are found infrequently at the lower elevations of this zone becoming common in the MS zone. Hardwood species form a minor component, while growing sites vary from low to good.

Forest cover maps provided by Ministry of Forests (MOF) would show that remaining undisturbed forest is age class 8 (141 to 250 years) or 9 (251+ years). Rock slides, avalanche chutes, logging and fire (wild and human origin) are the main causes of forest fragmentation. However, the lower half of Jumbo Creek Valley has been logged and swept by a fire that engulfed the entire valley. The upper section has been logged for almost a half century and is still currently being logged, with the most recent activity occurring from 1991 to 1994. Traces of previous logging activity are also visible where regrowth has occurred.

Located in the headwaters and upper reaches of Jumbo Creek, the project area is mainly alpine/glacier with mature coniferous forest at the lower levels. Mapping the remaining tree stands would catalogue forest age ranges from 100 to 251+ years. However, only a small area near the top of the valley may include what remains of the forest. The forested valley sides are cut by numerous rock slides and many of the forest stands are mapped as areas having regeneration problems due to geoclimatic factors. These would include deep, late melting snowpack and low temperatures.

Extensive logging has occurred on both sides of Jumbo Creek in the area of the proposed resort. Remnants of a sawmill operation are to be found in at least three locations of upper Jumbo Creek. Recent record of this activity dates from 1964 with further harvesting in 1973 to 1977. Aerial photography from 1985 shows how regeneration on the valley sides started. An improved logging road reaching the proposed resort site was built in 1991, and additional logging activity began at the end of that summer and carried on until the end of summer 1994.

Only the northeast corner of the study area is within the forested zone (ESSF) and occurs in the headwaters area of Farnham Creek. Age classes and species composition are similar to those found at the head of Jumbo Creek. The entire headwaters area of Farnham Creek is listed as having exceptionally high recreational values and no recent logging or recent fires have occurred in this part of the study area. Slide areas interrupt the forest cover along Farnham Creek and its tributaries. Northwards along this drainage are found areas of unstable/fragile soils and some logged sites.

The existing road corridor along Jumbo Creek from the confluence with Toby Creek passes through some areas of previous mining and logging activity, as well as some areas of recent logging. Access is through a small gorge. Some sections of the route are shown as having slow regeneration and being slide prone. Logging and fire have affected large areas of the valley floor and side drainage. Some of the higher slopes have burnt during the 1960's and 70's, possibly as a result of escaped slashburns.

The remaining undisturbed areas of forest in upper Jumbo Creek are mostly age class 8 and 9. Douglas fir and hemlock are common here in addition to the subalpine species (spruce, fir, larch and pine). Some cottonwood occurs in the floodplain of the creek.

A number of forestry sample plots are located in the Jumbo and Farnham Creek drainage and a few fall within the study area. A small proportion of these are permanent growth plots which should not be disturbed if at all possible. A major experimental plot installation is located on Jumbo Creek 6 km west of its confluence with Toby Creek.

3.2.4 Wildlife Resources

The conclusions in this report regarding each ungulate, bear, large carnivore, furbearer, small mammal and bird species are based on analysis of results of the Norecol Dames and Moore (Norecol) aerial and ground surveys conducted from September 1992 to April 1993. The full analysis of these results may be found in the Wildlife Resources Appendix (3-B) to this volume.

3.2.4.1 Mountain Goats

A small number of Mountain Goats winter in Jumbo Valley. They were seen, during the November survey, using the upper regions of the east side (south-west aspect) of the Commander basin and the area above the treeline on the east side (west aspect) of the upper Jumbo basin (slope below Karnak Mountain). Most goats migrate out of the area, wintering on the ridge lying north of Jumbo Creek (and south of Delphine Creek) and west of Toby Creek above Delphine Creek. Goats also winter on the ridges of the upper Delphine Creek basin.

Available information suggests that in summer and early fall, goats occur along the north and south sides of Jumbo Valley. Three goats were observed in the upper Commander Creek basin during the September 1992 survey, and goat trails were observed on the high ridges between The Cleaver and Black Diamond Mountain. Goats were not observed in the survey area during the November 1992 survey, though goat tracks were observed in the upper elevations of the Commander Creek basin.

During the February, 1993 survey, two goats were observed on a south-facing rock bluff on the north side of Jumbo Valley, opposite Leona Creek. Ten goats were observed on the south-facing rocky bluffs and ridges on the north side of the lower Jumbo Valley and on the west side of the Toby Creek Valley. This area of bluffs and ridges extends from Monument Peak (east of Black Diamond Creek) over to Delphine Creek. Goat tracks were also observed in the upper Delphine Creek basin.

During the April, 1993 survey, two goats were again observed in Jumbo Valley on the south facing bluffs opposite Leona Creek, and ten goats were counted on the rock bluffs on the west side of Toby Creek, between Jumbo Creek and Delphine Creek.

Mountain Goats appear to move out of the Jumbo Valley by November to winter ranges above Toby Creek (north side between Delphine and Jumbo Creeks). They remain there until May, and likely use the winter range for parturition, moving slowly into Jumbo Valley by June and being well dispersed by July. A small number (2 or 3) of Mountain Goats remained in Jumbo Valley and wintered there in 1993 (bluffs opposite Leona Creek). Rutting areas were not confirmed, but may include the upper Delphine Creek area, on the way to winter ranges above Toby Creek.

Mountain Goats appear to move extensively in and out of Jumbo Valley and adjacent areas, between summer ranges, rutting areas, winter range/parturition areas and back to summer ranges. The lick at the top end of Horsethief Creek may be a key element in the annual movement pattern of goats in the area. Movement corridors through

Glacier Dome and Black Diamond seemed to be well used.

Mountain Goats were not observed in Jumbo Valley during the May 26 aerial survey but two goats were observed in the snow at higher elevations in the upper valley during follow-up ground surveys. These were well above tree line. Goats were also reported up high at Black Diamond by a group of hunters in late May. Goats were still common on the Toby Creek winter range in late May. Two goats were observed in upper Jumbo Valley during the June 9 aerial survey and follow-up ground surveys. Mountain Goats were observed far up the valley (Glacier Dome) during the July 23 aerial survey, and a large group (12) at a lick at the top of Horsethief Creek. Goats were also reported on August 1 at Jumbo Pass.

3.2.4.2 Mule Deer

Winter snow conditions in the East Kootenay force Mule Deer from their traditional summering range to lower elevation areas in the Rocky Mountain Trench and major valleys (EKLUP 1994). Their survival completely depends on the quantity and quality of forage in their winter habitat.

During the late May aerial survey and follow-up groundwork, no Mule Deer were observed in Jumbo Valley, although large numbers were observed in the Toby Creek valley, especially at Mineral King. By early June, Mule Deer had dispersed again into the Jumbo Valley, at least into the valley bottoms. By July, Mule Deer were well dispersed in Jumbo Valley, including up to the tree line. No Mule Deer fawns were observed. Parturition likely occurs in the valley bottom habitats. Rutting areas are outside the Jumbo Valley.

No direct observations of Mule Deer were made in Jumbo Valley during the September, November, February, or April surveys. Sign (tracks, droppings) was observed at the lower elevations of the valley during September 1992 ground surveys and Mule Deer were often observed in the Toby Creek Valley in September 1992. Mule Deer appear to move out of Jumbo Valley in the fall (by November) and move down to winter ranges in the Rocky Mountain Trench. No observations of Mule Deer or tracks in the snow were made during the November, February, and April surveys in Jumbo Valley. Large numbers of Mule Deer winter on the benches to the west of Invermere and were common there in April 1993 (based on roadside observations).

3.2.4.3 White-Tailed Deer

According to the East Kootenay Land Use Plan, winter snow conditions in the East Kootenay force White-tailed Deer from their traditional summering range to lower elevations in the Rocky Mountain Trench and major valleys (EKLUP 1994).

In a study conducted by the Columbia Basin Compensation Program (Boulanger *et al.* 2000), variables that could potentially predict White-tailed Deer habitat were examined. Those variables were winter severity, mean pellet group count, yearly days on winter range, estimated deer density, aspect, slope, elevation, and pre-defined habitat classes. They compared habitat selection between good and bad winters to examine which habitats deer tend towards during periods of higher snow depths. Selection for steeper slopes and moderate elevation increases in bad winters, and there appears to be a strongest positive selection towards optimal cover and good cover and a negative selection towards forage. Their habitat modelling suggests that local topography is the main driving force behind winter habitat selection, at least in this particular study.

Boulanger *et al.,* based on the results form the Pend d'Oreille study, suggest that although higher crown closure stands on steeper slopes are utilized to a greater degree during winters with high snow accumulation, stands that produce forage are also extensively used.

White-tailed Deer start to appear in the lower portion of the Jumbo Valley in late May when they utilize the lower slide areas for feeding and cover. Few were observed during aerial surveys (one on June 9 and five on July 23), although they are relatively numerous along Jumbo Creek floodplain habitats from early June through the fall (Norecol 1993).

White-tailed Deer were observed most of the way up the Jumbo Valley, utilizing floodplains and slide area habitats. As with Mule Deer, White-tailed Deer move out of the valley by late fall (November) to winter ranges in the Rocky Mountain Trench. They are common again in Toby Creek by late May (especially at Mineral King). No White-tailed Deer fawns were observed in Jumbo Valley during May or June surveys. They likely drop their fawns in the forested habitats along lower Jumbo Creek. Rutting areas are outside of Jumbo Valley.

3.2.4.4 Moose

Winter snow conditions in the East Kootenay force Moose to lower elevations in the Rocky Mountain Trench and major valleys (EKLUP 1994). Their survival over the winter depends upon the quantity and quality of forage in their winter habitat.

Information indicates that Moose utilize the upper Jumbo Valley area (above Leona Creek) from summer to late fall (November). By early winter (December) they move down to their winter ranges in the lower part of Jumbo Valley and into the Toby Creek valley bottom. During colder weather and new snow (e.g. in February) Moose had moved to well below Leona Creek, where the valley is widest and has the greatest availability of browse (willows, poplars) in the early seral stages following fire (i.e., 7.8 km to 2.8 km on Jumbo Valley road).

In early spring (late April), Moose actively occurred up to about Leo Creek. No sign of Moose was observed in the upper part of Jumbo Valley during the April survey. They were well dispersed by late May and few were observed during the May, June, or July aerial surveys. A young calf Moose was observed with a cow in upper Jumbo Valley on May 26, suggesting that the upper Jumbo Valley is used for parturition.

The highest number of Moose observed in Jumbo Valley was in February when seven were counted during the aerial survey. The Moose population in the Jumbo Valley is a minimum of 5 (2 cows, 2 calves and 1 lone adult), based on aerial observation of 4, and tracks from a lone Moose. Several more Moose likely occur in the valley.

Rutting activity likely occurs throughout the Jumbo Valley, in the valley bottom and coniferous forests and successional stages on the lower valley slopes.

Anecdotal information suggests that hunting pressure on Moose in Jumbo Valley is heavy, and consequently, the Moose population may be depressed (Norecol 1993).

3.2.4.5 Elk

Winter snow conditions in the East Kootenay forces Elk from their traditional summering range to lower elevation areas in the Rocky Mountain Trench and major valleys (EKLUP 1994). Their survival completely depends on the quantity and quality of forage in their winter habitat.

Elk had moved out of the Jumbo Valley by the time of the November survey. Sparse Elk sign was still evident along Toby Creek; however, it appears that Elk generally move down to the main valley at Invermere, likely by late October.

Elk inhabit Jumbo Valley during summer and early fall. By November, Elk have moved out of the valley, likely moving down through Toby Creek to the Rocky Mountain Trench to winter. No evidence of wintering Elk was recorded in Jumbo Valley or the Toby Creek Valley during the November (1992) or February (1993) surveys and none were observed in Jumbo Valley during the April (1993) survey. Elk were observed again in Jumbo Valley in late May, including two Elk in the upper valley. This suggests that Elk move into the valley again by mid-May. Calf Elk were not observed in late May or early June and a few were observed during the late July aerial survey. Elk appeared to be well dispersed in small groups during the summer.

Parturition areas could not be confirmed but likely include the remaining mature coniferous forests in the valley. Rutting areas were also not confirmed. Suitable rutting areas occur throughout the upper elevation basins and parkland habitats near tree line. There is no information on population size in Jumbo Valley, though bands of >20 Elk were reported in the alpine areas on the north side of Jumbo Valley near Black Diamond Mountain in August 1992 (J. Christensen, pilot for Frontier Helicopters).

3.2.4.6 Grizzly Bears

The population and habitat requirements of grizzly bears in the project area have been assessed in detail. AXYS Environmental Consulting Ltd. estimated the Grizzly bear population based on collection of hair samples, analysis of DNA obtained from hair samples, and genetic identification of individual bears. ENKON completed an extensive literature review of Grizzly bear behaviour and habitat requirements and mapped habitat suitability for Grizzly bears. The details of these studies are presented in:

- Grizzly Bear Population Survey In the Central Purcell Mountains, British Columbia (Appendix 3-E), and
- Grizzly Bear Management Plan (Appendix 3-C).

According to the *East Kootenay Land Use Plan,* the East Kootenay area supports between 1000 and 1250 Grizzly bears (EKLUP 1994), with the West Kootenay supporting perhaps 700 to 1000 (WKLUP 1994). Moderate and high Grizzly densities and capabilities still exist in many areas of the East Kootenay region, but their persistence requires appropriate monitoring and management.

Information from Alberta (Gibeau and Herrero 1998) indicates that there is a population of approximately 800 grizzly bears on provincially and federally owned lands, with a goal of increasing the population to 1000 (Nagy and Gunson 1990). Gibeau and Herrero estimate that grizzly bears occur at relatively low population densities, only one bear for each 60 to 100 km^2. Male grizzlies have lifetime home ranges of approximately 1000 to 2000 km^2 (Russell et al. 1979, Carr 1989).

AXYS estimated the unbound Grizzly population of the Central Purcell study area (Jumbo, Horsethief, Toby, Glacier, and Hamill Creek valleys) to be 45 grizzly bears, with a 95% confidence interval of 37-68. They identified 33 individual bears based on DNA analysis of hair samples. They included 18 females, 10 males, and five of unknown sex. Of the 18 female grizzly bears, five were from the Glacier Creek watershed, three from Stockdale Creek, three from lower Toby Creek, three from upper and south Toby Creek drainages, two from Jumbo Creek watershed, and one each from Farnham and Hamill Creek watershed.

An unbound population estimate was used because the critical assumption of population closure could not be met. Population closure assumes that there are no births or deaths in the study area, or immigration or emigration within the study area during the course of sampling. AXYS concluded that the assumption was violated during the sampling program. The violation was likely due to the open grid of the sampling area and the immigration and emigration of bears.

The majority of male grizzly bears were sampled from within the southern one third of the study area, specifically Hamill, Upper Toby, South Toby, Mineral and Coppercrown Creeks.

The Jumbo Valley appears to be used by grizzlies for feeding in the late spring-summer. One local resident (Mr. Nolan Rad from Invermere) suggests that breeding grizzly bears use the upper Jumbo Valley during June.

One den site was observed from the air and was located at the upper elevation of the Commander Creek basin. No other den sites were found. Summer feeding sites (craters in meadows) were evident in several regions of the study area, notably west side of Jumbo Pass, upper Jumbo Creek, Commander Creek basin, and upper Leo Creek basin.

No tracks or other signs of bears were observed during the November 1992 survey, suggesting that bears had already entered their dens by the time of the survey. Grizzlies may still have been active in the region, as the weather had been mild and snow depth was light (generally less than 30-35 cm even at 2130 m (7000 ft) elevation).

Suitable bear denning habitat (based on aspect, slope position, and surfical materials) is located in the side drainages to the north of Jumbo Creek (e.g., the Commander basin and basin to the east.) The upper Jumbo Valley is rocky, with many unstable slide areas, and generally does not appear to provide suitable denning habitat for grizzly bears.

3.2.4.7 Black Bears

Black bears were observed during the September 7, 1992; May 26, June 9 and July 23, 1993 aerial surveys. Ground observations were also made during late May, early June and late July to early August (Table 1-6). Black bears frequented the slide area and lower valley forests. Fewer black bears were observed than expected, likely due to their habit of staying in dense cover. They are likely abundant in the valley bottom and lower slope forests of Jumbo Valley.

It is possible that denning occurs in older stands where large trees have suitable denning cavities. Suitable bear denning habitat (based on aspect, slope position, and surfical material) is located in the side drainages to the north of Jumbo Creek. The upper Jumbo Valley is rocky, with many unstable slide areas, and generally does not appear to provide suitable denning habitat for bears.

3.2.4.8 Large Carnivores

According to records from the Ministry of Forests, large carnivores that inhabit the Invermere Timber Supply Area (TSA) are Bobcat, Lynx, Cougars, Wolves, Coyotes, Fox and Black and Grizzly Bear.

In a lynx study in north-central Washington, the researcher suggest that the lynx population in the southern Rocky Mountains is not subject to dramatic peaks of increased productivity often seen in northern populations, and that alternate prey may be important in sustaining lynx throughout the snowshoe hare cycle (Koehler 1990). Only some landscapes with suitable terrain and climate conditions will support resident Lynx, resulting in patchy distribution of the regional population. In addition, preliminary analyses indicate that lynx crossed B.C.'s undivided Highway 93 within their home range, but their home ranges did not extend across the Trans Canada Highway (Apps 1998). Crossing frequency appears to be at least a partial function of traffic volume and highway allowance.

Relative to available habitat, wolves use more of the following for den site locations: valley bottoms and lower slopes, flat to moderate slopes, south and east aspects, depositional landforms, and sites close to trails, far from human habitation and activity, and close to meadows and other openings (Matteson 1993). Distance to nearest road, in this study, did not appear to be a factor in wolf den site use. However, many of the roads identified, including those nearest to den sites, were not heavily traveled, and seasonal in nature.

Available information (Norecol 1992, 1993) suggests that cougars occur in Jumbo Valley, though none had been observed during fieldwork. Others have reported cougar tracks and one sighting in Jumbo Valley during 1992/93.

Available information (Norecol 1992, 1993) suggests that Wolves occur in Jumbo Valley, though none have been observed during fieldwork. Discussions with a former trapper suggest that they may occasionally travel through Jumbo Valley in winter (pers. comm. Nolan Rad).

A lone Coyote was observed in Jumbo Valley during the February and April (1993) surveys and sign and tracks were observed during the November, February, and April surveys. In general, it is suspected that low numbers of coyotes use Jumbo Valley.

In general, it is suspected that low numbers of Lynx may use Jumbo Valley.

3.2.4.9 Furbearers

According to records from the Ministry of Forests, furbearers that inhabit the Invermere TSA are Mink, Otter, Fisher, Marten, Skunk, Weasel, Badger and Wolverine. In a Wolverine study of the North Columbia Mountains, Krebs and Lewis (2000) estimated a population of 25.6 (1996) or 24.0 (1997) for a 4000 km^2 study area. The annual survival rate was estimated to be 0.77, with six of 11 mortalities caused by humans. Of the 14 adult female reproductive seasons, 3 produced kit litters of 2-kits per litter.

Natal densities have been recorded in the ESSF biogeoclimatic zone associated with woody debris and/or large boulder talus in undeveloped drainages. Home range of males (1005 km2) was significantly larger than females (310 km^2) (Krebs and Lewis 2000).

Furbearers including Wolverine, Marten, Weasel and Ermine are active in the upper Jumbo Valley. Furbearers (mainly Marten and Weasel) are most abundant between Leona Creek (at km 14) and km 18 (Norecol 1993).

Based on discussion with local trappers (including a former trapper in Jumbo Valley) and observations during November, February, and April surveys, Jumbo Valley supports Wolverine (small numbers due to large home range size), Marten and Ermine. Suitable habitat for wolverines is found in the upper areas of Jumbo Valley. The remaining stands of mature coniferous forest in particular provide good habitat for Marten, while the recently logged areas on the valley side and the early regeneration after logging provide good habitat for Ermine.

Inferring from ground/aerial surveys and available information, the study area does not support a visible Fisher population. Preferred habitat is found in SWB, SBS and BWBS biogeoclimatic zones with abundant coarse woody debris. However, Cannings *et al.* (1999) identified the south-eastern corner of the province as former Fisher range. Therefore, the wildlife impact assessment (Section 3.3) includes Fisher.

3.2.4.10 Small Mammals

According to the Ministry of Forests, some of the small mammals that inhabit the Invermere TSA are Beaver, Muskrat, Squirrel, and Raccoon. According to field survey records, the area is home to Red Squirrel, Snowshoe Hare and Porcupine. Due to their conservation status, an emphasis during research was placed on red-listed Least Chipmunk and blue-listed Red-tailed Chipmunk.

Habitat for Least Chipmunk is restricted to alpine and subalpine areas. They have not been recorded in the immediate study area, but Nagorsen and Fraker (2002) recently collected specimens nearby in the Bruce Creek drainage and an area near Mount Brewer (Nagorsen *et al.* 2002). Thus, they could possibly occur in the upper Jumbo Valley below the glacier level. Fraker and Nagorsen concluded in their comprehensive study, that Red-tailed Chipmunk does not inhabit the Purcell Mountains.

3.2.4.11 Passerine, Passerine-Like Birds and Waterfowl

Common passerine and passerine-like bird species and migratory waterfowl residing within the Engelmann Spruce-Subalpine Fir (ESSF) and Alpine Tundra (AT) biogeoclimatic zone are summarized in Table 3.1 based on *Ecosystems of British Columbia*. Some of the listed species are migratory (e.g., Fox sparrow), while others are non-migratory passerine/passerine-like species (e.g., Gray jay).

Thirty-two migratory bird species occur in the biogeoclimatic zones of the study area (i.e., ESSF and AT). Species in boldface type have been recorded in the Jumbo watershed during field studies. A more extensive list of possible resident migrant bird species is included in Appendix 3-B; it has been compiled from *Birds of Canada* and *Birds of the Canadian Rockies.*

Table 3.1: Passerine and Passerine-like birds that Occur in ESSF and AT Biogeoclimatic Zones

Common name	Scientific name	Common name	Scientific name
American DipperK	***Cinclus mexicanus***	Red Crossbill	*Loxia curvirostra*
American RobinK	***Turdus migratorius***	Red-breasted Nuthatch	*Sitta canadensis*
American Tree SparrowU	*Spizella arborea*	Red-necked Phalarope	*Phalaropus lobatus*
Black-backed Woodpecker	*Picoides arcticus*	Rosy Finch	*Leucosticte arctoa*
Bohemian Waxwing	*Bombycilla garrulus*	Rufous Hummingbird	*Selasphorus rufus*
Cassin's Finch	*Carpodacis cassinii*	Say's Phoebe	*Sayornis saya*
Clark's NutcrackerK	***Nucifraga columbiana***	Smith's LongspurU	*Calcarius pictus*
Dark-eyed JuncoK	***Junco hyemalis***	**Steller's Jay**K	***Cyanocitta stelleri***
Fox Sparrow	*Passerellailiaca*	Three-toed Woodpecker	*Picoides tridactylus*
Hammond's Flycatcher	*Empidonax hammondii*	Townsend's Solitaire	*Myadestes townsendi*
Harlequin Duck	*Histrionicus histrionicus*	**Varied Thrush**K	***Ixoreus naevius***
Horned Lark	*Eremophilia alpestris*	Water Pipit	*Anthus spinoletta*
Least Sandpiper	*Calidris minutilla*	**Western Tanager**K	***Piranga ludoviciana***
Mountain Chickadee	*Parus gambeli*	White-winged Crossbill	*Loxia leucoptera*
Pine Grosbeak	*Pinicola enucleator*	Wilson's Warbler	*Wilsonia pusilla*
Pine Siskin	*Carduelis pinus*	**Yellow-rumped Warbler**K	***Dendroica coronata***

U=Unlikely, K=known

According to the Canada Land Inventory mapping for waterfowl suitability, the project area is class 7 habitat for waterfowl. This classification means that the site has no capacity for arable culture or permanent pasture (CLI 1998), two traits that are often required to be suitable waterfowl habitat. The steep topography of the area makes it unsuitable for most waterfowl, with the exception of Harlequin Ducks.

There are 12 species of neotropical birds observed during the Jumbo Resort field studies, and 32 bird species have a potential to occur in the area. They occupy a variety of habitat types. The most likely species to occur are those associated with coniferous forests, alpine meadows, riparian areas and alpine-subalpine areas.

3.2.4.12 Non-Migratory Birds

Common non-migratory bird species resident within the Engelmann Spruce-Subalpine Fir and Alpine Tundra biogeoclimatic zone are summarized in Table 3.2 based on information from Ecosystems of British Columbia. Species highlighted by boldface type have been recorded in the Jumbo watershed during field studies. A more extensive list of possible resident bird species is included in Appendix 3-B; it has been compiled from Birds of Canada and Birds of the Canadian Rockies. For organizational purposes, non-migratory passerine and passerine-like birds have been included in the previous section.

Table 3.2: Non-migratory Birds that Occur in ESSF and AT Biogeoclimatic Zones

Common name	Scientific name	Common name	Scientific name
Anatum Peregrine Falcon	*Falco peregrinus*[P]	Northern Hawk Owl	*Surnia ulula*[P]
Barred Owl	***Strix varia*[K]**	**Northern Pygmy Owl**	***Glaucidium gnoma*[K]**
Blue Grouse	*Dendragapus obscurus*[E]	Rock Ptarmigan	*Logopus mutus*[U]
Common Crow	***Corvus brachyrhynchos*[K]**	**Ruffed Grouse**	***Bonasa umbellus*[K]**
Common Raven	***Corvus corax*[K]**	Sharp-shinned Hawk	*Accipiter striatus*[E]
Golden Eagle	***Aquila chrysaetos*[K]**	Spotted Owl	*Strix occidentalis*[U]
Great Gray Owl	*Strix nebulosa*[K]	Spruce Grouse	*Dendragapus canadensis*[E]
Gyrfalcon	*Falco rusticolus*[U]	**White-tailed Ptarmigan**	***Lagopus leucurus*[K]**
Northern Goshawk	***Accipiter gentilis*[K]**	Willow Ptarmigan	*Lagopus lagopus*[U]

U=Unlikely, P=Possible, E=Expected, K=Known

Falconiformes observed in Jumbo Valley to date include Golden Eagle, Osprey, Red-tailed Hawk, Rough-legged Hawk, Goshawk, and American kestrel (Table 1-14). In addition, an historic record exists for the presence of Peregrine Falcon, but it was not seen during the course of the project field work. In addition to the species aforementioned it is also expected that the following species may be local residents or occasional migrants: Sharp-shinned Hawk, Cooper's Hawk, Red-tailed Hawk, Merlin and Bald Eagle.

Barred Owl, Great-horned Owl, and Northern Pygmy Owl are present within the project area, and it is expected that Great Gray, Long-eared and Northern Saw-whet Owls are also present in the vicinity. The rock bluffs and ledges at the upper elevations provide ideal nesting sites for several raptors, while the remaining mature coniferous stands and the open burned and/or logged valley slopes provide habitat for others.

Bald Eagle nest sites are generally located in riparian areas or next to large bodies of water. Due to the absence of large bodies of water, the Jumbo Valley should not be considered ideal nesting habitat. However, as noted in the preliminary wildlife surveys for the valley, Bald Eagle can be expected to occur in low numbers as migrant species.

Of the ground-dwelling birds, Ruffed Grouse and White-tailed Ptarmigan were the only species observed; however, Blue and Spruce Grouse may inhabit the area.

Specific nesting and feeding sites were not observed during the wildlife surveys to date. However, extensive migratory and non-migratory bird surveys are planned for the construction stage of the project. During this time critical bird habitat will be identified and construction and operational plans will be adjusted accordingly. Whenever possible, important habitat will be avoided, and when it cannot be avoided due to an intolerable increase in costs, efforts will be made by the project team to minimize impact or remediate by the creation of additional habitat in environmental reserves.

If raptor nests are found within the area earmarked for land clearing, the appropriate government agency will be consulted to discuss development options.

3.2.4.13 Rare and Endangered Species

Of the 18 red- or blue-listed wildlife species recorded by the Conservation Data Centre (CDC 2003) for the Invermere Forest District, approximately four species are expected or known to occur within the Jumbo Valley study area. Wolverine and Grizzly Bears have been recorded in the area, and Fisher and Least Chipmunk may inhabit the area, based on their habitat preference and range maps.

Table 3.3 is an assessment of the potential for the study area to provide suitable habitat for red- and blue-listed species identified for the Invermere area, with an emphasis on those which are known to occur in the study area or, according to habitat and range maps, could potentially occur. The Jumbo Glacier Project committee identified another four species of local concern: Bald Eagle, American Peregrine Falcon, Red-tailed Chipmunk and Harlequin Duck. The potential for these species to inhabit the study area is based on a careful review of the field studies and accumulated literature documenting their habitat requirements and occurrence in the province. None of the red- or blue-listed migratory bird species have been recorded in the study area. Due to the unsuitable habitat types, it is unlikely that they are inhabitants of the Jumbo watershed.

Table 3.3: List of Red- and Blue-Listed Mammals and Birds that May Occur in the Study Area

Scientific Name	English Name	List	Occurrence in Study Area**
Mammals*			
Gulo gulo luscus	Wolverine, *luscus* subspecies	Blue	**Known**[3] - ESSF, AT
Martes pennanti	Fisher	Blue	**Possible**[4] - ESSF, AT
Myotis septentrionalis	Northern Long-eared Myotis	Blue	Unlikely – found in lower elevations, requires more research[4]
Rangifer tarandus pop. 1	Mountain Caribou (southern population)	Red	Unlikely[1] – ESSF, AT - Occurs in Purcell range[4]
Tamias minimus selkirki	Least Chipmunk, *selkirki* subspecies	Red	**Possible** - ESSF, AT - found in Toby Creek watershed and Purcell Mtns[4]
Taxidea taxus	Badger	Red	Unlikely[4] - found in BG, IDF, PP
Ursus arctos	Grizzly Bear	Blue	**Known**[2,3]

Scientific Name	English Name	List	Occurrence in Study Area**
Birds*			
Aeronautes saxatalis	White-throated Swift	Blue	Unlikely[5,6] – BG, PP, IDF, ICH[4] – nest sites Invermere and Windermere[5]
Ardea herodias herodias	Great Blue heron, *herodias* subspecies	Blue	Unlikely[6] – CDF, CWH, BG, PP, IDF, ICH, SBS, req. cottonwood[4]
Asio flammeus	Short-eared Owl	Blue	Unlikely[6] - CDF, CWH, BG, PP, IDF, ICH, SBS, breeds in Okanagan
Botaurus lentiginosus	American Bittern	Blue	Unlikely[6] - CWH, BG, PP, IDF, ICH, SBPS, SBS, Okanagan Valley
Buteo swainsoni	Swainson's Hawk	Red	Unlikely[6] - BG, PP, IEF, SBS, Thompson-Okanagan hotspot
Dolichonyx oryzivorus	Bobolink	Blue	Unlikely[6] - BG, PP, IDF, ICH, SBS, prefers hayfields/riparian meadows
Falco mexicanus	Prairie Falcon	Blue	Unlikely[1,6] – BG, PP, IDF, AT-ESSF?
Grus canadensis	Sandhill Crane	Blue	Unlikely[6] – CWH, PP, IDF. SBPS, SBS, SWBS, 1-2 pairs in EKT
Melanerpes lewis	Lewis's Woodpecker	Blue	Unlikely[1,6] – BG, PP, IDF, ICH
Numenius americanus	Long-billed Curlew	Blue	Unlikely[6] – BG, PP, IDF, grasses
Otus flammeolus	Flammulated Owl	Blue	Unlikely[6] - IDF, PP
Tympanuchus phasianellus columbianus	Sharp-tailed Grouse, *columbianus* subspecies	Blue	Unlikely[6] – IDF,PP, outside of range
Other species of concern identified in Final Report Specifications (EAO 1998)			
Haliaeetus leucocephalus	Bald Eagle	Yellow	**Possible** in low numbers or as migrants
Falco peregrinus anatum	American Peregrine Falcon (*anatum*)	Red	Unlikely[4] - CWH, BG, PP, IDF, SBS, No CDC record in area
Tamias ruficaudus simulans	Red-tailed Chipmunk (*simulans*)	Blue	Unlikely - Limited to Selkirk Mtn[4] – found *T.amoenus T. minimus* in Purcell Mtns. [4]
Histrionicus histrionicus	Harlequin Duck	Yellow	**Possible** – not recorded by gov't or during wildlife surveys, human disturbance history

*As identified by the CDC Invermere Forest District Tracking List
** Refer to Appendix III of Appendix 3-B for Biogeoclimatic Zone abbreviations
[1]Jumbo Glacier Project Committee 1998 [4] Cannings *et al.* 1999
[2] Strom *et al.* 1999 2 [5] CDC Rare Elements Occurrence, East Kootenay Study Area
[3] Norecol Dames and Moore 1993 [6] Fraser, D.F. *et al.* 1999

Concerning the study location, Northern Long-eared bats would be at the outer edge of their range (Eder and Pattie 2001). They are also unlikely to inhabit high elevations, thus are unlikely to frequent the area of Jumbo Valley.

The Mountain Caribou inhabits the area parallel to the Yellowhead Highway, and parts of the Caribou, Monashee, Purcell and Selkirk mountains (Tinley 1999). This Caribou subspecies was not observed in the Jumbo Valley during the project field studies. The absence of this species from the Jumbo Valley may be due to the lack of suitable habitat (see Figure 3, MCTAC 2002). Although it does not appear to inhabit the study area, it does occur in the southern Purcell Mountains (Hamilton and Utzig 1995) and is recorded as inhabiting the Eastern Purcell Mountain Ecosection (EPM) (EKLUP 1994).

Least Chipmunks have not been recorded in the study area; their range is restricted to specific locales within the Purcell range. However, they could possibly occur in the upper Jumbo Valley below the glacier level.

Badgers are solitary carnivores that prefer open areas, brushlands, and open ponderosa pine forest in valleys of the central and southern interior. They have been sighted in the Kamloops area, the southern Okanagan and in the Kootenay, Elk and Flathead valleys of the East Kootenays. They have not been recorded in the study area, perhaps due to unsuitable habitat.

Most of the components required for nesting and wintering habitat for Bald Eagles are lacking in the study area. For an area to be considered suitable Bald Eagle habitat it must be near a large body of water or it must have a sufficient prey base to support nesting eagles. Thus, large numbers of eagles are not expected to nest in the area; however, they are expected to occasionally pass through the Valley.

Historically, Peregrine Falcons, *anatum* subspecies, regularly bred in the Okanagan Valley, where they would appear at the nesting cliffs in late April (Cannings *et al*. 1987). Although a small number would winter in the Thompson Basin and Okanagan Valley, most were migratory and headed south in late August and September (Campbell *et al.* 1990). At present, the Peregrine Falcon does not nest in the Jumbo Valley, and it is unlikely to pass through the area.

A three-dimensional environmental complex (i.e., coarse woody debris, low-growing and prostrate woody vegetation and complex rocky substrates) appear to be important for all chipmunks, including the Red-tailed Chipmunk. This habitat requirement is presumably for protection from predators (Nagorsen *et al.* 2002). Although appropriate habitat is present, Red-tailed Chipmunk is an unlikely resident of Jumbo Valley; the *sumulans* subspecies is restricted to the Selkirk Mountains only *T. amoenus* and *T. minimus* have been recorded in the Purcell Range.

The Ministry of Sustainable Resource Management (and formerly MELP), the CDC and the Jumbo Glacier project team have, to date, no recorded observations of Harlequin Duck for the project area. This is perhaps because the species requires habitats free from disturbance (Roderick and Milner 1991). Therefore, the project site may be unsuitable due to historic logging activities.

3.3 WILDLIFE RESOURCES AND PROPOSED MITIGATION MEASURES

This section discusses potential impacts of the project on environmental resources. Section 3.3.1 addresses impacts to aquatic resources including fish and fish habitat. It presents mitigation measures, which include riparian management areas. Details of aquatic impacts and mitigation measures are presented in Appendix 3-F. Section 3.3.2 addresses impacts and mitigation measures for all wildlife species or groups of species, except Grizzly bears. Details of these impacts and mitigation measures are presented in Appendix 3-B. Clayton Apps has prepared a Cumulative Impact Assessment for Grizzly bears, which is presented in Appendix 3-D.

3.3.1 Aquatic Resources/Riparian Areas

Impacts to aquatic resources are not anticipated. To minimize or eliminate potential impacts to fish habitat, ENKON has recommended a number of different "*Streamside Protection and Enhancement Area"* zone widths for the mountain and resort base development including:

- The Fish Protection Act-Streamside Protection Regulations (January 2001) is applicable to the resort base residential and commercial development areas only. A 30m "Streamside Protection and Enhancement Areas" from Jumbo Creek mainstem and tributaries is recommended for the resort base development; and
- The Forest Practise Code "Riparian Management Area Guidebook" (1995) was specifically designed to apply to harvesting, silviculture and road construction practises in working forests. Therefore, ENKON classified the streams within the mountain development areas and applied the FPC guidebook recommendations for "Riparian Management Zones" to the aligning and construction of ski lifts and ski runs within the mountain plan areas of the resort development. "Riparian Management Zones" widths range from 20-30m from tributaries of Jumbo Creek associated with the development of ski runs and ski lift lines.
- The FPC Stream Crossing Guidebook was also applied to the upgrading of the access road.

The following sections provide details of the specific application of these recommendations to the resort base development, mountain development and access road development.

3.3.1.1 Resort Base Development

Potential impacts to fish habitat from resort development have been minimized during the planning process and adherence to the recommended 30m "Streamside Protection and Enhancement Areas" as outlined in the Fish Protection Act-Streamside Protection Regulations (January 2001). As a result, there are no direct instream or riparian fish habitat impacts associated with the resort base development.

Since there are no fish habitat impacts associated with the resort base development, no further mitigation measures are proposed.

However, the following guiding principles and best management practises will also be followed during the final design and construction of the resort development areas:

- Principle #1: Impervious Area Reduction - Although general guidelines for density designations (i.e. Bed Units and the number of ski lifts and runs) have been planned, development will be sensitive to impacts to stream-flow hydrology and will strive to minimize Total Impervious Area (TIA). Wherever possible, source control, interception, infiltration and diversion will be utilised to reduce impervious areas.
- Principle #2: Maintenance of Water Quality - Water quality control facilities will be designed with bio-filtration systems to treat stormwater prior to discharging into Jumbo Creek.
- Principle #3: Post Development Stormwater Discharge – Post development stormwater discharge rates will be controlled through the use of retention or detention of stormwater runoff.
- Principle #4: Post Development Stormwater Volume – Post development stormwater volumes will be controlled by containing and dispersing the runoff volume from a 2 Year return, 2 hour duration design storm.
- Principle #5: Base Flow Augmentation - Base flows will be maintained in Jumbo Creek between rainstorms through a combination of techniques.
- Principle #6: Protection of Leavestrips – Leavestrips will be maintained and/or enhanced adjacent to Jumbo Creek following the recommendations of the Streamside Protection Regulations or the Forest Practises Code.
- Principle #7: No Net Loss-Net Gain in Fish Habitat – The development will strive towards meeting no-net-loss: net gain in fish habitat through protection of fish bearing sections of Jumbo Creek and tributaries and associated riparian corridors.
- Principle #8: Integration of Site Vegetative Planting with Natural Areas – The development will integrate re-planted areas with adjacent riparian corridors and ecological features.
- Principle #9: Monitoring – A biological, physical habitat and continuous water volume and quality sampling program will be implemented pre and post-development.

3.3.1.2 Mountain Development

To minimize impacts to fish habitat, design and location of ski runs and ski lifts have followed the Forest Practise Code-Riparian Management Area Guidebook (1995) recommended riparian management zone widths as follows:

1. Where ski lifts and runs are located parallel to streams, a 20-30 m wide riparian management zone width is proposed for S4, S5 and S6 streams.

In addition to riparian management zones, the following environmental protection measures have been taken into account during the planning and design of the ski runs/trails and lifts:

- Ski trails/runs will cross perpendicular to streams where possible;
- Ski lift towers will span riparian corridors;
- No ski lifts or runs will cross fish bearing sections of any stream; and
- Many of the ski runs are located within existing heli-ski runs that have either been previously logged or are above the tree line.

To further minimize potential impacts from mountain development, ENKON also recommended a number of mitigation measures and “Best Management Practises” as per the recommendations in 'Environmental Objectives, Best Management Practices and Requirements for Land Developments, Vancouver Island Region' (MELP 2001) and the Forest Practise Code.

3.3.1.3 Access Road Upgrade

To minimize impacts to fish habitat, stream crossings have followed the design, installation and protection measures outlined in the "Forest Practise Code - Fish Stream Crossing Guidebook" (March 2002).

The proposed road alignment provided by McElhanney Consulting Services Ltd. was draped over the classified streams to assess the number of crossings and type of crossing required. The *Route Study* report (June 2003) refers to various route options, however, for the purposes of this stream crossing assessment we refer to the preferred route alignment and not alternative route alignment options. This preferred alignment does not entail any new crossings of Jumbo Creek. Tributary crossings include 26 Open Bottom Structures (OBS), and 10 Closed Bottom Structures (CBS).

Based on the above structure types and information on fish bearing sections of Jumbo Creek and tributaries, ENKON recommends the following crossing structures:

- All road crossings of Jumbo Creek tributaries with <20% gradient (assumed to be fish bearing) will be designed as open bottom structures. There are 26 proposed open bottom crossings of fish bearing tributaries.
- All road crossings of Jumbo Creek tributaries with >20% gradient (assumed to be non-fish bearing) will be designed on a site-specific basis and follow the recommendations of the Forest Practice Code (likely closed bottom structures). There are 10 proposed closed bottom crossings of non-fish bearing tributaries.
- Final design of all crossing structures will follow the Forest Practise Code and the Department of Fisheries and Oceans hierarchy of crossing types.

Since the proposed stream crossings follow the recommendations of the "Forest Practise Code - Fish Stream Crossing Guidebook" (March 2002) a Section 35(2) Authorization for the harmful alteration, disruption or destruction (HADD) of fish habitat is not required from the Department of Fisheries and Oceans.

3.3.2 Wildlife Resources

The following environmental impact assessment determines the potential effects of summer and winter activities associated with the construction and operation of Jumbo Glacier Resort. Impacts related to wildlife and their habitats in the project area and region were assessed and mitigation strategies are proposed. Impacts associated with decommissioning were not assessed, as the project is expected to have a long operational life.

The general approach of the assessment focuses on species or species groups identified during scoping and/or identified in the *Project Report Specifications* (EAO, Volume 1 1998) as being of management concern within the project area. These Valued Ecosystem Components (VECs) were selected based on scoping of wildlife issues; professional judgement; input from government agencies and the B.C. Environmental Assessment Office; and issues raised during public, stakeholder, regulatory and Aboriginal consultation. The species or species groups selected were all resident ungulate species, Grizzly and Black Bear, furbearers, small mammals, and resident and migrating bird species. Special attention was given to provincially red- and blue-listed species, and species listed as special concern in the project report specifications (e.g., Grizzly Bear, Black Bear, Mountain Goat, Wolverine, Harlequin Duck) (EAO, Volume 2 1998).

Determination of the significance of environmental impacts on valued ecosystem components was based primarily on professional judgement; relevant literature; consideration of various impact attributes including spatial scope, direction, magnitude, duration, frequency and significance. The assessment provides impact attribute matrices for each environmental effect on each VEC. In these tables 'significance' of effect refers to significance on the scale described under 'spatial scope.'

A major portion of the impact analysis entailed estimating potential loss of wildlife habitat using Geographic Information System (GIS). Maps of the project design (Master Plan) were overlaid on habitat suitability maps. Areas of project component overlap with polygons having a habitat suitability rating of High or Moderately High were calculated. The calculated areas provide a worst case estimate of habitat loss. Actual habitat loss likely will be considerably lower for the following reasons:

- Habitat suitability maps were generated based on the highest rated ecosystem unit within a polygon. In actuality, the habitat within the entire polygon may not necessarily be rated as High or Moderately High. The suitability mapping over-estimates the amount of High or Moderately High quality habitat available.
- Overlap of ski runs on habitat does not necessarily equate to habitat loss, as vegetation on most of the runs, particularly in alpine areas, will not be cleared. The presence of skiers would reduce winter use of the habitat by sensitive species, and limited clearing in some areas could cause habitat fragmentation. Nevertheless, some habitat values would remain, and the connectivity between quality habitats would remain. Thus fragmentation would not be sufficient to cause the isolation of populations that Soulé (1987) writes of in *Viable Populations for Conservation*.

Table 3.4 lists potential sources of impacts to wildlife resources during resort construction and operation. The following sections describe potential impacts on various wildlife species (valued ecosystem components) and present mitigation measures for the impacts identified.

Table 3.4: Summary of Potential Impacts from Resort Construction and Operation

Project Activity	Potential Environmental Effect
CONSTRUCTION	
Clearing and construction of ski lifts and runs	-Permanent loss/alteration of forest habitat, some fragmentation -Creation of high value growing season foraging areas for deer -New habitat for wildlife utilizing herb/shrubs -Displacement possible increase in competition in adjacent areas -Sensory disturbance -Increase in human-wildlife encounters
Resort road clearing and development	-Permanent loss/alteration of forest habitat, some fragmentation -Sensory disturbance -Disruption of natural drainage

Project Activity	Potential Environmental Effect
	-Contamination through spills of oils/toxic substances
Helicopter use	-Sensory disturbance -Increased summer period stress
OPERATIONS	
Resort buildings and other facilities	-Increased stress to some species due to free-running dogs -Increase in human-wildlife encounters
Winter ski operations	-Sensory disturbance for sensitive wintering species
Avalanche control	-Sensory disturbance
Summer ski run maintenance	-Disturbance of species in that area
Use of surface water	-Surface flows will not be used
Stormwater run-off	-Contamination of streams and creeks -High water flows leading to bank scour and reduction of riparian habitat
Transmission lines	-Should positively impact many species by creating habitat. -Increased risk of electrocution to some raptors
Access and increased vehicle traffic	-Increased human activity, sensory disturbance, some fragmentation and displacement -Increased hunting pressure -Illegal garbage dumping -Increase in road kills -Should not affect high elevation species
Hikers and mountain bikers	-Displacement and sensory disturbance of sensitive species -Localized degradation of habitat
Garbage	-Localized contamination of habitat for small species -Possible ingestion of some stray litter -Wildlife foraging in garbage cans/dumps; creation of nuisance animals

3.3.1 Mountain Goats

3.3.1.1 Potential Impacts

Most goats winter on the ridge lying north of Jumbo Creek (and south of Delphine Creek) and west of Toby Creek above Delphine Creek. Goats also winter on the ridges of the upper Delphine Creek basin. These areas are not likely to be impacted by the proposed development. R.K. Heli-Ski has been in the area for some time. The existing populations of Mountain Goats have become habituated to the presence of helicopters; therefore impacts will likely be negligible. Overlaying the proposed resort facilities on goat winter habitat indicates there could be potential conflicts. According to the overlay, a maximum of 280 ha of High rated winter habitat on the project site will be impacted by ski run development, or ~5 % of the entire 5,926 ha controlled recreation area. However, Mountain Goats do not appear to winter in these areas due to deep snow conditions and there is an adequate supply of quality habitat in neighbouring watersheds of Toby and Glacier Creeks. In fact, 280 ha represent less than 1% of the habitat in Jumbo, Toby and Glacier Creek watersheds which is winter rated as High or Moderately High for Mountain Goats. Thus, there are adjacent areas of high quality for Mountain Goats.

Summer goat ranges are found along the north and south sides of Jumbo Valley, specifically in the upper Commander Creek basin and on the ridges between The Cleaver and Black Diamond Mountain. Goats were also observed at Jumbo Pass and at a mineral lick at the top of Horsethief Creek. An overlay of the proposed resort facility plan on potential Mountain Goat summer habitat has similar results to that of the winter overlay. A total of 317 ha could be affected by the resort if Mountain Goats are summering in areas earmarked for glacier skiing or hiking. This area represents 1.6 % of available quality summer habitat in the valleys of Jumbo, Toby and Glacier Creek.

3.3.1.2 Proposed Mitigation Measures

To reduce potential impacts on goats moving between winter and summer ranges, ski run and lift development activities in the areas of migrating goats will not be conducted in April, May or November. Areas used by wintering goats, where disturbance may occur, will have numerous signs warning skiers of the resort boundary and hazardous conditions beyond the posted sign. Skiers will avoid these areas due to the hazardous conditions, thereby reducing the potential for sensory disturbance to goats. Avalanche control activities will not take place in the vicinity of wintering goats, thus avoiding significant impacts to Mountain Goats. Avalanche control activities will be infrequent and located a considerable distance to wintering goat populations.

Resort and road development at lower elevations, where Mountain Goats have historically not been found, is unlikely to lead to any notable sensory disturbance. Resort facilities, once operational, are expected to have insignificant impacts on wintering or summering populations of Mountain Goats due to the large distances from known wintering and summering ranges.

The following enhanced plans from the former Ministry of Environment, Lands and Parks (MELP 2000) will be used to mitigate impact of helicopter noise and its presence in the valley.

- Restrict helicopter activity during construction to a minimum, particularly beyond the bounds of the Jumbo Creek watershed;
- Prohibit helicopter access for the sole purpose of transporting guests to and from the resort once construction is completed (except for emergencies and any necessary maintenance);
- According to B.C. draft guidelines, a minimum 2000 m above ground level horizontal and vertical distance will be maintained, with a no fly/no land buffer around designated Mountain Goat habitat (Denton 2000);
- Avoid air traffic in identified kidding areas during the spring kidding season (May 1 to July 15) and direct traffic away from these areas;
- Avoid disturbance of identified critical winter ranges between December 01 and April 30, and direct activity away from these areas;

- Schedule helicopter flights between one hour after sunrise and one hour before sunset from mid April to mid October;
- Establish flight patterns of less than half a mile wide along travel routes and landing zones, except where flight safety precludes this;
- Travel routes should avoid all steep cliff faces and known areas of high use;
- Designate landing zones with adequate visual of topographic barriers;
- A qualified biologist should monitor the location and activity of goats within Jumbo Creek Valley; and
- If possible, allow only one access route to the developed area, by way of the primary road, and restrict flight access into other areas in Jumbo Creek Valley (except for emergencies).

Mountain Goat access to the mineral lick identified at the top of Horsethief Creek will be protected from human access. Trail restrictions will be implemented to protect the known mineral lick site, and any that might be identified in the future.

Human intrusions into areas where Mountain Goats have limited habitat will be minimized. Intrusions will be limited where habitat is either desirable or exceptionally productive such as the summer ridge locations along the base of Commander Glacier. Access will be restricted through road and trail restrictions and public and staff education.

3.3.2 Mule and White-tailed Deer

3.3.2.1 Potential Impacts

An overlay of the proposed project on Mule Deer winter habitat that is rated as High or Moderately High indicates that high quality Mule Deer (and White-tailed Deer) winter habitat should not be affected by project development.

Ski run and lift development could affect approximately 476 ha of High or Moderately High rated Mule Deer summer habitat. This area represents less than 25 % of the available higher quality rated habitat on the site and less than 1 % of the available high quality habitat in the Jumbo, Toby and Glacier Creek Valley network. Outside of the Jumbo Valley, resident deer will likely find alternative habitat, which satisfactorily meets their life requirements.

3.3.2.2 Proposed Mitigation Measures

Large tracks of untouched forested areas will provide important security and thermal cover for deer during the growing season. Ski runs have been situated away from mountain streams, ensuring that valuable riparian habitats are not disrupted.

To ensure that unacceptable deer mortality does not occur, staff and residents will not be permitted to carry firearms or hunt on the resort property during construction and operation. In addition, recreational use of all-terrain vehicles (ATVs), feeding, harassment or destruction of any wildlife by project personnel on the resort site will be prohibited.

Management should make every effort to maintain the quality of deer habitat by maintaining forest cover to support foraging, security, thermal cover, and connectivity requirements. Mature forests should be the optimum distance to forage sites to provide deer with quick access to secure cover while feeding.

With helicopter overflight protocols established, disturbance to summering deer will be confined to the construction period and kept to a minimal, tolerable level. Helicopter traffic will be kept to a minimum and directed away from parturitions areas. Flights will be scheduled to avoid rutting and parturition.

Vehicle speeds (i.e., maximum of 50-60 kph) will be enforced to avoid unnecessary collisions with deer. Signs, enforcement, road design (e.g., speed bumps) and fencing are options being considered to limit vehicle speeds (Gunther *et al.* 2002). In years of deep snow, snow berms created by ploughing will be broken at regular intervals so that animals can easily escape from the roadway into adjacent secure habitat.

To reduce the impact of resort access roads on deer (and other ungulate) populations, ENKON recommends the following technical points:

1) Reduce the density of roads within the Jumbo Creek valley, logging roads not being utilized as part of the resort access road used should be de-activated and re-vegetated with native species.

2) Any temporary roads required for resort construction should be built in a manner to facilitate their eventual closure and re-vegetation (with native species).

3) Maintain existing drainage patterns along roads and prevent the introduction of drainage that promotes roadside vegetative growth.

4) Store any top soil removed from road construction and re-use the topsoil to re-vegetate areas along roadsides. Re-vegetation of roadside areas should not include plants that will attract foraging ungulates.

5) Where feasible, allow >100 m between important feeding/security habitat and any new roads in order to provide quick cover.

6) Do not create new roads or re-vegetate existing roads so that blind corners would occur between motorists and wildlife.

7) Road side reflectors, such as the Strieter-Lite® system, should be erected along the access road as they reflect light and create a virtual barrier (i.e., a visual fence) to wildlife.

8) Consideration should be given to the Wildlife Protection System being developed by InTransTech in cooperation with the Insurance Corporation of British Columbia and other partners (Kinley et al. 2003). The advantage of this system is that it operates to prevent WVC 24-hours a day and is triggered by animal presence. The disadvantage is that it may be prohibitively expensive.

9) If fencing is required during Phase 3 of the resort development, overpass/underpasses should be constructed to promote wildlife movements across roads. The crossing structures should be located at strategic locations with the following characteristics (based on Jackson and Griffin 2002):

- Low road densities
- Low human population
- Possess good terrain ruggedness
- Have an association with a major drainage and

- Be in proximity to high quality food and shelter habitat
- Avoid road construction/maintenance (where possible) during key ungulate periods (spring-early/summer).

3.3.3 Moose

3.3.3.1 Potential Impacts

An overlay of the proposed project on mapped winter range indicates that the majority of Moose winter range will not be affected by project development. An estimated 317 ha of Moderate rated habitat could be affected, but High or Moderately High Moose winter habitat will not be affected.

An estimated 317 ha (i.e., 34 % of 932 ha) of High rated summer habitat could be affected by the residential, road/parking infrastructure and ski run components of the resort development. Outside of the resort development area, within the Jumbo, Toby and Glacier Creek valleys there are over 27,000 ha of High and Moderately High rated habitat available.

3.3.3.2 Proposed Mitigation Measures

Mitigation measures recommended for deer can be applied to moose. Large tracks of untouched forested areas will provide important security and thermal cover for moose during the growing season. Ski runs have been situated away from mountain streams, ensuring that valuable riparian habitats are not disrupted.

To ensure that habitat fragmentation does not occur, resort development will follow the habitat management objectives for Moose from the KBLUP Implementation Strategy (*Kootenay Boundary Land Use Planning Implementation Strategy*). Namely, the resort plan should ensure the maintenance of snow interception, security cover and connectivity by retaining tracks of forested areas. Effort will be made to retain tracks of forests that are in close proximity to forage sites, because these wooded areas will provide Moose with resting places.

3.3.4 Elk

3.3.4.1 Potential Impacts

An overlay of the proposed project on Elk winter habitat indicates that high quality Elk winter habitat should not be affected by project development. In fact, according to the overlay calculation of habitat loss, only habitats rated as Very low or Nil are affected by resort development.

Ski run and lift development could affect approximately 280 ha of High rated Elk summer habitat. This area represents approximately 30 % of the available High rated habitat on the site and 1 % of the available high quality habitat in the Jumbo, Toby and Glacier Creek Valley network. Outside of the Jumbo Valley, if some resident Elk are displaced they will likely find alternative habitat, which will meets their life requirements.

3.3.4.2 Proposed Mitigation Measures

Mitigation measures recommended for deer and moose can be applied to elk. Large tracks of untouched forested areas will provide important security and thermal cover for moose during the growing season. Ski runs have been situated away from mountain streams, ensuring that valuable riparian habitats are not disrupted.

3.3.5 Black Bear

3.3.5.1 Potential Impacts

The proposed project may conflict with middle elevation winter denning habitat for Black Bear. Goodrich and Berger (1994), Linnell *et al.* (2000) note that the tendency for high overlaps between bear denning sites and potential winter recreation areas results in a high potential for den abandonment due to human disturbance. They recommend that bear denning areas receive protection from human disturbance during the winter. Fewer habitat conflicts are anticipated for the lower and high elevations.

Much of the area within the ski run areas will remain as high quality foraging habitat after revegetation (if necessary). Conflict areas are less of a concern in summer and fall when bears are widely distributed in the Valley and have a wide range of foraging opportunities available to them.

3.3.5.2 Proposed Mitigation Measures

Most ski runs have been designed to maintain large areas of forested habitats between lifts. These forested areas will provide important security and resting cover for Black Bear during the growing season. In addition, ski runs have been situated to ensure that valuable riparian foraging habitats are not disrupted, and lifts have been designed to minimize impacts to riparian habitats.

Similar to what has been undertaken in the communities of Revelstoke and Whistler, Jumbo Glacier management will facilitate the formation of a Black Bear task force or bear management committee that will further develop a comprehensive bear management plan for the proposed development. The primary goal of the plan will be to minimize the number of human-bear conflicts and the number of bears that may need to be destroyed. Essential components of the plan will include:

1. Public education to inform residents of proper waster disposal methods and to encourage greater human tolerance of bear presence;

2. Installation of bear-proof garbage containers;

3. Enforcement of proper waste management practices for both residential and commercial areas and;

4. Identification and preservation of critical foraging and denning areas, movement corridors and security/thermal cover.

A bear awareness program will be implemented, where project staff employed during the active bear season will be given special training. In addition, a public education program will be implemented to inform summer recreationalists about special precautions to avoid undesirable encounters. A pack-in/pack-out policy will also be implemented. Maintenance of a bear sighting log will help resort staff identify areas where the probability of a bear-human interaction is expected to be unacceptably high. Temporary or possibly permanent trail closures may be implemented to minimize human access to such areas.

A policy will be initiated which prohibits feeding bears, with contravention subject to fines or legal action, as was enforced in the Resort Municipality of Whistler (Globe and Mail, September 12, 2002, A12).

Mitigation measures proposed in the Grizzly Bear Management Plan (Appendix 3-C) prepared by ENKON Environmental Ltd should adequately address potential impacts to black bears.

3.3.6 Large Carnivores

3.3.6.1 Potential Impacts and Proposed Mitigation Measures

Potential impacts and mitigation measures applying to predators such as Coyote, Cougar, Bobcat and Wolf are similar to that which was discussed for Black Bear. Recommendations for Grizzly Bear management will ensure that impacts associated with garbage are minimized and public education will assist in reducing conflicts with humans.

Bear management will address many of the issues associated with other carnivores (e.g., wildlife-human encounters, road kill, garbage etc.). Workers and staff will be briefed on the potential occurrence of the various predator species on the project property. Precautions to avoid interactions will be discussed. Maintenance of a sighting log will help resort staff to identify areas where the potential animal-human conflicts may exist. If carnivore den sites are located during resort development, all activities will cease in the vicinity of the den site until a management plan can be developed. The goal of the management plan will be to ensure that the health and integrity of all denning animals is maintained.

Resort staff and workers will not be permitted to carry firearms or hunt within the project area.

3.3.7 Furbearers

3.3.7.1 Potential Impacts and Proposed Mitigation Measures

Impact to furbearers may result from a loss of habitat and sensory disturbance. However mitigation measures will be implemented to minimize the impact from resort construction and operation.

Avoidance and impact mitigation guidelines will follow those set out by 1) the *Expanded Kootenay Region Interim Wildlife Guidelines for Commercial Backcountry*

Recreation in British Columbia (2000), 2) *Draft Guidelines for Mitigating Impacts of Commercial Backcountry Recreation on Wildlife in British Columbia* (2001) and 3) recommendations from Krebs and Lewis (2000).

Retention of large areas of existing forest and woody debris between ski runs and protection of riparian habitats will ensure that Fisher, Wolverine and other furbearers continue to have security cover as they move attitudinally through the Jumbo Valley. Activity around riparian zones will be minimized and removal of coarse woody debris will be prohibited (when practical and safe).

Workers and staff will be briefed on the potential occurrence of Wolverine within the project area. Precautions to avoid interactions, particularly garbage management, will be critical.

In the unlikely event that a Wolverine den is found within the commercial recreational area, all activities will cease in the vicinity of the den site until a management plan can be developed. The goal of the management plan will be to ensure that the health and integrity of all denning animals is maintained. Temporary closures of ski trails and other facilities are potential options until the den has been vacated.

3.3.8 Small Mammals

3.3.8.1 Potential Impacts and Proposed Mitigation Measures

Construction of ski runs will result in permanent alteration of existing forested habitats. Many small mammals will potentially be impacted by forest removal. Local populations of some of the small mammals (e.g., squirrel) can be expected to contract, but the regional population should remain unchanged. Sensory disturbance associated with ski run construction will likely also impact small mammals in habitats adjacent to the ski runs. Small mammals could also be harmed by construction equipment. Overall, local impacts to small mammals are considered to be moderate, but Low after mitigation strategies are implemented. Impacts to regional populations are not expected to be significant.

The recommended management strategy for small mammals includes the following points:

- Retain slash piles, spaced at regular intervals, along the edge of ski runs to provide security and thermal cover for several species of small mammals;
- Maintain Coarse Woody Debris;
- Place logs and slash on the ski runs to provide cover for small mammals moving across these open areas; and
- Retain wide riparian corridors along creeks and other sensitive habitats to ensure that major movement opportunities exist on the site.

3.3.9 Harlequin Ducks

3.3.9.1 Potential Impacts and Proposed Mitigation Measures

Precautions will be taken to protect their habitat type. Mitigation measures for reducing impacts to fish utilizing these systems will also benefit Harlequin Duck. Additional information and more detailed mitigation measures are included in Appendix 3-P: Bird Survey Report.

3.3.10 Passerine, Passerine-like Birds and Waterfowl

3.3.10.1 Potential Impacts

Clearing and construction of ski runs will result in permanent loss of habitats of importance to many bird species. However, impact on passerine and passerine-like habitat is being minimized and all species are expected to continue to breed in the area. Overall populations of forest-dwelling bird species may be reduced, but the viability of local populations is not likely to be compromised.

The increased amount of edge habitat may lead to increased nest predation and nest parasitism (Manolis *et al.* 2002, Flaspohler *et al.* 2001). In addition, birds inhabiting areas not directly impacted by ski run development will be subjected to a considerable level of sensory disturbance. Overall impacts of the project activity on passerine and passerine-like species are considered to be of moderate significance on a sub-regional scale, but of low significance following mitigation.

Development of shrub-dominated habitats on ski runs will attract a diversity of shrub-associated species (e.g., American robin, song sparrow). Populations of these and other species with similar habitat requirements are expected to increase within the project area. Other species dependent on dead trees for nesting cavities and foraging (e.g., woodpeckers) will likely take advantage of trees blown down along the edge of ski runs.

3.3.10.2 Proposed Mitigation Measures

Maintaining as much avian habitat as possible with the retention of large forested blocks between ski runs will ensure that forest-associated birds will continue to nest on the property. Minimizing fragmentation will help maintain interior forests for forest-associated birds. The position of shrub-dominated areas, and resulting extensive edge habitats, will likely result in a higher species diversity and density than currently exists.

To abide by the *B.C. Wildlife Act,* clearing of natural habitats will not occur during the critical 01 April to 31 July breeding period for birds, where feasible. In cases, where project development scheduling conflicts with the breeding bird window are unavoidable, a recognized wildlife biologist will conduct a comprehensive and intensive nest survey of the subject area to ensure that no active nests will be disturbed by clearing. The nest survey protocol will follow the protocols of the Resources Information Standards Committee.

See also Appendix 3-P: Bird Survey Report.

3.3.11 Non-Migratory Birds

3.3.11.1 Potential Impacts

Raptors observed in Jumbo Valley to date include Golden Eagle, Osprey, Red-tailed Hawk, Rough-legged Hawk, Goshawk, American kestrel, Barred Owl, Great-horned owl and Northern Pygmy Owl. Bald Eagle, a species of concern, has not been observed in the project area during field surveys. It is acknowledged that it may occur in the area, but most likely as a migrant. Bald Eagles are generally associated with large bodies of water or rivers with salmon spawning runs, both of which do not occur within the project boundaries. Project impacts on Bald Eagles are expected to be negligible.

Retention of riparian habitats along creeks will ensure that important breeding and foraging habitat for many raptor species is maintained and that corridor-linkages are maintained between core forested areas.

3.3.11.2 Proposed Mitigation Measures

If active raptor nests are found within the construction area during land development activities, all activity in the vicinity of the nest will be halted until a management plan is developed with the cooperation of regulatory agencies. The *Draft Guidelines for Mitigating Impacts of Commercial Backcountry Recreation on Wildlife in British Columbia* (MELP 2001) should be considered as a template. The guidelines for Bald Eagle nests from this document are appropriate for the nests of other raptors:

- Prevent facility development within 100 m of nest trees.
- Minimize human activities within 100 m of active nests between February and July.
- Maintain all existing habitat components within 100 m of nest trees.
- Train staff and provide information to guests on appropriate behaviour in the vicinity of raptors and their nesting habitat.

An attempt will be made to retain all large old-growth trees or other trees that may be suitable for raptor nesting and perching. Perching opportunities are not expected to be limiting along the edges of ski runs.

See also Appendix 3-P: Bird Survey Report.

3.3.12 Habitat Connectivity

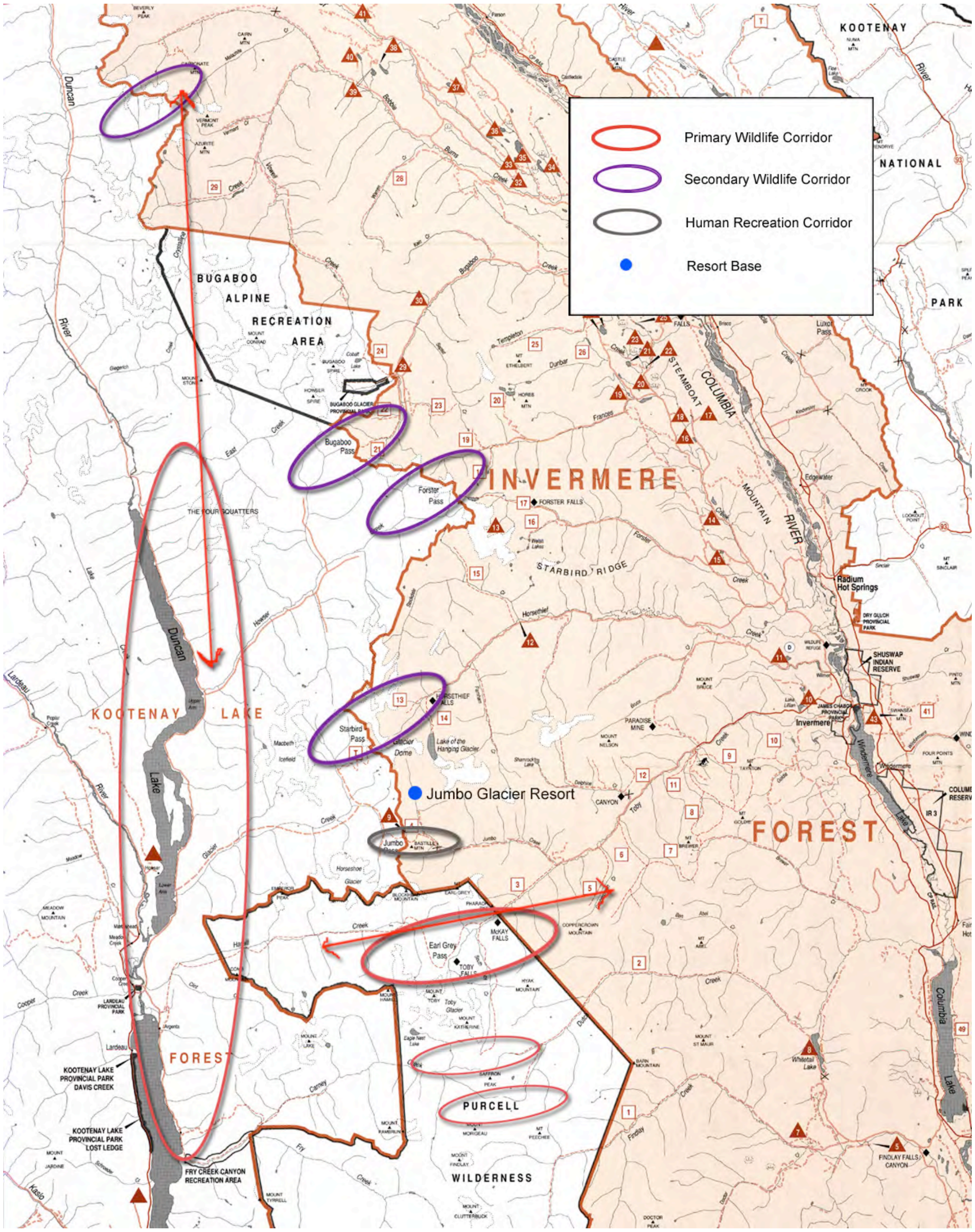
The Kootenay Boundary Land Use Plan KBLUP identified an east-west connectivity corridor between lower Dutch Creek through the Purcell Wilderness Conservancy and between Kootenay and Duncan Lakes via lower Hamill Creek. Jumbo Creek and Upper Glacier Creek (including Jumbo Pass) were included along the northern boundary of the corridor; however, these two areas form a north-south peninsula and do not contribute significantly to east-west connectivity.

The only north-south connectivity corridors identified on Ministry maps are located along the Columbia River to the east or through a variety of interconnected east-west corridors west of

Kootenay and Duncan Lakes. A series of glaciers to the north and south of Glacier Creek, to the north of Jumbo Creek and Howser Creek, and east of Duncan River limit north-south connectivity through the west-central Purcell Mountains.

Primary and secondary connectivity routes are outlined as follows:

Exhibit 3.1: Connectivity Routes



Resort construction and operation will not affect the main connectivity corridor through the Purcell Wilderness and west across Kootenay and Duncan Lakes. There could be some disruption of connectivity along upper Jumbo Creek, but with strict guidelines in place and appropriate mitigation measures the impacts can be minimized and kept to an acceptable level. Although the KBLUP did not make specific recommendations for the Jumbo Creek watershed, the general mitigation measures it provides are applicable to the Jumbo Glacier Resort project.

3.4 ENVIRONMENTAL MANAGEMENT PLANS

3.4.1 Introduction

In addition to the above outlined mitigation measures the following environmental management plans have been prepared to further reduce any potential impacts from the resort development. The individual plans address mitigation, management plans and monitoring for Jumbo Glacier Resort. These management plans include:

- Erosion and Sediment Control Plan
- Water Management Plan
- Solid Waste Management Plan
- Liquid Waste Management Plan
- Drainage Control/Stormwater Management Plan
- Non-point Source Waste Discharge Control Plan
- Vegetation Management Plan
- Grizzly Bear Management Plan
- Air Quality Management and Monitoring Plan
- Spill Contingency Plan
- Terms of Reference for Environmental Monitoring
- Additional Monitoring Plans

3.5 EROSION AND SEDIMENT CONTROL PLAN

3.5.1 Background

Issues of water quality and the impacts on the aquatic environment resulting from erosion and sediment have been raised. The control of sediment following construction has been addressed as a by-product of the hydrologic and hydraulic design of the drainage works within the development area. Methodologies to control erosion and sediment discharges through construction to full build out of the development can be developed in a conceptual manner through the use of an understanding of the issues involved and in developing an implementation process for the control of erosion during construction.

The types of erosion and a typical application of erosion control techniques are shown on Exhibit 3.2. As can be seen there are numerous sediment sources and methodologies that can be utilized to reduce or eliminate the sediment discharges to the aquatic environment.

One key factor influencing the selection of erosion control methodologies is the erodability of the soils. The soil texture greatly influences the erodability of the material and hence the degree of effort and care required to manage soil erosion. Shown on Exhibit 3.3 is a range of erodability factors for a range of soil textures.

Another factor influencing the erodability of soils is the exposure in terms of slope length and steepness. The potential for erosion increases with greater slope steepness and length. The description of slope gradient is shown in Table 3.5. The description of slope length as it relates to erodability is shown in Table 3.6.

Table 3.5: Slope Gradient Classes

Slope* (%)	Description
0 – 10	Gentle
10 – 15	Moderate
Over 15	Steep

*Vertical distance: horizontal distance between two contours computed as a percentage

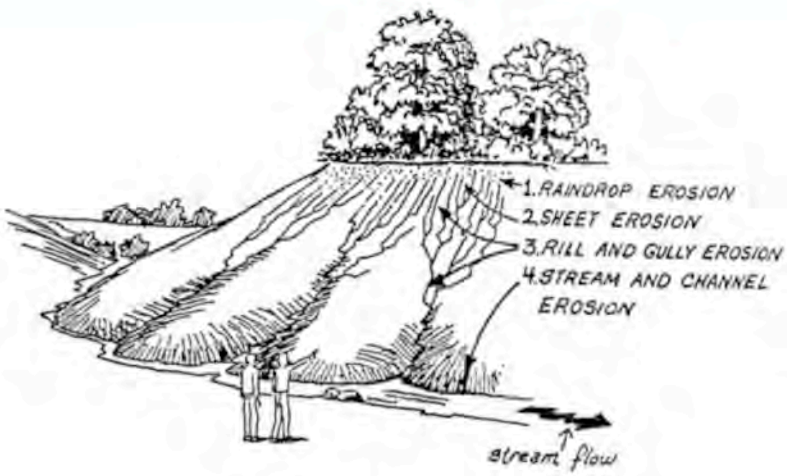
Table 3.6: Slope Length Classes

Length*	Description
Under 70 m	Moderate
Over 70 m	Long

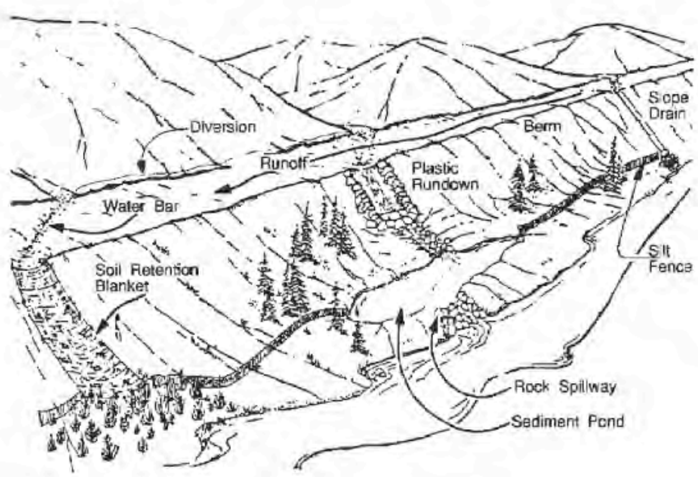
* Slope length is measured down the slope face

The erosion potential derived from the combination of slope steepness and slope length is shown in Table 3.7.

Exhibit 3.2: Erosion and Mitigation



Typical Erosion Types



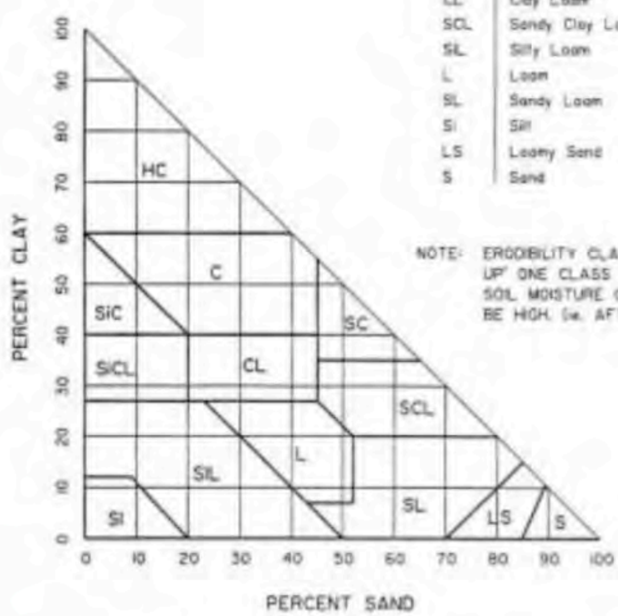
Potential Mitigation Works

McElhanney

Exhibit 3.3: Soil Texture and Erodability

KEY	SOIL TYPE	SOIL ERODIBILITY (K)
HC	Heavy Clay	Low
C	Clay	Low
SiC	Silt Clay	Medium
SC	Sandy Clay	Low
SiCL	Silty Clay Loam	Medium
CL	Clay Loam	Medium
SCL	Sandy Clay Loam	Medium
SiL	Silty Loam	High
L	Loam	High
SL	Sandy Loam	Medium
Si	Silt	High
LS	Loamy Sand	Low
S	Sand	Low

NOTE: ERODIBILITY CLASSIFICATIONS (K) SHOULD BE 'BUMPED UP' ONE CLASS IN SITUATIONS WHERE THE INITIAL SOIL MOISTURE CONTENT OF THE SITE IS LIKELY TO BE HIGH. (i.e. AFTER SNOW MELT)



SOIL TEXTURE CLASSES. PERCENTAGES OF CLAY AND SAND IN THE MAIN TEXTURAL CLASSES OF SOIL; THE REMAINDER OF EACH CLASS IS SILT.

SOIL TEXTURE NOMOGRAPH

McElhanney

Table 3.7: Erosion Potential

Gradient	Length	Low	Medium	High
Gentle	Moderate	Low	Low	Moderate
	Long	Low	Moderate	High
Moderate	Moderate	Low	Moderate	High
	Long	Moderate	High	High
Steep	Moderate	Moderate	High	High
	Long	Moderate	High	High

As can be seen the erosion potential increases with the steepness of the slope and the length of the exposed surface. The planning and implementation of erosion prevention measures must include consideration of the slope, its length and the type of soil.

3.5.2 Erosion and Sediment Control Principles

The conceptual sediment and erosion control plan is based on an adaptive methodology that can be employed in developing the detailed design and construction techniques that will be utilized. Implementation of the Erosion and Sediment Control Plan will include ten elements. This represents a comprehensive and integrated approach for achieving stream protection during construction. Only four of the elements actually involve better design and selection of practices. Three of the elements emphasize non-structural techniques for erosion prevention, while the last three elements involve management techniques.

The ten elements of an effective erosion and sediment control plan include:

- minimize needless clearing and grading;
- protect waterways and stabilize drainage ways;
- phase construction to limit soil exposure;
- stabilize exposed soils immediately;
- protect steep slopes and cuts;
- install perimeter controls to filter sediments;
- employ advanced sediment settling controls;
- ensure contractors are trained;
- adjust the plan at the construction site; and
- practice adaptive management.

3.5.2.1 Minimize Needless Clearing and Grading

Some areas of a development site should never be cleared and graded, or these activities should be restricted. This includes riparian buffers, forest conservation areas, wetlands, springs, highly erodable soils, steep slopes, and environmental areas. However, except for riparian areas, most of these environmentally sensitive areas are not present in the area proposed for resort base area.

3.5.2.2 Protect Waterways and Stabilize Drainage Ways

Streams and waterways are particularly susceptible to sedimentation. Clearing adjacent to a waterway will not be permitted, and a silt fence should be installed along the perimeter of the riparian buffer. Existing drainage ways should be identified, as these will likely be the major routes that eroded sediments will take to reach streams, rivers and storm sewers. Drainage ways are also prone to erosion due to the high velocity of runoff. Erosion should be minimized.

3.5.2.3 Phase Construction to Limit Soil Exposure

Large areas of grading should be avoided since this maximizes erosion potential. Construction phasing, where only a portion of the site is disturbed at one time, minimizes sediment load potential.

3.5.2.4 Stabilize Exposed Soils Immediately

To provide soil stabilization, it is important to establish cover over the denuded area within a short period of the soils being exposed. Covers such as grass, mulch, erosion control blankets, hydroseeding, and plastic sheeting can be used to achieve this.

3.5.2.5 Protect Steep Slopes and Cuts

Steep slopes are the most highly erodable surfaces within construction sites. Steep slopes are generally defined with slopes of 6H:1V to 3H:1V or greater. Where possible, clearing and grading of steep slopes should be avoided. Otherwise, special techniques, such as uphill flow diversion and silt fencing, should be used to prevent runoff from flowing down the slopes. However, the development area does not include steep slopes; therefore, clearing and grading of steep slopes will not be an issue at the proposed resort base area.

3.5.2.6 Install Perimeter Controls to Filter Sediments

Perimeter controls should be implemented at the edge of the construction site to retain or filter runoff before it leaves the site. Silt fences and earth dikes or diversion are the two most common controls.

3.5.2.7 Employ Advanced Sediment Settling Controls

Even when the best Erosion and Sediment Control measures are employed, high concentrations of sediments may be discharged during larger storms. Therefore, the Erosion and Sediment Control plan should include some sediment traps or basins to allow captured sediments to settle out. To improve the trapping efficiency, these basins must be designed to incorporate features such as larger volumes, use of baffles, skimmers and other outlet devices, and multi-cell construction. Regular inspection and maintenance are also critical to the operation of these practices.

3.5.2.8 Ensure Contractors are Trained

The most important element in the implementation of an Erosion and Sediment Control plan is the training and experience of the contractors, as they are usually responsible for installation and maintenance of the practices. In the end, everyone is responsible for erosion and sediment control. Therefore, training and education is important for everyone, from the developer down to the homebuilder. Everyone is working towards the same goal of protecting the waterways.

3.5.2.9 Adjust the Plan at the Construction Site

For an Erosion and Sediment Control plan to be effective, it may have to be modified due to discrepancies between planned and as-built grades, weather conditions, altered drainage and unforeseen requirements. Regular inspections are needed to ensure that Erosion and Sediment Control controls are working properly. Inspections should be conducted every seven days and following heavy rainstorms or snowmelt events.

3.5.2.10 Practice Adaptive Management

After a rainstorm, it is usually clear whether an Erosion and Sediment Control plan worked or not. If the storm was unusually large or intense, it is likely that many of the controls will require repair, clean out, or reinforcement. Therefore a quick response to assess and correct damages of the controls is required. An adaptive management process must be implemented into the Erosion and Sediment Control Plan to obtain the desired results.

3.5.3 Erosion Control Techniques

Many erosion and control techniques exist for short term and long-term applications. During construction the need is initially for short-term controls that relate to actual construction activities and that can be implemented on a daily basis. As construction draws to an end or where a pause in construction activity occurs there is a need for long-term methods.

One of the most effective long-term methodologies is to provide an effective cover for susceptible soils. The cover can be in the form of matting that can be applied to flat surfaces or channels as shown in Exhibit 3.4 and in Exhibit 3.5. The specification of the soil cover must be to meet the anticipated conditions and be tailored for the soils to which it is applied.

The channel protection may also include the use of rock check dams to slow the water and to promote sedimentation or settling of sediments in the water. A typical rock check dam is shown in Exhibit 3.6.

Exhibit 3.4: Slope Protection

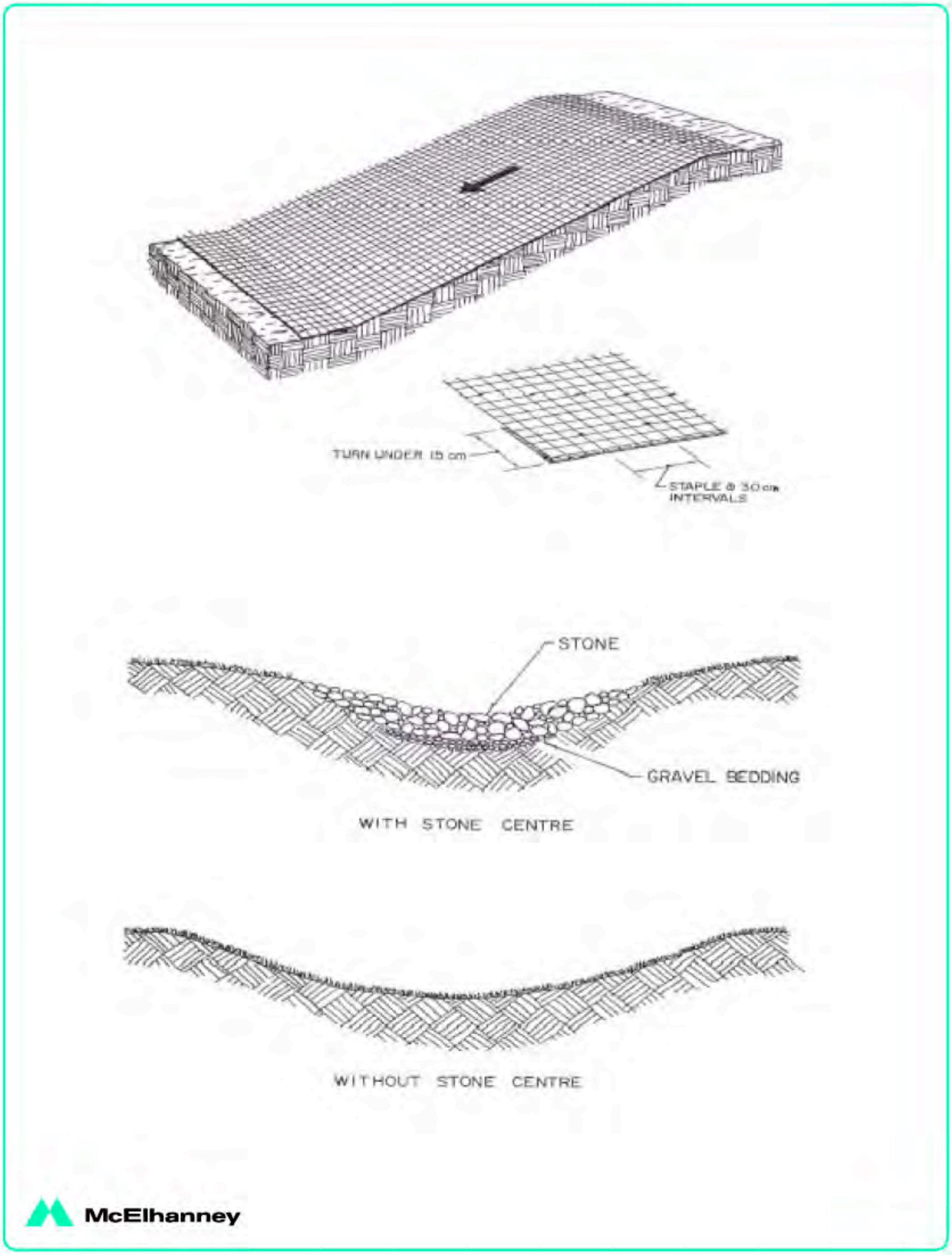
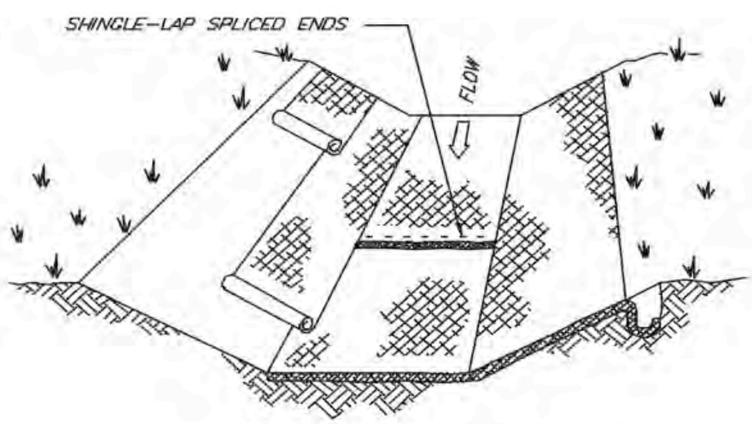


Exhibit 3.5: Grass Lined Channel

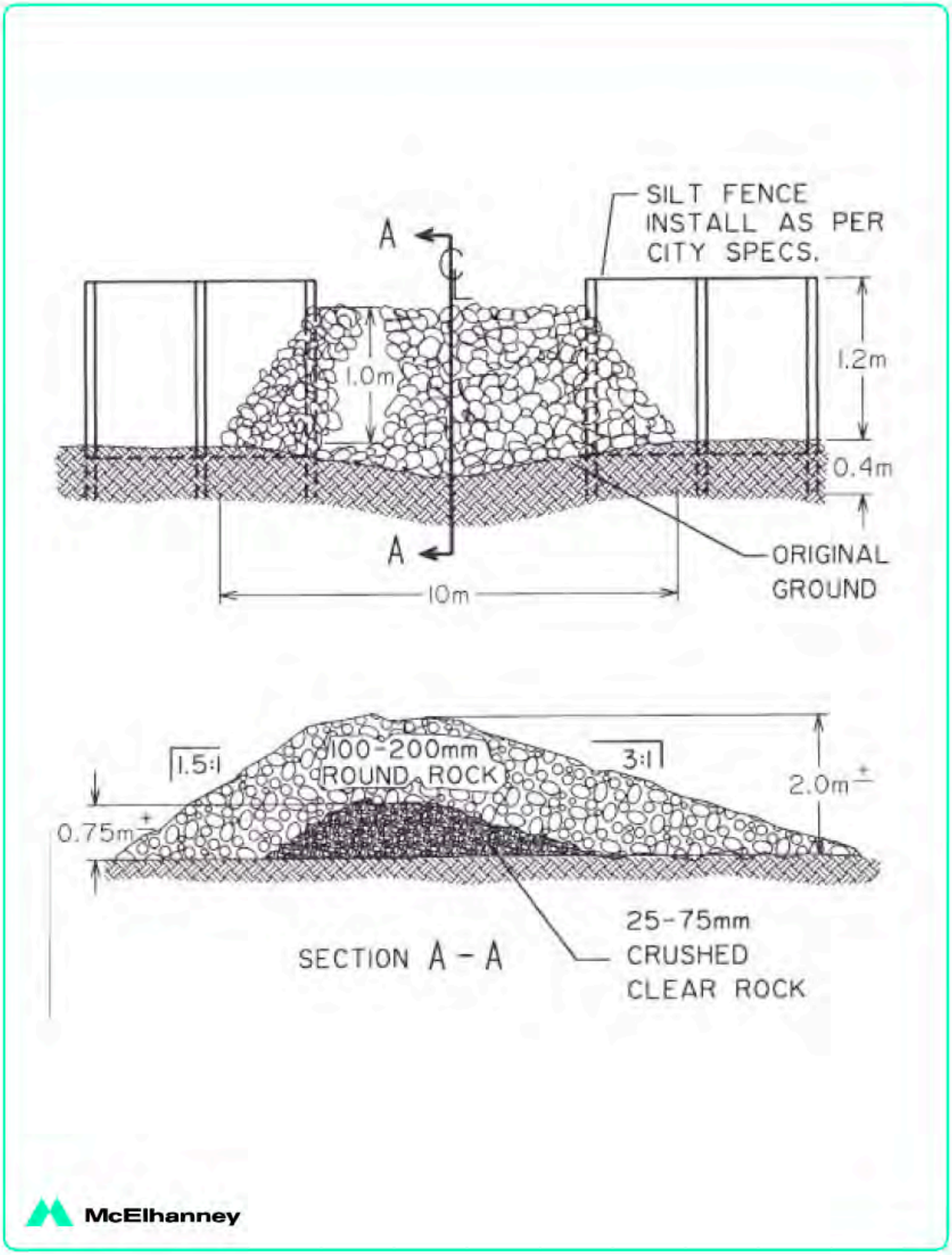
Cross-Section



Typical Placement

McElhanney

Exhibit 3.6: Rock Check Dams



On slopes a facility similar to a channel rock check dam can be employed with success. The sediment barriers on slopes can be comprised of silt fencing or brush barriers as shown in Exhibit 3.7. Silt fencing has become a relatively inexpensive practice in controlling sediment on construction sites. They can be utilized provided the limitations to their use are recognized in developing the Erosion and Sediment Control plan. The limitations on the use of silt fences are shown in Exhibit 3.8.

The rock check dams used in channels are often utilized for extended periods and may become permanent installations. For a more temporary use, straw bales can be utilized as shown in Exhibit 3.9.

Portions of Jumbo Glacier Resort will include a piped drainage system. This will be most common in the built up areas where the impervious surface areas are greatest. In these areas the construction management of erosion and sediment control will require additional techniques and facilities. Inlets into the pipe system can be temporarily modified to limit the sediment entering the pipe system through the use of inlet installations as shown in Exhibit 3.10.

The treatment of runoff conveyed by the pipe system will be required, as the pipes do not provide sediment removal in the same way as grass lined channels. The *Land Development Guidelines* (DFO 1992) provide the basis for designing the end of pipe sediment basins as shown in Exhibit 3.11.

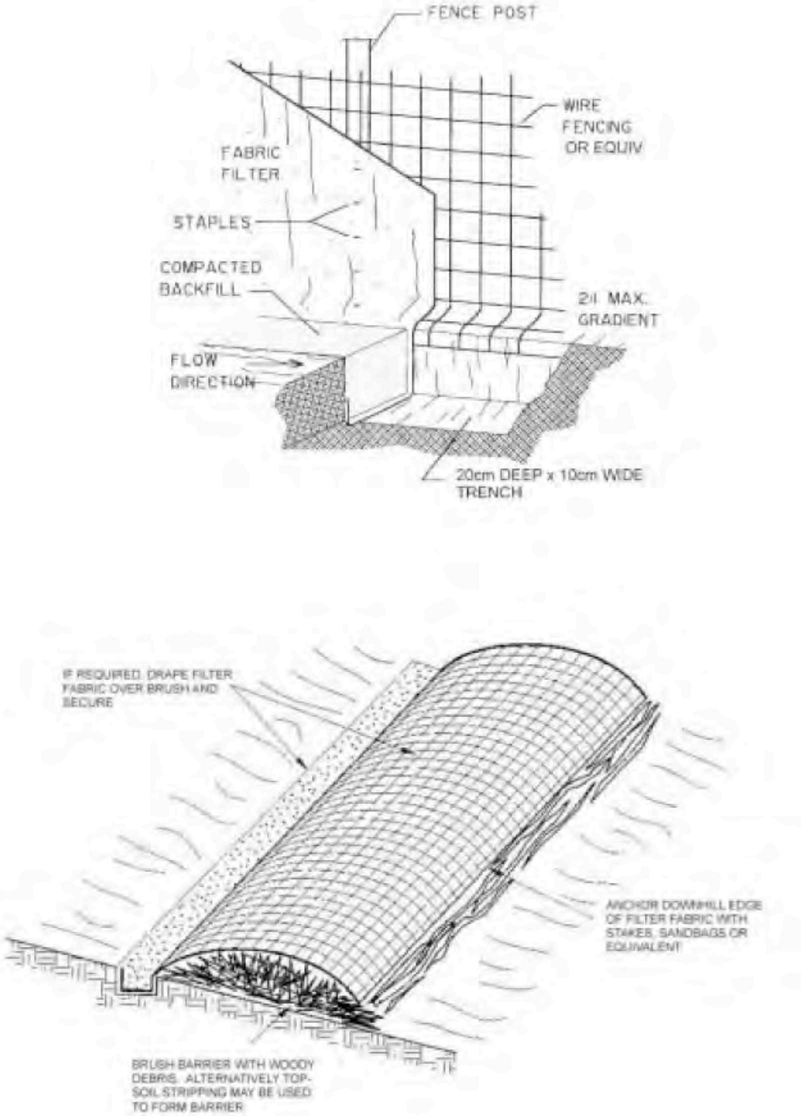
3.5.4 Additional Erosion Control for Ski Slopes

Jumbo Glacier Resort is unusual because most of the ski runs will be located on glaciers and moraines, or over ski runs already cut for heli-skiers. However, some ski runs will need preparation. This section describes sediment and erosion control measures for the few ski runs that will be constructed.

Sediment control for the ski runs will be similar to that for the other development areas, as described in the foregoing sections. In addition, sediment control will incorporate specific recommendations from *Ski Area BMPs* (Sibbernsen *et al*. 2001). These recommendations include the following:

- All improvements on one part of the mountain should be completed before work begins on other parts of the ski area.
- Construction should be planned such that any slope started can be finished during one summer construction season and the area reclaimed permanently before winter snows cover the ground.
- A contingency plan for erosion control is necessary to address any possibility that finishing a run could be delayed by an early snowfall.
- Cross slope water bars should be the first choice for the control of hill slope runoff and erosion.
- On steeper slopes, frequent small waterbars work better than a few large ones.

Exhibit 3.7: Sediment Barriers



McElhanney

Exhibit 3.8: Silt Fence Limitations

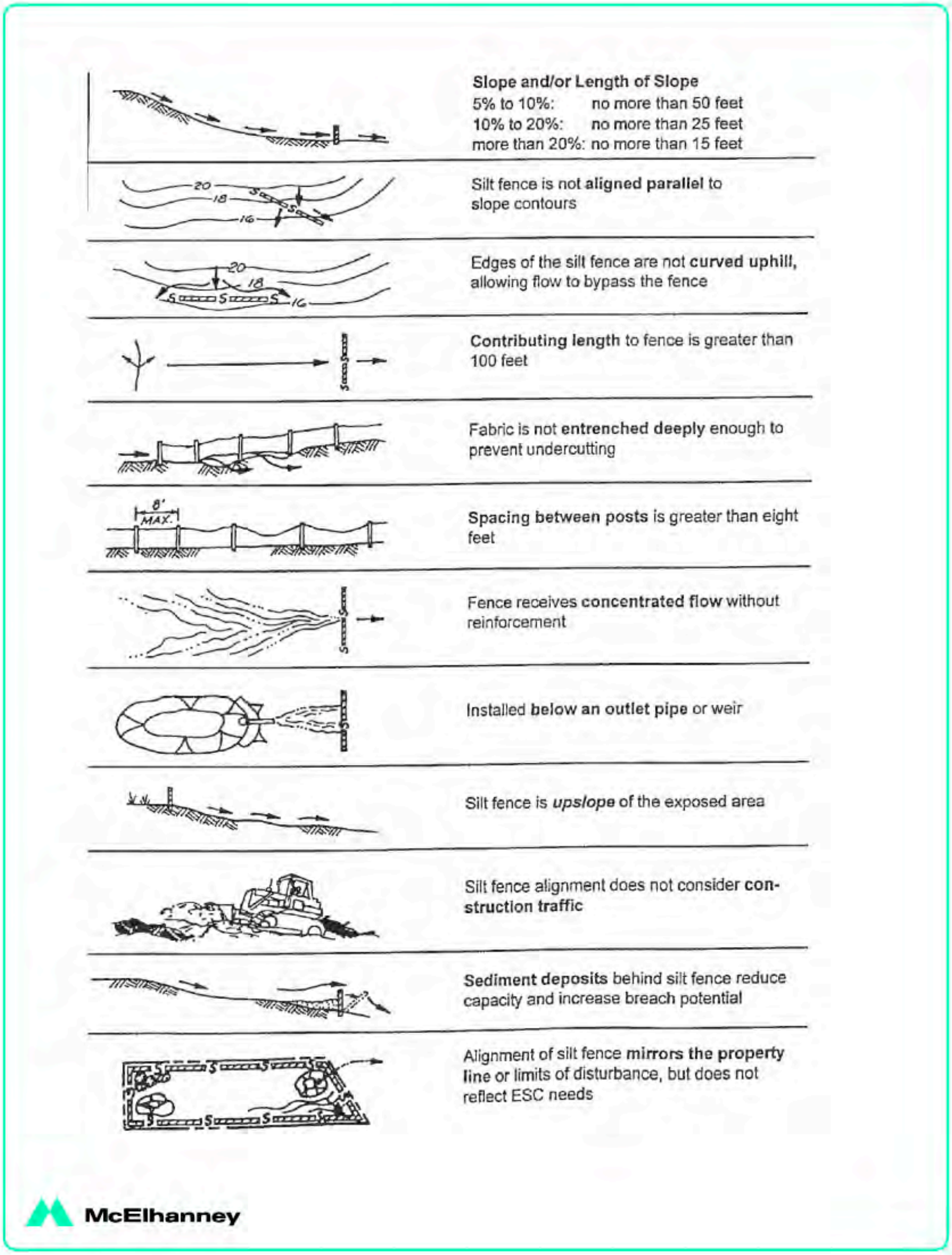


Exhibit 3.9: Straw Bale Channel Filter

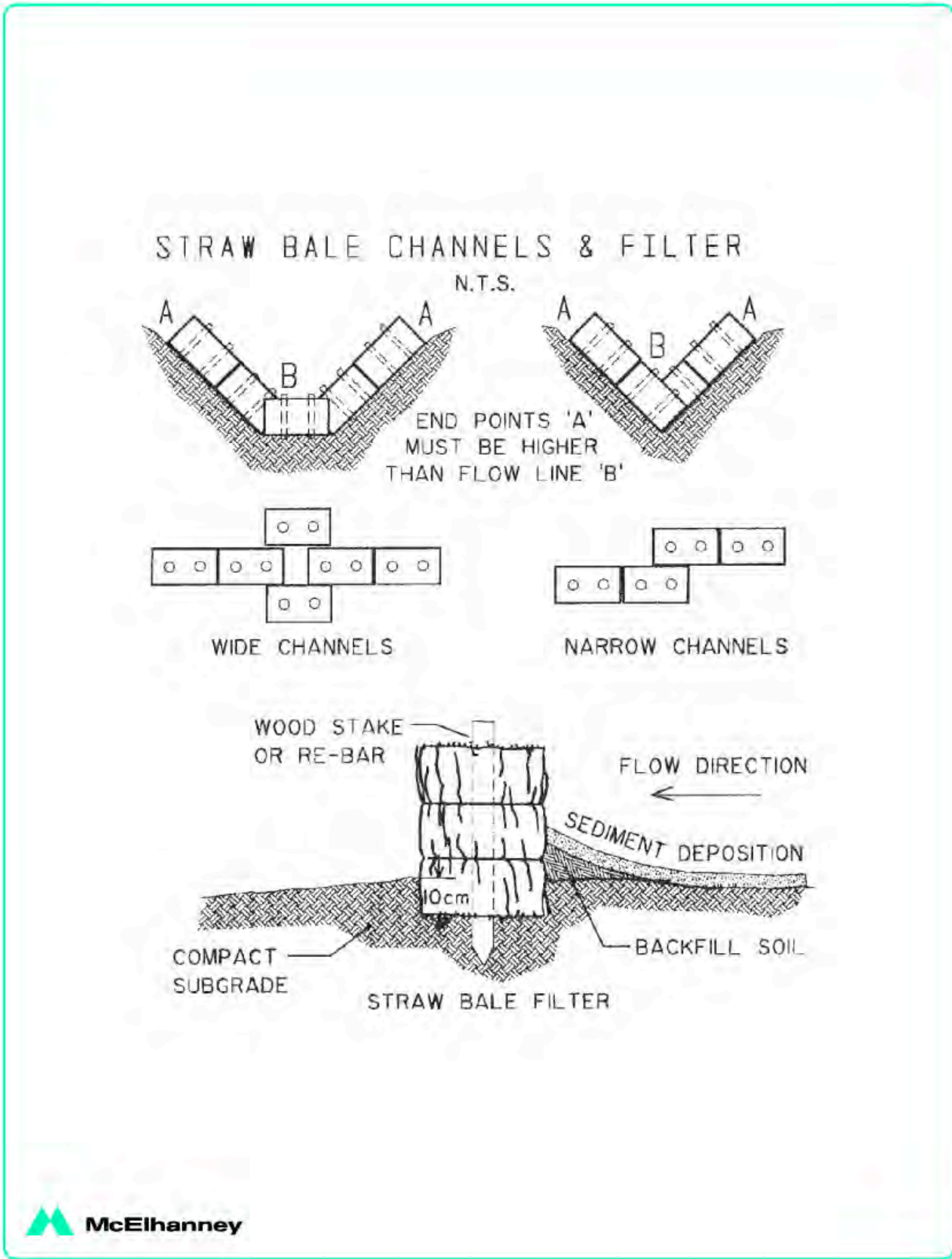
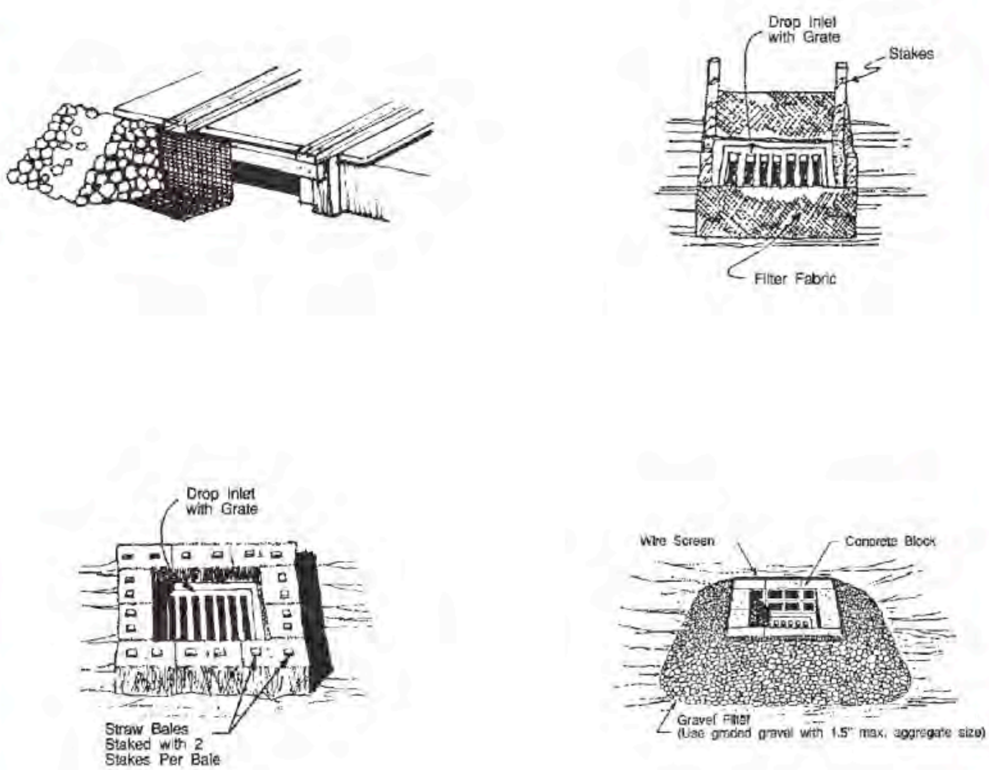
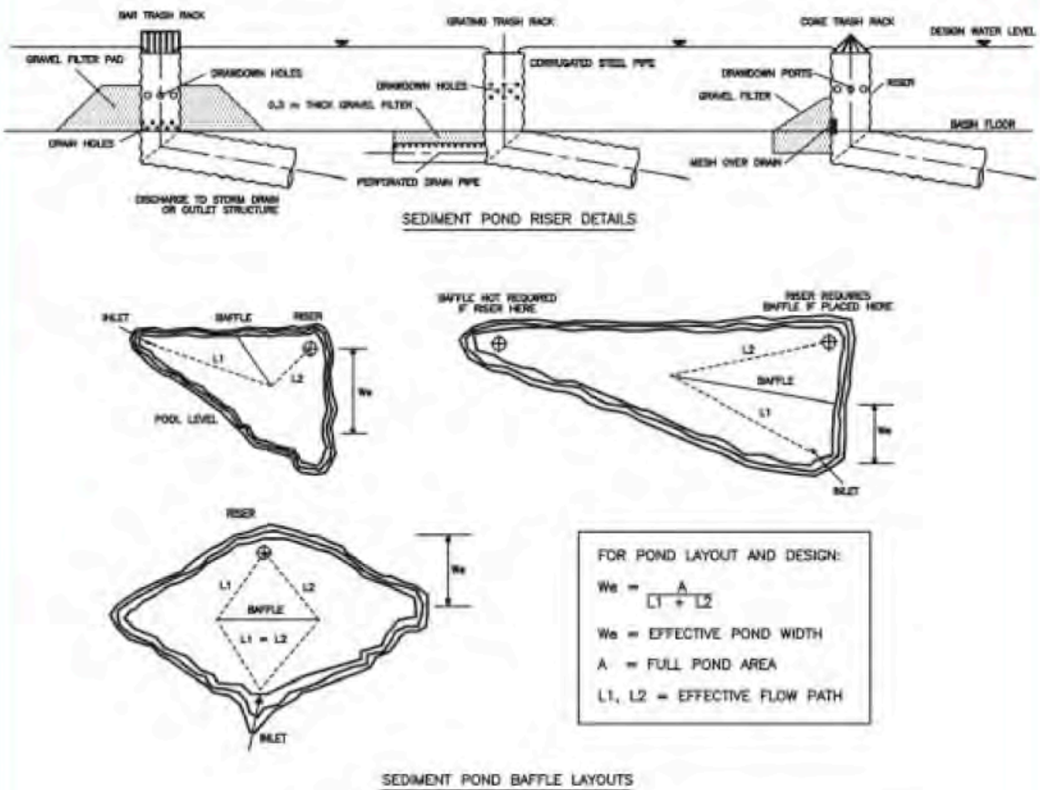


Exhibit 3.10: Inlet Types



McElhanney

Exhibit 3.11: Sediment Basin



Source: DFO, 1992

McElhanney

- Waterbars should extend well off bare slopes into adjacent vegetation.
- Waterbars must be inspected and repaired during spring snowmelt and cleaned of sediment following large rainstorms.
- The most effective method of treating fine sediments is to disperse runoff through a thick screen of live natural vegetation. Effluent from waterbars, silt fences and detention basins should be passed through a wide vegetation buffer strip before discharge into surface waters.
- Water discharged into buffer strips should be kept dispersed to maximize filtering and infiltration.
- Re-entry into previously disturbed areas with new construction should be delayed until vegetation has completely recovered.

3.5.5 Sediment Control Summary

The use of appropriate sediment control designs and facilities can minimize and potentially eliminate the environmental impacts resulting from the Jumbo Glacier Resort development. The formulation and implementation of an Erosion and Sediment Control must include appropriate designs, contractor education, operational reviews and an adaptive approach to modify any components that are not providing the protection required to prevent adverse environmental impacts.

3.6 SOLID WASTE MANAGEMENT PLAN

3.6.1 Introduction

The Solid Waste Management Plan provides the background and outlines the proposed policies and infrastructure for the **reduction**, **reuse** and **recycling** of solid wastes.

The following sources can generate waste at Jumbo Glacier Resort:

- Construction operations, mobile generators;
- Resort facilities, day use areas, and street receptacles;
- Commercial and institutional facilities;
- Hotels;
- Single family and multi family complexes;
- Maintenance facilities; and
- Food service facilities.

A conceptual plan is provided for temporary storage of solid waste prior to off-site disposal. Public health and safety concerns have been considered in the preparation of the conceptual plan, particularly with respect to bear and rodent problems. Plans for the minimization, collection and handling of household hazardous wastes are included. Solid waste disposal is the mandate of the Regional District of East Kootenay (RDEK), which operates disposal sites accessible after payment of the required fees.

3.6.2 Garbage Collection and Disposal

All domestic waste will be placed in a fully enclosed waste transfer station, which will be designed as a closed, odourless, and predator proof structure. To assist in reducing odours from the waste transit building, consideration will be given to freezing waste in the main transfer station, especially during the summer months.

Due to the presence of wildlife and the potential for animal/human conflicts resulting from unsecured garbage containers, there will be no curbside collection of garbage. Residents will be required to deposit garbage (and recyclable materials) at the waste transfer stations within the resort. All overnight visitors will be required to keep refuse in enclosed predator-proof areas before dropping it off at the resort transfer station.

Food and organic wastes will be generated mainly by the catering and restaurant facilities at the hotel and commercial facilities and at the mountain top teahouse. Separate food waste containers will be provided at these locations.

Refuse bins will be provided at ski lifts and at the Teahouse and on-mountain facilities. These bins will be emptied daily and the collected waste dropped off at the central waste storage facility.

A recognized waste management hauler will be retained to collect and remove the solid waste and recyclable materials from the resort. The non-recyclable refuse will be disposed of at the Columbia Valley Landfill operated by the Regional District. The refuse disposal site accepts municipal, residential, commercial and industrial wastes. Disposal will be by contract and eventually will be administered by the RDEK or by an independent authority, when one is established. The availability and policies of the RDEK have been confirmed in writing by means of a letter dated September 17, 2003. Residents may also drop off their own waste at the disposal site. At the outset, the hotel and commercial facilities will contract for their own waste collection.

3.6.3 Recycling

The focus will be placed on waste minimization and recycling programs. To match the recycling programs in place in the Regional District, Jumbo Glacier Resort will provide for collection of:

- paper (newspaper, magazines, envelopes, telephone books, fax paper);
- cardboard;
- tin and aluminum cans;
- plastic milk jugs; and
- plastics numbered 1, 2, 3, 4, 5 and 6 (except styrofoam).

Jumbo Glacier Resort will not provide curbside collection of recyclable materials because of the presence of wildlife and the potential for animal/human conflicts. Instead, an enclosed recycling depot will be strategically located within the resort complex to ensure cooperation of residents and guests and to keep garbage away from scavenging wildlife. In addition, dedicated bins for recyclable products will be proved at ski lifts and at the Teahouse and on-mountain facilities. These bins will be emptied daily and their contents dropped off at the central waste storage facility.

3.6.4 Criteria for Siting and Sizing Solid Waste Transfer Station

The following considerations should be taken into account during design of the transfer station:

- Screening from public view;
- Fencing to exclude animals (see Grizzly Bear Management Plan);
- Accessibility along primary daily travel routes of residential users;
- Snow control (i.e., receptacles should function in high snow load conditions. Sheds may be necessary, and manoeuvring room for snow removal equipment);
- Space for one or more compacting animal-proof garbage roll off type bins which allow access to public without need for retaining walls;
- Space for one or more animal-proof compostable material roll off type bins, which allow access to public without need for retaining walls;
- Space for animal proof recycling receptacles for cans, bottles and plastics;
- Space for other items collected for recycling, such as cardboard and newspapers;
- Space for other items that may be collected in the future, such as other plastics;
- Space for Paint care and household hazardous waste collection buildings;
- Stockpile areas for tires and metal goods; and
- Safety measures for public use, such as railings, vehicle barriers, and signage.

Although not always necessary, future consideration may be given to staffing the site, and fencing to restrict or control access and materials deposited.

Local waste haulers should review transfer station depot before the design is finalized.

3.6.5 Hazardous and Special Wastes

Storage collection and disposal of hazardous and special wastes may be another area of service under the administrative jurisdiction of a Mountain Resort Improvement District. Alternatively, those who generate that refuse will have to contract directly for its proper disposal. Some special arrangements must be made for hazardous wastes, as they are not accepted at any Regional District refuse disposal facility. Prohibited materials at the Regional District Refuse Disposal Site include animal carcasses, lead acid batteries, sludge, log yard waste, smoldering ashes, passenger vehicle tires, and commercially generated OCC (Old Corrugated Cardboard). The collection of hazardous and special waste at Jumbo Glacier Resort is not expected to be a normal occurence, except on rare occasions. In these circumstances, specialist contractors will remove the special and hazardous waste.

3.6.6 Household Hazardous Waste

Hazardous household waste includes all consumer products that are corrosive, toxic, reactive or flammable (paints, solvents, cleaners, etc.). The major users of the household products will be overnight visitors and maintenance staff of the resort. Where the operations of Jumbo Glacier Resort generate household hazardous waste, the resort will arrange for its proper disposal.

3.6.7 Special Waste

Special waste that will be generated includes waste oils and lubricants, refuse from the First Aid facility, and refuse from certain commercial facilities. As refuse from the first aid facility may be considered as Bio-Medical waste, consideration will be given to the co-management of this waste with the nearest hospital. The Ministry of Water, Land and Air Protection will be consulted on appropriate ways to handle special waste and handling will comply with established legislation and regulation.

Maintenance facilities will be equipped with conventional storage and handling equipment for used oils and lubricants. These used oils and lubricants will be collected and managed by a recognized recycling facility.

The operation(s) responsible for the production of special wastes will be required to retain a recognized waste management organization to collect and dispose of these materials.

3.7 VEGETATION MANAGEMENT PLAN

3.7.1 Introduction

The following plan outlines the guiding principles, proposed mitigation measures and best management practices to reduce potential impacts to vegetation resources in the proposed development area and includes the following recommendations:

- Revegetation of areas as soon as possible following the end of construction in order to limit the area of exposed soil;
- Salvage of all merchantable tree volumes;
- Use of seed mixtures that will not increase the frequency or distribution of any weed species or introduction of non-native species;
- Use of seed mixtures that will include species that are adapted to the climate and soil conditions of the region and will be obtained from local native sources wherever possible;
- Measures to address both the short term and long term impacts and how the ski runs will be managed; and
- Measures to preserve the maximum biodiversity within the project boundaries (e.g. allow forests to mature and wind firmness of trees at the edge of ski runs).

3.7.2 Tree Protection Plan

All trees that are to be retained will be protected from mechanical damage to the trunk and root system. This protection can be achieved through:

- Marking trees or flagging areas that are to be protected during the construction phase of the project;
- Installing ‘Tree Protection’ signs;
- Taking all measures necessary to prevent the activities such as storage of materials or equipment, stockpiling of soil or excavated materials, burning, excavation or trenching or cutting of roots or branches within the tree protection areas;
- Restricting vehicle traffic to designated access routes and travel lanes to avoid soil compaction and vegetation disturbances; and,

- Avoiding alterations to existing hydrological patterns to minimize impact on vegetation.

Clearing (of ski runs, in particular) will be done in a manner to minimize the potential for windthrow and other damage to newly exposed inner forest areas. The following practices will be implemented

- Trees will be cut to achieve a “soft edge,” keeping smaller trees near the edge and progressing toward larger trees in the middle. Unit edges will be feathercut to reduce the strong contrast between the ski trails and undisturbed areas.
- When cutting, the integrity of naturally occurring tree clumps will be maintained.

3.7.3 Sensitive Ecosystem Protection Plan

All Sensitive Ecosystems (i.e. riparian zones) will be protected from mechanical damage during construction. This protection can be achieved through:

- Limit clearing to the minimum area required for construction boundaries Snow fence areas that are to be protected during the construction phase of the project;
- Install ‘Sensitive Ecosystem Protection’ signs;
- Remove the minimum amount of vegetation possible from environmentally sensitive areas or areas where rare or endangered plants or plant communities are identified by the environmental monitor; and
- Take all measures necessary to prevent the activities such as storage of materials or equipment, stockpiling of soil or excavated materials, burning, excavation or trenching or cutting of roots or branches within the sensitive ecosystem protection areas.

Due to the close proximity of the development to sensitive ecosystems the following guidelines as outlined in the SEI Conservation Manual (McPhee et al., 2000) should be followed after the completion of construction, where possible:

- Where residential or other developments are adjacent to sensitive ecosystems establish conservation covenants;
- Restrict recreational access;
- Control the introduction or spread of invasive species;
- Prevent wildlife disturbance (especially nesting or breeding areas);
- Locate developments away from sensitive core areas;
- Establish a buffer zone between the core sensitive areas and the development area; and
- Maintain hydrologic regime.

3.7.4 Revegetation Plan

3.7.4.1 Ski Runs

The proposed development plan for the ski runs indicates that there will be very little requirement for tree clearing in subalpine and alpine parklands. Ski run routes will be designed to travel between the sparse stands of trees present in these areas. Where it is not possible to align the routes around existing stands of trees, the trees will be flush-cut so that the roots will remain to stabilize the soil. Areas that will require revegetation should be re-seeded with the appropriate seed mix.

The revegetation plan for the slopes will follow *Ski Area BMPs* (Sibbernsen *et al*.

2001), which contains the following recommendations:

- Finish the project during one summer construction season and reclaim the area permanently before winder snows cover the ground.
- Have a contingency plan for erosion control if there is any possibility that finishing the run could be delayed by an early snowfall.
- Strip and stockpile as much topsoil as possible for later reapplication. Limit topsoil losses to either two inches (5 cm) or half the thickness of the original topsoil, whichever is less.
- Protect reapplied topsoil layers from erosion using caterpillar track surface roughening, cross slope waterbars and surface mulch blankets.
- Apply seed in late autumn to take advantage of snowmelt and rainfall the following spring.
- Test soil to determine fertilizer requirements and, if necessary, apply fertilizer with the seeds.
- To establish successful vegetation at a density of 40 plants per square foot, apply seeds at a rate of at least 100 per square foot.
- For improved seed germination, consider using a snow cat to track in and cover the seed with soil.
- Monitor seedling establishment to fine tune seed mixes and determine if supplemental seeding is needed.
- Enhance seedling establishment and growth with supplemental fertilizer application during the spring following initial seeding.
- Cover freshly seeded areas with mulch to create a cool, moist environment for fragile seedling survival.
- Restrict vehicle access to reclaimed areas so that multiple trails do not form. Delay entering previously disturbed areas with new construction until vegetation has completely recovered.

The success of revegetation will be monitored, and reseeding will occur, if necessary. Monitoring will consist of the following:

- revegetation success;
- sheet and rill erosion, gullies, slumping and subsidence;
- soundness and effectiveness of erosion control measures;
- noxious and undesirable weed invasion;
- degree of herbivory by rodents on seeds and seedlings; and
- evidence of excessive wildlife grazing.

Monitoring will include the establishment of a reference transect to establish baseline conditions. The reference transects will be used to compare the revegetation success against the following performance standards:

- Percent cover: The reclaimed area contains 75% of the total vegetal cover measured for the reference transect.
- Dominant species: 90% of the revegetation consists of species contained in the applied seed mix and/or that occur in the reference transect.
- Seedling density: The density and abundance of seedlings is at least 10 to 12 seedlings per metre.
- Erosion condition: The erosion condition of the reclaimed area is equal to or in better than that measured for the reference transect.

3.7.4.2 Development Areas

Following construction, residential and commercial development areas should be revegetated using a mix of indigenous tree, shrub and groundcover species. Trees should be planted at an average density of one plant per 4 m^2 and shrubs should be planted at a density of approximately one plant per 1 m^2. Berry producing species are not recommended for development areas as they may attract bears. Bioswales should be replanted using a mix of sedges and rushes. Stormwater ponds should be planted with a mix of emergent and submergent native plants.

3.7.4.3 Roadways and Transmission Lines

Following the completion of roadways adjacent slopes should be reseeded with a mix of indigenous grass seed. A specialized mix designed for linear developments should be used which contains numerous species tolerant of varied elevation and soil nutrient and moisture regimes.

Reseeding of disturbed areas can be accomplished in two ways. On steep slopes hydroseeding is recommended. On gentle slopes and flat areas seed can be hand-broadcasted. To further protect seeded areas and stabilize exposed soil areas the application of mulch is recommended. Loose mulch can be applied on gentle slopes and flat areas, and cocoa-mats should be used on steep cut-slopes (greater than 2:1) immediately uphill of streams.

3.7.5 Trail Management Plan

Jumbo Glacier Resort is focussed on skiing and snowboarding, as well as sightseeing from the top lift arrival stations and viewpoints, in winter and summer. Except for the trails inside the resort core area, there will be only one summer trail, which will lead from the resort area to the base of the Glacier Dome Gondola. From there the trail will lead up to the moraines and to the glacier of Glacier Dome, with a trail arrival point over the glacier to the Glacier Dome Teahouse.

Off-trail use has the potential to damage sensitive vegetation, particularly in alpine areas. This damage can be minimized by selecting an appropriate route for the trail and by implementing a trail management plan, which includes a requirement for hikers to walk only on the approved trail.

The trail route will be selected to maximize hiking over bare ground or plant species that are most resilient to disturbance. The trail will be constructed through habitat/vegetation types in the following order of preference (from most desirable to least desirable route) (Butler *et al*. 2003):

- Rocky Ground
- Bare Ground
- Graminoids (grasses, sedges & rushes)
- Herbs & Forbs (Plants with buds below the soil surface)
- Geophytes, i.e. yellow glacier-lily & queen’s cup
- Plants with buds at the soil surface
- Hemicryophtes, i.e. alpine pusseytoes & scarlet paintbrush

- Woody or Herbaceous Plants with buds above ground
- Chamaephytes, i.e. kinnikinick, pink mountain heather
- Woody Plants with buds a great distance above the ground
- Phanerophytes, i.e. dwarf blueberry, mountain huckleberry

The trail will avoid areas with permanently or frequently saturated soils, where the potential for erosion and damage to vegetation is highest.

The following management plan for hiking trails will be implemented:

- The trail will be clearly marked, including fencing in particularly sensitive areas, to deter off-trail use
- Signs will be posted to inform trail users of the sensitive nature of alpine ecosystems and potential for damage from off-trail activities.
- Picking wildflowers will be prohibited.
- Any interpretative staff guiding visitors on trails will inform hikers of the potential damaged caused by off trail activities and picking wildflowers.
- Visitor information centre staff members will hand out information on trail etiquette and the protection of alpine and other sensitive ecosystems. Trained staff will be available to answer visitor questions.
- Resort staff will regularly patrol the trail to look for signs of vegetation damage (trampling, corner-cutting, unauthorized new trails). Portions of the trail may be closed temporarily if the damage appears to be significant. In cases of severe damage, reseeding with an appropriate seed mixture may be necessary.
- Trail use may be restricted based on seasonal conditions. For example north facing slopes and other areas of late-lying snow should be avoided early in the season, or until these surfaces are less water saturated.
- If there is an ongoing issue with damage to sensitive plant communities, access to some backcountry areas may be restricted using a permit system.
- Resort staff will be required to set an appropriate example for guests by adhering to the trail use rules.

3.8 GRIZZLY BEAR MANAGEMENT PLAN

3.8.1 Preface

Grizzly bears are blue-listed species in British Columbia. According to the British Columbia Ministry of Environment, a blue-listed species “Includes any ecological community, and indigenous species and subspecies considered to be of special concern (formerly vulnerable) in British Columbia. Elements are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed elements are at risk, but are not Extirpated, Endangered or Threatened”.[1]

While Grizzly bears are not endangered or threatened, particularly in the Central Purcells, where the government has reported a healthy population that is at 93% capacity and is sufficiently stable to permit hunting in locations such as the Purcell Wilderness Conservancy,

[1] http://srmwww.gov.bc.ca/atrisk/red-blue.htm

Grizzly bears were a key issue of concern during the *Environmental Assessment Act* review process for the project. It is the proponent's intent to design and manage the project in a manner that will minimize its impacts on Grizzly bears.

A summary of the Environmental Assessment Office's (EAO) review of the project's impact on Grizzly bears is included in the EAO's *Jumbo Glacier Resort Assessment Report*[2] (pages 55-59):

> Background
>
> The potential impacts of the Project on Grizzly bears, a blue-listed species, was a key issue in the EA review process that came to symbolize land use concerns of many review participants.
>
> The objective of the additional studies required by the Specifications was to ensure that a thorough understanding of the potential impacts of the proposed development on Grizzly bears was obtained, and that any viable options to prevent or mitigate any adverse effects were identified and analyzed.
>
> The phases of study needed to complete the assessment of the impacts of the Project on Grizzly bears and Grizzly bear habitat were: a) identification of Grizzly bears and Grizzly bear habitats (presence, absence, limiting factors), both existing and potential; b) collection of hair samples from Grizzly bears for one season for purposes of genetic analysis; c) identification of probable impacts (direct, indirect and cumulative) of the Project on those resources; and d) identification of measures to prevent impacts and minimize those which cannot be prevented.
>
> In addition, monitoring the impacts, their prevention and mitigation, with modification as necessary, if plans are not effective to achieve the expected results, would be required should the Project proceed.
>
> The *Project Report* (Volume 3, Section D.3(C), pages D-150 to D-193) contains the additional information on Grizzly bear resources required to complete the EA review. The proponent conducted several new studies to collect the additional information, including a Grizzly bear population survey (November 1999), a habitat suitability assessment (July 2002) and a cumulative effects assessment (CEA) (December 2003).
>
> The key finding of the CEA was that, **in the absence of any measures to mitigate impacts on Grizzly bears**, the Project would **increase the risk of Grizzly bear mortality by 2.6% to 3.8% and reduce habitat effectiveness by 1.7% to 3.1%** within the 3,977 km 2 study area (89% of the Central Purcell GPBU).
>
> On the basis of these and other studies and in response to concerns expressed during earlier phases of the EA review process, the proponent made the following project design modifications, in part, to address potential impacts on Grizzly bears:
>
> - 60% reduction in the size of the CRA; and

[2] included as Appendix 8-C to this Master Plan

- the removal or project components on the west side of Jumbo Valley and in lower Jumbo Creek (an area identified as being more frequently visited by Grizzly bears).

In addition, the proponent proposed a Grizzly Bear Management Plan (see Appendix 3-C) to address onsite impacts, including strategies to prevent or minimize bear problems (e.g., garbage management, access road management, education) and to deal with problem bears. The proponent also proposed a program of monitoring and adaptive management that includes continued hair sampling and DNA testing to assess changes in Grizzly bear numbers and distribution in response to project construction and operation, and to help manage the Central Purcell Grizzly Bear Population Unit (GBPU) with greater precision.

[…]

Agency review comments

The lead review agency for this issue was WLAP. Additional review comments were received from the SRM, the Ministry of Energy and Mines (MEM), MOF, the RDCK, and the KKTC, particularly in relation to any potential access restrictions in adjacent drainages.

The proposed Project is located in the 4,619 km 2 Central Purcell GBPU, one of 49 GBPUs in the Province designated as 'viable' under the Grizzly Bear Conservation Strategy. **This designation means that the population is stable and sufficiently productive to permit some hunting. The current population estimate of the Central Purcell GBPU is 150 bears. WLAP estimates that this population is currently at 93% of habitat capability (163 bears) and that would have to decline by 41% (i.e., to less than 81 bears) to be designated as 'threatened'.**

WLAP currently classifies the risk of human-caused mortality in the Jumbo Creek valley as "moderate". Although Jumbo Creek valley contains highly suitable Grizzly bear habitat, the effectiveness of this habitat is reduced somewhat by the existing level of human disturbance (existing access road, hiking trails, forestry activity and a backcountry hut).

WLAP determined that in the absence of any mitigation, the Project would result in significant impacts to Grizzly bears, both in terms of mortality risk and habitat effectiveness (including habitat fragmentation) within and outside Jumbo Valley. However, **the risk of mortality and loss of habitat effectiveness within the CRA would be substantially reduced by application of measures described in the proponent's Grizzly Bear Management Plan**. Within the CRA, areas opened for ski run development and for managing risk of wildfire will assist in offsetting the loss of habitat effectiveness, particularly when coupled with management of human activities to prevent disturbance of bears attempting to use these foraging areas. Implementation of the proponent's Outdoor Recreation Management Plan would further reduce mortality risk in, and immediately adjacent to, the CRA by managing human activities in a manner that will avoid human disturbance of, and contact with, bears.

WLAP suggested the proponent pursue partnership arrangements with local forest tenure holders and government to improve habitat effectiveness within and adjacent to the CRA through incremental silviculture projects (thinning and spacing of young forest stands), deactivation of unnecessary (redundant) roads, and strategic harvest of merchantable timber. Reduction of the density of active roads in adjacent drainages by strategic deactivation (i.e., strategic actions to keep open only those roads that are needed for active resource extraction or to serve existing recreational tenures and existing levels of public use), in consultation with other tenure holders, will further reduce risk of mortality and loss of habitat effectiveness.

Based on the information available, including the CEA, WLAP has determined that there is a low risk that the Project would result in a reduction of the Grizzly bear population of such significance that the population in the Central Purcell GPBU would become threatened. This determination considers that:

- proposed mitigations for the area within and immediately adjacent to the CRA are fully applied; and
- the proponent will maintain the proposed monitoring program, and will adjust its mitigation programs to the fullest extent possible if resort-related impacts to Grizzly bear populations or habitat use are evident.

WLAP confirmed that wholesale restriction of motorized access to drainages adjacent to the CRA is neither a desirable, nor required, approach to off-site mitigation of cumulative impacts on Grizzly bears. Access management of this type would represent extraordinary measures that are not necessary to adequately manage the GBPU. It would be difficult, expensive, and extremely controversial to implement such measures over the lifespan of the Project (i.e., indefinitely).

WLAP further identified concerns regarding potential impacts from increased future activities (above existing levels) in Jumbo Pass and adjacent areas over time, whether the Project proceeds or not. Increased recreational traffic may evolve from new trailheads and/or points outside of the CRA. WLAP identified the need for government to carefully manage the Jumbo Pass and Glacier Creek areas. For its part, the proponent has committed to discourage employee and visitor use of Jumbo Pass and to not enter into any agreements for recreational activities, with the exception of agreements with R.K. Heli-Ski and the existing guide/outfitter, without LWBC's approval. LWBC has committed to consult review agencies (including WLAP) on applications for commercial recreation tenures outside the CRA. Further, the proponent committed to consult with the KKTC and the Shuswap Indian Band before entering into any agreements for recreational activities within the CRA. WLAP would be invited to participated on a Grizzly Bear Management Committee established to oversee implementation of the proponent's Grizzly Bear Management Plan.

<u>proponent response and commitments</u>

The proponent reiterated for agencies that the proposed mitigation does not include wholesale restrictions to motorized access in adjacent drainages and that the mitigation proposed the Grizzly Bear Management Plan will be adequate to mitigate the impacts. In response to WLAP's request, the proponent clarified that they do not intend to provide helicopter-based recreation activities. In addition, the proponent clarified that the treed areas of Jumbo Creek and Farnham watersheds to be cleared for runs and/or lifts (and to offsetting the loss of habitat effectiveness) to be 287 ha and 134 ha, respectively.

With respect to the monitoring and adaptive management, the proponent proposes that the implementation of the Bear Management Plan be overseen by a Grizzly Bear Management Committee with a reporting structure to be determined in consultation with WLAP. In response to WLAP's request for clarification, the proponent expressed a willingness to discuss alternatives to partial funding by the resort management for a local Conservation Officer service. The proponent is committed to monitoring to identify impacts and to responding to monitoring results to address any impacts detected.

The proponent has committed:

- to achieve and maintain Bear Smart community status (101).
- to implement, at its own cost, all mitigation measures and provisions for preventing or minimizing bear problems within and immediately adjacent to the Controlled Recreation Area, as outlined in the *Project Report* (102).
- to implement, at its own cost, all measures and provisions for managing problem bears within and immediately adjacent to the Controlled Recreation Area, as outlined in the *Project Report* (103).
- to monitor the potential direct and indirect effects of the Project on the Central Purcell Mountains Grizzly bear population through genetic testing to predict, detect, and assess any change (if any) in Grizzly bear numbers and distribution. The monitoring program is to include field collection of hair samples from Grizzly bears within the area of direct and indirect impacts before construction, at the end of each phase of construction and at appropriate intervals in the following 10 years, or until such time as the Ministry of Water, Land and Air Protection determines that it is no longer required (104).
- to implement (in consultation with the Ministry of Water, Land and Air Protection and Land and Water BC Inc.), at its own cost, an adaptive management program, as outlined in the *Project Report*, to evaluate the success of measures for mitigating impacts to Grizzly bears. The adaptive management program will include the identification of performance measures and targets, a decision protocol for the adjustment of mitigation programs to the fullest extent possible when resort-related impacts to Grizzly bear populations or habitat use are evident, and a mechanism for resolving adaptive management disputes (105).
- to establish and sit on a Grizzly Bear Management Committee to oversee implementation of the Grizzly Bear Management Plan as proposed in the *Project Report*, including a monitoring and adaptive management program and associated management practices (decision protocol, reporting, and a dispute resolution mechanism) (106).
- to pursue arrangements with local forest tenure holders and government to improve habitat effectiveness within and adjacent to the CRA through incremental silviculture projects (thinning and spacing of young forest stands), deactivation of unnecessary roads, and strategic harvest of merchantable timber (107).
- to make every effort to achieve the desired mitigation, in regards to Grizzly bear cumulative impacts, with strategies that will not alter the present access enjoyed by various special interests (108).
- to strive to achieve no net impact by implementing the Grizzly Bear Management Plan and by supporting or implementing additional measures identified and agreed to by Land and Water BC Inc. and the Ministry of Water, Land and Air Protection (109).

<u>Conclusion</u>

Based on the information and commitments provided, the EAO is satisfied that the

> proponent has identified and assessed the potential impacts of the Project on Grizzly bears (both in terms of mortality risk and habitat effectiveness, including habitat fragmentation) within and outside Jumbo Valley and can implement appropriate measures (e.g., garbage management, outdoor recreation management, adaptive management) to avoid or address any potential significant adverse effects.
>
> [Emphasis added.]

The Grizzly Bear Management Plan, partially summarized for Master Planning purposes and for ease of reading, is included in Section 3.8.2 and following, below. The complete Grizzly Bear Management Plan, including detailed references and mapping is included as Appendix 3-C.

3.8.2 Introduction

In 1998, AXYS Environmental Consulting Ltd. was retained by British Columbia's Environmental Assessment Office and Pheidias Project Management Corporation for the proponent to conduct surveys and estimate the abundance and seasonal distribution of grizzly bears in the Central Purcell study area, which encompasses the proposed development. The Central Purcell study area is defined by the heights of land of the headwaters of Stockdale Creek, Horsethief Creek, Jumbo Creek, Toby Creek, Glacier Creek and Hamill Creek. The approach used to generate the population estimate was based on collection of hair samples, analysis of DNA obtained from hair samples, and genetic identification of individual bears.

Primary results of the survey include the following:

- The unbounded population estimate for the Central Purcell study area and surrounding area was 45 grizzly bears with a 95 percent confidence interval of 37 – 68 grizzly bears;
- 33 individual bears were identified from the hair samples including 18 females, 10 males, and 5 of unknown sex. Approximately ½ of the bears were recaptured at least once;
- Grizzly bears were sampled throughout the study area; distribution of hair captures was non-uniform with least success obtained in the lower and middle Horsethief valley in the northeastern quadrant of the study area;
- Female captures were relatively evenly distributed in those drainages where grizzly bear presence was confirmed. Of the 18 female grizzly bears found in the Central Purcell study area, five were captured in the Glacier Creek watershed, three in Stockdale Creek, three in lower Toby Creek including Mineral and Coppercrown creeks, three in upper and south Toby Creek drainages, two in the Jumbo Creek watershed, and one female grizzly bear in each of Farnham and Hamill Creek watersheds. The two female grizzly bears captured in the Jumbo valley confirm that a minimum of two female grizzly bears use habitats in the valley;
- The majority of male grizzly bears were sampled from within the southern one third of the study area, specifically in Hamill, Upper Toby, South Toby, Mineral and Coppercrown creeks.
- The study area is not closed to grizzly bear movements, suggesting that bears were leaving or entering the study area during the sampling period; and
- Many of the bears in adjacent watersheds in the study area are related to each other.

The data provided by this survey shows that there is a currently viable resident population of grizzly bears occupying the Central Purcell study area. History and extrapolation from other research efforts in the region suggest that there will be impacts associated with the development, but further assessment will be required to attempt to quantify and estimate the significance of those impacts.

3.8.3 Resort Management Objectives

The proponent, Glacier Resorts Ltd. agrees with the government that the potential impacts to the Central Purcell Grizzly Bear Population Unit could be substantially addressed through a number of mitigation measures and provided that a comprehensive mitigation package was implemented may result in "no net impact" to the population. Therefore, Glacier Resorts Ltd. is committed to the following management objectives recommended by Austin (2000) to ensure the "no net impact" scenario occurs:

- Preparation of a comprehensive "Bear Management Plan" (contained herein) to reduce bear-human conflicts within and outside the Jumbo Creek drainage to be approved by the Ministry of Environment, Lands and Parks and implemented by Glacier Resorts Ltd. The management plan will include measures for managing any recreational use outside the Jumbo Creek Valley which originates directly from the resort (i.e. people hiking, biking, riding horses, or driving motorised vehicles from the resort into neighbouring drainages);
- Contribute towards efforts to reduce bear-human conflicts in the surrounding valleys through visitor education and improvements in infrastructure (i.e. provision of bear-proof garbage cans, fencing of the resort area);
- Commit to mitigate the impact of habitat loss and habitat deterioration of habitat effectiveness within the Jumbo Creek drainage through off-site habitat enhancement such as access management;
- Commit to increasing habitat effectiveness outside the Jumbo Creek drainage through measures (i.e. not allowing overnight parking for non-guests; **not operating lifts or building trails for summer sightseeing that would provide access into surrounding valleys**; prohibiting the use of motorised vehicles and restricting helicopter use) to minimise the movement of people from the Jumbo Creek drainage directly into surrounding valleys;
- Commit to reducing habitat fragmentation within the Purcell Mountains by investigating the feasibility and the potential benefit of constructing one or more crossing structures on the road between the project and Panorama Ski Resort when the road is upgraded in Phase 3;
- Apply an adaptive management approach consisting of monitoring as well as feedback mechanisms that will allow the results of the monitoring to influence the implementation of any mitigation measures adopted; and
- Support the government initiatives for controlling access into surrounding valleys through review of applications for commercial recreation tenures and protection of the Glacier Creek drainage.

While the objectives of the *Grizzly Bear Management Plan* are addressed based on the experience and proven techniques developed from other resort and park developments throughout the Pacific Northwest, the ultimate success of the mitigation measures will be achieved through an adaptive management approach by monitoring and effective feedback mechanisms. Undoubtedly, the implementation of the proposed mitigation measures will be adjusted and evolve over time.

Many of the recommendations in the Grizzly Bear Management Plan are also applicable to the management of other wildlife, such as Black Bear, Wolverine, Cougar and other predators.

3.8.4 Historical Bear Management Plans/Programs

Since the early 1960's, comprehensive grizzly bear management plans have been prepared to address grizzly bear-human conflicts in the National Parks throughout the Pacific Northwest.

In 1960, the National Parks Service implemented a bear management program in Yellowstone National Park designed to reduce the number of bear-caused human injuries and property damages occurring within Yellowstone National Park and to re-establish bears in a natural state (Gunther, 1994). During the 1960's, the National Parks of Canada were also developing and implementing bear management programs (Canadian Wildlife Service, 1971). Similar to the US plans, the early National Parks programs were focused on bear-human conflicts and reporting of bear movements.

In 1970, a new more intensive bear management program (Leopold et al., 1969) was initiated in Yellowstone National Park with the objective of restoring the grizzly and black bear populations to subsistence on natural forage and reducing bear-caused injuries to humans (Cole 1976, Meagher and Phillips 1983).

In 1983, the park implemented a modified grizzly bear management program with greater emphasis on habitat protection in backcountry areas. This plan restricted recreational use in areas with seasonal concentrations of grizzly bears.

Since 1983, bear-caused human injuries declined to an average of one per year. During the first years of these programs, most bear-human conflicts involved food-conditioned bears that aggressively sought human foods. In more recent years, management problems have involved habituated (but not food-conditioned) bears seeking natural foods within developed areas along roadsides.

In 1998, a bear-human conflict management plan was prepared by Parks Canada and was a synthesis of five bear management plans including Banff, Jasper, Yoho, Kootenay and Waterton National Parks . The plan concentrated on mitigation measures such as bear monitoring systems, bear-human conflict management, facility management, public information/education and training of park personnel.

In summary, grizzly bear management plans/programs have evolved over the years to reduce the cause of bear-human conflicts through such mitigation measures as backcountry access restrictions, food and garbage management, public information/education, training of park personnel and monitoring systems.

The following proposed "Bear Management Plan" is intended to reduce the potential impacts to grizzly bears from the Jumbo Glacier Resort development. For clarification, it is assumed that the proponent, Glacier Resorts Ltd. is responsible for implementing or funding each proposed mitigation measure unless otherwise noted.

3.8.5 Garbage Management – Background and Problem Description

Schullery (1980) chronicled the history of the grizzly bear/garbage situation in Yellowstone National Park. Both black and grizzly bears were feeding at hotel dumps as early as the 1890's and nuisance bears had emerged by the early 1900's. The number of grizzly bears feeding at dumps rose drastically from 40 bears in 1920 to 260 bears in 1930. Grizzlies were often closely associated with garbage in many preserves, therefore leading to human/bear problems, and as a result "nuisance bears" or habituated bears (GBIT 1987). Craighead

(1980) reported that 56-77% of the total grizzly bear population of Yellowstone Park congregated at the dumps. These nuisance bears become habituated to people and obtain non-natural foods, are “repeat-offenders” in relocation programs and express offensive aggressive behaviour towards humans, becoming a threat to human safety (MELP 1996). In 1932, the Research and Education Branch suggested that dumps were unhealthy for bears and were no longer necessary in Yellowstone National Park. The last of the Yellowstone Park dumps were closed in 1970.

Open-pit garbage dumps and poorly designed incinerators still enabled grizzly bears to obtain garbage in several Canadian National Parks throughout the 1960’s. The landfills in Banff and Jasper National Parks were fenced in 1970 but habitual garbage bears still managed to obtain garbage by digging under, or breaking through the enclosures (Kaye, 1982). The Banff landfill was closed in 1980 and an electric fence was placed around the Jasper landfill in 1981 to discourage bear activity. Kootenay and Yoho National Parks have hauled all refuse to nearby communities since 1973 and 1974, respectively.

Beginning in 1980, all refuse from Denali National Park was hauled to the public landfill at Nenana, Alaska. Singer (1982) felt that closure of the park dump, bear-proofing of most garbage cans and increased visitor awareness were the primary factors in minimising grizzly bear incidents in Denali Park.

Herrero (1970, 1976, 1978, 1982 and 1985) concluded that bears which habitually fed on human food and garbage often lost their natural wariness of people. Such food conditioned bears were more likely to show aggressive tendencies than non-food conditioned bears. Although there is some uncertainty as to the degree of habituation/conditioning related solely to feeding at remote garbage dumps, there is general agreement that acquisition of garbage or other human foods in campgrounds or developed areas can have serious consequences for humans and bears. Within North American National Parks, habituated food-conditioned grizzly bears accounted for approximately 2/3’s of all bear-inflicted human injuries up to 1970. Ninety percent of these injuries occurred in developed campgrounds in Yellowstone National Park where grizzlies had a long history of feeding on human refuse. Since 1970, improperly stored food and garbage was the second most common circumstance following surprise encounters associated with grizzly bear inflicted injuries.

Garbage feeding bears are generally more often predisposed to control actions and resultant re-location or mortality. Every year about 950 black bears and 50 grizzly bears are destroyed in BC to protect the public (MELP 1996, CWS 1971). Between 1986 and 1996, the Conservation Officer Service relocated 107 grizzly bears and 54 black bears and destroyed 15 grizzly bears and 266 black bears within or near the City of Revelstoke (Robinson 1997).

In Yellowstone National Park, the average size of grizzly bear litters before dump closure was 2.1 cubs whereas the average litter size after dump closure was 1.9 cubs. Knight and Eberhardt (1984 and 1985) reported that 70% of the females reproduced at age 5 prior to the dump closure while 60% of the females reproduced at age 6 after dump closure.

Knight et al. (1981) found that three adult males weighed less in 1980 after the Cook City dump closed. The mean weight of male bears five years and older was significantly less after dump closure. Russell et al. (1979) observed that the only grizzly bear in Jasper National Park that used a landfill was exceptionally large for its age. Their observations suggest that grizzly bears that used garbage to supplement their natural diet did attain greater weights than bears that did not supplement their diet with garbage.

3.8.6 Bear Smart Community

The Ministry of Water, Land and Air Protection in partnership with the British Columbia Conservation Foundation and the Union of British Columbia Municipalities has designed the Bear Smart Community program to address the root causes of bear/human conflicts, reduce the risks to human safety and private property, and mimimize the numbers of bears that have to be destroyed each year (WLAP 2001). The program is based on the following criteria, which a community must achieve in order to be recognized as being "Bear Smart”:

- Prepare a bear hazard assessment of the community and surrounding area;
- Prepare a bear/human conflict management plan that is designed to address the bear hazards and land-use conflicts identified in the previous step;
- Revise planning and decision-making documents to be consistent with the bear/human conflict management plan;
- Implement a continuing education program, directed at all sectors of the community;
- Develop and maintain a bear-proof municipal solid waste management system; and
- Implement "Bear Smart" bylaws prohibiting the provision of food to bears as a result of intent, neglect, or irresponsible management of attractants.

Jumbo Glacier Resort commits to achieving and maintaining Bear Smart community status by contributing towards efforts to reduce bear-human conflicts in the surrounding valleys. The resort will achieve this status by implementing its “Bear Aware” program and other components of the Grizzly Bear Management Plan.

3.8.7 Bear Aware Program

The availability of human food and garbage sources to bears is recognised as a major source of people-bear conflicts within Yellowstone National Park (1996) and in BC (MELP 1986). As a result, several communities that historically have extensive problems with human/bear conflicts associated with attraction to non-natural food sources have implemented “Bear Aware Programs” (Robinson 1998). Since 1996, the City of Revelstoke initiated a “Bear Aware Program” to develop long-term strategies to reduce the number of bear/human conflicts and thereby reduce the number of bears having to be destroyed or relocated. While the program is still in its infant stages, the number of bears destroyed or relocated has dropped dramatically in the Revelstoke area.

Therefore, Jumbo Glacier Resort will adopt its own “Bear Aware Program” to reduce bear/human conflicts associated with non-natural food attractants. The program will have the following objectives:

- Reduce or eliminate bear deaths and relocations as a result of their being attracted into built up areas by garbage, fruit, compost, and other human-generated attractants. Ultimately the reduction/elimination of bear deaths would ensure that births exceed deaths;
- Increase the public understanding of the negative implications to bears and humans when bears forage in urban areas; and
- Build public support for the objectives of these programs (Robinson 1998).

This component of the “Bear Aware Program” will implement the following mitigation measures to reduce or eliminate non-natural food attractants to bears within the resort base area, along the access road and along any developed trail systems associated with the resort base area. In addition, the details of the program outlined below should form part of the resort architectural design guidelines and bylaws.

3.8.7.1 Resort Base Area

- All outdoor trashcans and dumpsters will be of a bear resistant design and all trashcans will have plastic removable liners to contain odours as much as possible. Plastic can liners will be changed at every pickup to eliminate any odour. Maintenance personnel will ensure that the bear-proof garbage cans are available where needed;
- Areas of concentrated visitor use will be maintained as litter-free as possible within the limits of available staff and budgets;
- All bear proof containers will be picked up as quickly as possible, on a daily basis, if necessary, to minimise the build up of any odours or spillage;
- When loaded, trash collection vehicles will proceed directly to the appropriate transfer station, and the trash may be stored on the collection vehicle inside a closed utility building or in bins within a secured, enclosed utility building;
- All food wastes, including cooking grease, from resort restaurants will be stored indoors until they can be taken to the waste transfer station by the individual restaurants or by the resort management's collection service;
- Resort residents will be required to take all garbage and recycling to a waste transfer station within the resort. All overnight visitors will be required to keep refuse in enclosed predator-proof areas before dropping it off at the resort transfer station. The resort will not provide curbside collection of garbage or recycling.
- Drive-through inspections for garbage will be performed in the residential areas on a regular basis;
- Mishandling of garbage by resort residents/recreational visitors will be reported to resort officials. Repetition of mishandling garbage or any case of deliberate feeding of bears will result in a citation and may be grounds for loss of in- resort privileges;
- Planting of fruit trees, maintenance of compost piles and other bear attractants will be prohibited;
- A trained bear official employed by the resort will patrol all grounds and roads into and within the site during active hours to assure that food and garbage are stored properly and to talk with visitors about bears in the country;
- Resort management will consider partial funding for a local Conservation Officer;
- Resort staff will be required to complete bear awareness training as a requirement for employment;
- Facility personnel will identify and correct operational and maintenance deficiencies regularly on an on going basis. Inspections will be conducted all year round and comply with regional standards;
- All commercial operators will be given food and garbage management guidelines for the area as part of their business license conditions;
- Garbage transfer or detainment areas will be in enclosed, odourless buildings;
- All enclosures for refuse will be cleaned and disinfected (steam cleaned) both inside and out at least once per year, and
- If garbage is to be burned on-site all combustible garbage will be burned in enclosed incinerators. No garbage is to be buried, including empty cans or other food containers.

3.8.7.2 Roadside Corridors

The availability of human food and garbage sources to bears along roadsides is also recognised as a major potential cause of bear management problems and related public safety hazards. The following mitigation measures will be implemented along the access road corridor to the resort:

- All outdoor trashcans will be of bear-resistant design and equipped with plastic removable liners. Plastic can liners will be changed at every pickup to eliminate any odour, and
- Roadsides and all other areas of concentrated visitor use will be maintained as litter-free as possible;

Management of bears frequenting roadside areas will include:

- Prompt follow-up of bear reports (sightings, incidents, etc.) by resort staff to learn bear behaviour patterns;
- Investigation of any indications or possible evidence of deliberate feeding and initiate appropriate measures to curtail this activity; and
- Double-checking the garbage/food security situation along the roadside corridor.

3.8.7.3 Glacier Dome Trail

The availability of human food and garbage to bears in recreational trails is also considered a major potential cause of bear management problems and related public safety hazards. The following mitigation measures will be implemented along the recreational trails at the resort and the trail to Glacier Dome:

- Resort staff will be responsible for routine monitoring of trail areas and any deficiencies in garbage collection units. These will be brought to the attention of the commercial operators immediately;
- The “Pack in-Pack out” policy will be enforced on recreational trails;
- Overnight camping along the trail will not be allowed; and
- Bear warning signs will be posted at all entry points to trails or trailheads.

3.8.8 Outdoor Recreational Management

3.8.8.1 Background and Problem Description

Many studies have been conducted addressing impacts of recreational activities and related noise on grizzly bears due to urban presence (GBIT 1987, Gibeau 2000, Haroldson and Mattson 1985). Recreational areas are associated with prime grizzly bear habitat due to the human favoured panoramic views. Reactions of grizzly bears to human recreational use have primarily been documented as negative, resulting in bear displacements or human/bear conflicts (Gunther 1990, Schleyer et. al. 1984, Hemmera 1999, GBIT 1987, Herrero 1997). Many of these studies conclude that human recreational use in alpine and sub alpine areas can displace grizzly bears during foraging seasons, but most of these displacements can be avoided with seasonal trail closures (GBIT 1987). At Jumbo Glacier Resort there will be only one trail leading to Glacier Dome, and a seasonal closure will be easier to enforce.

The consequences of superimposing high recreational activity on productive grizzly bear habitat include both direct mortality and reduced habitat effectiveness. There is considerable evidence that grizzly bears avoid human facilities especially when they are occupied and active (Mattson, 1993).

3.8.8.2 Mortality

Mattson et al. (1992) indicated that the mortality risk was nearly five times greater for adult female grizzly bears in the inner zone (0-3 km) adjacent to a development, and only marginally greater for adult male grizzly bears. Conversely, subadults suffered greatest mortality risk in zones furthest from developments. Mattson et al. (1992) suggested that subadults were either displaced by adult bears into the less secure zones adjacent to developments (within 0-3 km) or stood an increased mortality risk by co-occupying the more remote zones (3-9 km) with adult bears. High adult female mortality risk close to developments was believed to be a consequence of habituation to predictable high-density human presence. Subadult and adult grizzly bear males occupying the inner zone (0-3 km) were presumably indifferent to human presence or developments unlike habituated bears. Thus these classes of bears were less predisposed toward conflict situations than were the habituated adult bears.

3.8.8.3 Habitat Displacement and/or Reduced Habitat Effectiveness

Mattson et al. (1992) found that in zones beyond the conceivable influence of human development, grizzly bears occupied habitat that was more productive than the average for that zone. However, in zones proximal to roads and developments, grizzly bears occupied habitat that was close to, or below the average for that zone. Thus, it appeared that grizzly bear foraging strategies directed towards habitat optimisation were disrupted by human developments. This reduction in habitat effectiveness was evident out to 3.5 km in spring and summer but less in the fall (Mattson et al., 1992).

Mattson also evaluated the displacement effects of human developments. They found that adult bears showed a bimodal distribution with neutral/habituated grizzly bears occupying the 0-3 km zone around developments and a group of more wary adult grizzly bears occupying the 9-15 km zone. All of the young adults occupied the 9-15 km zone, while subadults were more often occupants of the 0-3 km and 3-9 km zones.

3.8.8.4 Impacts on Grizzly Bear Habituation

Indications of grizzly bear habituation defined as a long-term decrease in the frequency or magnitude of a response as a result of repeated stimuli, have been noted for a number of areas.

Factors which contributed to bear habituation were consistent context for encounters (i.e. trails), frequent irregularly spaced encounters, easily recognised stimuli (hikers with bear bells), and innocuous habituation of grizzly bears’ fear surprise encounters with adult and subadult grizzly bears. Jope (1985) theorised that by reducing the occurrence of full charges, habituation of grizzly bears’ fear response actually reduced the rate of injury to hikers from surprise encounters with adult and subadult grizzly bears. Jope (1985) noted that no recorded hiker injuries had involved a grizzly bear that appeared to be habituated. Hornocker (1962) and Egbert and Stokes (1976) observed habituation by subadults and lone adults, but female grizzly bears with young remained intolerant of other bears.

The EKLUP (1994) state that many residents of Invermere use the Jumbo Creek area to hike up the Glacier Creek Drainage to a cabin in Jumbo Pass and hike and ski in the area. Some concerns have been raised in the past that these recreational activities may increase after development of the resort causing a potential increase in the frequency of human bear interactions. The potential for increased backcountry activity will be minimized because the resort design includes only one trail leading from the resort base to the base of Glacier Dome and from there to the Teahouse on top of the mountain (which will also be accessed via gondola). The Jumbo Creek drainage currently does not have any trail access to the mountains except for Jumbo Pass, and the geography of the upper Jumbo Creek valley as well as the resort design are not conducive to hiking. In addition, the trail will be managed to avoid off-trail activities

The following mitigation measures are intended to reduce/eliminate bear/human conflicts and associated bear mortality from recreational trail hiking:

- Prior to construction of the recreational trail, a bear hazard assessment will be completed to select a route that will minimize the potential for bear interactions;
- Trail development will avoid moderate-high value feeding and security habitat. These habitats are generally associated with the lower elevations adjacent to Jumbo Creek and a number of south and north-facing avalanche tracks within the lower portion of the valley;
- Trail development will be restricted in the upper alpine areas and located in areas with natural barriers (rock outcroppings, vertical slopes, etc.) to nearby drainages. Many studies conclude that human recreational use in alpine and sub alpine areas can displace grizzly bears during foraging seasons, but most of these displacements can be avoided with seasonal trail closures (GBIT 1987);
- The trail will be clearly marked/fenced to avoid off-trail use by hikers. Signs will be posted to warn hikers of the potential danger of grizzly bear encounters off-trail. Off-trail use by hikers will be discouraged;
- “Bear Warning” signs will be provided at the entrance to trails and at trailheads identifying grizzly bear habitat and recommending appropriate human conduct (creation of noise, staying on trails, proper food and garbage handling, etc.);
- “Hikers with Packs” will be prevented from using the lifts/gondolas to prevent hikers from gaining access into nearby drainages;
- Recreational hikers will be encouraged to travel in groups of four or more as most grizzly bears avoid large and noisier groups (USFS, 1985);
- Trail sections with a documented increase in grizzly bear use (i.e. spring or fall feeding periods) will be temporarily closed. Resort staff will regularly patrol the trail during visitor use to identify problem areas;
- Pets and other domestic animals, such as horses, will not be allowed on the trail;
- Hikers will not be allowed on the trail between one hour before sunset and one hour after sunrise;
- Motorised vehicles (all terrain vehicles) will not be allowed on the trail; and

- If grizzly bear tolerance levels have been exceeded, the backcountry areas will be restricted through the use of permit systems or the re-evaluation of commercial uses (subject to WLAP).

3.8.9 Access Road Management

3.8.9.1 Background and Problem Description

The most direct form of road-related mortality involve bears killed by vehicles (Knight et al., 1981, 1988; Greer 1985; Palmiscano 1986; Burns 1986). However, most researchers have concluded that the effects of increased human access into bear habitat, particularly increased vulnerability to legal and illegal harvest, constitute the most critical impacts of road activity on grizzly bears (Nagy and Russell 1978; Ruediger and Mealy 1978; Smith 1978; Schallenberger 1980; Zager 1980; McLellan and Mace 1985). In Banff National Park, between 1971 and 1995 of the 118 grizzly bear mortalities, only 11 were not man-caused. Over 80% of the man-caused mortalities occurred within 500 m of a road while only 14% of these mortalities were due to highway or railway collisions. Most were management actions toward problem grizzly bears.

Mattson (1987) suggested that adult female grizzly bears use roadside habitat in order to avoid close contact with adult male grizzly bears that pose a mortality risk, especially to cubs. Conversely, Gibeau (2000) found that female grizzly bears avoided the Trans Canada Highway regardless of habitat quality or time of day, while males and especially subadult males were found closer to the Trans Canada Highway when within or adjacent to high quality habitat and during the human inactive period. However, regardless of the sex of grizzly bear using roadside habitats, between 1975-1990 habituated bears were killed 3.1 times more often than wary bears in the Greater Yellowstone Ecosystem (Mattson et al., 1992). The authors concluded that road environments cause grizzly bears to make difficult choices with little opportunity to learn successful behaviours if they die in the process. Mattson et al. (1992) suggested that adult female grizzly bears that are thought to operate under considerable energetic duress in the Yellowstone area, might have higher mortality and lower productivity rates from avoidance of developments and roads.

While a number of different management strategies have been attempted to reduce mortality and impacts from road development, some mitigation measure may be detrimental to grizzly bear populations. For example, between 1983-1987 a 27-km section of the Trans Canada Highway in Banff National Park was upgraded from a 2-lane highway to a 4-lane divided highway. At the same time a 2.4 metre high woven-wire fence was installed on both sides of the highway to prevent vehicle-wildlife collisions (Gibeau and Heuer, 1996). Although highway overpasses/underpasses were constructed to allow wildlife movement across the highway, for the first 5-10 years since the installation of the highway fences in 1987, only two unconfirmed and one confirmed use of the wildlife underpasses by grizzly bears has been recorded (Gibeau and Heuer, 1996). The implications of fencing and associated mitigation could have profound effects on grizzly bear passage across the Bow River Valley and ultimately movement throughout the Central Canadian Rocky Mountains (Gibeau and Heuer, 1996).

3.8.9.2 Avoidance/Displacement

Much of the literature on road impacts concerns avoidance/displacement of grizzly bears from roads. Lloyd and Flect (1977) found that in south-eastern BC grizzly bears avoided areas within 0.5 miles from roads. Zager (1980 and 1983) concluded that in north-eastern Montana there was no overall avoidance of roads by grizzly bears. However, females and females with cubs avoided habitat within 200 m of roads whereas male grizzly bears appeared to prefer habitat adjacent to roads.

McLellan and Mace (1985) found that grizzly bears used the area within 100 m of a road an average of 40% of the expected value in spring and 50% of the expected value in summer/fall. Beyond 100 m the displacement effect was minimal and there was no difference between the effects of primary, secondary and tertiary roads. McLellan and Mace (1985) calculated that 8.5% of the area within 100 m of a road was lost to bears as a consequence of road avoidance. McLellan and Mace (1985) also concluded that bears were found directly on roads more frequently at night than during the day.

Brannon (1984) found that in Yellowstone National Park grizzly bears avoided areas within 50 m of a road and used the area between 3 and 4.5 km from a road more than expected. Mattson et al. (1992) found that primary roads and developments were within the most productive grizzly bear habitat in Yellowstone Park.

Puchlerz and Servheen (1994) summarised studies regarding the influence of roads on grizzly bear habitat use, documenting a range of distances between 100-914 m wherein bears appear to show avoidance. Given this range in the zones of less than expected use Purchlerz and Servheen (1994) recommended 500 m as a standard buffer for grizzly bear/motorised access management.

In the Bow River Valley, high road densities contribute significantly toward habitat alienation for grizzly bears along the valley bottom habitats. This avoidance behaviour is strongest in the adult segment of the population where male grizzly bears select high quality habitats and an absence of humans. Adult female grizzly bears select areas with a high degree of security habitat for raising cubs, which in some cases means avoiding adult male grizzly bears. With the safest and most habitats taken up by adult males and resident females, subordinate bears and other adult female grizzly bears are forced to utilise sub-optimal habitats including those with high human density. In this way roadside vegetation and other anthropogenic foods become important resources in sub-optimal habitats. Unable to successfully compete elsewhere, some bears are relegated to utilising habitats close to people and communities. While in proximity of humans a bear may become habituated to people, and although the bears have successfully adapted to use habitats near busy transportation corridors, they are also most likely to die at the hands of humans (Mattson et al., 1992).

3.8.9.3 Factors Affecting Grizzly Bear Responses to Roads

A number of factors affect grizzly bear response to roads including age, sex, type of area, individual habituation to road related stimuli, nature of the stimuli and character of the habitat adjacent to the road (Grizzly Bear Compendium (National Wildlife Federation, 1987).

Zager (1980), Miller and Ballard (1982) found that females with cubs avoided roads and roads interfered with movement. In Denali National Park, some family groups appeared to be thoroughly habituated to tour bus travel along the major park roads while single bears seemed to be under-represented in areas adjacent to roads (Tracy, 1977).

Bear populations in different areas show pronounced differences in their reactions and degree of habituation to road stimuli. Smith (1978) found that all grizzly bears displayed a strong escape reaction. McLellan and Mace (1985) noted that local bears reacted less strongly to road activity than remote bears. McLellan and Mace (1985) also found that bears in direct view of vehicles generally fled but bears close to roads in some protective cover were not affected. Loud noises were found to increase the degree of flight response (Tracy, 1977; Stemlock 1981).

In Denali National Park, snow removal, road dust and modified drainage patterns along roads caused roadside vegetation to green-up before other areas. Hastened green-up of some roadside forage species attracted grizzly bears to roads in late spring (Tracy, 1977).

3.8.9.4 New Roads or Upgrading of the Existing Access Road

Jonkel (1982) suggest that new roads have the greatest impact on grizzly bears because bears eventually avoid the surrounding area and a block of habitat is lost. The following mitigation measures should be considered during the upgrading and/or re-aligning of the access road into the proposed resort development:

1) Maximise the use of the existing Forest Service Road alignments and minimise the construction of new roads to avoid impacting undisturbed grizzly bear habitat. Minimise the width of road clearing for upgrades during later phases of development and avoid impacting moderate-high value feeding/security habitat;

2) Road densities that are a broad index of the ecological effects of roads in a landscape should be limited to a threshold density of <0.6 km per km^2. Presently, road densities within the Jumbo Creek Valley are an average 1.2 km per km^2 (Horejsi, 2000) with 35% of the area >0.62 km per km^2. Therefore, in order to reduce the density of roads within the Jumbo Creek valley, logging roads previously used for accessing timber supplies and landing areas should be de-activated and re-vegetated. Unused sections of the existing access road that have been re-aligned across Jumbo Creek are prime candidates for closure and restoration. Techniques for closure/de-activation should include placement of physical barriers (i.e. rocks, wood debris, downfall, etc.) gates, signage, scarification, water barring, re-vegetation of exposed soils, removal of culverts, etc.;

3) Maintain and/or restore high quality security habitat adjacent to roads especially if associated with forage/feeding areas. Maintenance/restoration of these areas is important for adult female and sub-adult grizzly bears because these bears are more likely to interact with humans resulting in greater chances of mortality;

4) Any new, temporary roads to be constructed to access ski runs for clearing and lift placement should be done so as to facilitate their eventual closure/obliteration and actively re-vegetated with indigenous vegetation or left for natural conifer regeneration. Closure and re-vegetation should occur within one season after use;

5) Minimise clearing widths, low cuts and fills of new roads and maximise diversity in a horizontal and vertical alignment through indigenous re-vegetation;

6) Maintain existing drainage patterns along roads and prevent the introduction of drainage that promotes roadside vegetative growth. As mentioned earlier, snow removal, road dust and modified drainage patterns along roads in Denali National Park caused roadside vegetation to green-up before other areas. Hastened green-up of some roadside forage species attracted grizzly bears to roads in late spring (Tracy, 1977).

7) Refrain from the creation of >0.6 m paved road shoulders;

8) Store any top soil removed from road construction and re-use the topsoil to re-vegetate areas along roadsides. Re-vegetation of roadside areas should discourage the use of plants that will attract grizzly bears;

9) Where possible, allow >100 m between important grizzly bear feeding/security habitat and any new roads in order to provide cover. Create/leave buffer strips especially in areas with steep slopes, rugged terrain and/or open habitats;

10) Do not create new roads or re-vegetate existing roads so that blind corners and surprise encounters would occur between motorists and bears;

11) Avoid road construction/maintenance (where possible) during key grizzly bear periods (spring-early summer and late fall);

12) Austin (2000) recommended that the access road be fenced to reduce the potential for grizzly bears to be struck and killed by vehicles. Gibeau and Heuer (1996) stated that from 1985 to 1995 only one grizzly bear was killed on the Trans Canada Highway.

While we recognise the increased risk of bear mortality associated with vehicle/bear collisions, habitat fragmentation within the Purcell Mountains was also identified as a potential impact from the resort development by Austin (2000). Austin (2000) concluded that human development and activity associated with the proposed resort development would extend approximately two-thirds of the distance between the Rocky Mountain Trench and Kootenay Lake. Therefore, fencing carries an inherent trade-off between reducing the risk of bear mortality from vehicle collisions and restricting bear movements through the Central Purcell Mountains.

Based on review of the research literature, high volumes of traffic combined with fences can severely disrupt movements by adult female grizzly bears and to a lesser extent male grizzly bear movements. Gibeau (2000) concluded that the Trans Canada Highway (TCH) through the Bow Valley with summer traffic volumes of 21,000 vehicles per day formed a home range boundary for six female grizzly bears. Highway 93, with summer traffic volumes of 3,530 vehicles per day bordered the home range of one adult female grizzly bear. Both the Bow Valley Parkway and Highway 40 with summer traffic volumes of 2,230 and 3,075 vehicles per day, respectively, did not appear to restrict the home ranges of female grizzly bears. All four highways had observed traffic speeds ranging from 80 to 115 km per hour.

In comparison to Gibeau's results, and based on the projected Phase 3 average annual daily traffic (AADT) volumes of about 943 vehicles (423 vehicles per day during summer) along the access road, it does not appear that traffic volumes should significantly disrupt grizzly bear movements, particularly since the speed limit along the road to Jumbo Glacier Resort will be substantially less (50 km per hour) than the four highways assessed by Gibeau.

Therefore, since high traffic volumes combined with fencing has been documented to disrupt grizzly bear movements (Gibeau 2000), and traffic volumes projected for the resort access road are relatively low, ENKON recommends that fencing should not be constructed for Phase 1 or Phase 2. Upon the initiation of Phase 3, the need for fencing should be re-evaluated to ensure that the trade off between grizzly bear movements and vehicle caused mortality is balanced.

In order to reduce the risk of vehicle/bear collisions during Phase 1 and 2, ENKON recommends the following:

- A “Bear Aware Information Booth” should be established at the entrance to the resort access road at the confluence of Toby and Jumbo Creeks to inform resort visitors of the dangers of bears and the potential for vehicle/bear collisions. The booth could operate in a similar way as the National Park entrance booths. Each visitor would be required to stop at the entrance to the resort access road (i.e. Mineral King Mine) to receive an information pamphlet on grizzly bears (i.e. “Bear/Vehicle Collisions”, “Bears are Dangerous” and “Hiking and Camping in Bear Country”). In addition, each visitor will receive a “Be Bear Aware” sticker indicating that the visitor has received the information regarding the danger of bears and as a reminder when using the recreational facilities. The cost of running the program could be included in the lift ticket price, much like Mount Washington Ski Resort recovers a fee from the lift ticket price for repayment of the loan from the BCTFA to construct their access road. The Information Booth would only need to operate during the active bear season from April-November.
- A “Bear Information Centre” should also be established within the resort base area to inform and remind visitors of the potential dangers of bears and the potential for bear encounters while at the resort. The “Centre” would only need to operate through the active bear season from April-November.
- As a component of the grizzly bear monitoring program, grizzly bear/human conflict areas along the resort access road should be patrolled/monitored to identify high risk areas which would then be incorporated into the information pamphlet hand-outs;
- Wildlife Warning Signs should be placed at the entrance to the access road, at strategic locations along the access road (i.e. high-risk areas for bear crossings), and within the resort base area. Wildlife “Warning Signs” will be posted and display the following warning “Resort Regulations Prohibit the Feeding of Bears – Warning, Bears are Dangerous – For Your Safety Do Not Feed Bears – View from a Safe Distance. “No Stopping” signs will be displayed in areas of expected high use by grizzly bears to prevent bear-jams (public stopping and watching grizzly bears along roadsides).
- Road side reflectors should be erected that reflect light and create a barrier image such as the “Streiter-Lite Wildlife Warning Reflector”. Headlights from passing vehicles strike rows of staggered reflectors, which are mounted on posts at headlight height along each side of the highway, with each reflector in turn directing flashes of low intensity reflected light across the road. Entering light from vehicle headlights is reflected at approximately 90 degrees. Drivers do not see and are not bothered by the light (http://www.strieter-lite.com/).

- The access road should be designed for low speed limits (50-60 km/hr.) and the speed limits should be enforced by resort staff in combination with the RCMP.

13) If fencing is required during Phase 3 of the resort development, overpass/ underpasses should be constructed to promote grizzly bear movements across roads. The crossing structures should be placed at strategic locations with the following characteristics:

- a) Low road densities;
- b) Low human population;
- c) Rugged terrain;
- d) An association with a major drainage; and
- e) Proximity to high quality food and shelter habitat.

Wildlife fencing may be required to guide animals towards wildlife crossings. The exact design and location of the fencing would be determined after the location of any potential wildlife crossings have been determined. However, Banff National Park has used fencing situated in a "V" formation to guide animals towards the crossing structures. Fences should also be located a significant distance from the highway set-back.

In Banff National Park, such fencing occasionally has inadvertently trapped some prey species, which can lead to increased predation along the fencing. However, because the Jumbo Valley is not frequently used by carnivores the effect on predator-prey dynamics is not expected to be significant.

Gibeau and Herrero (1998), working in the Bow River Valley, concluded that adult female grizzly bears select areas with a high degree of security for crossing and foraging as well as for raising cubs, which in some cases means avoiding adult males. In this way roadside vegetation and other anthropogenic foods become important resources in road "sub-optimal female areas". Studies by Gibeau in the Eastern Slopes Grizzly Bear project identified that the grizzly bear population in the Bow Valley watershed was accepting to roads and crossings where traffic volumes were low, but they were concentrated in specific locations occurring both during the night as well as day. The important factor of grizzly bear highway crossings varied in relation to traffic volume and intensity of highway use, and these crossings were primarily associated with areas of high quality habitat, with major cross drainage's of the watershed, and were primarily associated with terrain ruggedness.

Based on the existing grizzly bear habitat mapping conducted to date and the requirements of Gibeau (2000), ENKON has identified four potential crossing locations along the access road. All of the crossings are located in the lower half of the valley to avoid areas of high human concentrations. During the initiation of the Phase 3 construction, the crossing locations should be re-assessed by the "Grizzly Bear Management Committee" and MWLAP.

14) As part of a recommended education program for visitors and resort personnel a committee or persons (as part of interpretative and regulating staff) should be allocated to monitor access road traffic and regulate any interactions of tourists/visitors with grizzly bears. The following are mitigation plans to help reduce bear mortality as a result of human/bear interactions, and "bear-jams" resulting from

visitors stopping to view and interact with bears along roadsides and trails[3]:

- In the unlikely event that bear jams occur, a “bear-sitting program” will be implemented at bear jams when there are safety concerns or significant traffic congestion. Resource, interpretative and bear management staff will be dispatched to the bear jam for managing visitors and traffic. Bear-sitting will involve a combination of traffic control, answering visitor questions and ensuring that the public does not approach, feed or behave inappropriately around bears;
- Erect signs in and out of the watershed along the road to identify “no-stopping zones”. This method is intended to keep traffic moving and prevent people from stopping and interacting with the observed bears:
- Erect temporary closures (regular/seasonal) in zones of potential, historical and identified bear crossing areas. These temporary area closures would allow people to stop to view bears from the roadside, but keep people from leaving the safety of the roadside and approaching the bears too closely;
- Along areas of high frequency defined or potential bear crossings or constructed crossings for bears, provide vegetation screening to reduce the chance of poaching and hunting. Vegetation screening involves the planting of indigenous vegetation screens in order to screen high quality habitat from the road corridor, primarily to reduce any bear-jams and roadside stopping;
- To reduce the possibility of illegal hunting, poaching and the potential for people to wander into bear habitat from the resort base or road areas, it is recommended that fences be erected to create a physical barrier discouraging people from accessing bear habitat;
- Wildlife carcasses within 100 m of the access road which could pose a hazard to bears from vehicle collisions will be removed to areas away from visitor activity; and
- If interpretative and/or regulatory staff for the development is not available to control problems with visitors and bears, it may be necessary to bait bears out of identified human/bear confrontational areas. If the potential for interaction between bears and humans has escalated beyond controllable limits, bait such as ungulate carcasses may be placed in areas where it will lure the unwanted bears and reduce the need for bear mortality. This methodology, if implemented, would have to be approved and performed by WLAP.

In addition to the aforementioned mitigation measures it was suggested by MWLAP that a workshop with Ministry wildlife experts, the proponent and the proponent’s consultants be organised to explore measures that may be applied to mitigate impacts. Such a workshop would incorporate the most recent experiences with access mitigation and provide a forum for exchange on the issue. The proponent is prepared to participate in such a workshop during detailed project design.

The proponent has prepared for such a workshop by providing a comprehensive literature review and summary of experience elsewhere. This literature review and summary has been provided in Appendix 3-B Wildlife Resources and Appendix 3-C Grizzly Bear Management Plan.

[3] However, it should be noted that the potential for bear jams is extremely low to non-existent based on the relatively small number of grizzly bears observed within Jumbo Valley by the proponent, their consultants and Strom et al (1999) over the past ten years.

3.8.10 Aircraft Access Management

Aircraft such as helicopters and small planes have not been documented very intensely (GBIT 1987). Grizzly bears are very affected by aircraft but have been known to habituate to their presence (Harding and Nagy 1980).

3.8.10.1 Background and Problem Description

In Yellowstone National Park, Graham (1978) and Peacock (1978) observed grizzly bears which fled into timber as research tracking planes approached. Conversely, Schleyer (1980) found that research planes did not disturb grizzly bears. Campbell (1985) observed that 54.5% of the grizzly bears seen from small planes showed no response while only 29% showed a severe response. McLellan and Mace (1985) found that 15-20 grizzly bears observed from the air showed no reaction to the aircraft, while the remaining five bears ran to cover.

Grizzly bears may be more sensitive to helicopters than to fixed-wing aircraft. Quimby (1974) found that 90% of the grizzly bears in the Caning River study reacted moderately or strongly to helicopters while only 21% reacted strongly to fixed-wing aircraft. Harding and Nagy (1980), Eebhart (1983) and Spreadbury (1984) found that grizzly bears that had previously been captured or re-located using helicopters were particularly sensitive to helicopter disturbance. McLellan and Mace (1984) found that individual bears in several areas demonstrated significantly different tolerances to helicopter disturbance.

3.8.10.2 Factors Influencing Grizzly Bear Reactions to Aircraft

Factors such as degree of habituation to aircraft, availability of cover, altitude, noise level and behaviour of the aircraft may influence grizzly bear reactions to aircraft. McCourt (1974) found that there was no consistent trend in grizzly bear reaction to fixed-wing aircraft at different altitudes. Campbell (1985) indicated a relationship between age/sex class of grizzly bears and reactions to aircraft. Lone or paired adults seldom reacted severely while females with cubs were more susceptible to disturbance. Quimby (1974) and Rutton (1974) found that grizzly bears may be more reluctant to flee form aircraft when feeding on carcasses or while at feeding sites (McLellan and Mace 1985).

Reynolds et al. (1984) found that mid-winter flights caused no significant increase in the heart rates of grizzly bears, however, during the period just after emergence the heart rates of two different females increased by up to 10% or became erratic when planes flew overhead. Although no bears abandoned dens from aircraft disturbance, Quimby (1974) reported that five bears abandoned den construction due to helicopter disturbance.

3.8.10.3 Helicopter Access Management

The proposed development is anticipated to create noise and problems with aircraft use, primarily during the construction phases of the development in the summer, causing bear displacement problems, and in winter for helicopter skiing. The following plans may be used to mitigate impact of aircraft noise and its presence in the valley:

- Restrict helicopter activity during construction to a minimum, and particularly beyond the bounds of the Jumbo Creek watershed;
- If possible, prohibit helicopter access for the sole purpose of transporting guests to/from the resort once construction is completed (except for emergencies and any necessary maintenance);
- Minimise air traffic during the denning period, particularly during the den entry period (October-mid-November) and emergence (April-May);
- Schedule helicopter flights between one hour after sunrise and one hour before sunset from mid April to mid October;
- Maintain minimum helicopter altitudes of 300 m;
- Establish flight patterns of less than half a mile wide along travel routes and landing zones, except where flight safety precludes this;
- Designate landing zones with adequate visual of topographic barriers; and
- If possible, allow only one access to the developed area; by use of the primary road and restrict flight access into areas elsewhere within the Jumbo Creek Valley except for emergencies.

3.8.11 Education Program

In order for the recommendations of the “Bear Management Plan” to be successful, the public and resort staff within and surrounding Jumbo Glacier Resort must be committed to making it work. Education, awareness and involvement of the general public and staff of the resort are critical to the future success of the program.

Members of the public must learn how to avoid creating situations where bears can gain access to non-natural foods and appreciate the consequences of habituating or conditioning bears. The public must also recognise that responsible handling and storage of garbage can reduce the potential for bear-human conflicts.

Educational communication tools such as newsletters, posters, signs, mailouts, pamphlets, videos, and public presentations/training seminars in combination with involvement of community groups/organisations and co-operation with stakeholder groups (i.e. hunters, backcountry hikers) may provide the winning formula. However, there is also a need for continued research, new resort/regional district bylaws and provincial regulations/legislation.

The Grizzly Bear Management Committee will review and approve all educational communication tools prior to distribution.

3.8.11.1 Goals

The goals of the education program include:

- Reduce or eliminate bear-human conflicts through understanding of bear ecology, becoming bear aware (safety) and reducing the potential for bear–human interaction, and responsible disposal, transfer and storage of human-generated waste;
- Increase public understanding of the negative implications to bears and humans when bears forage in areas of urban centres; and
- Build public and visitor support for the program.

3.8.11.2 Communication Tools and Dissemination of Bear Safety Information

The following communication tools will be used to disseminate the educational information and warning literature to the public and resort staff:

- Visitors checking into resort hotels will receive a brochure that contains bear safety-warning articles such as “Bears are Dangerous” and “Hiking and Camping in Bear Country”. Resort hotels will also be asked to provide this brochure as part of any information packages sent by mail or through the internet to potential visitors;
- Residents working or vacationing at the resort will be provided bear safety information (i.e. “Living in Bear Country”) through door-to-door delivery services;
- Wildlife warning signs depicting “Regulations Prohibiting Feeding or Molesting of Animals - Warning Bears and Other Large Animals are Dangerous - For Your Safety Do Not Feed Wildlife - View from a Safe Distance” will be displayed at strategic locations to the entrance of the resort and along the access road pullouts (if any);
- The local “Resort” and “Invermere” newspapers/newsletters will be given quarterly (or as required) articles to publish regarding bear safety and warnings;
- The local Invermere radio station will also be given quarterly (or as required) articles to publish regarding bear safety and warnings;
- Trailhead information boards will be displayed at any trailhead accessed from the resort and/or lifts. Signs will state “Danger Entering Bear Country – a Risk” and “No Overnight Camping” with supporting information bulletins containing information about avoiding bear/human encounters, reacting to a bear if encountered and proper food storage and removal;
- All interpretative staff guiding visitors on trails will be trained and knowledgeable of and able to answer questions concerning bear safety recommendations for hiking in bear country;
- The visitor information centre in the base area will be staffed with trained and knowledgeable staff on bear safety. These staff members will handout information on bear safety and be available to answer visitor questions;
- The resort will sponsor monthly seminars that invite guest speakers to discuss bear safety issues;
- The resort will also sponsor workshops (Clarkson, 1986) in order to train people with a variety of backgrounds and experience in the art and science of coping with potential bear-people conflicts. Three types of workshops will be considered:
    - One day workshop for staff/volunteers who perform duties relating to distribution of information about bear-people conflicts;
    - Two-day workshop for staff responsible for dealing with bear-human conflicts;
    - Four day workshop to train “Safety in Bear Country” Instructors
- Resort book stores will be encouraged to stock bear safety books/pamphlets Stores would likely stock products such as the following due to customer demand:
    - Bear Attacks-Their Causes and Avoidance (Herrero, 1985)
    - Safety in Bear Country: a Reference Manual (Bromley, 1985)
    - Bears and Menstruating Women

  - Bear-Inflicted Human Injuries in Yellowstone, 1970-1994
  - Beyond Road's End
  - Bear Us in Mind, Grizzly Country
- Develop activities and contests for local residents and visitors to the watershed that reinforce bear-proofing messages.

3.8.12 Problem Bear Management: Action Plan

All bear management actions including aversive conditioning, trapping, immobilisation, relocation or destruction of bears will not be implemented without the knowledge and approval of the Ministry of Water, Land and Air Protection and the Bear Management Committee.

The Ministry of Water, Land and Air Protection will retain sole decision-making authority over all direct actions such as aversive conditioning, trapping, relocation/translocation and destruction unless there is immediate threat to life or property. In these exceptional cases, properly trained resort employees through agreement with WLAP may carry out these emergency actions.

Any extraordinary costs associated with responding to bear/human conflicts (i.e. use of helicopters for translocation of bears) will be the responsibility of the proponent.

3.8.12.1 Habituated Bear Management Techniques

Over the years numerous methods and techniques have been experimented with, with varying degrees of success. On the results of a workshop held in the spring of 1997 leading experts in the field of bear-human conflict developed a matrix of current bear management techniques (Parks Canada, 1998). This matrix will be used throughout the Jumbo Creek Drainage as a template for decision making when managing habituated bears. Preventative actions will continue to be the primary management strategy for bears in Jumbo Creek drainage.

Aversive Conditioning

The process of aversive conditioning makes use of an animal's ability to negatively associate events and is a specialised form of learning imposed on an animal by punishing it for behaviour that is deemed undesirable with a painful experience.

When managing the symptoms of bear-human conflict are of concern, aversive conditioning offers an advantage over more traditional methods of bear relocation and destruction. The technique avoids the removal of breeding animals limits individual bear displacement and offers the potential to have avoidance, rather than nuisance behaviour passed from generation to generation. However, the technique fails to address the source of human-bear conflicts such as human use in good bear habitat and poor storage of human food and garbage.

The goals for using aversive conditioning techniques within the Jumbo Creek Drainage are:

- Reduce the number of bears that must be removed from the ecosystem;
- Reduce the number of nuisance bears that must be trapped and relocated to backcountry areas. Relocation of a bear from a conflict area does not prevent the problem from recurring by the same bear in a new location or by

the bear returning and causing the same problem in the same location. Most bears have an innate ability to return to their original home range and become repeat offenders at the same or different site that requires removal or destruction. Aversive conditioning offers the potential to modify nuisance behaviour whereas relocation is often a temporary solution or moves the problem to a new area;

- Reduce the rate of bear-caused human injuries and property damages occurring within the Jumbo Creek drainage by discouraging bears from frequenting developed areas, campgrounds and backcountry campsites;
- Establish a fear of humans that might otherwise become dangerous due to their habituation to humans; and
- Evaluate the effectiveness of various aversive conditioning agents in keeping bears away from sites of human activity and/or food sources.

Guidelines for determining when to use aversive conditioning will be as follows:

- As an additional management technique to prevent removal of some bears from the ecosystem. Under some conditions free-ranging bears may be conditioned to avoid people and specific sites within their home ranges;
- Most effective if it is used on bears when they first encounter humans or situations offering a potential food reward;
- The highest priority candidate bears for aversive conditioning are:
    - Grizzly bears as compared to black bears;
    - Degree of aggression or threat the bear poses to public safety;
    - Yearling through subadult bears for their initial exposure to humans or human foods;
    - Both problem bears and bears that endanger their own lives along roadsides;
    - Female bears as compared to male bears;
    - Bears already subjected to aversive conditioning as compared to new candidates;
    - For new candidates, those bears with no history of food reward and little tolerance of human presence as compared to those bears that exhibit food conditioning or habituation towards humans and high human use; and
    - Bears frequenting areas where attractants have been properly stored and/or removed as compared to bears frequenting areas where food reward remains likely.
- Adult bears that have been repeatedly food rewarded and have lost their fear of humans are not good candidates for aversive conditioning;
- Not to be used when food attractants cannot be removed. Aversive conditioning has proven ineffective at open sewage lagoons and trout spawning streams;
- Not be attempted on sick or injured bears;
- Not be used on aggressive bears;
- Focus on roadside bears (i.e. to avoid cars on the access road) and resort bears (i.e. to render human developments less attractive to bears that have learned to associate them with food rewards);
- Only equipment approved by the Bear Management Committee for hazing/use of deterrents should be used, for example:

- Cracker shells and sling shots to be used to move bears away from roadsides, developed areas, backcountry campsites or in other situations when there is a bear-related human safety or crowd control problem;
- Bear deterrent rounds (i.e. rubber slugs) should only be used by trained personnel from a minimum distance of 40 metres for rump shots only;
- Screamers, bangers and sirens should be used simultaneously when a clear line of fire and a safe backstop exist. Screamers and bangers not to be used during periods of extreme fire hazard rating; and
- Photography and video taping of bear management operations should only be conducted for training purposes by trained personnel.

Hazing/use of deterrents will only be used when the situation demands immediate attention due to an immediate threat to bear(s) or people (i.e. roadside bear causing a traffic jam with potential for a traffic accident or bear/vehicle collision).

- Shot placement (i.e. rump) is critical to insure the target animal is not severely injured; and
- Consistent and thorough documentation is necessary to assess the long term effectiveness, impacts and financial cost of aversive conditioning. Location, behavioural data and bears that have been fired at should be recorded. A database should be developed for all bears that have been aversive conditioned.

Capture and Relocation

The decision to capture and relocate a bear will be made by the Ministry of Water, Land and Air Protection. In general, relocation refers to moving a bear within its estimated home range where as translocation means moving a bear out of its home range. Recent research In the Rocky Mountains indicates that 300 km2 for a female grizzly and 1500 km2 for a male grizzly bear could be used as a guideline (Strom et al. 1999, Parks Canada, 1998).

Decision Criteria

The decision to relocate a bear will be based on the following criteria:

- Degree of aggression displayed by the bear;
- Degree of habituation to humans and conditioning to human foods;
- Bears past history and disposition;
- Age, sex, and physical condition of the bear;
- Effectiveness of previous relocation if applicable;
- Alternate visitor management actions;
- Area of the Jumbo Creek drainage (i.e. backcountry, roadside, developed areas) the bear is considered a problem in; and
- Human safety considerations.

Non-problem bears captured unintentionally will not be marked and generally not be relocated.

Training

Thorough training in capture/trapping techniques, immobilisation agents, use of firearms and handling wildlife will be mandatory before resort employees are allowed to handle bears or other wildlife. Use of immobilising drugs will be restricted to those qualified through additional training and only under supervision of WLAP's instructors. The Grizzly Bear Management Committee will maintain a list of qualified persons.

The following minimum qualifications are required for resort employees handling or immobilising bears within the Jumbo Creek Drainage:

- Successful completion of an immobilisation and handling class covering the following topics:
  1. Bear monitoring systems
  2. Traps
  3. Drug pharmacology
  4. Wildlife reactions to drugs
  5. Human and wildlife safety
  6. Wildlife handling ethics
  7. Handling and Monitoring immobilised wildlife
  8. Relocation and translocation
  9. Destruction
  10. Necropsy
  11. Bear/human emergency plan
- Current Cardio-Pulmonary Resuscitation (CPR) qualification;
- Successful completion of a refresher training course every year; and
- Successful qualification semi-annually with immobilisation rifles, pistols and blow guns. A minimum of 80% proficiency is required on a course specifically designed for capture weapons used within the Jumbo Creek Drainage. Use of firearms for bear management purposes are for the protection of the visitor in case of animal attack or for the disposal of animals. Secondarily the firearm is available for trained personnel protection in case of animal attack during management actions and patrolling of areas closed due to bear problems.

Trapping Techniques and Equipment

Trapping will normally be used prior to application of other capture techniques. The Bear Management Committee and WLAPwill approve all traps including culvert traps, aluminium traps, barrel traps and foot snares. Parks Canada prefers culvert traps baited with natural food and uses foot snaring or free-range immobilisation techniques only if culvert traps prove ineffective and all human safety concerns are addressed. To prevent bears from becoming conditioned to human foods, only road-killed wildlife or wildlife blood will be used as bear bait.

Conspicuous warning signs will identify baited traps and set traps shall not be left unattended in public use areas during busy, daylight hours. Area closed signs will be used to close the area in the immediate vicinity around all baited traps.

The Ministry of Water, Land and Air Protection and the Grizzly Bear Management Committee will approve wildlife immobilisation drugs (i.e. telazol, ketaset, rompun, M-99).

While in captivity, bears that are to be relocated will be isolated from human activity and kept in a cool, shaded area and given water and natural foods as needed. No bear will be kept for more than 24 hours. Bears handled for management or research purposes will be marked by ear-tag, paint mark, tattoo, radio collar, backpack radio or radio implant. The Grizzly Bear Management Committee and WLAP must approve other methods of marking bears.

Relocation and Translocation of Nuisance Bears

Except in emergency situations involving an immediate threat to human safety, grizzly bears will be relocated as a free-roaming individual within their own home range. Bear relocations into home ranges occupied by other bear(s) generally result in displacement. A high priority release site would be one where the niche is known to be available. Problem bears will not be relocated to a national park unless prior arrangements have been made with Parks Canada. Wherever possible, release sites should be remote from visitor use areas and provide as many of the bear's ecological requirements as possible. Distance from the capture site and geographic barriers will be considered when choosing the relocation/translocation site.

As determined by the Ministry of Water, Land and Air Protection , some nuisance bears may be translocated to remote sections of the Central Purcell Population Unit or to a threatened unit such as the Yahk, South Selkirk, Kettle-Granby or North Cascades.

3.8.12.2 Emergency Response to Bear Attacks

Bear related emergencies should be infrequent occurrences but require an immediate effective response in order to ensure public safety and resolution of the problem. A bear-human conflict emergency plan will be developed through the Grizzly Bear Management Committee and will be based on the following principles:

- Ensure safety of response team and the public;
- Immediate, safe evacuation and treatment of the victim(s);
- Safe removal and exclusion of other people from the area;
- Investigation and evaluation of the attack circumstances and possible capture/destruction of the bear;
- Preservation, collection and documentation of evidence and response actions;
- Disposition of the bear (continue/discontinue capture efforts, relocate, destroy, etc.); and
- Post trauma victim support.

3.8.12.3 Destruction of Bears

Except in life threatening situations, the decision to destroy a bear will only be made by WLAP. The decision will be based on the following criteria:

- Threat to public safety and/or property;
- Effectiveness of alternate visitor management procedures;
- Thorough evaluation of causal factors, bear behaviour and human provocation;
- Past history of the bear;

- Degree of habituation/conditioning shown by the bear;
- Species, sex, age, presence of cubs and general health; and
- Additional criteria relevant to the particular incident.

All bears will be destroyed in a humane and discrete manner and thoroughly documented. Any bear destroyed as a result of contact with a human will be independently necropsied and any saleable parts (i.e. teeth, skull, claws, gall bladder, coat) will be disposed of in such a way so as to render them unsaleable.

3.8.13 Monitoring and Adaptive Management

3.8.13.1 Grizzly Bear Management Committee

It is recommended that the implementation of the "*Bear Management Plan*" be overseen by a committee (Grizzly Bear Management Committee-GBMC) representing WLAP and the proponents' biologists.

Due to the research and conservation/management nature of some portions of the monitoring program, it is recommended that costs for WLAP's committee members be reimbursed by WLAP, while the proponents' biologists costs be reimbursed by the proponent.

The committee overseeing the implementation of the "*Bear Management Plan"* will make recommendations to the Environmental Assessment Office (EAO) on the appropriate level and types of compensation and associated funding source(s). The Ministry of Water, Land and Air Protection will ultimately determine appropriate compensation measures that the proponent must implement, but only after a consensus has been reached with the "*Bear Management Committee"*. Where decisions necessitate management actions being considered and implemented by government agencies rather than by the proponent, then pursuant to the *"Memorandum of Understanding"* (MoU; Section 5.4), WLAP will refer the matter to appropriate staff within these agencies for follow-up.

Where the decision is that the proponent provide as part of a strategy to manage a particular adverse effect on grizzly bears, the proponent will have the option to provide compensation in cash or if appropriate, equipment and/or workers.

3.8.13.2 Monitoring

To evaluate the success of the mitigation/compensation measures it is recommended that an adaptive management approach through an effective monitoring program be implemented after project certification. The monitoring program should have feedback mechanisms that will allow the results of the monitoring to influence the implementation of any further mitigation measures. Adaptive management requires that identified problems are addressed, particularly when actual or potential conflicts persist in particular areas and/or times, including the issue of people moving from the resort directly out of the valley into adjacent drainage's. In addition, it is recognised that there may be some residual impact on habitat effectiveness and at least a slightly increased mortality risk to bears from the presence of the resort that cannot be completely mitigated. These residual impacts may need to be compensated by habitat enhancement or restrictions of human activities outside of the drainage. If so, the proponent would be responsible for investigating, identifying and implementing appropriate off-site enhancement opportunities (e.g., increasing the habitat effectiveness through access management). Glacier Creek would be considered a priority area for potential off-site enhancement.

Monitoring involves regular data gathering on bear occurrence, bear-human conflicts, human recreational uses in the area, and other factors of interest to bear security that may be identified. Due to the research nature of some of the proposed mitigation measures and their relevance to conservation and management, it is recommended that both government and the proponent share the responsibility and cost of on-going monitoring.

Grizzly Bear Populations and Distribution

Under Section D. 3(C) Grizzly Bears of the *Project Report* Specifications, "Population Monitoring Through Genetic Testing" is required to monitor and report on the potential direct and indirect effects of the project to predict, detect and assess change (if any) in grizzly bear numbers and distribution. The monitoring program is to include:

1. Field collection of hair samples of grizzly bears within the area of expected direct and indirect impacts for one field season (approximately June 1-July 31) prior to the completion of the *Project Report*, genetic analysis of the hair samples to identify individual bears, interpretation of the hair analysis data to assist in the prediction of potential direct and indirect impacts of the project on grizzly bears and to establish a baseline for future monitoring and reporting of the findings of the *Project Report*.

During 1998, the proponent and the Environmental Assessment Office jointly funded a grizzly bear population survey utilising hair samples/genetic analysis. The intent of the survey was to gather additional information on grizzly bears within and adjacent to the proposed Jumbo Glacier Resort project. The results of this population survey were reported to WLAP by Axys (1999) and satisfy the requirements of point #1 above.

2. Once the project is approved under the EA Act, continued field collection of hair samples from grizzly bears within the area of direct and indirect impacts during final project planning and construction (and thereafter for 10 years, or until such earlier time as WLAP determines that it is no longer required) is required. The hair samples should undergo genetic analysis, and the genetic analysis should be interpreted to detect and assess changes (if any) in grizzly bear numbers and distribution in response to project construction and operation. The results should be reported to WLAP.

The proponent acknowledges the requirements of Point #2 above and upon receiving the project approval certificate and depending on the timing of project advancement, is committed to further monitoring of the grizzly bear populations in the Central Purcell study area.

Human Recreational Use

If a project approval certificate is granted to the proponent for the development of the Project under the *Environmental Assessment Act*, it is also recommended that the proponent/WLAP monitor the unsupervised public recreational use (including use by resort construction and operations employees, resort visitors and resort residents) and other use of roads which link to Highway #95 at Invermere. The purpose of this monitoring will be to establish the baseline level of use of roads during the period when grizzly bears are active and after construction of the project has commenced, to establish what proportion of observed use of these roads is attributable to resort construction and operations employees, resort visitors and resort residents.

The monitoring should be undertaken before construction of the Project begins, during initial construction of the Project (i.e. prior to commercial-scale resort operations), and during commercial-scale operations.

Since these monitoring activities include collecting information on human activities that are relevant to grizzly bear conservation and management and are not directly related to the impacts of the project, it is recommended that WLAP take responsibility for this component of the monitoring program. If the proponent undertakes this component, it should be considered as partial/complete compensation for some of the project's impacts (with the caveat that mitigation is strongly preferred over compensation).

Application and Updating of Cumulative Effects Assessment

Assessment methods are iterative processes that include the following features:

- Impact hypotheses or models used to characterize possible impacts and interactions among impacts;
- Quantitative or qualitative analysis as appropriate;
- Verification of modelled results through field data collection, baseline characterization and ongoing monitoring programs; and
- Modification of impact hypotheses or models if necessary.

Models are used extensively to imitate reality when conducting Cumulative Effects Assessments (CEAs), but model outputs are only as good as the understanding and assumptions behind them and the data used to create them. Thus, updating models and frequently verifying predictions by comparing them to current field data should be required in order to refine the model's accuracy.

A Cumulative Effects Assessment model for Grizzly Bears in the Jumbo drainage and neighbouring drainage basins has been developed (Apps 2003, see Appendix 3-D). It suggests that mitigation measures directed at achieving no-net-impact will be required for the Jumbo watershed, as well as neighbouring watersheds. The CEA model identifies Jumbo, Toby and Horsethief as watersheds potentially impacted by the proposed development. Any mitigation measures that are proposed should focus on these watersheds, as well as Glacier Creek watershed, as it was identified by the province as a priority area.

The project proponent will commit to the continuing development and refinement of the Grizzly Bear CEA model. This commitment will be integrated into the monitoring and adaptive management plan. The refinement of the model will depend on verification of the model assumption and data input.

Through the continued improvement of the CEA model, the proponent and the provincial government can address some of the mitigation concerns highlighted by MWLAP. These concerns are related to the achievement of no-net-impacts to Grizzly Bears. MWLAP notes that it would be necessary for impacts within the Jumbo drainage to be counter-balanced with off-site mitigation. The proponent agrees, and the CEA model confirms the statement. The decision on the application and acceptability of off-site mitigation will be made by the Ministry with input from the Bear Management Committee; the decision will be based on data and information gathered by the proponent.

To achieve no-net-impact to Grizzly Bears within the CEA study area, as identified by Apps (2003) (see Appendix 3-D), it would be necessary to prevent, and where prevention is not practical, to offset the incremental increase in human activity as a result of the project in the surrounding area through access management and careful scrutiny of applications for commercial recreation tenures. This is the responsibility of the provincial government, but the proponent will commit to assisting and providing input when requested.

Promising new methods in CEA assessment methods such as system and successional modeling could be applied within the CEA study boundary, and the information obtained can be used to identify important sources of impacts to Grizzly Bears. A reliable CEA model can be a useful tool to develop mitigation strategies. The proponent and the provincial government could cooperatively develop possible Grizzly Bear mitigation scenarios in the CEA study area, each of which is designed to result in no-net-impacts to Grizzly Bears. These model scenarios would allow the provincial government to identify the most promising mitigation techniques. Some issue that have been identified are: decreasing road densities by road closures, reducing the number of bear conflicts, addressing infanticide, managing access and providing quality foraging and den habitat. Mitigation strategies will be assessed for effectiveness and likelihood of implementation.

Performance Indicators

Methods to achieve the management plan outlined in this report will be implemented, and evaluated each year to identify their effectiveness and that of all management implementations relating to the human activities in and around the resort facilities. This will involve the monitoring of several criteria to indicate the performance of the management plan and its effectiveness to the protection of human/bear problems. The following criteria have been identified as important indicators of performance in the bear management plan surrounding the proposed resort development activities, and each will be assessed annually qualitatively and quantitatively for implementation effectiveness:

- Number of garbage storage units;
- Number of property damage incidents;
- Number of threat encounters;
- Number of no contact charge encounters (base and back country);
- Number of annual bear relocations/translocations necessary by WLAP, in and around the facilities;
- Number of bears destroyed in and around the Jumbo Creek Drainage;
- Total known mortality in and out of the Jumbo Creek watershed. This should be separated into human and natural causes;
- Total number of bear observations reported in the Jumbo Creek Drainage;
- Total annual resort visitations;
- Total bear occurrences;
- Total human injuries, deaths caused by grizzly bears in and out of the Jumbo Creek drainage vs. outside; and

- The education program should be reviewed and analysed annually before the start of a new season comparing records of data.

All identified characteristics should be divided into front and backcountry occurrences for annual analysis of the program success. Annual analysis, because of observer bias, will be based on multi year trends to evaluate bear/human conflicts. The program is to be implemented immediately upon phase construction and by all staff associated with the final development. Roles and duties may be formulated at that time.

Finally, if the grizzly bear management program objectives are not being met to an acceptable level, as determined by the Grizzly Bear Management Committee, contingency measures will have to be implemented. The proponent, with the cooperation of the provincial government, will devise and implement the contingency measures, which include but are not limited to the following:

- Increased enforcement (patrol frequency);
- Area design and delivery of the bear/human conflict awareness and education programs;
- Additional spot closures to human access;
- Hunter harvest restrictions and closures as recommended by affiliated agencies in the Purcell Mountain Range or by WLAP; and
- Perform on-going monitoring and research in the Jumbo Creek Drainage involving the monitoring of grizzly bear security habitats and how effective this habitat is relative to the impacts of the proposed development and human presence in the Jumbo and surrounding valleys.

3.8.13.3 Memorandum of Understanding

Although the mitigation/compensation options outlined above are intended to reduce potential impacts to grizzly bears to an acceptable level from the proposed Jumbo Glacier Resort Project, there may be residual adverse effects (‘Residual Effects’) to grizzly bears. These residual effects may be associated with increased recreational use of surrounding backcountry areas related to:

- Issuance by BCAL of Commercial Recreation tenures under the *Land Act* in surrounding areas; and
- Increased unsupervised public recreational use of forestry roads off the main access road between Invermere and the resort development.

Therefore, it is recommended that a “*Memorandum of Understanding*” (MOU) be agreed to by WLAP, MOF and BCAL to effectively manage any residual effects. The MOU will complement the proponent’s Bear Management Plan, and will ensure that development of the Project does not result in adverse net effects on grizzly bears and grizzly bear habitat. The costs associated with the MOU should be the responsibility of the three participant agencies.

3.9 AIR QUALITY PROTECTION PLAN

3.9.1 Introduction

Construction and operational activities at Jumbo Glacier Resort could result in localized air quality impacts. Construction-related impacts are generally short-term in duration, but may still cause adverse air quality impacts. The project most common construction activities will include site preparation, earthmoving and general construction. General construction includes roadways, infrastructures and facilities. Earthmoving includes cut and fill operations, trenching, soil compaction and grading. Activities associated with site preparation include blasting, general land clearing and grubbing. Emissions generated from the sources include:

- Combustion emissions from mobile heavy-duty diesel and gasoline powered vehicles and equipment;
- Combustion emissions from worker commute trips;
- Combustion emissions for open burning of wood and organic debris; and
- Fugitive dust from blasting, soil disturbance and land clearing.

Operational activities that may impact air quality at Jumbo Glacier Resort include the use of wood burning appliances, traffic to and from the resort by employees and visitors, and energy use. Emissions generated from these sources include:

- Combustion emissions from wood burning appliances; and
- Combustion emissions from worker and visitor vehicular traffic.

To minimize potentially significant construction and operational emissions, the following mitigation measures will be implemented at the Jumbo Glacier Resort.

3.9.2 Construction Activities

3.9.2.1 Air Emissions Mitigation Plan

Heavy Construction Vehicles and Equipment

The contractor will implement the following mitigation measures to minimize release of air pollutants from construction-related heavy-duty vehicle and equipment.

1) On unpaved roads traffic speeds shall be limited to 20 kmh.

2) Equipment producing excessive exhaust pollution, as determined by the Project Manager, shall be repaired or replaced at the Contractor's cost.

3) All on-road dump trucks used on the Project shall be model year 1994 or newer.

1) All dump trucks will be subject to visual inspection by the Project Manager. Vehicles shall have better than 10% opacity (i.e. 10% or lower). The Project Manager will remove any vehicles deemed to have excessive emissions from the Work Site.

2) All off-road dump trucks shall be equipped with a catalyzed particulate trap fitted on the exhaust system. At no time shall any off-road truck be operated without a fully operational catalyzed particulate trap, maintained as recommended by the manufacturer. Catalyzed particulate traps shall remove a minimum of 85% of particulate matter and shall oxidize 90% of unburned hydrocarbons from equipment

emissions.

3) All off-road dump trucks shall utilize ultra-low sulphur diesel fuel. At a minimum, the fuel must match the catalytic particulate trap manufacturer's and vehicle manufacturer's requirements. Fuel shall have sulphur content less than 50 ppm.

Emissions from Worker Commuter Trips

To decrease emissions of air contaminants resulting from worker commuter trips during construction, the contractor will:

1) Educate workers on air quality issues related to vehicle exhaust;

2) Encourage carpooling;

3) Explore the use of low-pollution shuttle buses to transport workers to and (if necessary) around the project site during construction.

Open Burning Plan

Land clearing for construction of the Jumbo Glacier Resort will result in the removal of timber, vegetation and organic debris from the landscape. Potential impacts to air quality from the disposal of wood, wood residue or debris that is cleared would only occur during disposal by burning. Smoke produced from the prescribed burning of timber harvest residue and natural fuels can have an adverse effect on air quality. To minimize potential air quality impacts, the contractor will implement the following:

Determine the wind direction and speed for the day of the open burn. The burn may be rescheduled if the wind direction allows smoke to impact environmentally sensitive areas, such as upland nesting habitats.

1) To the extent possible, conduct open burning in the spring and early summer. Daytime heating and general windflows help smoke to rise above ridgetops and into the free air winds where it is diluted and dispersed.

2) Conduct open burning when the ventilation index4 on the day of the burn is good and the ventilation index on the following day is good or fair.

3) Prohibit or restrict open burns at times and places where stagnant weather conditions result in poor smoke dispersion.

4) Minimize the amount of dirt in the material being burned to reduce smoldering.

5) Prohibit the burning of oils, rubber, tires, pesticide containers, and any other material creating unreasonable amounts of smoke or air pollutants.

6) Extinguish open burns completely to ensure that smoldering of material does not persist.

7) Notify the RDEK Fire Commissioner' Office about when and where the open burn will occur.

8) Closely monitor the open burn to assess smoke dispersal and direction.

9) For major burns, conduct a test burn to determine if smoke dispersal will be adequate.

[4] Ventilation Index outlines whether wind and weather conditions are favourable for burning and is prepared using Environment Canada data and approved by a manager or a forest official.

10) For major burns, a Burn Plan will be prepared for approval that includes:
- location, duration and inclusive dates for the planned burn;
- location of all sensitive features that may be impacted by smoke;
- weather forecasts and how they will be used to prevent smoke impacts;
- how weather changes will be monitored and what will be done to reduce or mitigate smoke impacts if unfavourble weather should occur after ignition;
- coordination with air quality authorities;
- how public will be informed prior to, during and after burning; and
- what will be done to enhance active fire phase and reduce smouldering phase.

<u>Fugitive Dust Control Plan</u>

Emissions during construction can be associated with drilling and blasting, land clearing, excavation, earth moving, material storage and handling. The extent of these impacts would depend on the existing air quality, the size of the affected area and the level of construction and demolition activities associated. Typical dust-producing sources are:

<u>Demolition of existing structures and other obstacles</u> – mechanical wrecking and dismemberment of structures and obstacles; drilling and blasting of structures and rocks, if required; debris and land clearing, stockpiling of debris and soil; loading of debris and soil into trucks; loaded truck transport; and unloading of trucks.

<u>Site preparation</u> – excavation by bulldozers; scraping and removal of topsoil and subsoil; loading of excavated material into trucks; dumping, storage and moving of fill material, aggregates and other materials; compacting; and grading.

<u>General construction</u> – vehicle movements; material storage and handling; portable crushing and screening, and other operations.

To minimize potential impacts from fugitive dust, the contractor will implement a Fugitive Dust Control Plan. Elements of this plan will include:

1) Use only environmentally acceptable dust suppressants or water as necessary to control dust on access roads, laydown, work and disposal areas. Use water in preference to chemical dust suppressants whenever practical.

2) Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary and permanent roads.

3) Water any temporary storage soil piles to reduce the potential for fugitive dust.

4) Avoid potential dust-generating activities during periods when wind direction may carry dust into environmentally sensitive areas (e.g., riparian zones or nesting areas).

5) Implement onsite cement and concrete batching in enclosed areas, with suitable water dowsing and wind shielding.

6) Conduct a visual inspection of the site perimeter to check for dust deposition on vegetation, cars and other objects. Take remedial action if necessary.

7) Replant vegetation in disturbed areas as quickly as possible.

Table 9 shows estimated fugitive dust emissions reductions for a variety of particulate matter (PM) control measures. These measures are expressed as a percentage of total fugitive dust PM from project construction.

Table 3.8: Estimated Fugitive Dust Emissions Reductions for Particulate Matter Control Measures

Source	Mitigation Measure	Control Efficiency
Soil Piles	Enclosing, covering or watering twice daily all soil piles	16%
Exposed Surface/Grading	Watering all exposed soil twice daily	37%
	Watering exposed soil with adequate frequency to keep soil moist at all times	75%
Truck Hauling Road	Watering all haul roads twice daily	3%
Truck Hauling Load	Covering load of all haul/dump trucks securely	2%

Source: SCAQMD, weighted for percentage contribution of PM emissions.

3.9.3 Resort Operation Activities

3.9.3.1 Wood-Burning Appliances

Any Wood-burning appliances installed at Jumbo Glacier Resort are a potential source of common air contaminants such as particulates and greenhouse gases including CO_2, CH_4 and N_2O. To minimize potential air quality impacts from these emissions, Jumbo Glacier Resort will ensure that all installed wood burning devices will adhere to BC's *Waste Management Act Solid Fuel Burning Domestic Appliance Regulation* that specifies emission, labelling, testing and record keeping requirements for new solid fuel burning devices. This includes stoves, pellet stoves, fireplace inserts and factory built fireplaces that have air-fuel ratios of less than 35 to 1 and minimum burn rates of less than 5 kg/hr but does not include cook stoves, central heating systems, masonry heaters or site-built fireplaces. The regulation also contains specifications for residential pellet fuels.

Jumbo Glacier Resort will employ Best Available Control Technology measures such as:

- Use of new technology wood stoves;
- Ensuring that the stove/fireplace is of proper size for its location and use.
- Ensuring that the stove/fireplace is properly installed and regularly inspected.
- Improvements in wood burning performance (e.g., control of wood moisture content, weatherization of residences);
- Ensuring good draft and proper chimney size (liner).

- Installing a sealed, double-wall flue pipe from the stove to the chimney.
- Use of internal baffles, catalytic converters, and adequate air supply to promote the burning of vaporized unused fuels.

Jumbo Glacier Resort will also explore a public education program to make resort residents and visitors to the resort aware of the potential air quality impacts of improperly operated wood-burning appliances. Among some of the more education points that will be included in this program are:

- Avoid smouldering fires by using proper burning techniques.
- Avoid smouldering, overnight burns.
- Avoid the burning of trash or garbage in a wood-burning stove as these emit toxic fumes when burned.
- Avoid the burning of coal in a wood-burning appliance as coal emits oxides of nitrogen and sulphur along with carbon monoxide.
- In fireplaces, make small hot fires because with these types of fires combustion is more complete and pollution is less.
- Avoid the use of lighter fluids (these are not regulatory, but BACM) or other flammable liquids to start fires.
- Start fires with strips of newspaper and kindling placed loosely on top. As the wood begins to burn, add larger pieces until the fire is stable. Too much fuel will cause the fire to smolder and smoke.
- Remove ashes frequently, leaving a light "bed" to catch the coals. Too many ashes obstruct the flow of oxygen and smother the fire. (Use a metal bucket to remove the hot ashes and store them until cooled).

In addition, Jumbo Glacier Resort will investigate the use of a voluntary and/or mandatory program for curtailment of wood burning during periods of stagnant meteorological conditions. Voluntary curtailment programs have been demonstrated to be effective in reducing peak period PM_{10} emissions by 16-50% in a variety of instances. Mandatory curtailment programs have reported peak period PM_{10} reduction rates as high as 90% when combined with a public awareness program and stringent enforcement.

3.9.3.2 Emissions from Worker, Resident and Visitor Vehicles

To reduce emissions of common air contaminants and greenhouse gases from exhaust emissions from worker, resident and visitor vehicles, Jumbo Glacier Resort will:

- Design the resort to promote the use of walkways and bike paths within the resort and make most of the resort a pedestrian-only area ;
- Require overnight visitors to leave their cars parked during their stay;
- Promote the use of busses as modes of transportation to and from the resort; and
- Use low-pollution electric shuttle buses to transport visitors around the resort area as is done at resorts in the Alps, such as Zermatt, Switzerland.

3.10 SPILL CONTINGENCY PLAN

3.10.1 Introduction

Prior to the start of site development work, Jumbo Glacier Resort will prepare a Spill Prevention Plan for the construction phase and a general Spill Contingency Plan. The Spill Contingency Plan will be consistent with the requirements of Canada Standards Association Standard Practice CAN/CSA-Z731-M91: Emergency Planning for Industry. It will include details of the amounts and types of fuels and other dangerous goods, such as bulk oils, antifreeze, solvents, etc., and the locations where they will be stored on-site. This section outlines the general contents of the Spill Prevention and Spill Contingency plans.

3.10.2 Spill Contingency Plan Outline

Prior to the start of site development work, JGR will prepare a Spill Prevention Plan for the construction phase and a general Spill Contingency Plan for approval by the Regional Waste Manager. An overall Contingency Plan for accidents, malfunctions and other emergencies during operation of project will be drafted at the detailed design phase of the project. The plan will be consistent with the requirements of Canada Standards Association Standard Practice CAN/CSA-Z731-M91: Emergency Planning for Industry. The plan will target environmental risks from accidents/malfunctions the following project activities/facilities:

- transport of goods;
- wastewater treatment plant operation;
- chemical product storage;
- waste storage; and
- pollution control devices.

The Contingency Plan will be prepared according to the following standards for emergency planning:

- Canada's National Standard titled, *Emergency Planning for Industry* (CAN/CSA-Z73 I - M91), and
- the international Incident Command System (ICS) as *per* the standard for site

The table of contents for the Spill Contingency Plan as recommended in the *BC Guidelines for Industry Emergency Response Plans* will be as follows:

1. Policy Statement
2. Purpose and Scope
3. Pre-Emergency Planning
3.1 Hazard Identification
3.2 Risk Analysis
3.3 Legislation and Industry Standards
3.4 Emergency Organization and Responsibilities
3.5 Resources
3.6 Internal Alerting
3.7 External Alerting
3.8 Communications

3.9 Public Affairs
4. Emergency Response
4.1 Response Action Decision
4.2 Plan Activation and Response Mobilization
4.3 Response Action/Containment/Cleanup
4.4 Emergency Operations Centre
4.5 Evacuation
4.6 Disposal of Spilled Contaminants and Debris
4.7 Site Restoration and Remediation
4.8 Post-Incident Evaluation
5. Training and Practice
5.1 Training
5.2 Practice Drills
6. Plan Evaluation
7. Plan Updates

The overall Spill Contingency Plan will include both spill prevention plans and spill response plans.

Jumbo Glacier Resort will also pursue endorsement of the *Partnerships Towards Safer Communities* by the Canadian Association of Fire Chiefs. This is designed to foster close working relationships between industry and local communities to define risk, to mitigate impacts, and to understand response roles and capabilities.

3.10.3 Spill Prevention Plans

Spill Prevention Plans will be site and/or activity specific. The Spill Prevention Plan for the construction phase based on the following guidelines:

- The construction staging area should be located at least 30 m away from streams or any ephemeral drainage channels;
- Activities that carry a risk of materials spills should take place within a bermed staging area. These activities include mixing concrete or other materials and any vehicle fuelling and other maintenance that is done on site;
- Any areas where vehicle fuels or other potentially deleterious substances are stored should be equipped with impervious containment berms. If fuel tanks larger than 250 l are present within a berm, the bermed area should have a holding capacity equal to 125% of the capacity of the largest tank;
- Storage and maintenance facilities should have spill clean up and disposal equipment;
- Any equipment that will work in streams and/or wetlands should be maintained and used in a manner that will prevent deleterious substances such as fuel, oil, grease or other chemicals from entering the watercourse. This may necessitate cleaning the equipment prior to use; and
- Mobile construction equipment should be fuelled, lubricated and serviced only at approved locations (i.e. within the bermed staging area; at least 30 m from all watercourses). Field servicing of equipment, particularly near streams should not be permitted. In addition, equipment and machinery should not be washed near watercourses.

3.10.4 Spill Response Plans

The Spill Contingency Plan will contain separate spill response plans for the various project phases and activities. Each plan will be in writing and kept in a binder at the appropriate location (e.g., construction office/staging area, wastewater treatment plant and other location(s) where potentially deleterious materials are stored or used). All pages of the spill response plan(s) will be numbered and dated for referencing and updating. At a minimum, each binder will contain:

- A copy of the *Spill Reporting Regulation* (which includes a list of substances and spill volumes that must be reported);
- The 24-hour toll-free telephone number of MWLAP's Environmental Emergency Program: 1-800-663-3456 prominently displayed;
- A list of the information that should be provided when reporting a spill to Environmental Emergency Program:
    - Reporter's name and telephone number;
    - Name and telephone number of person who caused the spill;
    - Location and time of the spill;
    - Type and quantity of the substance spilled;
    - Cause and effect of the spill;
    - Details of action taken or proposed;
    - Description of the spill location and surrounding area;
    - Names of agencies on the scene; and
    - Names of other persons or agencies advised concerning the spill.
- A list of 24-hour emergency contacts for the project (e.g. site engineer, construction supervisor, environmental monitor): names, positions and telephone numbers;
- A list of other relevant 24-hour emergency contacts and a description of the circumstances under which they should be contacted;
- A list of the substances most likely to be involved in a spill or incident;
- The *Material Safety Data Sheets (MSDS)* for all potentially deleterious substances stored on site and clean-up instructions for each substance or class of substances;
- A list of the spill response equipment on site along with a map of where it is stored;
- A description of potential environmental impacts should a spill occur;
- A detailed site map that identifies areas of particular concern with respect to environmental impacts, such as probable flow pathways to watercourses; and
- Detailed instructions for preventing/mitigating environmental impacts, such as containment measures for spills that have entered watercourses.

General spill response measures, which will be incorporated into the Spill Contingency Plan, are summarized below:

Table 3.9: General Spill Response Procedures

Secure the Site	• Locate the source of the spill and stop the flow ***if it can be done safely***. • Use common sense and act quickly. • Warn people in the immediate vicinity. • Enforce *no smoking* and evacuate the area, if necessary. • Remove ignition sources (turn off motors, electrical circuits, naked lights; extinguish any flames and lit cigarettes), ***if safe to do so***. • Plug any visible leaks and right containers that have tipped, ***if safe to do so***. • Contain the spill using the Spill Kit and personal protective equipment, as necessary. Block off drains, culverts and ditches; surround the spill with absorbents to prevent spreading.
Commence Spill Clean Up	• Clear the area. Notify the appropriate authorities. • Do not attempt to contain a large spill by yourself. • Determine the nature of the spill. From a safe location, obtain and deploy appropriate personal protective equipment. • Approach the spill with caution. Deploy absorbent material around the spill to prevent its spread. Never step into the spill. • When the spill is contained, move absorbents on the ground toward the centre of the spill. When the containment absorbents begin to reach their saturation point, add more absorbents directly to the spill and continue to advance toward the centre. • In the event that the spill is larger than the available absorbent capacity, absorbent pads can be wrung out and reused with the same chemical. • When the spill has been absorbed, place all used absorbents into the disposal bags or the kit containers and seal. Store in a safe location until proper disposal can be arranged. • Immediately restock used equipment to be prepared for another spill.
Assess the Spill	• What caused the spill? • Which product spilled (diesel, heating oil, gasoline, other)? • What vessel was the product stored in? • Quantity released (gallons, liters, or other units)? • Did the spill reach a drain or waterway? • Are there any vapours from the spill? • Are there any hazards to people or the environment? • Are there any special problems such as fire, injuries, or property damage?
Report the Spill	• Report all spills over 0.5 liters to the project Engineer. • For spills of substances exceeding the specified amounts (as per the *BC Waste Management Act* Spill Reporting Regulation BC Reg 63/88), contact the **Provincial Emergency Plan** (24 hours) -**1-800-663-3456** and **Environment Canada – (604) 666-6100** All spill reporting is mandatory and must include: • name and phone number of person reporting the spill; • name and phone number of person causing the spill; • location and time of the spill; • type and quantity of the spill; • cause and effect of the spill; • details of action proposed or taken to contain and minimize impact; • names of agencies on the scene; and • names of other persons or agencies advised.

3.10.5 Transportation-related Spills

The following potentially hazardous substances may be transported to Jumbo Glacier Resort by road:

- concrete;
- paints and sealants;
- fuels and oils;
- explosives for use during construction of the resort and for avalanche control;
- cleaning products; and
- pesticides and fertilizers for use at the resort base.

The main hazards to the environment related to the transport these and similar substances are:

- Chemical Spill/Release
- Fire
- Explosion

<u>Accidental Release/Spill</u>

Spill prevention will be the primary mechanism of mitigating potential spills of chemicals during transport to and from the resort. Spill prevention measures include:

- use of certified disposal and transportation services;
- proper labeling of materials;
- inspection of containers prior to and after transport; and
- selection of safest means of transport and routing.

In BC, details for transporting special wastes are prescribed in the *BC Waste Management Act* and the associated Special Waste Regulation as well as in the *Transportation of Dangerous Goods Act* and Regulations.

The shipper(s) will ensure that each container of dangerous goods has the required safety marks. Containers will be labeled with the following information:

- diamond shaped hazard symbol (includes primary classification);
- shipping name and PIN;
- label for the subsidiary classification without the class number (if applicable); and
- if it is a liquid – an orientation label is required.

A waste manifest will be prepared for:

- waste paint > 205 L;
- waste oil >205 L;
- hazardous liquids > 5 L; and,
- hazardous solid waste > 5kg (except for batteries).

Spill kits will be kept and maintained on vehicles transporting hazardous goods.

In the event of a spill, the general response procedures provided in the *General Spill Response Procedures* table above will be implemented.

Fire and/or Explosion

In the event of a fire and/or explosion of a vehicle transporting materials to and from the resort, the discoverer of the fire will contact relevant emergency agencies.

3.11 WATER MANAGEMENT PLAN

3.11.1 Annual Water Demand

Yearly water demand has been calculated based on the projected demand at Jumbo Glacier Resort. The resort will be focussed on year round skiing on natural snow and sightseeing. Therefore, it will not require water for golf courses or snow-making as do many other resorts. The amount of water required for the project was calculated using estimates of overnight and day visitors at the resort and assuming that the resort will operate 335 days per year.

The total amount of water to be drawn yearly at full build out has been calculated to be approximately **183,000 m^3** per year. Preliminary investigations by Golder Associates support the expectation of the civil engineers to be able to easily draw water from wells. A detailed description of the data and assumptions utilized to calculate annual water demand is provided in Section 5.3.1 of this Master Plan.

3.11.2 Potable Water Supply

Surface water and ground water are both available and both options have been reviewed by the consulting engineers. The preferred option is to use groundwater. This preference is based on the relatively low amount of water required by the resort and the fact that groundwater will require minimal or no treatment.

During the first stages of the project studies, KPA Engineering and Golder Associates investigated the availability of surface water at two locations on Jumbo Creek. The first location was some 1.3 km upstream of the proposed site of the resort base near elevation 5,600 feet (1,707 metres), and the second site was immediately upstream of the possible area for single family chalets in the lower logged areas near elevation 5,550 feet (1,692 metres). The catchment area of Jumbo Creek at these sites is 18.3 km2 and 27 km2 respectively. The upstream site would be the preferred site as it is located further above the proposed resort facilities and therefore would be less subject to potential contamination. However, based on the abundance of groundwater, the use of surface water was rejected. There currently is no intention to withdraw water directly from Jumbo Creek.

A review of the availability of groundwater approximately 1 km upstream of the proposed village site has indicated that production wells with individual yields ranging from 0.33 L/s to 6.6 L/s are probable. These wells could require drilling to depths of between 20 m (65.6 ft) to 100 m (328 ft). It is further estimated that the total groundwater flow that could be extracted continuously from one or more wells at this location would be in the range of 7.5 L/s to 22.5 L/s. This flow range is sufficient to supply the needs of the resort. Additional available locations in the valley have not been investigated as it appears that it is unlikely that additional wells would be necessary.

More detailed information is provided in Section 5.3.2 of this Master Plan.

3.11.3 Water Storage and Distribution System

3.11.3.1 Distribution System

The wells will pump water to one or more ground-level reservoirs above the resort in suitable locations hidden among the trees. Water from the reservoirs will supply all of the resort by gravity. Due to the differences in elevation across the site, the service area will be divided into pressure zones, which will be fed by gravity through pressure reducing valve stations.

The water distribution system will be designed to deliver water in adequate quantities and at adequate pressures for both domestic use and fire flows. Fire flow requirements will be based on the most recent publication by the Fire Underwriter's Survey. The waterworks system will be designed with input from the Fire Commissioner's Office, the East Kootenay Regional District, the Town of Invermere Fire Department, and from other existing mountain resort communities.

The watermain network will generally follow the proposed roadways. Sufficient watermain looping will be provided for better flow/pressure balancing and elimination of stagnant water problems. Due to the difference in ground elevation of the various parts of the development, the distribution system may operate in at least two different pressure zones.

3.11.3.2 Storage Facilities

The resort's water distribution system will be designed to provide for peak flow requirements, such as instantaneous and daily/ hourly domestic flow variations, irrigation, fire suppression, etc. This will accomplished by incorporating a potable water storage reservoir within the water distribution system. The reservoir volume will include fire storage, balancing or equalizing storage, and an emergency storage.

The minimum reservoir volumes are recommended by Fire Underwriters Survey (F.U.S.) . Automatic sprinkler systems will be employed for all building types, except for the single-family chalets, to substantially reduce the fire flow demand. The highest fire flow demand on completion for the proposed development is estimated at 150 L/s.

In addition, the required reservoir storage volume is based on the estimated average daily water demand at buildout. This volume has been estimated at 544 m^3/d. The determination of reservoir storage capacity is as follows:

Total Average Day Demand (ADD)	=	542,000 L
Maximum Day Demand (MDD) = 2.3x ADD[5]	=	1,246,600 L
A. Equalization Storage = 25% MDD	=	311,650 L
B. Fire Storage = 150 lps x 120 min. x 60 sec./m	=	1,080,000 L
C. Emergency Storage = 25% (A & B) *	=	347,913 L
Total Reservoir Storage		1,739,563 L ($1,740\ m^3$)

One or more reservoirs will be located above the resort base site, at an approximate elevation of 1,800 m. A separate reservoir at an approximate elevation of 1,920 m may serve the single family dwellings and heliplex development area west of the creek. These locations will provide gravity service for the entire resort development.

3.11.3.3 Isolated Water Supply Facilities

The Teahouse/Restaurant located on the top of Glacier Dome may be supplied separately with water from a 25 m^3 reservoir installed in the restaurant. The potable water demand for Teahouse/Restaurant will range from 10 m3/day to 20 m3/day in Phase 1, depending on the number of visitors. For the first few years, demand is expected to be around 10 m3/day, increasing to 20 m3/day within five years. Initially, potable water may be hauled from the potable water system in the resort base area to the Teahouse/Restaurant water reservoir by snow cat or similar service. Eventually, this means of potable water transport will be replaced with a pumped system.

Daylodges of similar size to the Teahouse/Restaurant are planned for the midstation of the Glacier Dome gondola and in appropriate locations in the Commander/Farnham drainage. It is expected that wells of adequate capacity will serve the daylodges from appropriate locations nearby.

3.11.4 Water Treatment

It is anticipated that the new wells will have a water quality that meets all the Canadian Drinking Water Standard parameters. Therefore, minimal, if any, treatment will be required. Depending on the storage system, the drinking water may need to be disinfected (chlorinated) for health purposes prior to consumption.

3.11.5 Water Conservation Measures

Current practice is to design projects that consume a fraction of the amount of water of urbanized areas. Water conservation principles will be incorporated as part of the sustainable design concepts into the Jumbo Glacier Resort development.

While there are many areas in North America that adopted water conservation strategies, the scope of these strategies varies widely. In most of those areas, these strategies are applied to

[5] 3,794 overnight peak visitors / 1,650 overnight average visitors = 2.3

existing built-up areas through gradual replacement of plumbing fixtures and change in personal use habits. Consequently, there are no published water use rates reflecting water conservation measures that could be readily applied to a new development such as Jumbo Glacier Resort, although examples such as Sun Peaks Resort provide a useful guideline.

The water conservation strategy for Jumbo Glacier Resort should consider the following range of conservation measures at the levels of planning, design, construction, operation and maintenance by the water utility company, as well as public awareness and education:

- Universal water metering;
- Water accounting and loss control;
- Incentive producing water costing and pricing practices;
- Non-combustible building construction where possible;
- Sprinkler systems in all buildings;
- Impounding of runoff and snow melt water;
- Landscape efficiency;
- Water system pressure management;
- Water saving plumbing fixtures;
- Water saving domestic/ commercial appliances and building envelope equipment, and
- Water conservation awareness program.

The above water conservation measures can be further described as follows:

3.11.5.1 Universal Water Metering

It has been shown in many studies that metered water systems typically save substantial amounts of water compared to unmetered water systems. Universal water metering includes both source water metering and service connection metering. Source water metering is essential for water accounting purposes by the water utility. Service connection metering is needed to more accurately track water use and bill customers for their usage. It also informs the customers how much water they are using. All water provided free of charge for public use should also be metered in order to accurately account for water. Source meters and service connection meters should be read at the same relative time in order to facilitate accurate comparisons and analysis. Meters should be tested for accuracy on a regular basis. It is also important that the meters are properly sized to prevent under or over-registering. These practices will allow for effective leak detection and repairs as part of the normal operation and maintenance program.

3.11.5.2 Water Accounting and Loss Control

A water accounting system will help track water throughout the system and identify areas that may need attention, particularly large volumes of non-account water. Non-account water includes unmetered water as well as water that is metered but not billed. Non-account water should be analyzed to identify recoverable losses and leaks in the system. The water utility company should institute a comprehensive leak detection and repair strategy. This strategy should include regular on-site testing with leak detection equipment. A loss prevention program including pipe inspection, cleaning, lining and other maintenance efforts should compliment the loss control program.

3.11.5.3 Incentive Water Costing and Pricing

The value of costing and pricing as a conservation strategy is in involving the water customers in understanding the true value of water, and conveying information about that value through prices. A water utility will need to be created and operate the water system under the Certificate of Convenience and Public Necessity (CNCP). The water utility will use cost-of-service accounting, consistent with generally accepted practices established by the CNCP. The customer's bill should correspond to their water usage. Any changes in the water tariff by the water utility will require an application to and approval from the water comptroller's office. The water tariff rate should be structured to promote conservation.

3.11.5.4 Non-Combustible Building Construction Where Possible

The Master Plan gives serious consideration to fire suppression systems in building structures. All major buildings and buildings over four storeys in height will be non-combustible and have sprinklers. All combustible buildings will have sprinklers. At Jumbo Glacier Resort it will be recommended that single family chalets and bed and breakfast buildings also have sprinklers, as the cost of providing sprinkling for small building structures is no longer prohibitive.

3.11.5.5 Impounding Runoff and Snow Melt Water

Consideration will be given to strategic placement of water impoundment storage areas throughout the development. Runoff and snow melt intercepting ditches or swales should be located and graded such as to channel the surface water into the impoundments. These impoundments would have a function of storing water for fire fighting purposes.

3.11.5.6 Landscape Efficiency

Outdoor water usage drives maximum-day demand. The maximum-day demand, in turn, drives the demand for larger water supply and storage, transmission and treatment facilities. Outdoor usage is often the greatest source of water demand in a resort development; therefore, reducing the outdoor usage can be a very effective water conservation strategy. The land use vision for the Jumbo Glacier Resort's base core area, with the commercial and higher density residential component of development, will include minimizing hard surfaces and landscaping with low water use indigenous vegetation as much as possible. The single family chalets and bed and breakfast areas of development will be landscaped to blend with the natural forest setting with mandatory restoration of indigenous plants and avoiding a city-type grass lawn and flower bed landscaping as outlined in the Design Guidelines.

3.11.5.7 Water System Pressure Management

Reducing water pressure in the distribution system can save a significant quantity of water. It can decrease leakage, amount of flow through the open fixtures, as well as stresses on pipes and joints, which may result in leaks. System-wide pressure management during the design stage should ensure that pressures in the system exceeding 45 – 50 psi are eliminated through a proper placement of pressure-reducing valve stations in the system. The reductions in pressure should obviously not compromise the integrity of the water system or quality of service for customers. Pressure-reducing valves or regulators in the buildings should fine-tune the best pressure range in individual buildings.

3.11.5.8 Water Saving Plumbing Fixtures

The importance of water conservation through the installation of water conserving plumbing fixtures is generally recognized by the public. In British Columbia, it is now identified in a separate building regulation, pursuant to Section 692 of the *Municipal Act*, entitled "Water Conservation Plumbing Regulation". At the present time, the regulation addresses the demand side of water efficiency measures only through the inclusion of water efficient devices and fixtures by specifying maximum flow rates and flush cycles. Sanitary piping systems within the buildings that control the use of other water-efficient measures (i.e., graywater re-use) are not yet included in the regulation.

The design and construction of commercial and residential components of the resort, from single-family homes to hotels, should feature the following water-saving plumbing fixtures:

- High efficiency lavatory and kitchen faucets. These devices use 1.9 to 8.3 l/min compared with standard faucets using 11 to 19 l/min.
- High efficiency showerheads. These devices use 3.8 to 9.5 l/min compared with standard showerheads using 11 to 19 l/min.
- Low consumption direct type or flush type toilets. These devices do not use more than 6 l/flush compared to the watersaver water closets, which use 13.35 l/flush.
- Low consumption direct type or flush type urinals. These devices do not use more than 5.7 l/flush. The water supply to urinal flush tanks equipped for automatic flushing should be controlled with a timing device in order to limit operation during normal working hours.
- Low flow aerators should be used on faucets where applicable/possible.

3.11.5.9 Water Saving Domestic/Commercial Appliances and Building Envelope Equipment

Consideration and encouragement should be given to the use of water-saving appliances, equipment and measures including the following:

- Front loading, horizontal axis, clothes washing machines. Such machines typically use 30 percent less water and 40 – 50 percent less energy than the top loading machines.
- High water (and energy) efficient automatic dishwashers. This refers to both domestic and commercial dishwashers.
- Air conditioning units and cooling equipment. Water used in cooling equipment, such as air compressors, should be minimized in accordance with the manufacturer's recommendations. (Air conditioning is not planned except possibly fro the two hotels.)
- Hot water instant demand system. Some of these systems typically utilize electronically controlled pump/ recirculating loop and gas heat.

- Installation of water heaters as close to the point of use as possible and well insulated hot water piping.
- User of water softeners should be restricted due to the frequent refresh cycling and high water consumption.

3.11.5.10 Water Re-Use and Recycling

Water re-use, also synonymously known as reclamation or recycling, is re-using treated wastewater for beneficial purposes such as agricultural, golf course and landscape irrigation; cooling and industrial processes; groundwater recharge, toilet flushing, wetlands and recreational water impoundments; etc. Commonly, the source of recycled water is municipal wastewater. Recycled water requires adequate treatment (settling, filtering, disinfection, etc.) before it can be used again. This includes some risk, because there is some potential for malfunction, where it would not be properly treated, and health problems could arise from exposure or drinking due to disease-causing organisms and other contaminants.

After consideration, utilization of graywater re-use systems is considered an unnecessary risk in this project for the following reasons:

- Many graywater re-use systems thus far have been abandoned or have achieved less than 10% re-use efficiency within five years.
- The economic payback time may still be longer than the system life.
- Many such systems consume so much energy and extra materials, while saving comparatively little water, that they do not make sound investment sense. Many such systems are often technologically overbuilt using additional pumps, valves, filters, dual plumbing, and often use a lot of electricity.
- Claims made for package systems on the market are often inflated and difficult to verify. While there are exceptions to the rule, they are generally expensive, especially for small housing units, and many do not work as well as desired.
- Water re-use standards and plumbing codes and regulations in British Columbia do not adequately govern the design and operation of graywater systems.

3.11.5.11 Water Conservation Awareness Program

Public information and education are critical to the success of any conservation program. It is recommended that Jumbo Glacier Resort adopt a water conservation awareness program strategy early in the resort's development stage. Direct savings can be made when customers improve their water use habits. Education alone may not produce the same amount of sustained water savings as other more direct approaches but it can greatly enhance the effectiveness of other conservation measures. Customers that are informed and involved in a conservation policy are more likely to support the water utility company's conservation planning goals. An information and education program should explain all of the costs involved in supplying potable water to Jumbo Glacier Resort and demonstrate how water conservation practices will provide water users with long-term savings. Covenants with mandatory rules and requirements on the property titles and appropriate user charges will support the information process and ensure that conservation programs will be followed.

3.12 LIQUID WASTE MANAGEMENT PLAN

This section presents a summary of the options considered and the preferred option for handling domestic wastewater. Stormwater management is described in Section 3.13.

3.12.1 Liquid Waste Treatment and Disposal

3.12.1.1 Wastewater Flow Projections

Projected wastewater flow from the resort base is expected to average up to 80 m^3/day in the initial development phase. During the second phase, wastewater flows are estimated at an average flow of 100 m^3/day and a peak flow of 225 m^3/day. At maximum built out the average flow would be about 542 m^3/day, with a peak flow of about 1,084 m^3/day on a high season day. Depending on the number of visitors, the Teahouse/Restaurant is expected to produce 10 m^3/day of wastewater during the initial phase. This discharge may double on a peak day at the completion of the resort. Preliminary Daylodge locations in the Commander and Farnham drainages are expected to generate similar wastewater volumes.

3.12.1.2 Options Evaluated

The options considered for wastewater treatment and disposal all focused on ground disposal. Wastewater from Jumbo Glacier Resort will not be discharged into Jumbo Creek.

The possibility of using an onsite sewage disposal system for each individual lot, or communal systems servicing one or more groups of lots was considered as an interim measure for the initial phase of the Jumbo Glacier Resort project. Single-family chalets may be developed initially on lots of sufficient size and in locations with suitable ground to permit septic field installations and in locations to permit septic field installations regulated by the BC Ministry of Health. Apart from single-family chalets initially using on-site sewage disposal, the rest of the resort would be connected to the tertiary sewer treatment plant. Gradually, the entire resort would be connected to the tertiary sewage treatment plant. This option was rejected in favour of immediately connecting all of the development, except the isolated Teahouse and Daylodges, to the wastewater treatment plant.

3.12.1.3 Preferred Wastewater Treatment Option

From the opening phase, the entire Jumbo Glacier Resort will be connected to a tertiary treatment plant. A sanitary sewer collection system will service the hotel, condominium, commercial, townhouse and single-family areas of the resort. Wastewater from the Teahouse/Restaurant and other on-mountain facilities initially will be transported by snowcat or other mobile equipment to the treatment plant. Eventually, this means of transport will be replaced with a gravity piped system.

The sewage treatment plant will be constructed pursuant to a design/build proposal from the wastewater industry. A possible option at this time is a sewage treatment system similar to one from Ecofluid, which has recently been constructed at the

Kicking Horse Mountain Resort in Golden, BC. The system in Golden uses an Upflow Sludge Blanket Filtration process. A detailed description of this system is provided in Section 5 of this Master Plan. The expected effluent quality of a plant of this type is as follows:

- BOD5 < 10 mg/L
- Total suspended solids (TSS) < 10 mg/L
- Ammonia < 1 mg/L
- Phosphorus (total) < 1 mg/L.

The treatment process will involve separating the solid fraction from the liquid fraction. The solid fraction will be concentrated to an estimated 4-6% of its initial volume, resulting in relatively low costs for trucking the sludge away. The level of treatment for the liquid fraction is determined by the effluent criteria required in the MSR.

Ultraviolet light will be used for disinfection to avoid potential toxicity issues associated with chlorine. Ultraviolet light is the method of disinfection recommended in the MSR.

The sewage treatment plant will be built in stages to keep up with the progress of the resort development. The treated water may drain by way of pipe to an approved outfall and small drainage field according to the Ministry of Water, Land and Air Protection application requirements based on the recommendations of the Environmental Impact Study. Wastewater will not be discharged into Jumbo Creek.

3.13 STORMWATER AND SNOW MELT MANAGEMENT PLAN

This section of the report outlines the processes and criteria to be used during the detailed design of the built up areas of the resort.

3.13.1 General Considerations

Stormwater and snowmelt runoff from the uphill ski areas will occur primarily as overland sheet flow and concentrated flow in numerous channels and small creeks criss-crossing the development site. This run-off will be intercepted by cut-off ditches on the uphill side of the development and routed around into the closest receiving streams. In open areas outside of the development, the run-off will be intercepted by roadside ditches and pass through culverts under the roads.

The concentrated base area of development near the central resort area will be serviced with piped storm drains. Where possible, the discharge from ditches and storm drains will be routed through the system of natural and man-made features downstream of the development site.

Efforts will be made to maintain existing hydrological patterns at the site by reducing the amount of diversions. Drainage areas will remain unchanged. Although local diversions near the base facilities will be provided to reduce the risk of erosion and water quality problems, overall run-off patterns will be maintained.

3.13.2 Stormwater Discharge Management

Published guidelines (DFO 1993) have established the design criteria for the water quantity management (drainage) systems. The criteria specify that the post development discharges be controlled using retention or detention of stormwater runoff. Further criteria provided in Stormwater Planning: A Guidebook for British Columbia (Stephens et al. 2002) specify the management of stormwater runoff volumes as well as discharge rates. All of the criteria are predicated upon the observations that the post development discharge rates and volumes tend to be greater than under natural conditions.

Drainage systems are always comprised of two conveyance components; a minor system that may include a series of buried pipes or culverts and a major system of surface conveyance where the pipe system either does not exist or has insufficient capacity. There is always a major system, whether or not one is planned.

The establishment of capacity criteria for the minor system is largely a trade-off between cost and convenience in terms of level of service. The minor system should be designed to carry the peak flow resulting from a 1 in 5 year rainfall event. For the major system, the design should be based on a 1 in 100 year runoff event to prevent flood damages.

Some drainage systems do not include storm sewer pipes as a dedicated minor system. These drainage systems combine both the minor and the major systems into a single overland conveyance ways. Typically these combined minor and major drainage systems are in the form of grassed swales. Swales are natural depressions or wide shallow ditches that store, infiltrate and convey road runoff. The grass or emergent vegetation in the swale acts to reduce flow velocities, prevent erosion, and filter stormwater contaminants. Grassed swales may be used on public rights-of-way, including easements, for the collection and conveyance of major and minor runoff to appropriate points of interest or release. Grassed swales must be properly maintained to ensure effectiveness and prevent ponding of water.

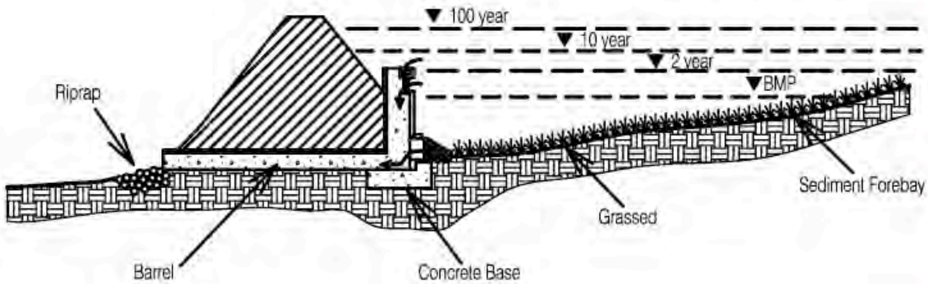
The rates of discharge can be controlled using storage facilities. Providing a sufficient volume to temporarily store runoff for later release at a safe and acceptable rate can effectively restrict the rates of discharge.

3.13.2.1 Storage Facilities

Urban land developments greatly increase the volume and rate of runoff, mainly because of the large areas of impervious surfaces that they contain. In the case of Jumbo Glacier Resort this increase in impervious area is more moderate, and is found in the form of roadway surfaces, building rooftops and parking lots. As there is a need to control stormwater runoff and the drainage system will not always have sufficient capacity to convey flows to an adequate receiving stream, there will be a need to implement stormwater storage. Storage facilities would contain the flows in excess of the receiving stream capacity and allow that system to convey the runoff as capacity becomes available following the runoff event.

The naming convention applied to stormwater storage facilities is used to describe the duration of stormwater storage. Detention facilities temporarily detain runoff and are normally dry. These are often referred to as dry ponds. Retention facilities permanently retain runoff and are referred to as wet ponds. A typical stormwater storage facility is shown below.

Exhibit 3.12: Retention Pond



McElhanney

Stormwater storage facilities can have a multitude of uses in addition to the management of stormwater runoff. Dry ponds for instance can be used for a multitude of purposes from playgrounds through utility corridors. This is made possible because of their infrequent utilization for the storage of runoff. With wet ponds the other uses usually occur on the perimeter of the facility.

3.13.2.2 Stormwater Storage Facility Sizing

Stormwater storage basins for the proposed development will be designed to provide temporary storage of the stormwater runoff and to release the stormwater back into the watercourse at a predetermined and acceptable release rate. These ponds can be designed either as a dry pond constructed within parking areas, play areas, and natural depressions or designed as a wet pond with a permanent water surface. In some instances, wet ponds may be used as a pre-treatment to the stormwater before it is discharged to the receiving waters or they may be viewed as strictly an architectural or landscape feature within the development area. To aid in maintaining water quality, the storage ponds can be configured to provide improved quality of stormwater discharges.

A storage pond can be configured as an infiltration basin as shown in Exhibit 3.13 or as a wetland as shown in Exhibit 3.14.

The design criteria adopted for the conceptual sizing of these ponds dictated that the release rate of the stormwater from the retention basins would be limited to the 2 year return, 2 hour duration storm under natural conditions (i.e. the pre-development flow). These criteria have been published by DFO and the Province of British Columbia (DFO, 1992). The depth of “live” storage was fixed at 1.0 metre and would apply to either a dry detention pond or to a wet detention pond. In the latter case, additional depth would be required for the permanent storage component. A 10-year return, 2-hour duration storm was selected for the post-development condition. Runoff volumes that exceed the design condition must be safely conveyed to the receiving stream.

3.13.3 Stormwater Volume Management

The latest guidelines published by the Province of British Columbia (Stephens *et al.* 2002) call for the control of post development stormwater runoff volume as well as the discharge rates. In order to comply with the restrictive runoff volume criteria, a series of infiltration facilities are required to direct the surface runoff water into the soils and underlying geologic formations. These facilities can be configured in a number of ways and will operate by directing stormwater runoff into permeable underground zones. The geotechnical design required to identify the most effective systems have not yet been undertaken. As a result a series of alternative concepts are presented to demonstrate a wide variety of techniques that are available.

Generally two subsurface zones can be used to discharge the stormwater runoff. The shallow, near surface zone and a deeper subsurface zone. The facilities used to discharge into the shallow subsurface are less costly and can be configured in a number of different ways. As shown in Exhibit 3.13 a stormwater storage facility can form a part of an infiltration system.

Infiltration facilities discharging into the shallow subsurface can be constructed on individual residential properties as shown in Exhibit 3.14. These facilities do not need a constructed storm sewer but building foundations must be safeguarded.

Exhibit 3.13: Infiltration Basin

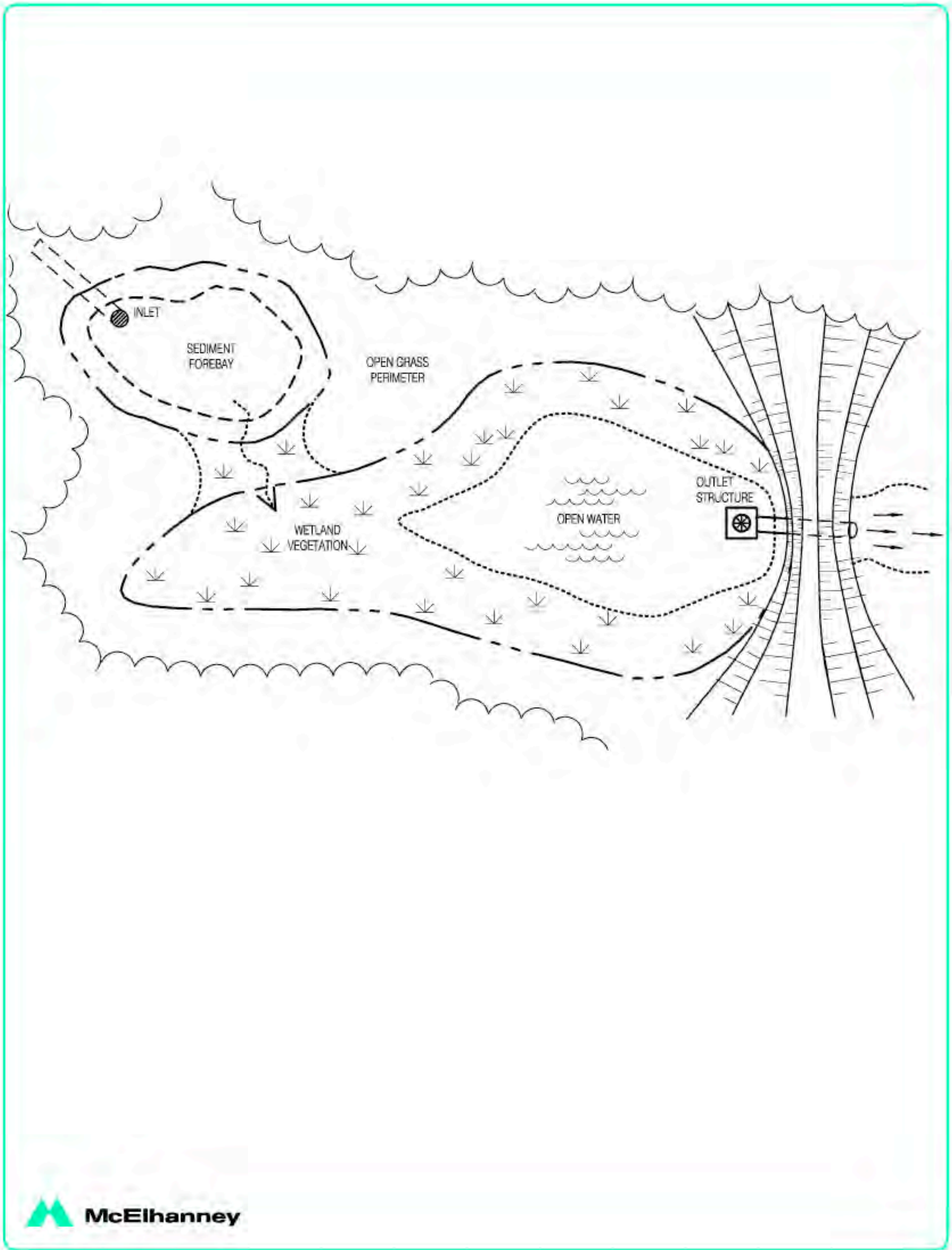
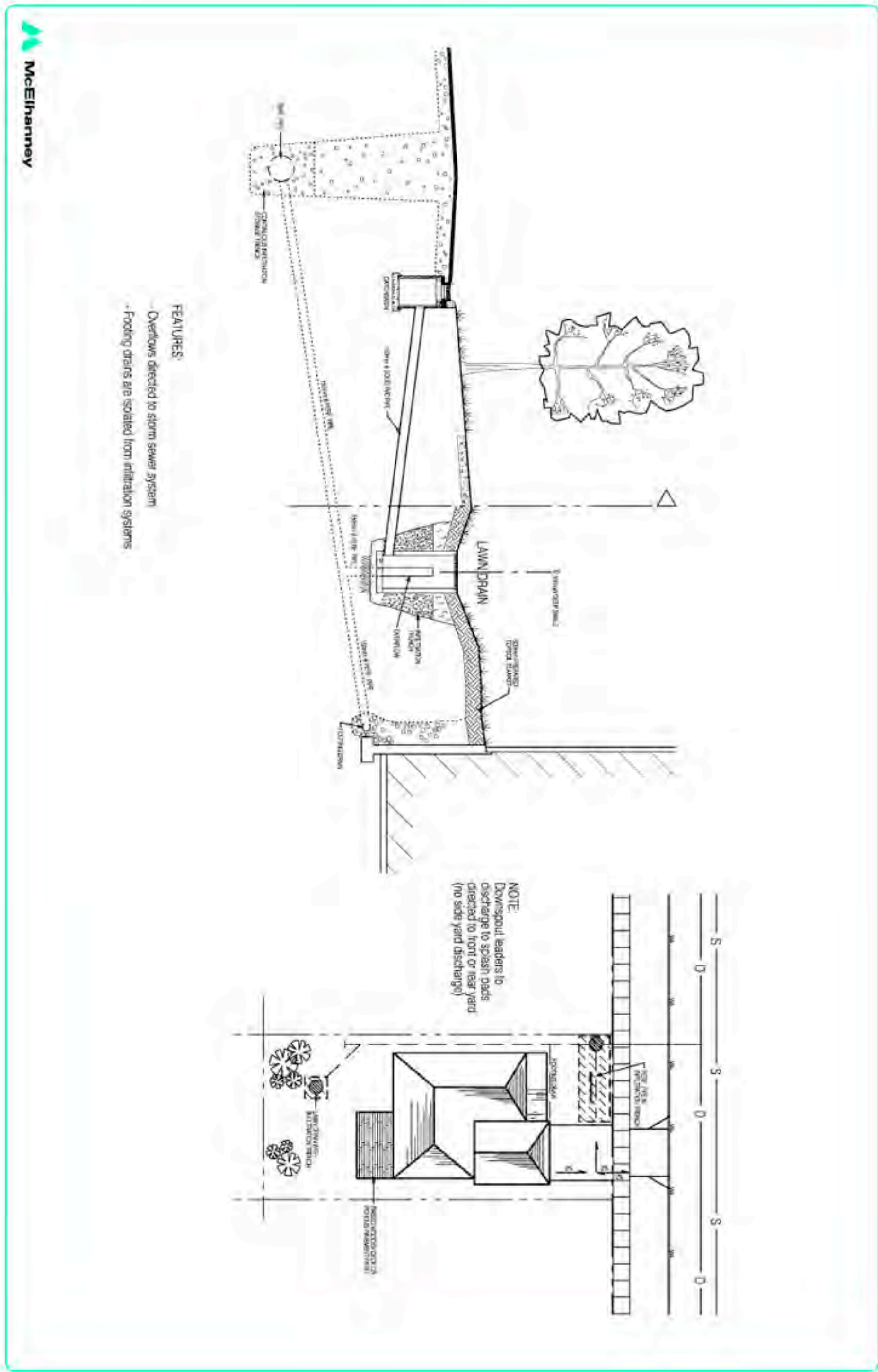


Exhibit 3.14: On-Lot Infiltration



Where storm sewers are to be constructed, infiltration along the trench can be utilized for the disposal of stormwater as shown on Exhibit 3.15. Additional infiltration can be obtained as required by modifying the standard manholes as shown on Exhibit 3.16. Where shallow infiltration systems need to be augmented by deep infiltration systems a facility as shown on Exhibit 3.17 can be utilized.

The stormwater conveyance system for Jumbo Glacier Resort has been envisioned at this stage as being comprised primarily of surface swales and ditching. It is not anticipated that curbs and gutters will be constructed or that an extensive stormwater sewer network will be required. However, as the conceptual plans outlined in Section 5 the Master Plan indicate, the resort base area will be utilizing storm sewers.

To provide infiltration in areas without storm sewers, other infiltration system configurations will be employed. Trench infiltration systems as shown on Exhibit 3.18 can be effective.

Innovations in road pavements have been ongoing and there is potential for utilizing porous pavement design as shown on Exhibit 3.19 to provide infiltration of stormwater.

Parking lots constructed with conventional pavements would be fitted with perimeter infiltration systems as shown on Exhibit 3.20.

As can be seen, there are numerous methodologies and facility configurations available to provide stormwater infiltration within the development. The use of these facilities, either singly or in combination will be determined by detailed geotechnical investigations and stormwater design during the detailed design phases prior to construction. These concepts have been shown to demonstrate a wide range of practices that are available to meet the current stormwater management guidelines and regulations in the Province of British Columbia.

Exhibit 3.15: Street Infiltration

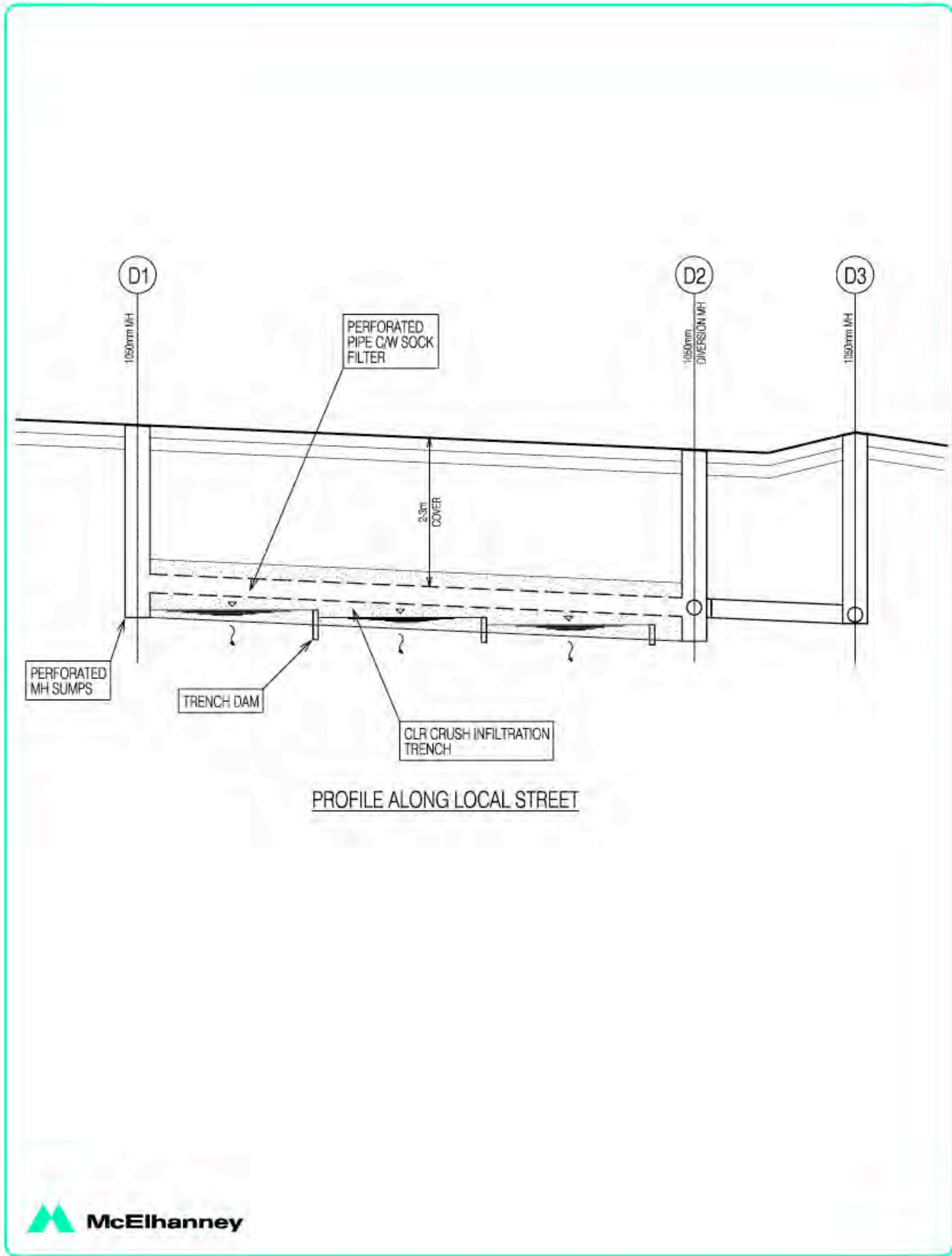


Exhibit 3.16: Sand Filter Manhole

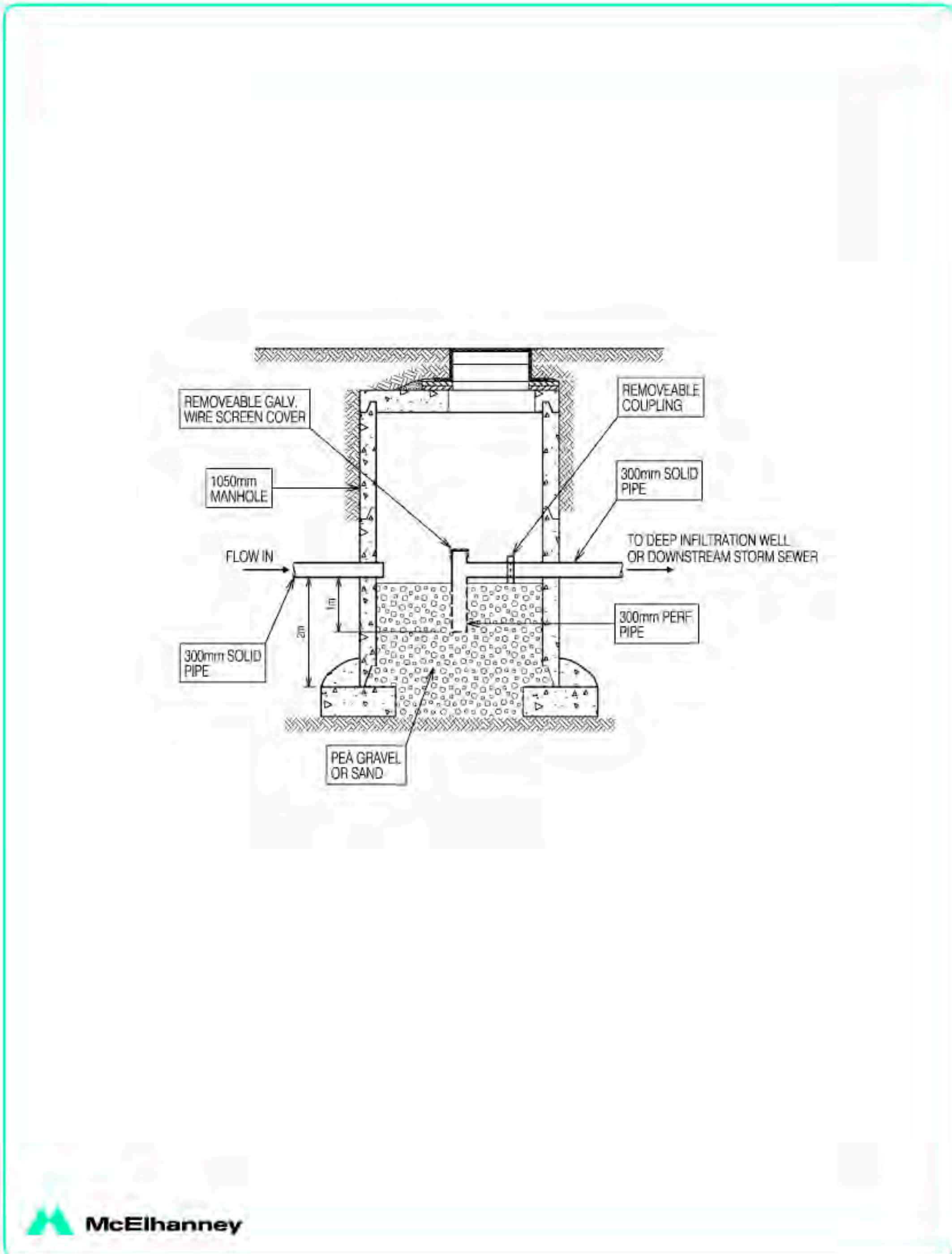


Exhibit 3.17: Street Infiltration Well

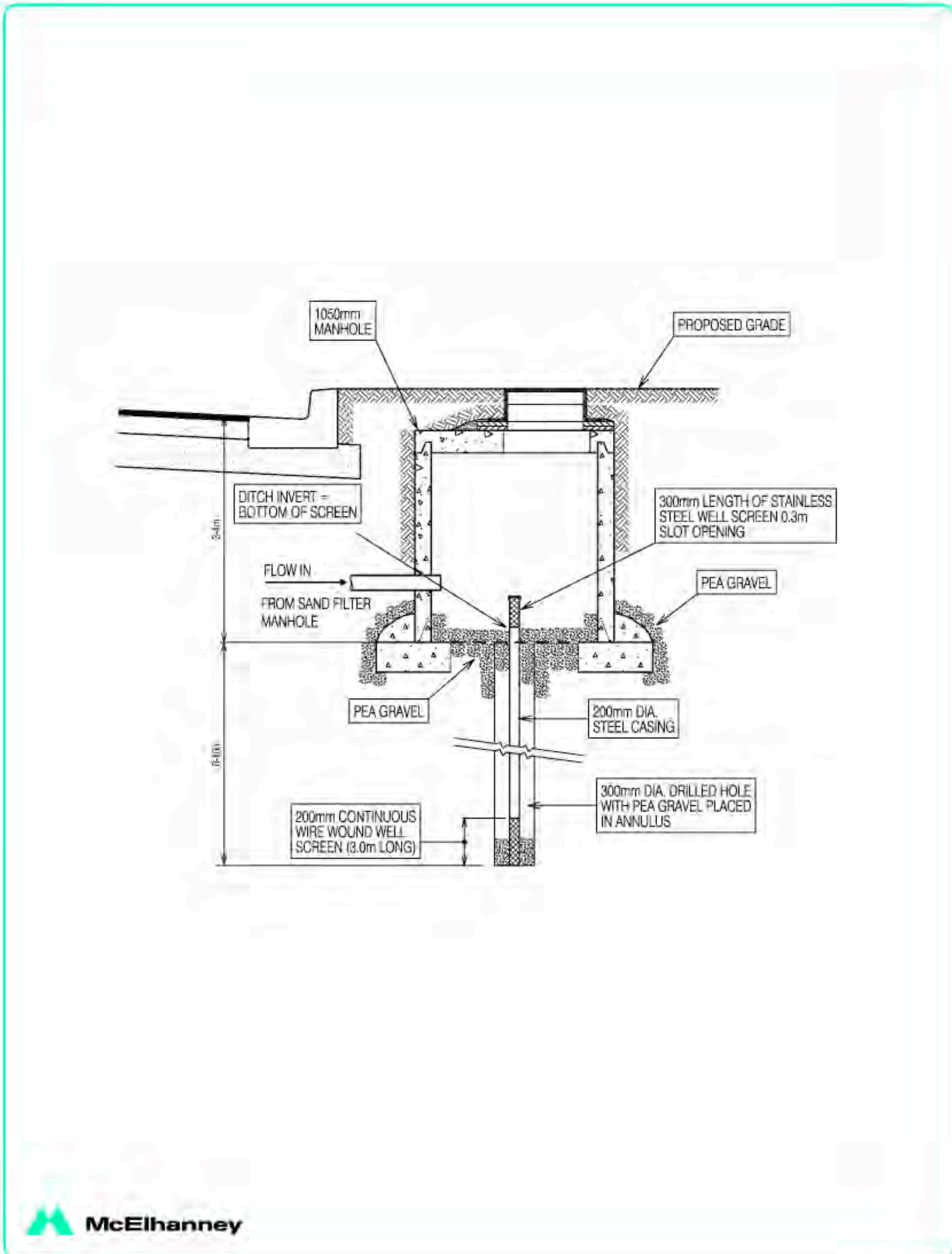
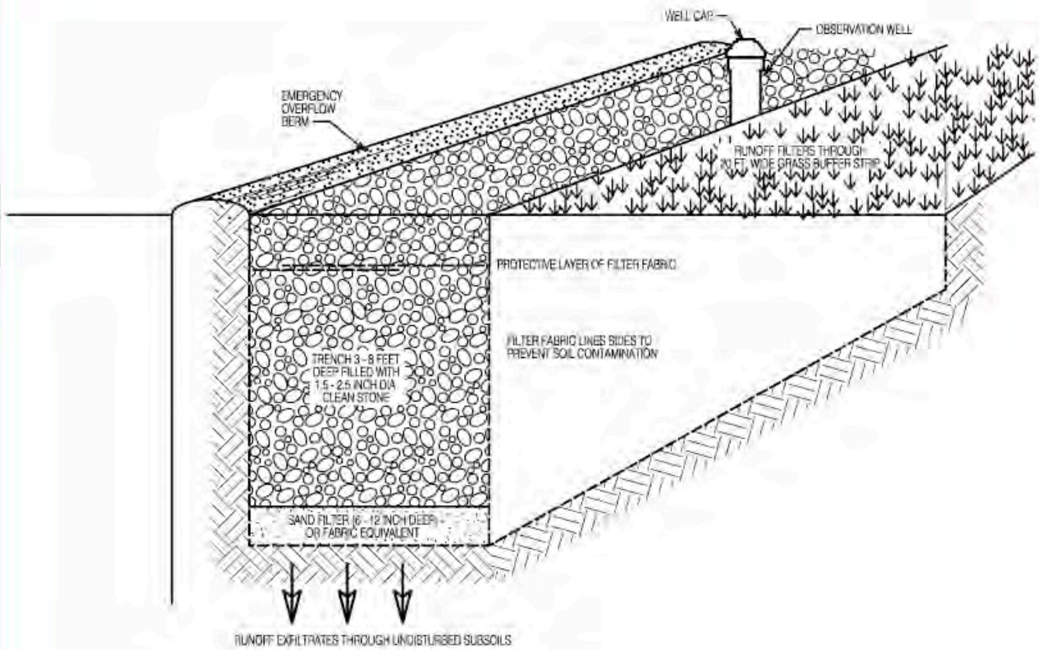


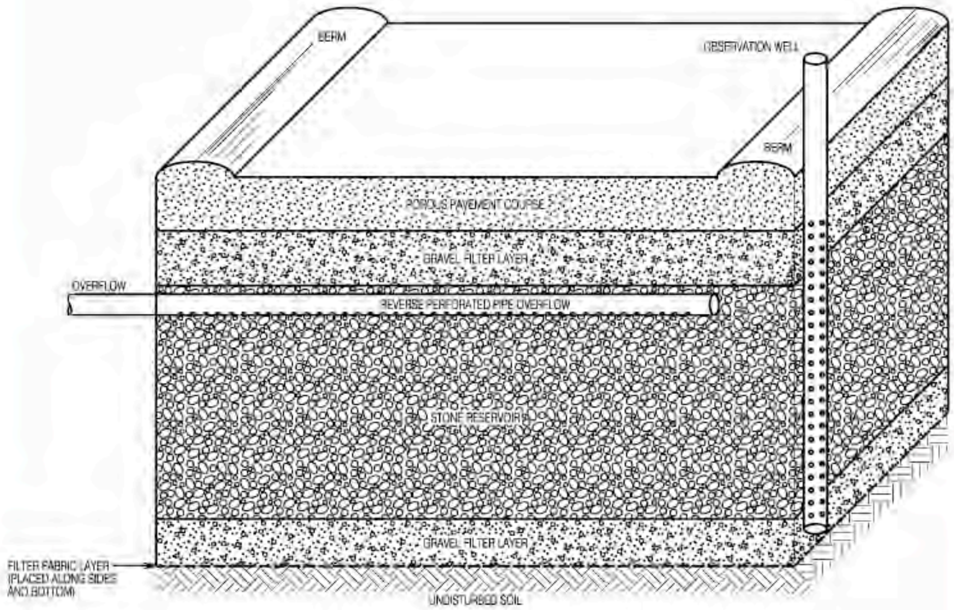
Exhibit 3.18: Trench Infiltration



Source: Schueler et al, 1992

McElhanney

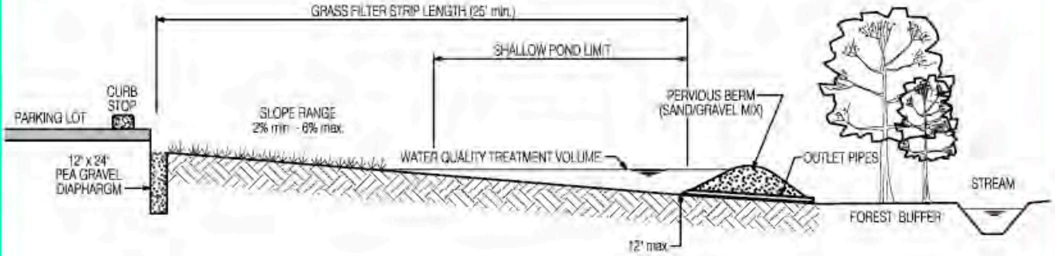
Exhibit 3.19: Porous Pavement



Source: Adapted from Schueler, 1987

McElhanney

Exhibit 3.20: Grass Filter System



Source: Claytor and Schueler, 1996

McElhanney

3.14 NON-POINT SOURCE (NPS) WASTE DISCHARGE CONTROL PLAN

3.14.1 Water Quality Management

In the past it had often been assumed that stormwater is uncontaminated, and therefore discharged to the nearest watercourse without further concern. In recent years, however, it has been recognized that direct discharge of stormwater can have detrimental effects, on the receiving water, caused by the quality of the runoff, as well as the rate of discharge.

The potential for significant input of pollutants from urban runoff to the receiving water is now generally recognized. The runoff becomes contaminated through contact with street litter, eroded swales, de-icing chemicals, animal droppings, traffic residues, fertilizers, biocides, atmospheric dust fall and other substances. Major pollutants of street runoff have been found to be in the form of suspended settleable solids along with organic matter, nutrients, coliform bacteria, heavy metals, and pesticides.

Regulatory agencies have recognized the importance of water quality British Columbia. As a part of an ongoing awareness of the importance of the environment, the regulatory and approving agencies are taking steps that will result in the safeguarding of natural areas (the riparian zones) plus the quality of the flows in the watercourses.

Developments within British Columbia are encouraged to meet the criteria for water quality discharge. The establishment of water quality objectives in other jurisdictions was undertaken in a manner that dictates the use of a number of possible Urban Stormwater Best Management Practices (BMP’s).

In anticipation of provincial regulations Jumbo Glacier Resort proposes the use of commonly accepted practices that can be found in a number of jurisdictions across North America. The practices will include a series of BMP’s being distinguished or categorized as follows:

- Source control BMP’s involving street sweeping, catchbasin cleaning and animal litter removal;
- Lot-level BMP’s involving reduced lot grading, use of soak-away pits for roof leader and weeping tile discharge;
- Conveyance system BMP’s using pervious pipe and catchbasin systems plus grassed swales; and
- End-of-pipe BMP’s using pond and wetland systems, infiltration and filtration systems plus oil/grit separators.

It is important to note that conveyance system BMP’s include grassed swales and the ‘End of Pipe’ systems include stormwater ponds and wetlands.

A review of the guidelines and practices recommended by other regulatory agencies and jurisdictions was undertaken. Information from the Department of Fisheries and Oceans (DFO, 1993), Environmental Protection Division of the Province of British Columbia (EPD, 1992), plus further information from the Metropolitan Washington Council of Governments (Schueler, 1987) and (Schueler, 1995) and (MWCOG, 1995) was obtained and reviewed. Generally the importance of reducing the sediment loadings to streams and the protection of the riparian zones along streams was stressed by each document. The techniques and processes involved are usually quite similar with the various documents referring to Schueler and the Metropolitan Washington Council of Governments.

The storm sewers discharging runoff are major contributors of short-term, high-intensity pollutant loadings (acute loadings) to the creeks and rivers, although the upstream reaches of the river may contribute significantly to the pollutant loading in a long-term (chronic) manner.

Both the chronic and the acute pollutant loadings are of concern because of the risk or potential to degrade water quality in the system. To limit the water quality degradation, water quality objectives would become a part of the design criteria for any additional stormwater discharges. It is these concerns that predicate the use of treatment systems to provide improvement in the quality of stormwater runoff.

3.14.2 Options for Improving Water Quality

Methods have been implemented and monitored in a number of other jurisdictions. A review of some of these methodologies was undertaken and reported to the U.S. EPA (Schueler, 1992). Two of the conclusions reached by Schueler include:

- No single BMP option can be applied to all development situations and all BMP options require careful site assessment prior to design; and
- Many of the conventional urban BMP's need to be enhanced to provide more reliable pollutant removal and greater longevity.

The BMP's with demonstrated effectiveness and longevity include wet ponds, extended detention (enhanced dry pond) systems, stormwater wetlands, multiple pond systems, and grassed swales. All of these systems are designed to remove sediment from stormwater runoff.

3.14.2.1 Wet Ponds

Conventional wet ponds have a large permanent pool of water for treating stormwater runoff. These can be seen to be typical of the sedimentation facilities. One very interesting concept involves enhancing the configuration of the wet pond in order to improve the water quality benefits. The enhanced wet pond has two additional features. The first is a sediment forebay to trap incoming coarse solids, plus the separation of the inlet and outlet structure in order to route all the runoff through the pond for treatment.

3.14.2.2 Extended Detention Ponds

Conventional extended detention (ED) ponds are normally dry between storm events. Problems can be anticipated during winter operation when the build-up of ice could be severe and affect the integrity of the system.

Enhanced ED ponds are designed to prevent clogging and resuspension of sediment. They are equipped with permanently wet areas at the inlet and outlet to the ponds. The wet areas provide zones for aquatic vegetation that will improve water quality by filtration and the uptake of nutrients from the runoff. The normally dry areas of the ED pond provide areas for settling of suspended solids, filtering of shallow flows in the grasses and other vegetation. Enhanced ED ponds can be seen as a small wet pond with wide dry overbank areas or as a dry pond with a small permanently wet area. A low flow bypass would be required to route winter base flows into the shallow marsh. The outlet works and level controls would be placed within the embankment in order to prevent ice damage.

3.14.2.3 Stormwater Wetlands

Conventional stormwater wetlands are shallow pools that create conditions for the growth of marsh plants. Stormwater wetlands are designed to maximize pollutant removal through nutrient uptake, retention and settling of sediment. Stormwater wetlands are constructed systems and are not typically located within natural wetlands. Stormwater wetlands differ from natural wetlands in that they do not replicate the natural ecological functions. For this reason, the use of natural wetlands for stormwater uses should be approached with a great deal of caution.

3.14.2.4 Multiple Pond System

A multiple pond system (MPS) is a collective term for a cluster of pond designs that incorporate redundant runoff treatment techniques within a single pond or series of ponds. These pond designs employ a combination of two or more of the following: extended detention, permanent pool, shallow wetlands or infiltration. Multiple pond systems are reported to provide incrementally higher and more consistent levels of urban pollutant removal than single treatment systems. Often, one treatment storage component can be used to protect the long-term capacity of another component.

3.14.2.5 Vegetated Swales

The use of vegetated swales for drainage is normally for highway drainage and is recommended wherever the design criteria will allow their inclusion instead of the conventional pipe systems. Conventional grassed swales are earthen conveyance systems in which pollutants are removed from urban stormwater by filtration through grass and infiltration through soil. Enhanced vegetated swales, or biofilters, utilize check dams and wide depressions to increase runoff storage and promote greater settling of pollutants. Well-designed facilities have the capability to withstand larger flood flows without damage or loosing the overall effectiveness in treating stormwater runoff.

The removal efficiency of well-designed, well-maintained conventional swales is projected (Schueler 1992) to be 70% for suspended solids, 30% for total nitrogen and from 50% to 90% for various trace metals. No performance data exists on the effect of check dams in swales; however, the detention and trapping capability that they add can be projected to be beneficial.

The use of naturalized landscaping without pipe drainage systems may be the ultimate form of BMP.

3.14.3 Water Quality Improvement

The establishment of water quality objectives should be undertaken in a pragmatic manner that allows the optimization of system performance for the removal of sediment and pollutants from stormwater runoff. The process of sedimentation can be selected as the method of removing pollutants from stormwater runoff. The optimization of the sedimentation process and the facilities constructed for sediment removal would be undertaken so as to meet a specific, operational criteria.

Settleable solids resulting from erosion may be considered the largest single source of receiving water pollution and should receive the most scrutiny in any attempts to reduce pollutant loadings. A major source of sediment is from land undergoing urbanization. Land under construction can have erosion rates which are from 50 to 500 times the rate of undeveloped farmland, see Table 3.10. In contrast, a stable post-development watershed generated much less sediment due to erosion (Ports, 1975).

Table 3.10: Sediment Yield

Type of Land Use	**Sediment Yield** (tonnes/ha/yr)
Natural Forest	**0.66**
Agricultural	0.11 to 2.2
Urban Construction	1.8 to 73.5
Stable Watershed	0.039 to 0.367
Urban Areas	0.10 to 0.61

Note: The urban areas are specific to older developments tributary to Glenmore Reservoir in Calgary, (MMM 1985).

As can be seen from the sediment yield data, it is critical to implement on-site sediment controls during construction. Every effort must be made to reduce the loading to any sediment control facility as those facilities are typically designed to remove only a percentage of the inflow loading. If the loading to these facilities is increased as a result of construction activities, the result will be an increased sediment load to the creek and river system. The design of the construction sediment management processes must be undertaken as a part of the design and construction process.

The loading of sedimentation facilities will vary greatly depending on the state of the catchment, the development staging and the sediment control practices implemented within the catchment. Due to the methods of design and of describing BMP performance the actual physical and chemical properties of the discharge will be difficult to predict. The design processes target removal of some proportion of the inflows rather than the specific quality of the effluent. As a result it will be difficult for a regulatory agency to place strict measurable criteria upon the quality of the effluent.

A methodology for evaluating possible facility performance was developed by the U.S. EPA (NURP 1983(b)). The basis for the evaluation suggests that performance should be expected to improve as the volume ratio increases. That is, the measure of the sedimentation facility volume (V_b) as compared to the mean rainfall runoff event volume (V_m). As the ratio of V_b/V_m increases, so does the expected efficiency of the sedimentation facility. Future facilities should be planned to have a V_b/V_m ratio exceeding a value of 3.80.

Based upon the data (NURP 1983(a)), a prediction of the performance of such a facility is shown in Table 3.11.

Table 3.11: Predicted Pollutant Removal Rates

Pollutant	**Removal Rate** (%)
Total Suspended Solids	80
Total Phosphorous	43
Total Nitrogen	34
Total Lead	80

The information as reported to the US EPA (Schueler 1992) indicates that the effectiveness of sedimentation facilities can be improved if biological processes are incorporated into the facility design. The ponds would be required to include a shallow submerged aquatic bench to allow emergent vegetation to establish. A transition area from the permanent water level to the dry uplands portion of the facility should have a shallow surface slope to allow the growth of bushes and willows which would be able to withstand periods of inundation while trapping suspended solids on their leaves and stems. The overall impression of such a facility would be that it would resemble a naturally occurring wetland, but it would be designed specifically to trap sediment and remove nutrients in order to achieve the objective of maximizing the quality of the stormwater discharge

3.14.4 Stormwater Quality Facilities

The stormwater storage and water quality improvement includes a combination of dedicated storage/ treatment facilities and vegetated swales. The facilities will be located and designed as part of the detailed design but will provide the required benefits and will be applied on a site-specific basis. In this manner, the use of these facilities will be done in a pragmatic manner that allows for the different requirements across the development. The proposed storage facilities could be described as the Enhanced Extended Detention Ponds (EDP's) as defined in a previous section of this report. For the purposes of this report the EDP's will be considered to be of the enhanced variety.

3.14.4.1 Enhanced Extended Detention Ponds

Enhanced Extended Detention Ponds are constructed facilities that may be used primarily to improve water quality, and to reduce downstream discharge capacity requirements. They reduce the downstream flow rates by storing water temporarily. Features of the Enhanced Extended Detention Ponds include shallow pools that create growing conditions suitable for emergent and riparian wetland plants that provide the mechanism for biological uptake of nutrients. The permanently wet portion of the Enhanced Extended Detention Ponds would mimic the natural wetlands found in other parts of the Columbia Valley drainage system.

Landscaping for Enhanced Extended Detention Ponds projects involves more than creating a cattail marsh with grassed side slopes. Several vegetation zones must be considered and designed into the site. While stormwater treatment systems theoretically can be designed with only consideration of pond - marsh zones, facilities that are to be integrated into communities require greater planning of the permanently wet areas and surrounding buffer zones. From an engineer's viewpoint, the zones present alternatives for enhancing water quality particularly for stormwater applications. From a designer's point of view the zones can serve as the landscape architect's palette for creation of an aesthetic and multiple use site.

Plant selection can minimize long-term maintenance costs. Plants are typically selected based on native species observed to inhabit analogous zones (in terms of aspect, soils and hydrology) in natural local sites.

3.14.4.2 Vegetated Swales

The use of vegetated swales for drainage is normally for highway drainage and is recommended wherever the design criteria will allow their inclusion instead of conventional pipe systems. Conventional grassed swales are earthen conveyance systems in which pollutants are removed from urban stormwater by filtration through grass and infiltration through soil. Enhanced vegetated swales, or biofilters, utilize check dams and wide depressions to increase runoff storage and promote greater settling of pollutants. Well-designed facilities have the capability to withstand larger flood flows without damage or loosing the overall effectiveness in treating stormwater runoff.

The removal efficiency of well-designed, well maintained conventional swales is projected (Schueler 1992) to be 70% for suspended solids, 30% for total nitrogen and from 50% to 90% for various trace metals. No performance data exists on the effect of check dams in swales; however, the detention and trapping capability that they add can be projected to be beneficial.

Grassed swales have also been reported (Schueler 1992) to be effective in the improvement of runoff water quality. A comparison of the reported performance characteristics of grassed swales and of wetlands in removing pollutants found in stormwater runoff is shown in Table 3.12.

Table 3.12: BMP Performance Comparison

Reported Pollutant	*Grassed Swales (Schueler, 1992)*	*Wetlands (Schueler, 1992)*
TSS	***70%***	***50% to 90%***
Total Nitrogen	***30%***	***40% to 80%***
Trace Metals	***50% to 90%***	***30% to 90%***

As can be seen, the anticipated performance of grassed or vegetated swales can be comparable to wetlands. The use of well-designed grassed swales can be comparable to that of wetlands.

3.14.5 Access Road and Transmission Line NPS Measures

During construction of the access road, a combination of sediment/erosion control measures will be implemented. Silt fencing is expected to be utilized in conjunction with drainage ditches which will use straw bails and/or rock berms every 50 metres in order to trap sediments and slow water velocity. Construction precautions for sediment control are discussed in Section 3.5, above.

During operation and maintenance of the access road, existing natural drainage channels will be crossed using conduits of appropriate size and configuration for the flows. Overland drainage will be intercepted by roadside bio-filtration ditches or vegetated swales and directed to natural drainage channels or allowed to continue down slope through cross culverts. Cross culverts will be provided as required or every 400 metres, whichever is less. On steep slopes, cross culvert spacing may be reduced to 200 metres.

The transmission line will consist of single poles spaced to carry three conductors, and possibly a telephone line, along the road side. During construction, precautions (discussed above) will be taken to prevent sediments from entering the natural drainage system. It is not expected that its construction and maintenance will be capable of causing significant environmental impacts or NPS discharges.

Drawings outlining the access road drainage systems have been included in Schedule A: Map Volume (see drawings RD1 to RD5).

3.14.6 Conclusions

An appropriate combination of the foregoing BMPs will be implemented for Jumbo Glacier Resort. The proposed infrastructure will reduce the potential for significant adverse impacts from non-point source discharges through implementation of stormwater BMP's that meet the current guidelines and regulations of the Province of British Columbia. It is economically and technically feasible to construct the proposed facilities.

3.15 TERMS OF REFERENCE FOR ENVIRONMENTAL MONITORING

3.15.1 Responsibilities of the Environmental Monitor

The environmental management plan includes provision for environmental monitoring during construction. Environmental monitoring also will take place over the long term during operation. This section provides draft terms of reference for the Environmental Monitor.

The objectives of the environmental monitoring program are to:

- ensure proper development and implementation of the environmental management plan and other mitigation measures;
- assess the performance of environmental controls and mitigation measures;
- ensure that the contractor corrects any mitigation measures that are not functioning acceptably; and
- ensure that water quality, fish and wildlife in the Jumbo Glacier Resort area are protected throughout the construction program.

The Environmental Monitor will be an independent third party who will have the authority to stop construction activities temporarily if unacceptable environmental events occur or appear likely to occur. The Environmental Monitor will be on site full time when stream crossing work is done. He/she will make periodic inspections during other construction activities to ensure that the construction contractor is following all aspects of the Environmental Management Plan. The Environmental Monitor will report immediately to the appropriate agencies any significant environmental events or construction deviations. He/she also will make regular (monthly) reports on progress with construction, any other (minor) environmental events or impacts that occurred and actions taken to address these events or impacts.

The Environmental Monitor's specific responsibilities will include the following:

- meeting periodically with the contract project manager to discuss work requirements, compliance issues, and other environmental matters;
- conducting inspections of all sediment/silt control works;
- inspecting other aspects of the work area and equipment for general housekeeping, dust control and compliance with the spill prevention plan;
- monitoring all instream works;
- conducting fish salvages, as necessary; and
- monitoring receiving water quality during activities that could cause increased total suspended solids (TSS) or turbidity in Jumbo Creek or other watercourses.

The following sections provide a more detailed description of the responsibilities and tasks of the Environmental Monitor.

3.15.2 Meeting and Communication

The Environmental Monitor will meet with the contractor for the site to establish appropriate lines of communication. The monitor will also meet with subcontractors, other field staff, environmental agency representatives, key stakeholders and other engineering staff associated with the project where required.

The monitor will be available on call by a designated superintendent of the contractor and by other persons on site.

3.15.3 Monitoring Prior to and During Site Preparation

The monitor will be responsible for the following activities before and during site preparation:

- marking environmentally sensitive areas and identifying these areas to the construction foreman and/or crew;
- reviewing vehicle access points to the site and the sediment control structures at these points prior to start of clearing;
- ensuring that the site designated for clearing is clearly marked and that any environmentally sensitive features are not enclosed within this area; and
- reviewing the sediment control structures proposed during site construction.

3.15.4 Drainage and Sediment Control

The Environmental Monitor will review the sedimentation control system (SCS) proposed for the site with the contractor before construction activities. It is understood that the contractor will be responsible for the day-to-day maintenance of the SCS and ensuring that it is working adequately to control all discharges from the site.

The Environmental Monitor will inspect the SCS weekly to:

- make recommendations to the contractor on improving the SCS, if required;
- review placement of sand, gravel and materials specified to control erosion in exposed areas;
- require that works be stopped in the event of malfunction of the SCS;
- ensure that runoff is diverted from cleared areas by use of swales, water bars or low

berms and that runoff is routed to the appropriate sedimentation control structures;

- ensure that runoff does not reach streams or any storm drains that have been connected to receiving waters;
- review stockpiling methods of excavated materials to ensure that they are placed in appropriate locations away from watercourses and stored properly (e.g., covered with tarps); and
- recommend mitigation measures and ensure expeditious implementation if activities are found to have the potential for environmental impact.

3.15.5 Stream Crossings

The Environmental Monitor will be onsite during all instream construction activities to ensure that operators and crew comply with the Environmental Management Plan and all applicable regulations. The Environmental Monitor will:

- arrange for and/or participate in fish salvage operations, as required;
- measure turbidity upstream and downstream of the work site periodically (at least four times per day or as deemed necessary depending upon the types of instream activities);
- measure pH upstream and downstream of the work site periodically during any concrete works; and
- collect total suspended solids samples from sedimentation ponds and upstream and downstream locations on receiving waters during periods of runoff and major storm events.

3.15.6 Control of Deleterious Substances on the Site

The Environmental Monitor will review housekeeping practices on site (e.g., daily cleanup, use of disposal bins) and ensure proper use, storage and disposal of deleterious substances and associated containers. The monitor will need to be aware of all such substances used on the site. The monitor will review the contractors spill contingency plans for the site and will ensure that an inventory of all hazardous materials is maintained. The monitor will respond to and review any spillage of fuels, lubricants, hydraulic oils or other hazardous substances to determine if additional remedial measures are required and if necessary, implemented expeditiously.

3.15.7 Air Quality Management

<u>Fugitive Dust Control</u>

The Environmental Monitor will review the fugitive dust control plan with the contractor to ensure that proper dust control techniques are used and that the plan is implemented during periods when dust problems are most likely to occur. During his/her regular inspections, the monitor will ensure that the dust control plan is implemented and functioning adequately.

<u>Smoke Control</u>

The Environmental Monitor will ensure that the Burn Plan is properly implemented. The Burn Plan prepared for Jumbo Glacier Resort will include:

- location, duration and inclusive dates for the planned burn;
- location of all sensitive features that may be impacted by smoke;
- weather forecasts and how they will be used to prevent smoke impacts;

- how weather changes will be monitored and what will be done to reduce or mitigate smoke impacts if unfavourable weather should occur after ignition;
- coordination with air quality authorities;
- how the public will be informed prior to, during and after burning; and
- what will be done to enhance active fire phase and reduce smouldering phase.

3.15.8 Management Plans for Vegetation and Wildlife

The Environmental Monitor will review the management plans for vegetation and wildlife with the contractor prior to site preparation. The environmental monitor will inspect the construction site to ensure that:

- vegetation to be protected is clearly marked using appropriate fencing or tape;
- fencing is placed at an adequate distance from vegetation to be protected;
- recommendations for the bird and wildlife management made in the environmental assessment report and supplementary reports are adopted; and
- construction stops if unacceptable impacts to vegetation or wildlife are occurring or appear likely.

3.15.9 Waste Management

The Environmental Monitor will ensure that adequate, bear-proof garbage disposal facilities are on site. The Monitor will observe general housekeeping practices and ensure that all food and other odiferous waste is properly disposed in in bear proff containers and removed from the site regularly.

3.15.10 Fire Prevention

The Environmental Monitor will review the Fire Prevention Plan with the contractor and ensure that the plan is implemented adequately. The Environmental Monitor will be onsite during all phases of burning of woody debris, slash, etc. If measures to prevent accidental fire or fire suppression equipment are inadequate, the Environmental Monitor will identify these deficiencies and provide recommendations to upgrade fire prevention measures/equipment.

3.15.11 Frequency of Site Inspection

The Environmental Monitor will visit the site on a pre-established schedule during the lifespan of the project to ensure that all environmental management measures are in place and these measures have demonstrated effective site control. The Environmental Monitor will be onsite during all stream crossing work.

3.15.12 Reporting

The monitor will prepare quarterly monitoring reports and a summary report at the end of the construction phase. Additional reports may be prepared at the conclusion of specific instream works. The reports will outline major construction activities in relation to environmental issues, significant concerns encountered during the project and mitigation measures used to deal with those concerns.

3.16 ADDITIONAL MONITORING PLANS

3.16.1 Water Quality Monitoring

Additional baseline water quality monitoring will be conducted. The monitoring will be completed and the results submitted to WLAP before any site development/construction activity is undertaken. The additional baseline monitoring will include the following:

- additional sampling in Jumbo Creek to characterize sediment production during spring freshet (April 1 to June 30); and
- additional sampling in Jumbo Creek to confirm the low level of mineralisation in the basin, as suggested by the water chemistry data.

The sampling during freshet will be conducted at two sites on Jumbo Creek: one within the CRA and one immediately downstream of the CRA. These sites were sampled during the 1992-93 baseline monitoring program.

Sampling to confirm the low level of mineralization will entail collecting bottom sediments from depositional areas. The two sampling sites will located as close to the water column sampling sites as possible. The sediment fraction that passes through a 150-mm sieve will be tested for total metals.

3.16.2 Wildlife Monitoring

3.16.2.1 Field Surveys

Wildlife and vegetation (habitat) inventory and documentation studies will be conducted during all phases of construction and during the operational phase of the resort. Field studies will be conducted on a regular basis during each season, with a special emphasis being placed on locating the following sites (if present): ungulate mineral licks; Grizzly and Black Bear dens; large carnivore den sites (e.g., Wolverine); and raptor nests. Data will be compared to data collected during the previous years.

3.16.2.2 Management Approach

To evaluate the success of the mitigation/compensation measures it is recommended that an adaptive management approach through an effective monitoring program be implemented after project certification. The monitoring program should have feedback mechanisms that will allow the results of the monitoring to influence the implementation of any further mitigation measures. Adaptive management requires that identified problems are addressed, particularly when actual or potential conflicts persist in particular areas and/or times, including the issue of people moving from the resort directly out of the valley into adjacent drainages. In addition, it is recognized that there may be some residual impact on habitat effectiveness and at least a slightly increased mortality risk to ungulates from the presence of the resort that cannot be completely mitigated. These residual impacts may need to be compensated by habitat enhancement or restrictions of human activities outside of the drainage.

Monitoring involves regular data gathering on ungulate occurrence, significant ungulate-human conflicts (esp. during rutting), human recreational uses in the area, and other factors of interest to ungulate security that may be identified. Due to the research nature of some of the proposed mitigation measures and their relevance to conservation and management, it is recommended that both government and the proponent share the responsibility and cost of on-going monitoring.

The monitoring should be undertaken before construction of the project begins, during initial construction of the project (i.e. prior to commercial-scale resort operations), and during commercial-scale operations.

Since these monitoring activities include collecting information on species conservation and management, and are not directly related to the impacts of the project, it is recommended that the Ministry of Sustainable Resource Management (MSRM) take responsibility for this component of the monitoring program. If the proponent undertakes this component, it should be considered as partial/complete compensation for some of the project impacts (with the caveat that mitigation is strongly preferred over compensation).

3.16.2.3 Performance Indicators

Methods to achieve the management plan outlined in this Master Plan will be implemented, and evaluated each year to identify their effectiveness and that of all management implementations relating to the human activities in and around the resort facilities. This will involve the monitoring of several criteria to evaluate the performance and effectiveness of the management plan. The following criteria have been identified as important indicators of performance in the management plan surrounding the proposed resort development activities, and each will be assessed annually qualitatively and quantitatively for implementation effectiveness:

- Number of property damage incidents due to wildlife;
- Number of threat encounters;
- Number of no contact charge encounters (base and back country);
- Number of annual wildlife relocations/translocations (by species) at the resort assessed as necessary by a conservation officer;
- Number of animals destroyed (by species) in and around the Jumbo Creek Drainage;
- Total known mortality (by species) in and out of the Jumbo Creek watershed. This should be separated into human and natural causes;
- Total number of observations (by species) reported in the Jumbo Creek Drainage;
- Total annual resort visitations;
- Total human injuries, deaths caused by ungulates (e.g., Moose and Elk) in and out of the Jumbo Creek drainage versus outside; and
- The education program should be reviewed and analysed annually before the start of a new season comparing records of data.

All identified characteristics should be divided into front and backcountry occurrences for annual analysis of the program success. Annual analysis, because of observer bias, will be based on multi year trends to evaluate ungulate/human conflicts. The program is to be implemented immediately upon phase construction and by all staff associated with the final development. Roles and duties may be formulated at that time.

Finally, if the management program objectives are not being met, at an acceptable level according to the Wildlife Management committee, contingency measures will have to be implemented by the provincial government including but not limited to the following:

- Increased enforcement (patrol frequency);
- Area design and delivery of the bear/human conflict awareness and education programs;
- Additional spot closures to human access;
- Hunter harvest restrictions and closures as recommended by affiliated agencies in the Purcell Mountain Range or by MSRM; and
- Perform on-going monitoring and research in the Jumbo Creek Drainage involving the monitoring of ungulate security habitats and how effective this habitat is relative to the impacts of the proposed development and human presence in the Jumbo and surrounding valleys.

3.17 ENVIRONMENTAL MANAGEMENT PLAN REFERENCES

Apps, C. 2003. A Cartographic Model-Based Cumulative Effects Assessment of the Proposed Jumbo Glacier Resort Development on Grizzly Bears in the Central Purcell Mountains, British Columbia. Prepared for ENKON Environmental Limited and Pheidias Project Management by Aspen Wildlife Research Inc., Calgary Alberta.

Austin, M., 2000. An Analysis of the Potential Impacts of the Proposed Cayoosh/Melvin Creek Resort on the Stein-Nahatlatch Grizzly Bear Population and Opportunities for Mitigation/Compensation.

Brannon R.D. 1984. Influence of Roads and Developments on Grizzly Bears in Yellowstone National Park. Interagency Grizzly Bear Study Forestry Sciences Lab Montana State University, Bozeman, Montana. 59717

Bromley, M. 1985. Safety in Bear Country: a Reference Manual. NWT Department of Renewable Resources. Yellowknife.

Butler, D., N. Holmes-Smith, B. Harley, B. McCorquodale, C. Jenkins, G. Smith and D. Williamson. 2003. Stewardship of Mountain Ecosystems: Best Practices for Sustainability. Prepared for the BC Helicopter and Snowcat Skiing Operators Association. Available online at http://www.cotabc.com/documents/ bchssoa_best_practices_report_may2003.pdf.

Canadian Wildlife Service (CWS). 1971. Background for Managing Grizzly Bears in the National Parks of Canada. Canadian Parks Service.

Clarkson, P.L. 1986. Safety in Bear Country Workshop Outlines. NWT Deptartment of Renewable Resources. Yellowknife.

Craighead, J.J. 1980. A Proposed Delineation of Critical Grizzly Bear Habitat in the Yellowstone Region. Montana Co-operative Wildlife Research Unit, Missoula.

Egbert, A.L. and A.W. Stokes. 1976. The Social Behaviour of Brown Bears on an Alaskan Salmon Stream. Int. Conf. Bear Res. And Manage 3.

Gibeau M.L. and S. Herrero. 1998. Roads, Rails and Grizzly Bears in the Bow River Valley

Alberta.

Gibeau, M. L. 2000. A Conservation Biology Approach To Management of Grizzly Bears in the Banff National Park, Alberta. Resource and the Environment Program, University of Calgary 2000.

Gibeau, M., and K. Heuer. 1996. Effects of Transportation Corridors on Large Carnivores in the Bow River Valley, Alberta.

Gunther, K.A. 1990. Visitor Impact on Grizzly Bear Activity in Pelican Valley, Yellowstone National park. Inter. Conf. Bear Res. And Manage. 8.

Gunther, K.A. 1994. Bear Management in Yellowstone National Park, 1960-1993.

Herrero, S. 1970. Man and Grizzly Bear. Bioscience 20.

Herrero, S. 1976. Conflicts between Man and Grizzly Bears in the National Parks of North America. Environmental Design Faculty and Department of Biology. University of Calgary, Calgary, AB, Canada.

Herrero, S. 1978. A Comparison of Some Features of the Evolution, Ecology and Behaviour of Black and Grizzly/Brown Bears. Carnivore 1.

Herrero, S. 1985. Bear Attacks-Their Causes and Avoidance.

Horejsi, B.L. 2000. The Purcell Mountains Grizzly Bear: Cumulative Effects and the Purposed Jumbo Glacier Development. Western Wildlife Environments Consulting Ltd. Calgary, Alberta.

Hornocker, M.G. 1962. Populations Characteristics and Social and Reproductive Behaviour of the Grizzly Bear in Yellowstone National Park. M.S. Thesis Montana State University, Missoula.

Knight, R.R., B.M. Blanchard and L.L. Eberhardt. 1988. Mortality Patterns and Population Sinks for Yellowstone Grizzly Bears. Wildl. Soc. Bull. 16.

Mattson, D.J. 1993. Background and Proposed Standards for Managing Grizzly Bear Habitat Security in the Yellowstone Ecosystem. Co-operative Park Studies Unit Report.

Mattson, D.J., B.M. Blanchard and R.R. Knight. 1992. Yellowstone Grizzly Bear Mortality, Human Habituation and Whitebark Pine Seed Crops. Jour. Wildl. Manage. 56.

McElhanney Consulting Services Ltd. 1995. Preliminary Traffic Estimates Mineral King Mine to Resort Village.

McPhee, M., P. Ward, J. Kirkby, L. Wolfe, N. Page, K. Dunster, N.K. Dawe and I. Nykwist. 2000. Sensitive Ecosystems Inventory: East Vancouver Island and Gulf Islands, 1993 - 1997. Volume 2: Conservation Manual. Technical Report Series No. 345, Canadian Wildlife Service, Pacific and Yukon Region, British Columbia.

Ministry of Environment, Lands and Parks (MELP), 1996. Human-Bear Conflict in British Columbia Draft Discussion Paper.

Ministry of Environment, Lands and Parks (MELP). 1986. Untitled. Technical Report 22. Ministry of Environment.

Ministry of Water, Land and Air Protection (WLAP). 2001. Best Management Practices to Protect Water Quality – Urban Runoff. Online at http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendium/Municipal/Urban_Runoff/Urban_Runoff.htm.

National Wildlife Federation, 1987. Grizzly Bear Compendium.

Parks Canada, Mountain District 1998. Bear/ Human Conflict Management Plan (Banff National Park).

Robinson, D. 1997. Revelstoke Bear Awareness Program. 1997 Final Report. Columbia Basin Fish & Wildlife Compensation Program & Ministry of Environment, Lands and Parks.

Robinson, D. 1998. Revelstoke Bear Awareness Program 1998 Final Report. Columbia Basin Fish & Wildlife Compensation Program and Ministry of Environment, Lands, and Parks.

Russell, R.H., J.W. Nolan, N.G. Woody & G.H. Anderson. 1979. A Study of the Grizzly Bear in Jasper National Park. 1975-1978. Can. Wildl. Ser. Edmonton.

Schullery, P. 1980. The Bears of Yellowstone . Yellowstone National Park, Wyoming

Sibbernsen, C., H. George, S. Layton, P. Flood and C. Condrat. 2001. Ski Area BMPs (Best Management Practices): Guidelines for Planning, Erosion Control and Reclamation. Prepared by the USDA Forest Service, Wasatch-Cache National Forest in cooperation with Sun Valley Corporation and Snowbasin Ski Area.

Stephens, K.A., P. Graham and D. Reid. 2002. Stormwater Planning: A Guidebook for British Columbia. Ministry of Water, Land and Air Protection, Environment Canada, and Regional District of Nanaimo

Strom, K. M. Proctor and J. Boulanger. 1999. Grizzly Bear Population Survey in the Central Purcell Mountains, British Columbia. Prepared for British Columbia Environmental Assessment Office. Victoria, B.C.

United States Environmental Protection Agency (USEPA). 2003. Construction Site Storm Water Runoff Control. Available online at http://cfpub.epa.gov/npdes/stormwater/menuofbmps/con_site.cfm.

Yellowstone National Park. 1996. Annual Bear Management Plan.

4. SKI AREA AND RESORT BASE PLAN

4.1 CONCEPTUAL OVERVIEW

4.1.1 Objectives

The purpose of this section of the Master Plan is:

- To generate the preliminary design for the ultimate ski area and mountain resort in North America;
- To outline a development plan and vision that will facilitate a prompt project start including the realization of the only North American location for summer ski training in anticipation of the Vancouver 2010 Olympic Games;
- To confirm the sustainability and viability of the development; and
- To update the 1995 and 2003 Master Plans and to supplement the *Project Report*.

The studies carried out over the last fifteen years and summarized in this Master Plan have determined the optimum model of development that would create an economically viable and environmentally sustainable recreational resort dedicated to a unique mountain experience in North America and this report sets out below the ultimate development potential and targets for the area as required under the *Commercial Alpine Ski Policy* (CASP).

4.1.2 The Concept

The project proposal is a result of an undertaking to find a location with the best terrain, climate, access, and environmental suitability for year-round skiing and sightseeing in order to compete or surpass the best of the European Alps and of the world. This approach is unique in North America, where the majority of existing resorts began as spin-offs or afterthoughts – many originated as company-run lifts that were built on the outskirts of mining or forestry settlements, typically providing access only the lower portions of mountains in less than ideal locations for skiing.

Jumbo Glacier Resort is focussed on the mountains and the alpine experience. All the critical components, ranging from the non-contrived layout of the resort core, to the intentionally low Comfortable Carrying Capacity (CCC) of its proposed lift system, to the bed-unit calculations and skier to terrain ratio have been considered with the goal of creating the best alpine experience possible while providing safe and affordable access to the average Canadian and world traveller to high alpine glaciers.

Prior to this proposal, the only way to access high alpine glaciers in North America was via helicopters or serious mountaineering expeditions. **The average Canadian has never had the opportunity to see and experience the spectacular vistas and high-mountain glaciers that cover a large extent of western Canada.**

The project site has a unique ski development potential due to its terrain, both in terms of vertical drop and expanse. Access to several glaciers and a huge skiable terrain of over 10,000 acres (4,050 ha.) is possible. Up to 1,800 metres (5,900 feet) of vertical drop are skiable. This constitutes the largest lift-served vertical drop (entirely above the natural snowline) on the North American continent to date. In terms of skiable terrain, the quality of snow and the continuity of slope, this can be described as one of the most impressive skiable vertical drops, not only in North America, but also in the world. The availability of terrain of this kind manifests a dramatic mountain resort environment for the proposed project. It is, therefore, very likely that Jumbo Glacier Resort will become a unique and well-known international high alpine and glacier sightseeing attraction.

This project is designed to create an enjoyable sightseeing, sporting and learning experience in a mountain glacier setting and a mild climate, with much sunshine and enough powder snow to allow easy skiing on groomed runs on glaciers, high alpine terrain, and among the trees to the valley base. The experience will be complemented by supporting commercial facilities and opportunities for overnight accommodation that will be governed by well conceived and up-to-date conservation guidelines.

The resort is not only expected to be a regional destination, but it is also expected to attract people from further away – from the rest of the continent and from overseas. Because of the possibility to access large, high mountain glaciers with significant vistas, a large vertical drop, and expansive, varied summer skiing terrain, this project will be unique in North America.

The project was characterized as being in "the broad public interest" by the Executive Director and Deputy Minister of the B.C. Environmental Assessment Office in her final recommendations for an Environmental Assessment Certificate (see Appendix 8-B).

4.1.2.1 Glaciers and Summer Skiing

Up to 700 m. (2,200 ft.) vertical of glacier skiing will be available in mid-summer. This is equivalent to the winter vertical of many regional destination ski resorts in North America.

Glaciers are indicative of historical snowfall patterns and high alpine glaciers are a guarantee for snow. In Europe, the focus of skiing has had to move to higher altitudes due to a series of warmer and/or drier winters and also due to more rigorous demands on snow by skiers using high capacity lifts. Glaciers are one answer to guaranteed skiing. Unfortunately, particularly in North America, the more common answer is to use snowmaking devices. The latter consume considerable quantities of energy and resources and have added dramatically to the cost of many ski area operations; in fact, it is the design team's contention that unnatural snow and congestion have distorted the original enjoyment and image of skiing.

In contrast, energy needed to transport skiers to higher altitudes is wisely spent, particularly when it exposes them to the glaciers and its unique aesthetics. Glacier skiing, where it can be obtained, brings skiers into a high alpine oasis where they can re-create their inner peace, which is the true meaning of recreation. Commander Glacier and Glacier Dome are the primary locations for glacier skiing because they offer a variety of slopes appealing to beginner, intermediate and advanced skiers in the summer as well as in winter. Jumbo Glacier provides excellent summer skiing for beginners.

Exhibit 4.1: Summer Skiing on Farnham Glacier (1)

Canadian National Ski Team training on Farnham Glacier in July 2003.

Exhibit 4.2: Summer Skiing on Farnham Glacier (2)

Canadian National Ski Team training on Farnham Glacier in July 2003.

Exhibit 4.3: Farnham Glacier in Winter

Exhibit 4.4: Commander Glacier in Winter (1)

Exhibit 4.5: Commander Glacier in Winter (2)

Exhibit 4.6: Farnham and Commander Glaciers in Summer

Farnham Glacier is on the left hand side of the picture; the larger Commander Glacier is on the right..

Exhibit 4.7: Commander Glacier in Summer

The upper reaches of Commander Glacier in summer

Exhibit 4.8: Jumbo Glacier

Exhibit 4.9: Glacier Dome in Winter

Exhibit 4.10: Glacier Dome in Summer

4.1.2.2 Sightseeing

The Canadian Rockies have attracted large numbers of sightseeing visitors for more than a century and the National Parks in North America have a storied history. However, in contrast with Europe and other locations in the world, easy access for sightseeing to high alpine glaciers has never been provided in North America. As noted above, the average Canadian has never seen the high mountain vistas and glaciers that cover a large extent of western Canada.

Development of the most spectacular sightseeing journeys in the Alps dates back to the turn of the twentieth century when Europe's mountain recreation industry was initially created. Construction of the Jungfrau Bahn in Switzerland for example, began in July 1896, and 14 years later, after a Swiss industrialist spent 14.9 million Swiss Francs of that time, access to the "Top of Europe" at 3,454 m (11,332 ft) was inaugurated. Today, the Jungfrau Bahn is running at capacity without a developed glacier skiing component. The restaurant, view terraces, ice caverns and sled rides on the glacier are immensely popular despite an extravagant CAN$175.00 fare to ride the Jungfrau Bahn, with a four-hour round trip from Interlaken. Also, the famous Gornergrat Bahn railway in Zermatt, Switzerland, is most profitable thanks to summer and winter incomes. Being the highest of the glaciers in the area, and being as impressive in terms of viewpoints and location as its European equivalents, the Jumbo Glacier massif is a primary target for viewing and non-skiing activities.

Economic realities will not justify a mountain railway; nor is it practical to propose a funicular at the Jumbo Glacier Resort. In Europe access to glaciers by funiculars running in tunnels have been constructed during the last two decades, in Austria (Dachstein and Kaprun), in France (Deux Alpes and Tignes) and in Switzerland (Saas Fee and Zermatt), but the relative economic dimension of projects planned for North America is so small that such considerations must be left to a distant future, if it will ever be economically possible.

Today, due to the evolution of aerial tramways, any kind of alpine transportation requirement can also be met by a less costly aerial tramway or gondola. Trams and gondolas also offer a minimal visual impact, especially in high-alpine environments, and are the most suitable solution in the steep terrain characterizing the Purcell Mountains. By careful layout of lifts, it is possible to integrate sightseeing and winter sports. Some examples where sightseeing via aerial tramways have been a strong success are at Grouse Mountain in Vancouver, in Switzerland (Klein Matterhorn), in France (Chamonix-Aiguille du Midi), and in Italy (Courmayeur, Point Helbronner and Vallée Blanche).

Exhibit 4.11: Mountain Railways

The Junfrau Bahn near Grindelwald, Switzerland (left) and the Gornergrat Bahn in Zermatt, Switzerland (right).

Exhibit 4.12: Modern Funiculars

Funiculars provide effective and efficient mountain transportation for both skiers and sightseers throughout the world, but are too expensive for a small resort such as Jumbo Glacier Resort. Clockwise from top left: (1) St. Moritz-Corviglia, Switzerland, (2) Moléson Village, Switzerland, (3) Davos, Switzerland, (4) CairnGorm, Scotland, (5) Jiujiang, China, (6) Zermatt-Sunnegga, Switzerland, (7) Les 2 Alpes, France.

Exhibit 4.13: Aerial Tramways

Aerial tramways provide cost effective, relatively low impact and efficient mountain transportation for skiers and tourists throughout the world. Clockwise from top left: (1) Grouse Mountain, Canada, (2) Samnaun-Alp Trida, Switzerland, (3) Katoomba, Australia, (4) Palm Springs, U.S.A., (5) Courchevel, France, (6) St. Moritz, Switzerland.

4.1.2.3 Legendary Winter Skiing

Skiing continues to grow significantly in mountainous regions – especially in accessible locations where better than average quantity and quality of snow can found, and where significant amounts of terrain can be skied.

In addition to offering the largest all-natural snow vertical drop in North America, Jumbo Glacier Resort will have large amounts of intermediate and beginner ski terrain necessary to handle teaching and inclement weather skiing. The lower elevation intermediate terrain in combination with the high alpine is essential for fun skiing on natural snow as well as for a dependable ski area operation for beginners and intermediate skiers during inclement weather.

In addition, the resort will offer some remarkable ski runs exceeding the norm in both variety and vertical drop. They are likely to become known as the most scenic and memorable descents accessible to downhill skiers in North America.

Glenn Wurtele, former coach of the Canadian Ski Team, one of the most experienced Canadian admirers of the proposed project, wrote an enthusiastic letter (Appendix 4-E) after skiing with Oberto Oberti and Glenn Thompson from Glacier Dome to the valley base on April 30, 1993.

When researching similarities between Europe's great descents, one cannot help but refer to a notable book, *Salute the Skier. The Hundred Best Runs in the Alps* by Walter Pause (New York: Bob Laurie Books 1963). The book was written by an international ski mountaineering authority, describing a state of mountain development most similar to the conditions found today in the Jumbo Glacier area. Amongst the 100 best runs in the Alps at the time, four of them were later developed as downhill ski runs – the Valuga in St. Anton and the Hahnenkamm run in Kitzbuehl, Austria, the Piste Nationale in Crans-Montana, Switzerland and Tondi in Cortina d'Ampezzo, Italy.

Contrasting the area of the Alps with the huge territory of the western Canadian mountain ranges, it is a wonder that some of the thousands of world-class and relatively unknown descents that are currently accessed by helicopter have not been made accessible by mechanical lift.

The largest lift accessible skiable drop in the Alps occurs between Mont Blanc and Chamonix, France, and is 3,300 m (10,827 ft). To achieve this, it is necessary to hike the top 623 vertical metres (2,044 ft) from the Aiguille du Midi to a starting point at 4,400 metres (14,435 ft). Several other skiable drops in Europe exceed 2,440 metres (8,000 ft) and have similar glacier configurations as Jumbo and Commander Glaciers. The vertical drop from the arrival point of the Aiguille du Midi tram at over 3,800 metres to Chamonix at 1,200 metres is over 2,600 metres (8,530 ft).

The ski runs from the top of Jumbo Mountain over Commander Glacier into Farnham Creek compare well with the ski runs to Chamonix because of Jumbo's superior snow conditions, particularly at the lower elevations, as well as the spectacular scenery, the vastness of the runs and skiable vertical drop. At Jumbo Glacier Resort, a spring skiing "ideal hang" (an ideal large open slope with uniform slope and exposure) can also be found below the Glacier Dome crest facing South. Other large-scale topographic features, (i.e., slopes) offer different conditions; for example, the area to the immediate west of the resort base (serviced by Lift 2.5) would be ideal for more advanced mid-winter powder skiing. Depending on crevasse conditions, many of the glacier slopes, such as the upper Commander and the East lobe of Commander, promise to be most popular and the glacier runs on Glacier Dome are known to have good visibility even in bad weather thanks to their protection from cloud cover and their lower elevation relative to Jumbo Mountain, which tends to stop cloud movement.

4.1.2.4 The Resort Base

The resort base will be built at a former sawmill site in the upper Jumbo Creek valley. The site provides access to Glacier Dome and the Jumbo Mountain massif. The location offers excellent sun exposure in a southerly orientation and it is the highest point in the valley that is completely protected from avalanche paths.

The central and guiding concept is to create a resort with two functional nodes at each end, developed in three major defined phases, while eschewing the densely packed, overbuilt look that so often occurs in new developments.

A phased, slow rate of growth, emanating from three different development starting points is planned and will be more in keeping with the historical way in which mountain accommodation has developed and will result in a higher quality of design and development, less construction disruption, and a more human scale. To assist this process, it is intended that all development in the area be under one overall architectural guideline and control system, as detailed in the Design Guidelines.

The gradual growth of the resort will also allow a step-by-step identification of the real needs for on-site staff accommodation and to plan it progressively according to the development of the resort, although both the expected requirements and potential expansion are addressed in this Master Plan. An important component of the resort base will be the Interpretive centre, which will become also an environmental monitoring station for the development. It is planned that First Nations that will be partners in the development will staff both the Interpretive centre and the Environmental Monitoring Station, which will provide a yearly audit of the environmental progress of the resort.

4.2 SKI AREA PLAN

4.2.1 Ski Area Classification

According to the *Commercial Alpine Ski Policy* (CASP)[1] mountain resorts can be classified into six different types:

- Community Ski Areas;
- Urban Ski Areas;
- Regional Ski Areas;
- Regional/Destination Ski Areas; and
- Destination Ski Areas.

A sixth classification, “Other Types of Ski Areas” is also considered. These are described as “Remote, low density ski area development serviced by ski lifts, and snowcats and/or helicopters”. Because of its low-density year round skiing concept, the Jumbo Glacier Resort project falls in between the concept of “Destination Ski Areas” and “Other Types of Ski Areas”.

4.2.2 Controlled Recreation Area (CRA)

The Controlled Recreation Area (CRA) is the area enclosing all the ski runs and the skiable terrain surrounding the mountain resort. It is an important planning definition because it determines the extent of the area to be covered under the Licence that grants the tenure comprising the ski area where skiing by means of mechanical lifts is permitted. In this area the ski area operator has defined responsibilities according to the Master Development Agreement with the Province. It is not an area owned by the developer, the land remains the property of the Crown, that is of the Province, in perpetuity, but it is the area in which the ski area operator has certain rights and obligations with the Province and the public. It is the area of the Licence. The CRA is an area substantially contained in the Study Area, defined in the Interim Agreement between the Province and the proponent, but it is not the same area. The Study Area is the area identified by the proponent in the Expression of Interest and the Formal Proposal originally filed under CASP in 1993 (see the study area map included in Appendix 4-C), in order to study and submit a Master Plan. During the project review and the final planning studies the CRA replaces the Study Area as the area of interest for the project proposal.

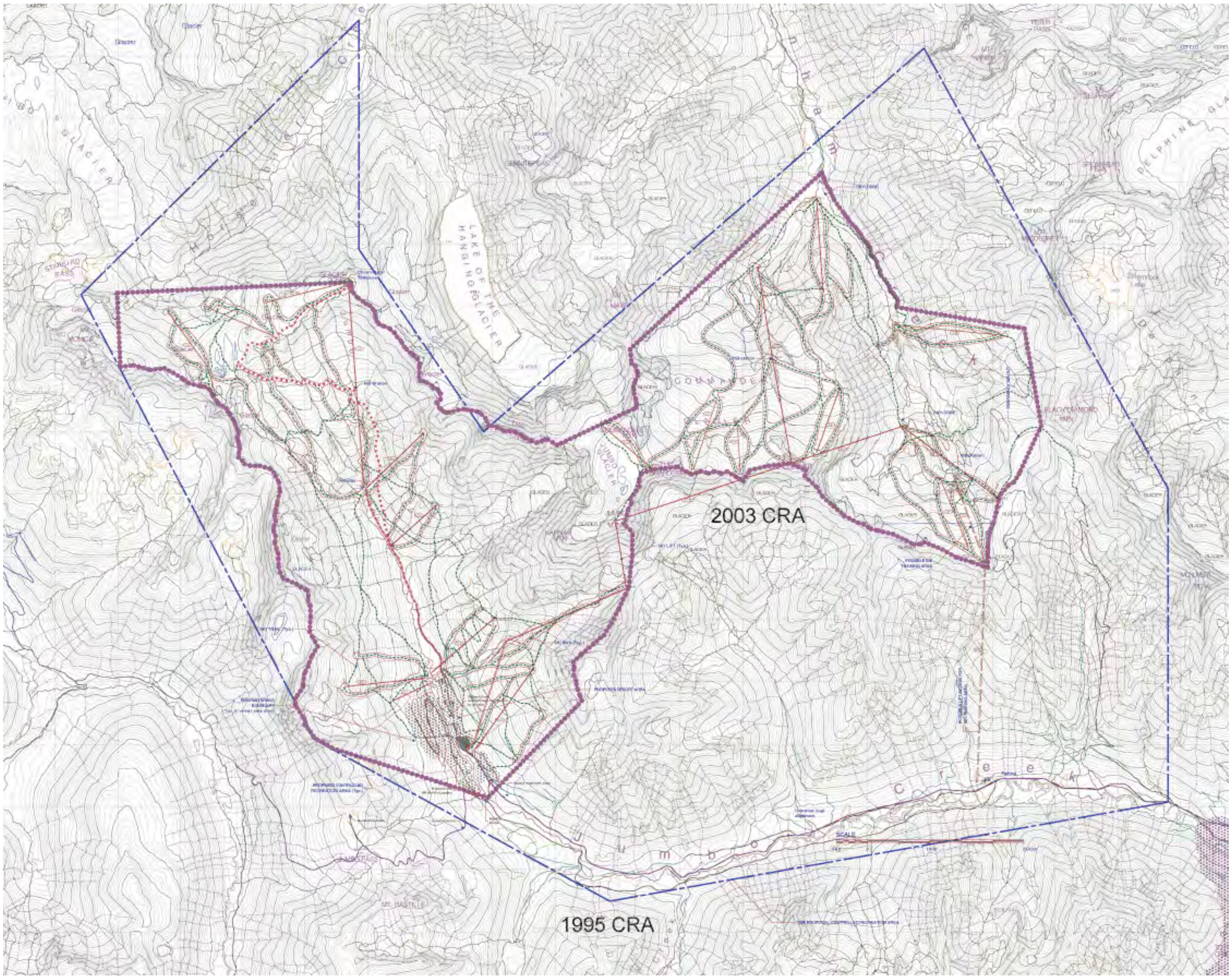
---

[1] see *Guidelines to Alpine Ski Area Development in British Columbia* (1996); available online from: http://lwbc.bc.ca/02land/tenuring/skiing/ Please note that the *Guidelines to Alpine Ski Area Development in British Columbia* are currently being redrafted; a new document, *All Season Resort Guidelines* prepared by Brent Harley and Associates is currently being circulated in draft format.

4.2.2.1 1995 CRA vs. 2003 CRA

Exhibit 4.14 below illustrates the CRA changes between the 1995 Master Plan and the current (2003) Master Plan. The Controlled Recreation Area has been reduced to less than 40% of the earlier Master Plan (from 36,731 acres to 14,643 acres).

Exhibit 4.14: 1995 vs. 2003 CRA



4.2.3 Ski Slope & Lift Planning

4.2.3.1 Ski Trails, Capacity, & Ski Run Classification

A large number and wide range of ski runs are possible on the Glacier Dome, Upper Jumbo Valley, Jumbo Glacier, Commander Glacier and Farnham Glacier areas. As is typical of the higher collection areas of glaciers and high alpine terrain consisting of moraines, gentle slopes generally represent the terrain of the area. Steep terrain, however, can also be readily found. The preponderance of ski runs will be in the easy to intermediate range of difficulty, with an initial planned breakdown of 30% beginner, 50% intermediate and 20% expert, along the lines of the 1995 Master Plan. Extreme skiing will also be possible in several locations.

An analysis of the ski trails and capacity is included in the 1995 Master Plan, which has remained substantially unchanged for the first phase. A reduction in the design lift capacity has rendered a new analysis unnecessary. In terms of terrain, a number of ski runs follow the same route of existing heli-ski runs, the majority of which can be classified as “low intermediate” to “intermediate”. The vastness of the terrain, however, will allow ample choice to the ski area managers and the marketing team regarding the final selection of groomed ski run mix in terms of skier skill levels. The proposed low density of this project fits well with the observations contained in the new CASP *All Season Resort Guidelines* currently being drafted for Land and Water BC. With regards to ski trail capacity, the following excerpt is particularly relevant:[2]

> …it should be noted that the preferred and acceptable skier/rider densities have decreased considerably in recent years (for all skill classes). The advent of shaped skis -- combined with snowboarding’s relatively easy learning curve -- has enabled a larger number of riders to negotiate steeper and more adventuresome slopes sooner and with greater control than ever before. In other words, what was considered “experts-only’ terrain ten years ago is now accessible to a much broader segment of the skiing population. The result: faster speeds, more congestion and a greater potential for collisions.
>
> The issue of what is acceptable, what is expected, and what is desirable, should be given careful consideration. All destination skiers expect a low-density skiing experience. Resorts that wish to cater to a powder skiing experience need to keep the density even lower. Urban skiers may still be willing to put up with higher densities in exchange for the convenience created by ease of access -- but this too is changing fast.

Ecosign Mountain Resort Planners Ltd. completed an additional preliminary ski lift and ski trail plan for the first phase in 2005 (see Appendix 4-F).

4.2.3.2 Lift Selection Considerations & Ski Trails

Some North American ski resorts have utilized techniques such as a pod analysis to

[2] *ASR Draft Guidelines,* (June 26, 2005); page 48.

assist in lift planning. A pod analysis of uniformly skiable terrain is valid to size the potential of most lifts by category of users, but it overlooks a year round use concept of lifts and makes it difficult to justify straight access to the mountaintops of large mountains. Yet the mountaintops typically provide access to some of the best ski pods (although not necessarily in a continuous fashion to the bottom, requiring trail connections) and have multiple functions, particularly in view of the interests of non-skiers and skiers alike in enjoying spectacular views from the mountaintops.

Providing access to a mountaintop via a single lift can open up large skiable areas to a relatively small number of skiers in an economical manner. Low skier density is as prized by skiers as are scenic views. This is the design concept that made Kicking Horse Mountain Resort possible. Where it is feasible to access more than one mountaintop from a resort, a limited number of long lifts can provide access to a huge skiable terrain and a large variety of ski pods for skiers of various ability.

The design team believes that this design philosophy is **the way of the future for the ski industry**, but it is not supported by current CASP guidelines that would tend to maximize skier density for each ski pod. In a sense, if the computer model allowed for “lateral thinking” it would assign a premium for mountaintop access, which currently does not seem to be adequately recognized.

Year round use of the lifts to the top of Glacier Dome and Jumbo Mountain is important for this project. Consequently, planning of the alignment and selection of the project’s major lifts has not been limited by a ski pod analysis but has been made according to major planning considerations, including the provision of mountaintop access, summer use, sightseeing and the opportunity of skiing entire mountain faces with a small number of lifts.

The design philosophy of many of the resorts that were designed or upgraded in the late 1980s and 1990s was to reduce the number of lifts by increasing the capacity and by reducing the ride time. This can create crowding of ski runs that were originally designed for lower-capacity lifts. The conventional design assumption has been that time on the ski hill would be spent 1/3 waiting in line, 1/3 riding the lift and 1/3 skiing down. It is now common that there is practically no waiting in line, and the ride time is usually less than half the time previously assumed for conventional skier distribution.

As a guiding principle to help achieve low-density skiing in the comfort of unimpeded space, trails should be developed to accommodate 100 skiers/hour per 10 metres of trail width as a minimum. The accumulated trail width should be larger when slopes exceed 45% slope and it should not be less than 5 metres in width per 100 skiers per hour, except for glide paths. Glide paths (or cat tracks) may traverse sections that are too steep for fall line skiing and can transfer lower ability skiers from upper benches to the base.

Current planning calls for skiers to follow trails and glide paths to transfer to and from the Glacier Dome area to the resort and vice versa, utilizing one or both chair lifts in Jumbo Valley and ski the diagonal runs from the end of the valley to the resort base to cover the balance of the vertical drop (a shuttle bus is expected to provide additional service, particularly for sightseeing visitors)[3].

[3] Some of the longer glide paths in the upper Jumbo Valley are a compromise due to the realities of the terrain. In some instances they cross ski runs. While not ideal, this looks to be unavoidable at the current level of planning.

The most important consideration for glide paths is that the minimum gradient per 50 metres section is maintained at 8-10% slope. The lower gradient of about 8% would be used in areas with lower ability use and upper grades of about 10% should be the norm for inclusion of expedient snowboard movement. A width of 6 metres is desirable to guarantee unimpeded traffic flow. The glide paths can deliver up to 1,000 persons per hour when this specification is met, but at the proposed resort a low-density skier specification shall always be followed.

Trail planning is done in conjunction with lift layout, and in this project it will be carried out to provide for low density skiing in keeping with the overall project concept. Low density and relaxed skiing will also be an important consideration in future marketing for people looking for more low-key holidays and the relaxation of locations such as Jumbo Mountain.

Ecosign Mountain Resort Planners Ltd. completed an additional preliminary ski lift and ski trail plan for the first phase in 2005 (see Appendix 4-F).

4.2.3.3 Slope Analysis and Aspects

Extensive planning took place between 1990 and 1995 with the participation of Alpentech Inc. and Cascadia Planning leading to the 1995 Master Plan submitted in compliance with CASP and as an application under the EA Act. Ski slope classifications and aspect analyses were prepared by Alpentech Inc. Topographic mapping at a scale of 1:20,000 with 20-metre contour intervals was utilized as a base. Mapping can be found in the first two volumes of the 1995 Master Plan and in the application to the Environmental Assessment Office, which remains as a background to the current Master Plan.[4]

Pheidias Project Management carried out additional computer aided analysis as well as ground truthing between 1995 and 2005 with the assistance of Peter Lev, Dan Griffith and other local guides. The area involving the Jumbo Mountain, Commander Glacier and Farnham Glacier remains conceptual, while the area of the first phase leading to skiing on Glacier Dome has been studied in greater detail. Pat Boyle of Leitner Poma has surveyed the lift line to Glacier Dome.

See also Appendix 4-F for additional slope analysis data compiled by Ecosign Mountain Resort Planners Ltd. for the first phase.

In any case, ski ways that cross the fall line of ski trails are a fairly common occurrence — including at higher density resorts such as Whistler Blackcomb. The much lower skier density and higher dispersal rate at Jumbo Glacier Resort mitigates congestion difficulties.

[4] The 1995 Master Plan has not been duplicated for this submission, although full scale maps may be made available for discussion purposes.

Exhibit 4.15: 3D Analyst Slope Analysis Sample

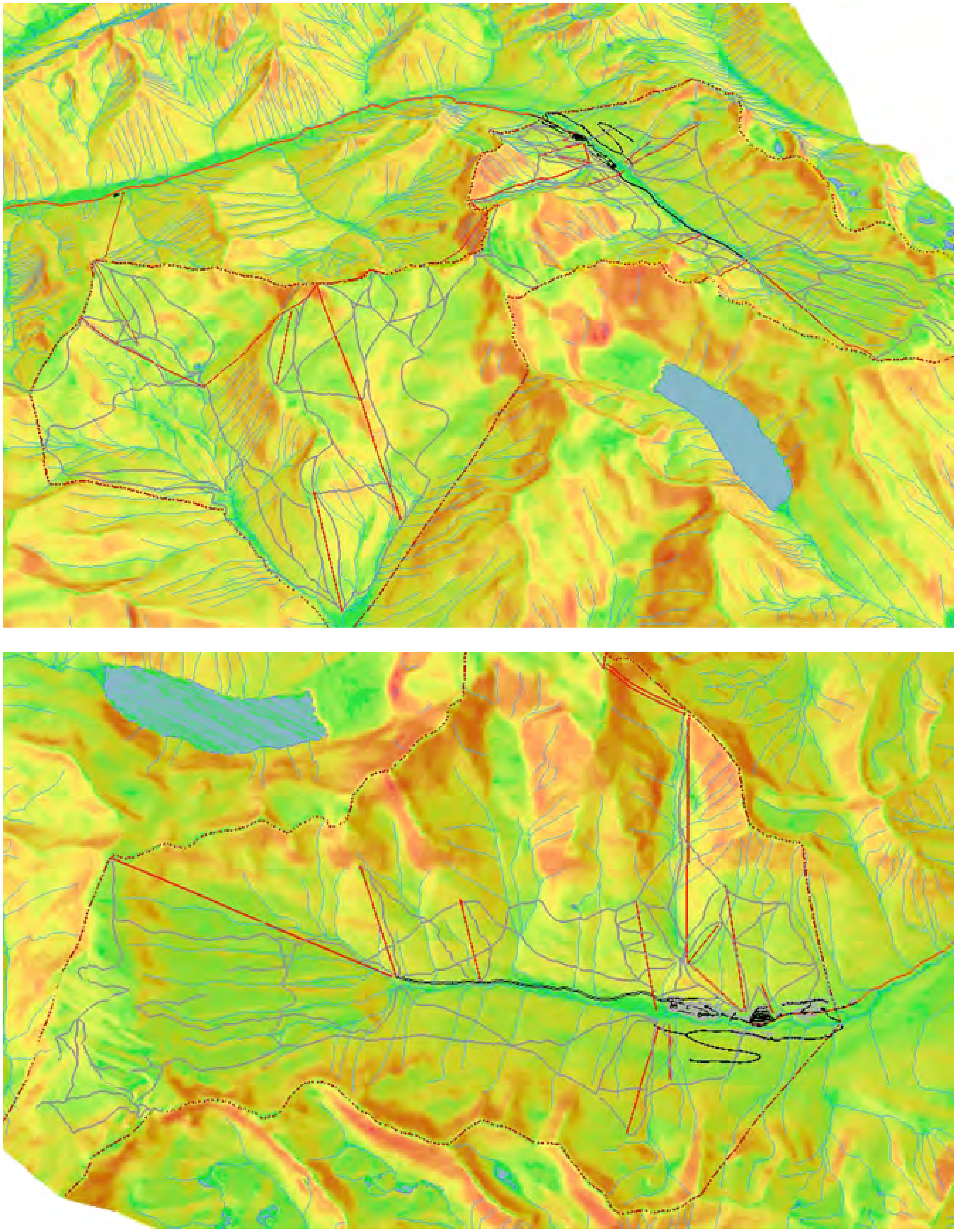
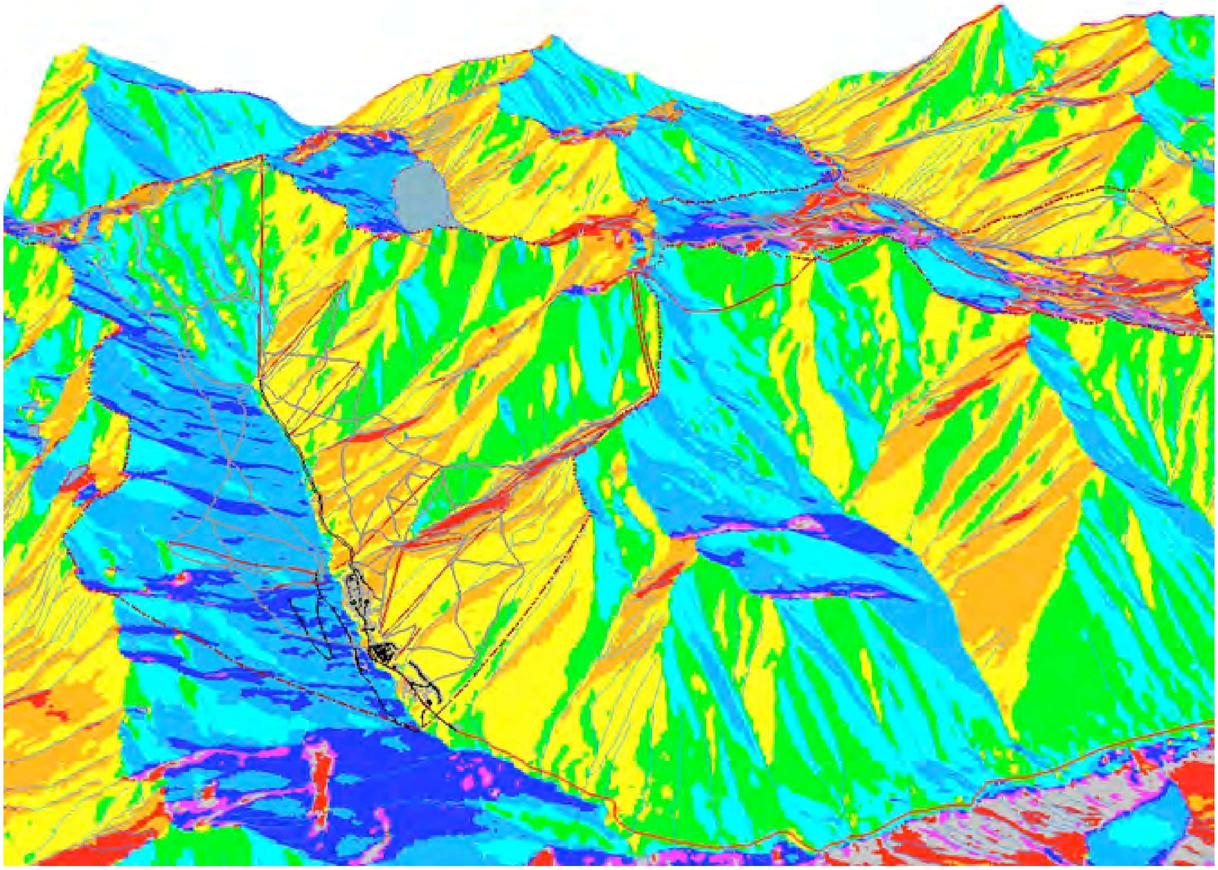


Exhibit 4.16:3D Analyst Aspect Analysis Sample



4.2.3.4 Ski Slope Suitability

Planners for ski areas have pioneered suitability modelling since the 1970s. Landscape architecture and civil engineering computer modelling programs were first utilized for ski area modelling. Today a number of programs can be utilized to digitise mountain information and to analyse it.

A computer generated mountain model allows for a faster and more flexible technique to arrive at the qualitative analysis that the planner must make for each slope that will support lifts and ski runs. Following the straight analysis of sun exposure, shadows, slopes and elevations, the qualitative sum of the influencing factors may be summarized in a colour scheme that outlines the range from poor suitability to greatest suitability for the various areas of the mountain. The model used in this presentation is limited by the large-scale topography used for the preliminary studies, but is corroborated by ground truthing by helicopter skiing and by extensive aerial reconnaissance.

Finding the most suitable skiable terrain is the objective of the analysis. This has already been achieved to a great extent, especially in the Glacier Dome area, which has been examined in great detail. It has few crevasses, and has been surveyed for the gondola lift location. Further on-site visits and more detailed topography will be undertaken before the other major lift installation design is completed. A survey is anticipated for each lift line prior to execution that will permit accurate positioning for the final layout.

Consideration of the most desirable viewpoints has been an additional factor in the design of the Master Plan, including the location of the mountain area amenities, such as the teahouse at the top of Glacier Dome.

Digital modelling is utilized as an aid in planning but the actual qualitative analysis and mountain planning is done before and after the computer modelling on two dimensional mapping and area cross sections, with the resultant value judgements incorporated in the final digitised information of the computer model. The modelling then provides a mathematical verification of the feasibility based on the planner's evaluations and design input. This allowed earlier theories of computerized ski pod computer modelling to be advanced. However, over time and experience, they have proven less satisfactory because of limited ski area planning and design considerations in the past hiding behind the appearance of mathematical modelling. The preconceived notions of the planners generally have led them to use DEM techniques, primarily for illustration purposes. In reality, creative planning is originated by the knowledge of the designer, who then uses digital tools and information to support and present the proposed plan.

Consideration of known soils and geologic constraints in this area increases the confidence in the preliminary modelling that has been done. Other factors, such as prevailing winds, proximity to the base, sensitive environmental areas, and distribution of wildlife may require refinement of the model. Site-specific information will be gathered on the ground by flagging ski runs. The assistance of a ski lift construction company will be utilized to evaluate practical lift lines and survey the best alignments. There is no replacement for site-specific knowledge and practical experience for locating skiing and snowboarding routes. In this respect, the knowledge and site investigations by Peter Lev and Dan Griffith, a former lead guide of the heli-ski operator, have proven most useful. It is expected that experienced mountain guides will continue to provide valuable advice to the planning team as the project progresses.

More detailed survey information (to 5 metre contours of the upper Jumbo Valley) will soon be available and will allow for further refinement of the planning work. A review of the optimum lift selection, ski run mix and layout will be ongoing until the development stage.

4.2.3.5 Vertical Drop and Base Area Elevations

The proposed site can accommodate a large variety of runs of great vertical drop. The entire vertical drop is above the natural snow line. A vertical drop of about 1,320 m (4,331 ft) exists from the top of Glacier Dome at approximately 3,020 m (9,908 ft) to the resort base at approximately 1,700 m (5,577 ft) elevation. The effective vertical drop from Glacier Dome to the valley base covered by the proposed gondola is in the order of over 1,000 m (3,280 ft).

The biggest vertical drop will be found on the Jumbo and Commander glaciers combination, with spectacular runs beginning at 3,400 m (11,160 ft) elevation on Jumbo Glacier and running down Commander Glacier to the Farnham Creek base at 1,700 m (5,577 ft) or below. This will be the largest natural snow vertical drop (1,700 m or 5,577 ft) in North America[5] and one of the most impressive ski runs or *pistes* in the world.

The elevation of the resort base in the Jumbo Creek valley will be approximately 1,700 m (5,577 ft). It is higher than Lake Louise, but lower than Sunshine. This elevation is above the natural snow line and eliminates any need for snowmaking. This relatively high base elevation, combined with the weather patterns in the area, ensures a significant amount of snow cover in winter at the proposed base location, and provides an ideal climate for health and relaxation both in winter and in the summer.

For comparative purposes, the approximate valley base elevations and vertical drops of various other ski resorts are included in the following tables:

Table 4.1: Valley Base Elevations - Various Ski Resorts

Ski Area	Base Elevation
Aspen, USA	7,900 ft./ 2,409 m.
Blackcomb, Can.	2,214 ft./ 675 m.
Cervinia/Valtournanche, It.	6,724 ft./ 2,050 m.
Chamonix, Fr.	3,378 ft./ 1,030 m.
Courchevel	4,265 ft./ 1,300 m.
Courmayeur, It.	4,015 ft./ 1,224 m.
Davos, Switz.	5,085 ft./ 1,550 m.
Grindenwald, Switz.	4,796 ft./ 1,452 m.
Gstaad/Reusch-Diablerets, Switz.	5,314 ft./ 1,620 m.
Jackson Hole, USA	6,311 ft./ 1,924 m.
Jumbo Glacier Resort	5,577 ft./ 1,700 m.
Kicking Horse Resort, Can.	3,904 ft./1,190 m.
Klosters, Switz.	3,907 ft./ 1,191 m.
Lake Louise, Can.	5,450 ft./ 1,662 m.
Lake Tahoe, USA	6,500 ft./ 1,982 m.
Les Menuires, Fr.	5,904 ft./ 1,800 m.
Mount Bachelor, USA	5,800 ft./ 1,768 m.
Mount Hood, USA	5,834 ft./ 1,779 m.
Mount Washington, Can.	3,680 ft./ 1,122 m.

[5] The recently announced expansion plans for the Mt. Mackenzie ski area near Revelstoke call for an impressive vertical drop of 1,846 m. (6,056 ft.) which would surpass that of Jumbo Glacier Resort. However, at Mt. Mackenzie the bottom 300 m (984 ft) are below the natural snowline and consist mainly of connector-type runs that will require snowmaking. The effective vertical drop is similar to JGR's, but at a lower elevation. Mt. Mackenzie's top elevation is 2,455 m (8,055 ft.) and its bottom elevation is only 609 m (1,998 ft) – compared to Jumbo Mountain's 3,400 m (11,160 ft) top elevation and its proposed 1,700 m (5,577 ft) base elevation.

Panorama, Can.	3,600 ft./ 1,098 m.
Sestriere/Cesana, It.	5,000 ft./ 1,524 m.
Snowbird, USA	8,000 ft./ 2,439 m.
Snowmass, USA	8,220 ft./ 2,506 m.
St. Moritz, Switz.	6,089 ft./1,856 m.
Sunshine Village, Can.	7,086 ft./ 2,160 m.
Vail, USA	8,200 ft./ 2,500 m.
Val d'Isere, Fr.	5,413 ft./ 1,650 m.
Whistler, Can.	2,214 ft./ 675 m.
Zermatt, Switz.	5,413 ft./ 1,650 m.

Table 4.2: Vertical Drops – Various Ski Resorts

Ski Area	Vertical Drop
Aspen, USA	3,267 ft./996 m.
Blackcomb, Can.	5,280 ft./1,609 m.
Cervinia/Valtournanche, It.	6,417 ft./1,956 m.
Chamonix, Fr.	9,223 ft./2,812 m.
Courchevel	5,740 ft./1,750 m.
Courmayeur, It.	6,560 ft./2,100 m.
Davos, Switz.	4,212 ft./1,284 m.
Grindenwald, Switz.	3,393 ft./1,034 m.
Gstaad/Reusch-Diablerets, Switz.	5,347 ft./1,630 m.
Jackson Hole, USA	4,139 ft./1,262 m.
Jumbo Glacier Resort	5,577 ft./1,700 m.
Kicking Horse Resort, Can.	4,085 ft./1,245 m.
Klosters, Switz.	5,423 ft./1,653 m.
Lake Louise, Can.	3,250 ft./991 m.
Lake Tahoe, USA	3,600 ft./1,097 m.
Les Menuires, Fr.	4,620 ft./1,400 m.
Mount Bachelor, USA	3,100 ft./945 m.
Mount Hood, USA	2,500 ft./762 m.
Mount Washington, Can.	1,600 ft./487 m.
Panorama, Can.	3,800 ft./1,160 m.
Sestriere/Cesana, It.	5,905 ft./1,800 m.
Snowbird, USA	3,100 ft./945 m.
Snowmass, USA	3,555 ft./1,084 m.
St. Moritz, Switz.	4,750 ft/1,447 m.

Sunshine Village, Can.	1,870 ft./ 570 m.
Vail, USA	3,451 ft./1,052 m.
Val d'Isere, Fr.	4,593 ft./1,400 m.
Whistler, Can.	5,006 ft./1,526 m.
Zermatt, Switz.	7,216 ft./2,200 m.

4.2.3.6 Comfortable Carrying Capacity (CCC) & Skier Skill Levels

CASP enumerates many factors affecting the Comfortable Carrying Capacity (CCC), such as issues of circulation, staging time to remote lifts, multiple periods of use during the day, egress time from remote areas, the need for downloading, etc. The CCC is stated by CASP to be the critical number in understanding annual (winter) capacity potential of a ski area. CASP limits the number of visitors that comfortably fit on a winter sports site from ski trail configurations and lift utilization viewpoints. CASP notes "destination skiers expect a low density skiing experience. Areas that wish to cater to powder skiing experience need to keep the density as low as possible." (*Guidelines to Ski Area Development in B.C.*, page III-10). However, the CASP model is based on the early model of North American ski area development and planning, which was substantially that of a network of lifts and ski runs following the fall line on the sides of each lift, with each lift serving a "ski pod", with a relatively high density of skiers. Most of the ski areas were also on forested hills and the ski runs were necessarily limited to the trails cut in the forest. Because of the high alpine terrain and the type of ski experience proposed in this project, **a low CCC is at the basis of the design for accessing the glaciers of the Jumbo Mountain area**.

Changes that winter sports areas have undergone more recently, since snowboarding mixed with conventional skiing and since skiing itself was transformed by new technology, are not directly reflected in formulas. The key formula defines CCC as the potential "supply" provided by the ski area divided by the "demand" from users. The "supply" is given by the design of a ski area, and by details of the planned ski lifts, which provides by lift planning a relatively fixed number of maximum people per hour based on given equipment specifications. The "demand" is a weighted vertical demand created by ski trails per day and is subject to varying user patterns.

CASP states "the CCC is defined as the optimum number of skiers that can utilize the resort per day, while being guaranteed a pleasant recreational experience without causing a decline in the quality of the physical and sociological environment." Sophisticated planning views based on the experience of the areas developed in the Alps over a century propose the successful model pioneered at Kicking Horse Mountain Resort in Canada, for the first time in the year 2000, where the lifts are planned for a total mountain experience.

Accessing the mountaintop and providing the opportunity to ski the whole mountain with one lift is an important component of the experience. In this type of planning the CCC may be deliberately below the maximum targets of CASP in order to provide the type of mountain experience that the CASP numbers originally were not designed to provide.

At the same time, a lift that accesses a whole mountain is different from a lift designed to achieve maximum utilization of a ski pod; if a lift that accesses a whole mountain provided the maximum number of skiers, it would be possible that most of the mountain would be covered with ski runs and skiers. This would not be a good plan and the philosophy of design that has been applied to this unique project is that of achieving the mountain experience with relatively low utilization numbers, i.e. placing only a limited number of skiers on a limited number of ski runs.

All ski areas tend to become four seasons resorts so that both summer and winter occupancy of the winter sports site support the repayment of the lift and resort infrastructure, but without the snow blanket, the mountain carrying capacity of other resorts depends on a more passive mountain use, centred on view rides, the development of attractive summer trails, activities such as mountain biking, and appropriate sizing of tourism facilities in the resort as a recreation and shopping centre. Jumbo Glacier Resort is different and unique because its main summer activity will continue to be skiing.

In addition, because the major lifts will include a percentage of sightseeing riders who are not skiers (even in winter) it is assumed that this will require a downward adjustment in the loading efficiency of the lifts in order to allow comfortable loading for skiers and non skiers alike.

Finally, in determining the Comfortable Carrying Capacity (CCC) it has been assumed that the initial skiing public will be composed of a majority of low intermediate skiers, but not as low as the CASP formula of 10,000 ft (3,050 m) vertical demand per day would assume. The vertical demand per day on average has been assumed to be initially in the 4,000 metres per day growing to a possible high average of 5,000 to 7,000 metres per day with the progressive development of the market and of the skier public.

The above considerations and a number of detailed calculations in their sum total have induced the project designers to believe that an apportionment of a CCC in the range of 70% of the design capacity of the lifts is a prudent and reasonable design basis.

4.2.3.7 Skiers At One Time (SAOT)

The CASP formula for Skiers At One Time (SAOT) is at the basis of the CCC for each effective lift pod. Capacity needs to be considered in light of the special conditions of the lifts, the mountains, the type of visitor (including sightseers as well as skiers) for several of the main lifts, and the experience that will be created.

The CASP formula for SAOT is:

$$CP = \frac{CL \times VR \times LE \times HO}{VSD}$$

Where

- CP = effective lift pod capacity
- CL = hourly lift capacity (skiers and boarders/ hour)
- VR = vertical rise of specific lift
- LE = Lift loading efficiency (.9)

- HO = hours of operation (7)
- VSD = vertical skied per day (10,000' except for beginners)

In determining SAOT and CCC calculations for Jumbo Glacier Resort, a number of additional factors were considered that affected the CASP formula. The types of lifts that have been proposed are designed to combine economy, coverage of a large skiable terrain, a lower density of skiers, and the ability to transport sightseers as well as skiers to the best viewpoints.

In order to load both sightseeing and skiing passengers in comfort, the load efficiency factor must not exceed 0.8, and may be as low as 0.75. Even when, for example, the Glacier Dome gondola will become a faster detachable type of lift, it is expected that the combination of sightseers and skiers, and the more relaxed approach of this ski area, will not result in a substantial increase of the Load Efficiency Factor.

On the denominator side, because of the unique terrain of Jumbo Glacier Resort, the Weighted Vertical Demand is expected to be substantially higher than the norm in British Columbia. Most of the skiing will be done on wide runs in high alpine terrain, where easy skiing is available over significantly larger vertical drops than most ski resorts in B.C. In addition, the larger number of good weather days, relative to the coastal climate, combined with lower utilization rates, will be one of the unique market factors of this project, and will also facilitate a greater amount of skiing in terms of vertical drop. It is therefore more appropriate to use a figure more similar to a European average of 3,800 to 4,000 vertical metres per day than the CASP norm of 3,050 metres per day.

When all these factors are considered, it appears necessary for this project to estimate the CCC in the range of 70% of the lifts' design capacity, for the lifts that serve the ski runs. The ski area and the lifts as planned are in balance with the type of mountain resort that is proposed.

4.2.3.8 Balanced Resort Capacity (BRC)

Jumbo Glacier resort is a unique project in which many factors, particularly environmental and conservation factors, play a more significant role than in average ski area projects of the past. Due to a number of design the maximum number of visitors per day on completion of the project will be approximately 5,000, and an optimum number based on BRC design assumptions will be in the range of 3,000 to 3,500 per day. The average day use of the resort and the ski area on completion is anticipated to be in the range of 2000 to 2,500 people per day. Design assumptions and visitor projections are analyzed in greater detail in other parts of the Master Plan, and particularly in section 4.6.

4.2.3.9 Ski Lift Planning Overview

A conceptual ski area lift plan has been proposed (mapping is included in Schedule A). The mountain planning process will require more field time along actual lift and trail alignments, which will be carried out when the survey of the lift lines will be done before construction. Only the Glacier Dome gondola alignment has been surveyed to date. This ground truthing will be carried out with the assistance of the selected ski lift construction company. A preliminary selection of lift types and best estimate of carrying capacity is outlined below in Section 4.4.4, below.

Photographs, maps, and reports from the heli-ski operator and its guides have been carefully studied since 1990. Site visits beginning in April 1990 and reviews with the consulting team are the basis for the preliminary plan. Lift alignments are shown for a proposed year-round lift to the mountaintop at Glacier Dome and Jumbo Mountain, capable of operating all year and for several major additional proposed lifts for winter and summer glacier skiing. The plan makes provision for the future lifts necessary to optimize the use of the area. Detailed avalanche hazard mapping will be carried out to ensure that the base terminals and mid-stations of lifts are safe from avalanches and lift towers are able to withstand avalanche forces if necessary.

The vision for the project and of the ski lift plan is to create a low-density skiing experience. In other words: to make vast amounts of terrain available to a smaller number of skiers. A lower capacity lift design that encourages the dispersal of skiers to different mountain access points has been favoured.

4.2.3.9.1 Fixed Grip and Detachable Lifts

Many North American ski area owners take pride in advertising detachable lifts. Although there are several successful ski areas that have stayed with fixed grip lifts, the norm today is to build detachable lifts offering less than 10 minute rides while most of the shorter lifts, especially lifts for teaching or for high-altitude skiing, remain fixed grip. There is another school of thought, however, that suggests that detachable lifts are preferable for the convenience of beginners, and in this project, the current planning envisions detachable lifts for the convenience of beginners.

For reasons of economics, terrain, maintenance and a design philosophy that stresses access and a low-density, high quality skiing experience, the majority of the initial lifts will be fixed grip lifts. Rolling surfaces at the departure point may be installed to allow greater rope speeds. This alternative, while not yet widely accepted in North America, has proven successful in Europe and provides a number of benefits – most particularly, it enables the resort to provide early access to a significantly large skiable terrain from a limited bed base and a relatively small number of initial visitors.

The initial pulse lift gondola may be converted to a detachable system when traffic will justify it, or it may start as a detachable gondola without the mid-station if the project economics and speed of travel suggest it as a preferable solution. Most project components will be well served initially by using fixed grip lifts, possibly with rolling departure mats to increase travel speed. As the project will grow, the option of detachable lifts may be made available for added convenience and greater speed of travel.

In general, lift selection is driven by the requirement of providing access to the year round skiing in an economically viable manner from a limited bed-base. Eventual upgrading of fixed-grip lifts to more convenient and higher-speed designs is proposed (see Lift Schedule Phasing and Capacity, below). These improvements can be implemented earlier in the phasing plan, should it be deemed preferable.

More specifically, the choice of initially installing low-capacity lifts has been made for the following reasons:

- Providing access to the four large glaciers and unparalleled viewpoints for both year-round skiing and sightseeing is the primary and fundamental aim of the project;
- In order to allow comfortable loading for skiers and non skiers alike, a downward adjustment of the loading efficiency of the lifts is warranted;
- Comfortable Carrying Capacity (CCC) that is dispersed over a large area makes it possible to access a greater amount of terrain from a smaller resort base – this is particularly true in the opening phases of the project;
- A smaller resort base is desirable and viable: 15 years of process have shown that 5,500 visitor beds is a threshold that is acceptable under the EA Act;
- 5,500 visitor beds are a realistic response to the skier market for this location;
- A smaller resort base in this unparalleled location makes a high-end, boutique type resort possible, creating a better cachet and generating a better return on investment;
- A small CCC dispersed over a large area ensures low density on the ski slopes, mimicking the heli-skiing or cat-skiing experience and ensuring “epic” snow conditions throughout the winter season, particularly in this climate and location, and
- The use of fixed-grip lifts such as T-bars to provide access to uniquely spectacular locations and ski terrain such as Jumbo Glacier and Glacier Dome will prove acceptable to even the most jaded of skiers; the success of cat-skiing operations in B.C. as well as the success of some European locations such as Passo Stelvio and Les Deux Alpes in summer demonstrates that access to spectacular terrain trumps technology, especially when there is no direct competition.

4.2.3.9.2 Surface Lifts

Shorter lifts, such as T-Bars and platter lifts, are the most proven installations on glaciers, and they will be proposed for this project. In Europe, newer lifts including major chairlifts have been installed on glaciers on pivoting and roped towers, but this is an expensive mode of transportation and it will not be necessary for the small number of skiers and for the type of skiing experience for which this project is designed and planned.

4.2.3.9.3 Beginner Ski Lifts/Ski School Lifts

Various beginner ski area locations are being considered for ski school use. A beginner ski area next to the resort is being considered in the area to the immediate west and north of the initial Daylodge. Another location will be on the eastern slopes of the resort at the gondola mid-station. A year-round beginner ski area is planned to be located at the top of Glacier Dome and of Jumbo Glacier. The glacier ski areas will be serviced by surface lifts while the mid-mountain and lower mountain beginner ski areas will be serviced by detachable quad chair lifts.

4.2.3.10 Summer Skiing and Ski Training

Summer skiing will be available on Farnham Glacier, Jumbo/Commander Glaciers, and Glacier Dome. Up to 700 m. (2,200 ft.) vertical of glacier skiing will be available in mid-summer on Jumbo/Commander Glaciers. This is equivalent to the winter vertical of many regional destination ski resorts in North America. Glacier skiing at Jumbo Glacier Resort, especially in summer, will have no valid skiing comparisons on the North American continent.

Glacier Dome has a top station elevation of 3,002 metres (9,850 ft.) and provides a summertime skiable vertical drop of 518 metres (1,700 ft.). Commander Glacier has a top station elevation of 3,291 metres (10,800 ft.), and provides a summertime skiable vertical drop of 762 metres (2,500 ft.). Jumbo Glacier adjoins Commander Glacier, adds another 128 metres (420 ft.) of vertical drop, reaching 3,419 metres (11,217 ft.), and increases the amount of skiable summer terrain.[6]

The Canadian Alpine Ski Team and CODA have undertaken summer ski training on Farnham Glacier since the summer of 2003 (see Exhibits 4.1 and 4.2 above). A number of ski runs and training courses in the 500 m. vertical range are available on Farnham Glacier.

Glacier Dome offers an equal, and in some respects superior, summer skiing opportunity as Farnham Glacier. Initiating an Olympic training program at Glacier Dome instead of on Farnham Glacier may allow an easier, earlier and more economical start, especially if it can be timed to begin near the same time as the first phase of the Jumbo Glacier Resort project

A field investigation was undertaken on July 25, 2004 to demonstrate the potential of Glacier Dome for summer training to a representative from CODA and to the coaches of the Canadian National Ski Team.

Two well-known mountain guides, Robert Koell and Reinhard Bergerweiss, who have also been coaches in the Austrian racing environment, organized and directed the field investigation. They identified three possible courses in their initial reconnaissance and reported as follows:[7]

> <u>Here are the stats of the proposed World Cup Ski Racing training site at Glacier Dome:</u>
>
> Please check on the lengths of the runs, as I did not measure them but guessed. The verticals are accurate, taken with my professional Thommen altimeter. The slope Incline may vary slightly.
>
> - Top of Glacier Dome: 2900 meters
> - Course start: 2880 meters
> - Course finish: 2350 meters

---

[6] As is evidenced by comparing these figures with those of Whistler/Blackcomb (which offers a partial summer season) and Mount Hood (which offers limited, non-glacier summer skiing), the proposed summer season vertical drop would place the proposed resort in a class by itself in North America.

[7] Please see Appendix 4-B: *July 2004 Glacier Dome Summer Skiing Field Investigation* for a summary report and images.

Start of course: 2880m. Low angle ridge going SW of top. Approximately 400m, turning W into top part of Bowl. Incline 18 degrees. Terrain turns N and incline increases to about 22 degrees in middle part of approx. 500 meters wide bowl. Length of bowl after low angle top traverse approx. 1500 meters. Aspect: NNW. Bottom part of Bowl ends at flat low angle terrain.

- Total length approx. — 2000 meters
- Average incline approx.: — 20 degrees
- Average Snow depth on top of glacier as of July 25th: — 165-cm
- Total vertical: — 530 meters

Note: This is not a representative year for snow cover on glaciers. Little early season snow last fall/early winter and very warm spring/early summer conditions are responsible for the lowest snow cover on glaciers in over a period. At good snow depth on the area, more vertical distance can be gained. The given verticals are representative for the conditions of this summer.

Terrain at the visited site offers two more training routes with various course lines. From same start position and top traverse the line leads NNW before reaching the main bowl into steeper terrain with an approx. incline of 30 degrees. The terrain has more interesting character with a break-over at the top and one smaller one at the bottom. Line connects to the same finish as at above described course.

- Total length approx.: — 1700 meters
- Average incline approx.: — 28 degrees
- Snow depth: — same
- Total vertical: — 540 meters

The third course line starts at top of second proposed T-bar lift. Leads N down steeper top part into lower angle bowl to very steep break-over with maximum incline of about 40 degrees down steep slope turning NW and connecting to same finish area as the other two course routes.

- Total length approx.: — 1400 meters
- Average incline: — 20 degrees
- Snow depth: — same
- Total vertical: — 400 meters

Scott Blissett, a local parent involved in junior-level ski racing, participated in the field investigation and reported as follows in an e-mail:[8]

> …I think Glacier Dome if developed, would provide good summer training opportunities for alpine racing and would welcome an invitation to share in the offer made to the Panorama Club to have lane space available to train local K and J level athletes at no charge (as you had mentioned). I believe there would be support from local ski clubs if more cost efficient opportunities were made available to train K and J level athletes locally.
>
> Flying up to the proposed Gondola/Teahouse location adjacent to Glacier

[8] Ibed.

Dome afforded awesome panoramic views of the Lake of the Hanging Glacier, Starbird Pass, and Glacier Dome. The weather was beautifully sunny and warm throughout the morning. No visible signs of human presence were noted while flying the area or traversing Glacier Dome. There were a few parked vehicles observed on the way out at around noon near the old lumber mill site (representing some hiking groups). I noticed that the Lake of the Hanging Glacier was not visible from the proposed site of the Gondola/Teahouse. Glacier Dome has the potential to provide excellent summer training for alpine racing if the risks are managed. The risks include mitigation of the hazards associated with crevasses, signage to assist under bad weather conditions, and a means to effect an emergency evacuation. It has adequate vertical, suitable snow conditions, and steepness to facilitate summer SL, GS and SG race training. The area has great potential as a ski Mecca and through careful planning, could be an example for other similar planned developments. I would welcome the opportunity to discuss further involvement with you at your convenience.

4.2.4 Avalanches and Ski Slope Management

4.2.4.1 Avalanche Hazards

Except for the central areas of the glaciers, many of the open slopes near or on the mountainsides of the proposed ski area above elevation 2,000 m. are exposed to avalanches as noted in the avalanche maps. Avalanches usually occur during and after snowfalls and with high temperatures. After a snowfall, the snow may remain unstable for several weeks. Avalanches either start naturally, or may be triggered by skiers and snowboarders. In addition to starting avalanches, trail users may be exposed to avalanches that initiate on steep slopes above.

4.2.4.2 Control of Avalanche Hazards

The current practice in ski areas is to prevent any exposure of skier clients to avalanches inside the ski area boundaries. This is achieved by releasing avalanches under control, stabilizing the snow on the slopes by skiing, and closing exposed ski runs when the snow is unstable. Permanent control structures are not applied except occasionally for the protection of lift towers.

The objective of preventing skiers from being caught in avalanches inside the ski area boundary can be achieved readily at Jumbo Glacier Resort with the methods that are commonly applied in other ski areas such as Panorama, Lake Louise, Sunshine, and Kicking Horse Mountain Resort.

4.2.4.3 Avalanche Control

Releasing avalanches with explosives best controls the avalanche hazard at the most exposed ski trails at Jumbo Glacier Resort. The avalanche hazards at the First Lieutenant and the Second Lieutenant could be controlled with three avalauncher guns at the top of the lift terminals (elevation 2,280m and 2,600m). The avalaunchers would be fired after every major snowfall, on the average eight times per winter.

Avalaunchers cannot be applied at the avalanche starting zones on Karnak and Commander because either the firing distances are too long, or the targets are not in a line of sight from gun positions. The rugged and steep terrain would make it very difficult to construct permanent installations, for example Gazex. Consequently, bombing from a helicopter would be carried out when the weather allows flying at the end of a snowstorm. Probably five control missions by helicopter would be necessary on the average per year, and the avalanches along the access road to the resort base would be controlled during the same missions.

4.2.4.4 Trail Closures

Ski trails will be closed to skier traffic when there is a possibility for large natural avalanches to reach to ski trails. Affected trails will also be closed when avalaunchers are fired and when bombs are dropped from a helicopter.

Helicopter bombing will require good visibility because the bomb targets are located in bowls with steep walls. Owing to the avalanche bombing missions, the trails through the Karnak and Commander paths may have to be closed about five times in an average year for two to three days during and after a severe snowstorm.

It is fortunate that under such conditions the lower slopes served by the lifts in the avalanche-free treed area around the resort base would offer enough safe and satisfactory terrain for skiing.

Glacier skiing on Glacier Dome, Commander Glacier and Farnham Glacier may utilize ski runs that are avalanche free, but their opening would be dependent on visibility.

It should be noted that both helicopter bombs and avalauncher shots would explode on rocky terrain well above the tree line. Therefore, there will be no impact on vegetation and wildlife.

At Jumbo Glacier Resort, a typical avalanche control procedure subsequent to a heavy snowfall could be described as follows:

Early in the morning, prior to the opening of the lifts for the public, ski patrollers release avalanches at slopes noted in the avalanche control map. This is done where practical with an avalauncher gun, which is mounted near the upper terminal of the lifts, or with discharges from a helicopter once the weather permits flying. Pre-determined targets are fired at. After shooting, the ski patrollers toss hand charges into the slopes, then ski down the upper bowls and stabilize by skiing the snow on short slopes. They close the access into the remaining avalanche paths by turning pre-placed signs and stringing a rope. When the lifts open to the public, about 10 a.m. the ski runs that are marked open are safe for powder skiing. The other ski runs remain closed until the same procedure is completed.

Ski patrollers then release avalanches with hand charges and by skiing short slopes at the ski trails that are served by the other lifts, which may open in the afternoon or on the next day.

When the weather permits flying, which might be on the next day or several days after a snowfall, avalanches are released on the slopes not yet stabilized by dropping explosive charges from a helicopter. After the successful treatment of the avalanche starting zones with explosives, all the ski runs are opened.

Although the local microclimate is exceptionally gentle and inclement weather is very rare, as noted elsewhere in this study, the design will take into account the potential for severe winter storms and avalanche control in progress, with closure of some areas and guests limited to specific areas. One must note that these are anticipated to be very rare occurrences, according to observations and reports over the last fifteen years. There are no avalanche conditions similar to those found at the village areas at Alta and Snowbird, in Utah, where Peter Lev reports that the inter-lodge closure (confining people to stay inside lodges) during high avalanche hazard has become a fairy tale promoting powder skiing.

4.2.4.5 Avalanche Hazard Forecasting

The success of controlling the hazard to the ski trails depends much on the skill of an avalanche hazard forecaster. The person in charge must be able to evaluate the stability of the snow on the slopes below the headwalls of the avalanche starting zones and to determine whether natural avalanches could reach the trails. The stability in the avalanche starting zones might not be the same as the ski runs.

4.2.4.6 Equipment

The avalanche control program requires the following equipment:

- Avalauncher guns; the avalauncher uses compressed gas as a propellant.
- Projectiles and compressed nitrogen for the avalauncher.
- Explosives and fuses for hand charges.
- Thermometers, thermograph, precipitation gauge, snow depth gauges, anemometers; anemometers would also serve the operation of the lifts.
- Computer and communication equipment;
- Warning signs at the lift terminals and where skiers could enter uncontrolled slopes.
- Fencing at entry points to uncontrolled slopes;
- Avalanche rescue equipment

4.2.4.7 Avalanche Control Costs

4.2.4.7.1 Avalanche Control at the Access Road

Avalanches at the road would be controlled on the average 4 times per year by bombing from a helicopter. The costs include bombs, flying time for ferrying and mission, and time and transportation of flag persons on the road.

The estimated average annual expenses not including personnel are:

- Toby Creek Road to junction with Jumbo Creek: $2,500
- Jumbo Creek Road from Toby Creek to Resort Base: $13,000
- Shuttle Road from Resort Base to Glacier Dome Gondola: $15,000

The cost for controlling the Shuttle Road is high because the avalanche starting zones are large and avalanches must be controlled frequently for the safety of the ski trails above the road. Estimates are based on 2003 costs, as provided by Peter Schaerer.

4.2.4.7.2 Avalanche Control at Glacier Dome

Avalanches would be controlled as follows:

a) Hand charges tossed from the ridge at the Teahouse into the steep slopes with south aspect.

b) Firing with an avalauncher into the rocky, west-facing slopes east of the Glacier Dome Gondola (Lift No. 1.3). The avalauncher would be located at the mid-station of the Gondola Lift.

c) Firing into the starting zones of the 1st and 2nd Lieutenant avalanche paths with avalaunchers at the top of Lifts No.1.2 and 2.2.

d) Helicopter bombing at the West Apex and Jumbo avalanche paths west of Jumbo Creek. The cost of the helicopter bombing is included in the cost of the avalanche control for the Shuttle Road.

e) Temporary closure of the ski-out trails to the Resort Base when the avalanche hazard demands.

f) Ski stabilization on short slopes on the glacier.

The estimated average annual cost is $6,000.

4.2.4.7.3 Access to Commander Glacier

The second phase of the Master Plan envisions the development of facilities on the Commander Glacier with access from the Resort Base by gondola lift and a tram. The Gondola Lift No. 2.3 and the ski run in the valley south of Karnak Mountain are exposed to avalanches from both sides of a valley. This means, that flowing avalanche snow could impact on lift towers and powder avalanches might affect the gondolas.

A few of the avalanche starting zones could be fired at with avalaunchers, but helicopter bombing seems to be the best control method for the majority of the avalanche paths. The control would produce avalanche deposits on the ski run, which may require snowcat grooming

Peter Schaerer recommends the following measures:

a) Location of the lift line high above ground to allow sufficient vertical clearance for avalanches at locations to be studied with respect to avalanche exposure, or use of an aerial tram.

b) Designing exposed lift towers against avalanche forces.

c) Bombing with helicopter the Karnak multiple avalanche paths.

d) Control with an avalauncher the slopes above Lift No. 2.6 (above the Resort Base).

e) Continuous monitoring of the avalanche hazard and temporary closure of the trail in the valley south of Karnak Mountain

The estimated average annual cost of the avalanche control is $11,000.

4.2.4.7.4 Avalanche Control at Commander Glacier

The following measures are recommended:

a) Application of hand charges on steep slopes at the side of Gondola Lift No.3.5.

b) Helicopter bombing at two pocket glaciers north of Commander Mountain, where avalanches could run to the main glacier.

c) Ski stabilization above the lower terminal of Lift No. 3.5.

d) Monitoring of the avalanche hazard and temporary closures of the trail from the lower terminal of Lift No. 3.5 to the Daylodge. The trail is exposed to avalanches from several long and steep slopes at the northwest side. A re-location of the trail to the opposite (southeast side) of the valley might be considered.

The estimated annual cost of avalanche control by explosives is $1,200.

4.2.4.7.5 Avalanche Control at Farnham Glacier

Avalanches from the steep and long slopes with east aspect and east of the Commander Glacier are a hazard to the trail between the upper and lower day lodges. Temporary closures of the trail would be necessary. It might be possible to start avalanches under control with hand charges and by blasting cornices from Commander Glacier, but the control would have to be supplemented by helicopter bombing.

In addition, hand charges would be applied at slopes east of the upper Day Lodge.

The total estimated cost of avalanche control at the Farnham Glacier is $6,000 including the maintenance of fences and warning signs at the trail.

4.2.4.8 Personnel

The ski patrol must initially include two persons who have completed a Level 2 avalanche course, possess blasters tickets for hand charges, avalauncher operation and helicopter bombing. They must also have obtained experience in avalanche control by working in a ski area. At project build-out, this will have to be increased to six or more persons.

A consultant will be hired for the development of a detailed snow safety plan and the training of the avalanche control staff.

No additional ski area staff would be needed, because the regular professional ski patrollers would carry out the avalanche control.

4.2.4.9 Snow Safety Plan

The above notes are a preliminary assessment based on site visits and map evaluations by Peter Schaerer and Peter Lev. A detailed snow safety plan according to CASP will be submitted prior to development. The snow safety plan contains an inventory of the avalanche paths, a description of the equipment and operation of the avalanche control, the safety measures, and a rescue plan. The rescue plan describes the responsibilities, actions, equipment, and outside resources for situations when an avalanche accident should occur (usually outside the ski area boundary).

4.2.4.10 Summary

1. An avalanche hazard to skiers and snow boarders exists on the slopes above the elevation of 2,000 m.

2. The avalanche hazard must be controlled by temporary closures of ski trails, explosives, and skiing. The avalanche control that is required for the Jumbo Glacier Resort is similar in type and extent as applied successfully in other medium to large size ski areas. The cost of the avalanche control is moderate.

3. The treed area can be used for skiing when stormy weather prevents the access and avalanche control to the upper slopes.

4. The observations above noted are rough preliminary evaluations based on several visits and reports by Peter Schaerer. However, he notes that "the estimates are conservative an the actual number and duration of trail closures may be shorter."

4.2.5 On-Mountain Facilities

4.2.5.1 Initial Daylodge

An initial Daylodge willl be located at the north end of the sawmill site in the upper Jumbo Creek valley. The Daylodge may be similar to the conceptual plans outlined in Exhibit 4.17 and following, below, and could be attached to a condotel building that is planned as a first entry of the First Nations in the hospitality business at the resort. The building will be located at the base of the first chairlift (Chairlift 1.1 and Building A2 of the Master Plan).

Exhibit 4.17: Preliminary Conceptual Design for Daylodge (1)

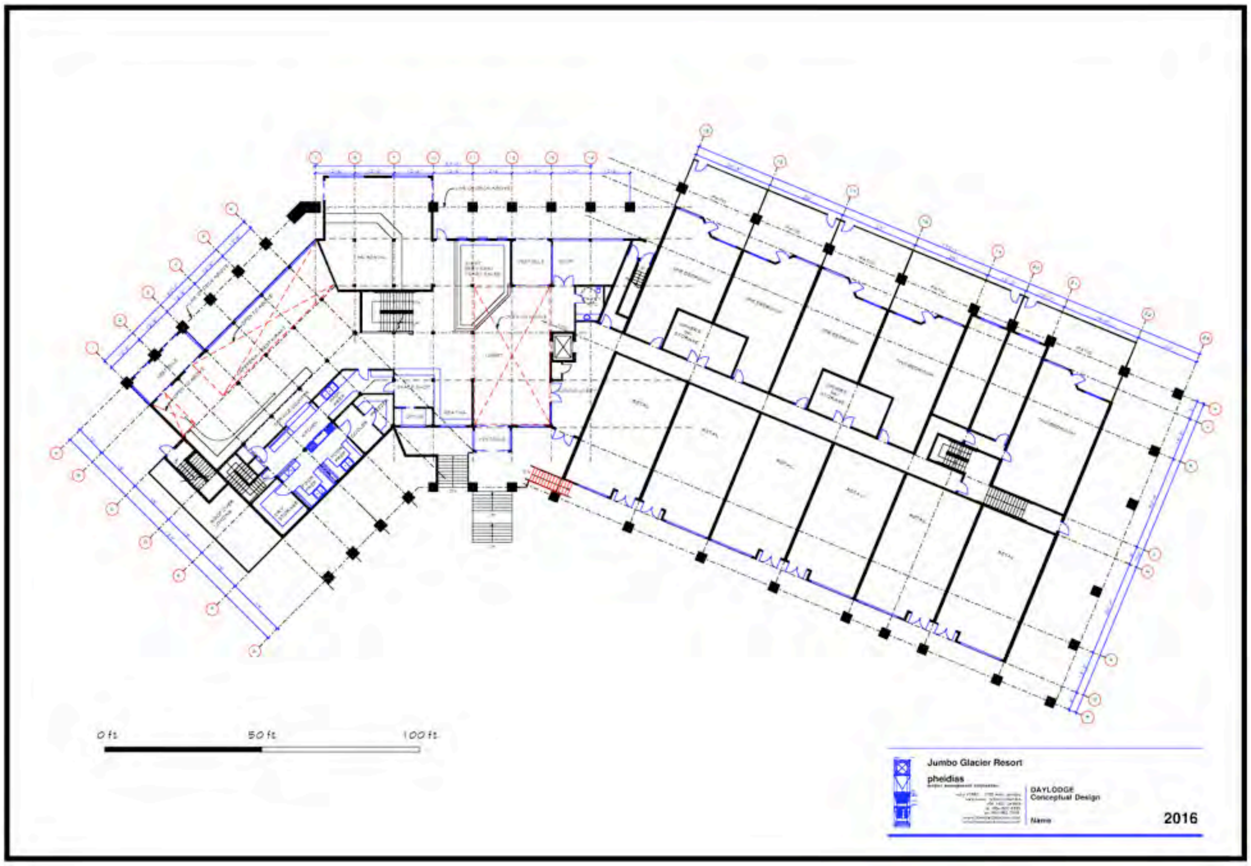


Exhibit 4.18: Preliminary Conceptual Design for Daylodge (2)

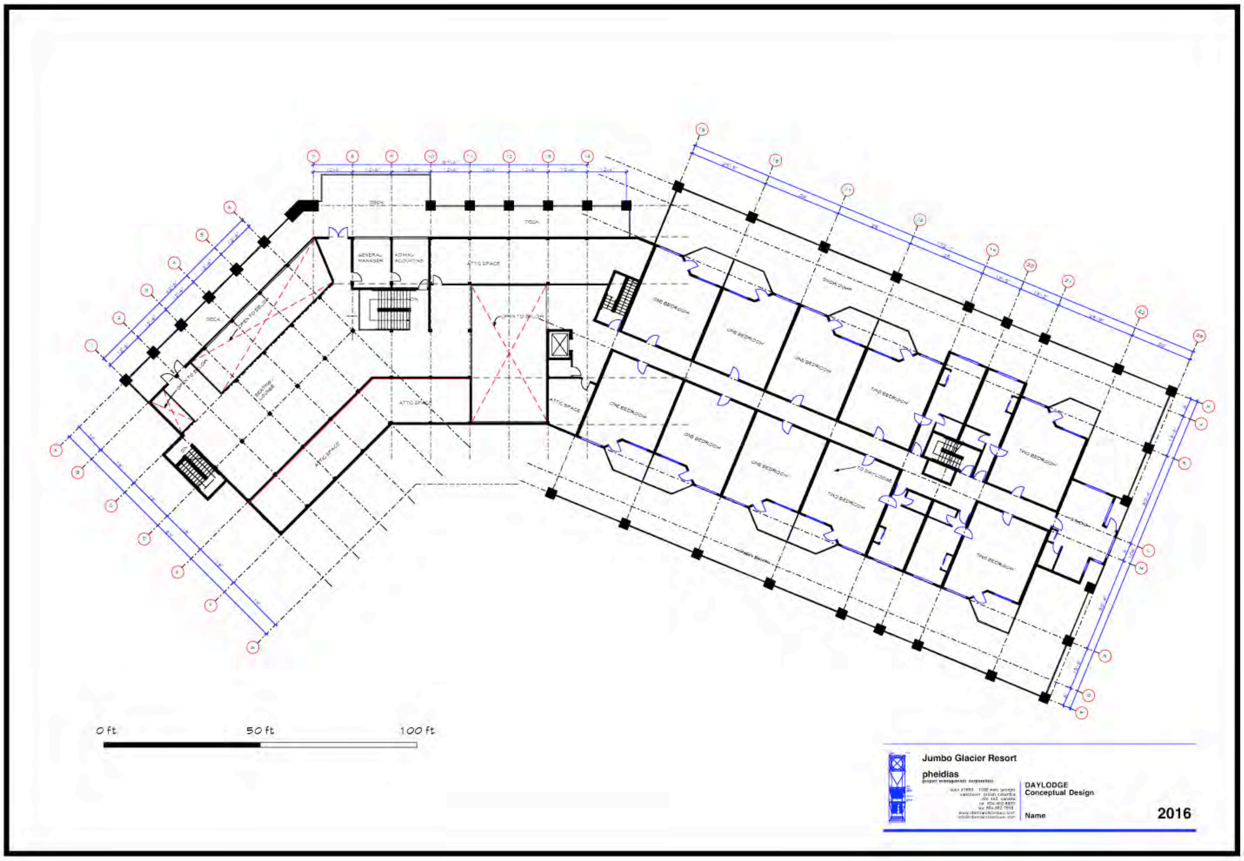
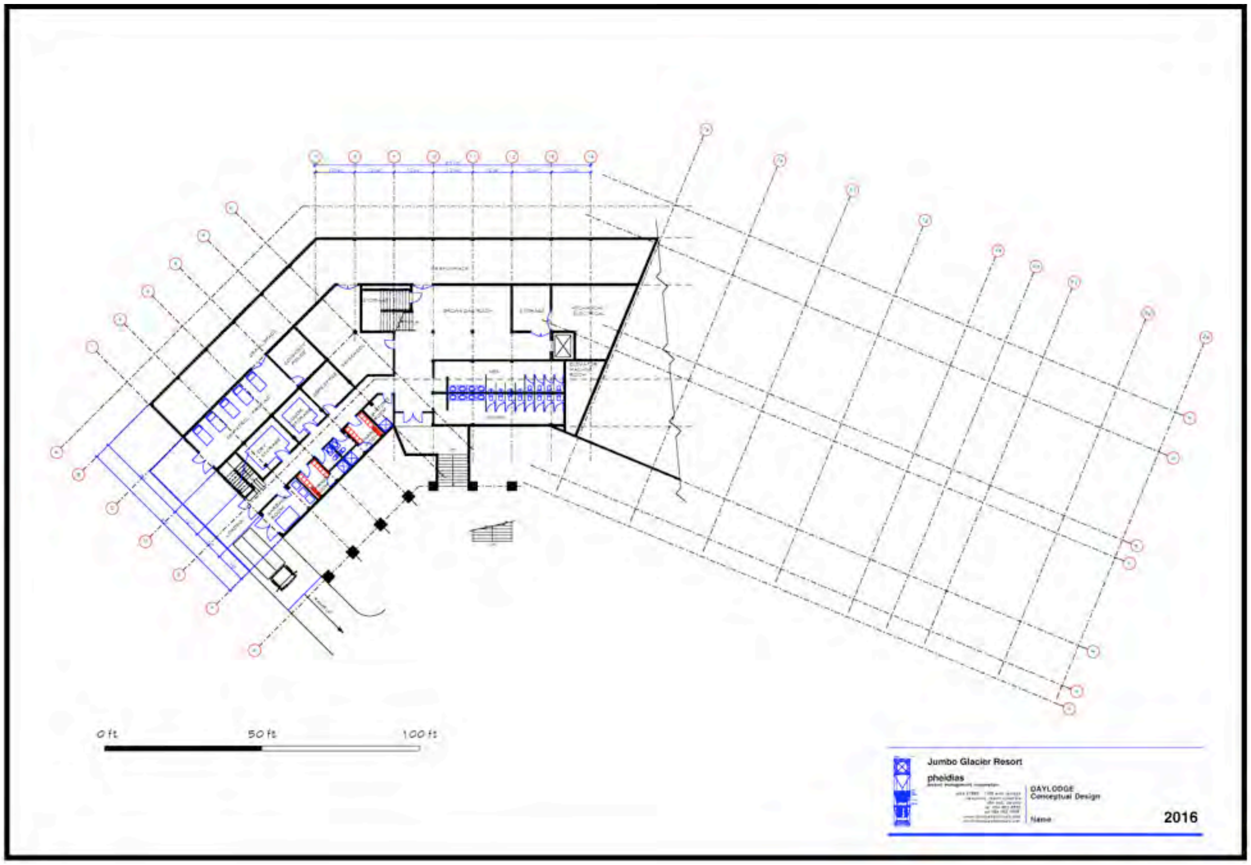


Exhibit 4.19: Preliminary Conceptual Design for Daylodge (3)



4.2.7.2 Glacier Dome Teahouse

The Teahouse located at the arrival point of Glacier Dome gondola (Lift 1.3) will likely be the most important building of the opening phase of the project. It is expected to achieve the same level of public response and world exposure as the Eagle's Eye Restaurant located at the top of the gondola at Kicking Horse Mountain Resort near Golden.

The Teahouse is planned to be similar in size to the Eagle's Eye building at Kicking Horse Mountain Resort and will feature a balcony or terrace open to the view of Jumbo Glacier and the Lake of the Hanging Glacier below. It will be positioned with foundations deeply set in the rock on the southern slope of the mountaintop. It will be designed to be sufficiently low relative to the crestline of the mountain so that no part of the building will be visible from the hiking trail leading to the Lake of the Hanging Glacier, from Horsethief Creek. It will offer a view of the southern end of the lake below the ice fall, a view of Jumbo Glacier and a 360º view of the mountains and glaciers around it. Site visits have confirmed that it is possible to position the building in a manner that would obscure it from below and therefore negate any visual impact on users of the hiking trail in the Horsethief Creek drainage below. The spectacular view to the south east (see below), however, exposing the southern rim of the lake and Jumbo Glacier, will be the most prized view of the project, and will make the Teahouse the project's most important mountain top facility.

Exhibit 4.20: View from Proposed Teahouse on Glacier Dome

A sightseeing tourist's view of Jumbo Glacier and the Lake of the Hanging Glacier from near the proposed Teahouse location on top of Glacier Dome in summer.

4.2.5.3 Additional Daylodges and On-Mountain Facilities

As the project develops, the initial Daylodge at the resort base will be complemented by a new building in Phase 2 of the project and by additional on-mountain facilities, which will be designed to function as self sufficient mountain refuges.

A convenient Daylodge will also be planned to be located either at the mid-station or at the base of the Glacier Dome Gondola and at the mid-station of the Jumbo Mountain gondola. Following the lift development to Jumbo, Commander and Farnham Glaciers, appropriate Daylodges will be planned and located to serve the expansion area. It is expected that there will be a Daylodge near the junction of Commander and Farnham Creek and another near the toe of Farnham Glacier.

A small Daylodge/refuge is also planned for the mid-station of the Gondola running from the Cleaver to the toe of Commander Glacier. A hut capable of sheltering snow cats will be located in a strategic location in the Jumbo Creek drainage and on the moraines of the glaciers. These huts will also act as mountain refuges and will be designed to be self-sufficient and self-contained small buildings.

4.3 RESORT BASE AREA PLAN

4.3.1 Planning and Development Principles

Traditionally, North American resorts have grown over time by responding to immediate needs in a sporadic manner. They grew around mining towns or pre-existing recreation facilities and were slowly expanded and improved in response to emerging market requirements with minimum investment and scattered planning.

The scattered planning was physically exemplified by the state of Whistler in 1976, and to rectify the situation a number of steps and policies were implemented, including the creation of the Resort Municipality of Whistler, the creation of the *Commercial Alpine Ski Policy* of the Province of B.C. and of the original Master Plan of Whistler, which deliberately set out to recreate a kind of European alpine village atmosphere, following the model of the new village of Vail.

The Whistler example took twenty years and a number of bankruptcies (including that of the Whistler Land Corporation) before being able to establish itself, but it is now considered the model development for new resorts, being imitated and developed from as far as Mont Tremblant and Mammoth Mountain, surpassing even the models of Vail and Beaver Creek.

Despite the final and overwhelming success of the Whistler Blackcomb development, one should be careful about reviewing its model, which should not be followed blindly. The Whistler model depends on certain marketing and real estate development techniques that are not necessarily possible to repeat and that require a large critical mass of capital and a booming, or recession proof, economy. Whistler emerged from its early difficulties to reach success, particularly in the 1988 – 1998 period, which saw significant economic growth in North America in general.

The ideal development model should be one that enables growth and is able to sustain itself in smaller economies and in periods of economic recessions, basing its economic well-being on the need for recreation that is basic to humankind and that is stable despite the ups and downs of the economy, provided it is not only world-class, but also genuine and affordable.

The planning model should work aesthetically with more genuine forms, without the need of whimsical imitations which tend to become “fake” and distasteful over time, and which produce an architectural burden that can be unnecessarily costly with the danger of becoming empty in an economic downturn. Planners who look for the European appearance easily overlook that the pleasant appearance of the European village is the complex product of a real response to culture and need over time, which is reflected in the meaningful architecture that forms the pretty picture.

It is therefore imprudent to copy the forms without understanding the need that generated them. There is a risk of creating an architectural pastiche that will quickly be recognized as a false representation. The downside of producing a mere appearance, without an adequate economic function to sustain it is that it may generate capital investment that may not generate adequate revenues. It may contribute to the failure of the resort or of its commercial enterprises in the initial stages. It is noteworthy that at Whistler, perhaps the most popular plaza is the one served by the parking area between the IGA supermarket and the liquor store, contrary to many planning theories, and that the mountain plaza of the original village stroll only came to life when major hotels were built around it, and gave life to it, so that in the evening strollers would not have the closed ticket office at Carlton Lodge as the terminus of their walk.

It is also important to add that the Whistler model would be a wrong economic example for this project, because Whistler depended heavily on a successful resort village as a drawing card in addition to skiing due to its low elevation and less than ideal climate. The ski resort that is being proposed at Jumbo Glacier will depend on skiing and its unique views, not on the resort’s entertainment capabilities, for its drawing card and its success. People may go to Whistler for a shopping and entertainment experience, but this will not be a prime need for the proposed resort, where travellers will come to ski and to see great mountains and the glaciers.

The Jumbo Glacier Resort base, like the mountains surrounding it, will try to be "real" and genuine, developing in a logical linear growth that will avoid exposing the public to crossing construction areas to go from one built place to another. It will start with the development of a Daylodge, and construction will move forward establishing sleeping accommodation where it is possible to ski in and out, with exposure to sun and views, and establishing the first nucleus of vacation homes in such a way that they will become the end and the first plaza of a small pedestrian stroll of shops and restaurants that will become a convenient centre for the resort. The centre of the stroll will be anchored by the activity of a hotel, and the growth of the heart of the resort will be timed to coincide with hotel construction, with each hotel creating a plaza in front of it. This is in the true alpine village tradition, where plazas were created to serve real activities and true centres of residential density, as well as to achieve a visual focus. A convention hotel will form the human focus that churches provided at the heart of the residential communities of the past, although it is expected that room and financing for a multi-denominational chapel will be found as proposed by the end of the development stage, in a prominent location in the centre of the resort.

The Master Plan drawings, design guidelines and conceptual sketches illustrate how the planning vision will unfold over time.

4.3.2 Resort Base Vision and Overview

The vision for the resort base evolved over many years, through studies of other resorts, travel, and input form public and project team meetings. The vision is that of an authentic mountain village inspired by the construction tradition of the Rocky Mountains, continuing with coherence the successful themes initiated in the National Parks architecture.

This concept has not only received great public favour but it aims to restore an authentic local tradition that has become increasingly diluted by a variety of developments of different inspiration and tastes.

Construction of the resort will begin near the sawmill site area.[9] The initial Daylodge will be located just to the north of the sawmill site at the base of chairlift 1.0, below Jumbo Mountain. This is an optimal location for skier movement and transfer. It will be possible to ski into the resort or to ski the diagonal trails that will lead to and from the gondola to Glacier Dome.

The Daylodge will provide all the initial day skiers' and visitors' services, including a restaurant, guest relations and room reservations office, ticket office, ski rental shop, first aid station, ski patrol, ski school, gift shop, washrooms, and lockers.

A condotel facility adjoining the Daylodge with a First Nations interpretive theme has been proposed as a First Nations' joint venture. This would be an initial investment in the project by First Nations together with the public utility company that will provide water, sewer and potentially other infrastructure services. First Nations opportunities are discussed in greater detail in Section 7 of this Master Plan.

The resort will grow in phases (see Section 4.4 below) and the Daylodge and condotel building will initially face an arrival plaza with day parking and will be the nucleus from which the first vacation homes will be developed, creating a bed base for the resort. Most of the parking from the first phase will be moved underground as buildings are constructed in subsequent phases.

Following the completion of the first phase, a new expanded Daylodge, a dayskiers' parking area and a new development nucleus will be built at the opposite end of the resort south of the sawmill site, where the departure of the gondola to Jumbo Mountain will be located. All dayskier parking will be located at the south end of the resort following the second phase start.

Buildings that will form a gateway to the resort will be constructed in the Second Phase. The gateway will consist of a building group arching over the road, with a clock tower on one side, marking the entry into the resort (building B9). The second phase will complete the road to the future main underground parking that will form the central platform for the construction of the third phase and of the central square. This road will lead to a smaller square in front of the hotel that is planned for the second phase and which would be the major building of that phase.

The gateway building (B9) will emphasize the use of stone and will provide a visual effect not unlike that of the old Banff National Park administration building facing the historical bridge over the Bow River, in Banff, even if at a much smaller scale. The gateway will not only be a visual anchor, but it will also be the location of the interpretive centre that will be a unique component of this project.

---

[9] The sawmill site has become a relatively frequently used ski run terminus for heli-skiers, following the glading of ski runs that was done in the early and mid 1990s. Incidentally, the Formal Proposal for Jumbo Glacier Resort was submitted in 1991 and it demonstrates the suitability of the location as a ski in and ski out area.

Completion of the third phase will see the construction of a major hotel at the centre of the resort. The hotel will face a main shopping square and an open air skating area that is planned for the centre of the square. This will be a traditional alpine square, a cheerful location that will become a public gathering area for informal encounters and social events. The third phase will also see the development of the pedestrian nucleus and pedestrian focused street network at the centre of the resort, as well as the construction of an expanded day parking area and Daylodge facilities at the southern end. A roof is planned for the expanded parking area in order to minimize snow removal work and to screen its appearance from the view of skiers and sightseers enjoying the mountains above the resort.

The resort base will be pedestrian oriented and will also be an exceptionally convenient place from which to access the mountains for skiing. Ski runs from both sides of the valley will lead directly to the resort base and the resort will be the ultimate focus for all lifts. In winter, a significant snow base will cover Jumbo Creek, which will allow easy skier transfer between the two sides of the resort. The entire resort is expected to offer ski in/ski out access.

The resort base will provide access to unparalleled glacier skiing in winter and summer, as well as unique sightseeing opportunities year round. Summer access to Glacier Dome may be facilitated both by the shuttle bus and by vehicular access to a small parking area at the base of the Glacier dome gondola, with parking available on a first come first serve basis.

While the resort will develop in phases, a linear construction sequence is planned so that construction will not be in the way of resort visitors. It is conceivable that the resort may be developed beginning with a bare land Strata Title concept, to avoid unsightly road regulations and waste of space, and that later the expanded phases may also be developed with several Strata Title groupings, minimizing the necessity of large subdivision roads which are not in character with mountain resort conditions.

On completion, hotels, bed and breakfasts, condominium apartments, townhouses and single family chalets will provide a complete variety and mix of sleeping accommodations. The resort core will be situated on the eastern side of Jumbo Creek while the single family chalet area will be located on the western side of the creek. Initial plans for crossing Jumbo Creek called for the restoration of an existing collapsed forestry bridge, which was the crossing in the closest proximity to the sawmill. It was discovered, however, that the restoration of this bridge would no longer be permitted under new regulations of the federal Department of Fisheries and Oceans (DFO) without starting a new review process that would involve an unknown number of years.

Instead, access will be over an existing bridge that will be upgraded over time located further to the south. It is also possible that future revisions to federal regulations may permit to replace the collapsed forestry bridge with a feasible application procedure. As noted before winter skier access crossing the creek will be possible irrespective of bridges due to the snow cover and temperatures in the valley.

The resort will include all the services necessary for a destination resort, including a small firefighters' station, a security office, a first aid emergency station, a central garbage deposit and temporary storage building, and necessary commercial facilities in a variety of shops. Meeting rooms and small convention facilities will be initially included in the major hotel building at the centre of the resort, but may be expanded later to become a separate building over the top of the day parking area.

Visually, on completion of the resort, the Daylodge and day-visitor parking area at the base of the Jumbo Mountain gondola will be the first elements seen by the tourist approaching the resort. Moving forward into the resort centre and into the pedestrian area, the visitor will pass a series of buildings flanking the road and leading to a centre group of buildings and a clock tower. This group of buildings will bridge or span the road, forming a gateway to the resort.

Proceeding through the gateway the visitor will then have the option of following a street to the left leading to the first hotel squares or to the right to another street opening to a major square where an outdoor skating area and a major hotel will provide a visual focus. The heart of the commercial and shopping area will be around this alpine square. This square will be surrounded by low scale buildings with a commercial ground floor like the rest of the resort. It will cater to the daily necessities of the long term visitors. Single family chalets users will be given a special pass to be able to drive to this plaza at appropriate times to buy staples. Those in closer proximity in the main resort will be expected to use the electric shuttles provided by the resort if not willing to walk. Delivery services will be available for additional convenience of the overnight guests.

Shops and restaurants will be distributed through the entire resort core pedestrian area and the small scale feeling will be maintained not only by the relatively narrow streets but also by the low and small massing of the buildings. The entire resort will fit into the valley so that it will hardly surpass the height of the trees. The character and activities of the resort will be the most fitting for mountain vacations and start a trend to create quiet pedestrian small destinations with a small scale design fitting for a new kind of health oriented tourism in the best mountain climates.

The ski lift stations will be at the two ends of the resort, rather than in the middle, in the traditional style of many Swiss Alpine villages, rather than the new style of instant ski resorts, like Tignes and Les Menuires in France or Jackson Hole Wyoming, where the main lift station is the centre focus of the resort. The reason is that the resort should not feel like sleeping accommodation around a skiing superstore, but it should have its own village atmosphere and squares as visual and emotional focus, catering equally to skiers and non-skiers, with more emphasis on being in the mountains, rather than on the technical aspects of skiing as a sport.

The dispersal of bottom lift locations provides for a more natural growth pattern to the resort and ensures that there is activity and movement between the two ends of the resort. A design centred on a “plaza” located at the terminus of the ski lifts was intentionally avoided for this project in part because of the topography of the valley and in part because it tends to generate an artificial space that is abandoned once the sun sets. Instead, a main plaza, located at the centre of the resort, acting as a crossroads and a gathering place has been envisioned. This is more in keeping with the natural development patterns of villages and village squares in the Alps and elsewhere.

The lifts will still be within a convenient distance from the resort centre, and the resort will be small enough that people will be able to walk its entire length. The resort would lend itself to the service of a few electric minibuses and electric taxis like those used in Zermatt or Saas-Fee, Switzerland, for additional convenience.

The Master Plan includes architectural conceptual plans and a rough volumetric outline of buildings. The resort will be compact to minimize its footprint in the valley. Height will be limited for most buildings to three to four storeys, except for some of the condominiums and the hotels, which may rise to six stories or more depending on the steepness of the rooflines. The hotels will be able to stand out among the other buildings with a stronger presence, without overpowering the rest of the resort. The resort is designed to allow the riparian areas to remain as open space, recreating a natural setting.

The preliminary design will focus on creating compulsory building envelopes, character through mandatory guidelines, and a mandatory building sequence determined by the design phases.

4.3.2.1 Pedestrian Zones and Minimization of Automobile Traffic

The resort core is intended to be a pedestrian zone. Automobile access at the resort will be limited in order to preserve the mountain character of the area. Most automobile parking and all the day skiers' parking will be out of the way of the resort pedestrians. It is intended that automobile traffic in the resort nodes will not be permitted except for loading and unloading for overnight visitors so that a pedestrian character is maintained.

In order to minimize the footprint, roads will be kept to a maximum of 50' right-of-ways, and where possible will be limited to one lane and one way in the resort core. It is intended that surface public parking in the resort will be limited to short stay drop off points. All automobile traffic by day visitors will be directed to the day parking areas. Overnight visitors will have access to enclosed parking spaces. Driving automobiles in the resort will not be permitted except for access to underground parking destinations for overnight stays. Single family chalet overnight visitors may be granted limited vehicle access to the shopping plaza at the north end of the resort.

The entry to the limited traffic zone and pedestrian area of the resort is marked by a gateway building that spans across the road (Building B9). At buildout, limited vehicle access will be permitted on the main two-way road that terminates in a roundabout at one of the two hotel plazas (fronting building block C8) from where overnight underground parking can be accessed. Limited vehicle access will also be available on a one-way street loop of the main pedestrian centre of the resort core, which is centred around the main hotel plaza fronting building blocks C1 and C2.

While limited vehicle access through some of the pedestrian areas of the resort will be permitted, most of the pedestrian area will be well beyond traffic boundaries. A good example of a pedestrian zone where limited vehicle traffic is allowed is that of the resort town of Courmayeur, located on the Italian side of Mont Blanc. Another example is St. Anton, Austria.

Additional visitor transportation may be made available by means of small electric shuttles or minibuses like those used in Zermatt, Switzerland. People will be able to reach the resort core on skis, and to walk from one end to the other, due to the smallness of the area.

4.3.2.2 Ski In/Ski Out

The entire resort base area, including the single family chalet area, is designed to be a ski in/ski out area. Initial ski trail alignments, including dispersal trails around the resort base, are outlined in the CRA drawings included in Schedule A. More detailed planning of ski in/ski out trails and ski ways will occur prior to construction.

4.3.2.3 Shuttle Buses

4.3.2.3.1 Glacier Dome Shuttle Bus

A shuttle bus for skiers and sightseers will connect the resort base area with the Glacier Dome gondola lift base. Current planning calls for year-round operation.

4.3.2.3.2 Panorama/Invermere Shuttle Bus

A shuttle bus for employees, skiers and sightseers will connect the resort base with Panorama Mountain Village and Invermere.

4.3.2.3.3 Farnham Training Base Shuttle Bus

A shuttle bus for skiers and athletes will connect the resort base with the base of lift FT1 that provides access to Farnham Glacier from the lower Jumbo Creek valley.

4.3.2.3.4 Resort Core Mini-bus

An electric, or alternative clean energy powered mini-bus, such as those currently operating in Zermatt or Saas-Fee Switzerland, may provide a shuttle service within the resort core at buildout.

4.3.2.4 Heli-plex facility

At the beginning of the first phase it is hoped that the local heli-ski company will start heli-skiing operations from a heli-plex proposed for the opposite side of the creek from the sawmill location, near the proposed area for individual chalets vacation homes, which will be located along the line of an existing logging road on the west side of Jumbo Creek.

4.3.2.5 Resort Size

The plan for the resort core, excluding the chalet sites and the heli-plex area will cover less than 28 hectares (69 acres). The chalets and the heli-plex development area will be dispersed in a forested setting covering less than 51 hectares (126 acres). The entire development area, including the chalets, will cover less than 104 hectares (257 acres) of land, entirely in the centre of the logged area around the sawmill site. The resort is planned to be completely self-contained as if it were a ship in the mountains, and could be completely fenced, if needed, to isolate it from wildlife.

This proposal is expressly designed as a high-quality, highly planned “boutique” destination resort. It does not qualify for the “mega resort” denomination. Size has been a long-misunderstood issue related to this proposal, and the geographic name of its location, "Jumbo", has led to more than a little confusion in the past. The name Jumbo refers to the glacier and to the mountain, rather than to the project, although numerous other geographical features in the are have been named after the mountain, including Jumbo Pass, Jumbo Creek and Jumbo valley. The use of the name Jumbo next to the resort name however seems to convey a wrong impression relative to the type of resort that is planned and it is for this reason that the proponent has been careful insisting that the name Glacier follow the name Jumbo, to communicate not only where the project is located but also to convey the notion of what the name Jumbo correctly applies to.

By comparison the following table outlines the size and base development areas of a few well known B.C. resorts:

Table 4.3: Size Comparison of Existing and Proposed Destination Ski Resorts in British Columbia

Ski Resort	Bed Units	Base Area (including all residential lots) (ha.)	Controlled Recreation Area (ha.)[10]
Jumbo Glacier Resort (proposed)	6,250 (proposed at full buildout)	104	5,926
Panorama	7,084 (approved)	336	816
Sun Peaks	23,342 (approved)	288	4,400
Whistler/ Blackcomb	52,500 (official)	12,950	18,950
Big White	14,800	361	3,139
Melvin Creek/ Cayoosh (proposed)	14,186 -16,800 (proposed at full buildout)	70 - 90	2,100
Garibaldi at Squamish (proposed)	Approx. 23,000 (proposed at full buildout)	910	3,500

Source: Data compiled by Pheidias Project Management and Ministry of Environment, Lands and Parks

[10] Including resort base area.

4.3.2.6 Architectural Theme and Growth Rate

The resort's architectural design will be inspired by the genuine tradition of rustic architecture of western Canada and the National Parks, emphasizing the use of natural materials, particularly wood and stone, in their real architectural functions will be emphasized.

Building heights will remain low – they will be kept to what is permissible under the B.C. Building Code for low-rise wood frame construction, possibly over one storey of concrete construction for the commercial ground floor. It is planned that two hotels may reach a greater height, up to six or eight storeys, but that they will be designed with sloping roofs in the style of mountain architecture, according to the design guidelines.

The resort will be designed to avoid the loose and overbuilt look that so often occurs in new developments. Various stages within the phasing will determine resort growth according to the speed of economic development. The planned, slow rate of growth, emanating from three different development areas and the single family chalet areas will be more in keeping with the historical way in which village development has occurred in Europe, and will result in a higher quality of design and development.

To assist this process, all development at the resort will be under one overall architectural guideline and control system. The anticipated slow development pace will greatly increase the possibility of creating something more natural and true to the mountain character that is expected for the resort.

Exhibit 4.21: Conceptual View of Resort Base at Full Buildout (1)

Exhibit 4.22: Conceptual Plan of Resort Base at Full Buildout

4.3.5 Accommodation Units

4.3.5.1 Condotel Units

Condominium units will be the main type of vacation homes in the resort core. The word *condotel* is utilized to indicate that preferably these units will become part of a rental management pool run by the resort and become similar to hotel units in the manner in which they are operated.

They may become part of a condominium rental pool or be part of some form of timeshare or fractional ownership program, or be simply owned. The form of ownership will be market driven, but the developer expects a good portion of the condominium unit purchasers to make their units available for the resort rental pool.

The form of the buildings will be generally three or four stories, with two possible exceptions being as high as six stories. They will be similar in appearance and conveniences to hotel suite units. The design will be in the National Parks heritage tradition and in accordance with the Design Guidelines (see Schedule B).

4.3.5.2 Townhouses

Townhouses will also be condominium units, but they will be ground orientated vacation homes of two or three stories, designed in wood and stone according to the design guidelines and the National Parks heritage theme of the resort.

4.3.5.3 Single Family Chalets

Single Family Chalets will be developed on individual lots along the logging road to the west of the abandoned sawmill site, distributed over the remaining visible clear cut on the western shoulder of the drainage, and will be developed according to mandatory design and landscaping guidelines that will recreate the forest, concealing the houses among the trees. Ideally, the chalets may be traditional alpine log homes, or will be stone and timber buildings in the same National Parks heritage tradition of the resort, but on a smaller scale.

The chalet lots are intentionally large. Larger lots enable larger buffer zones between chalets and make it possible to retain a larger forested area thereby causing a smaller visual impact on the landscape. The larger lots will also provide better value to prospective purchasers.

4.3.5.4 Hotels

The resort will have an abundant number of condominium units that will be utilized for fractional ownership and rental pools in a variety of ways, delaying the need for the development of pure hotel space until the later phases of the project. This is necessary as hotel financing has becoming an increasingly difficult task, particularly at the opening of a new resort. However, it is planned that as the resort grows it will become easier to establish the presence of hotels, and two hotels are planned of different sizes and market level. The hotels are planned to be complemented by pools and tennis courts, and skating areas in winter, and to be capable of hosting small conventions. The projected sizes are in the order of one hundred and two hundred rooms.

Table 4.4: Preliminary Projections of Hotel Recreation/Meeting Facilities

TYPE **(sq. ft.)**	**Phase 1**	**Phase 2**	**Phase 3**	**Total**
Spa /Pools in hotels	1,000	10,000	10,000	**21,000**
Theatre /Convention space in hotels		5,000	15,000	**20,000**

4.3.5.5 Staff Housing

On-site staff accommodation will be provided for 90% of the resort's full time staff, which at completion, translates into 750 Bed Units of staff housing. The gradual growth of the resort will allow the progressive identification of the requirements for on-site staff accommodation that will be constructed in accordance with the development of the resort. Accommodation that will be utilized for staff housing in Phase 1 will be converted to vacation homes when staff housing built in Phase 2 and 3 will be added.

4.3.6 Commercial Space

The resort will develop the entire spectrum of commercial and service facilities that are needed by tourists, similar to resorts such as Panorama or Sun Peaks.

Commercial activity at a nascent destination resort is the most difficult to develop economically. Initially it has to be subsidized by the developer. At Jumbo Glacier Resort, the advantage will be that the clientele will not be drawn for commercial reasons – such as the "village" entertainment or the shopping experience – and it is not crucial to the resort's success how much and how quickly its commercial space will be developed.

In this respect it is important to grasp correctly the type and size of project being proposed. Earlier comments have compared this project to Whistler, but the Whistler model is incorrect for a number of reasons. Firstly, the resort size at buildout will be less than one-tenth that of Whistler, and commercial and service uses would be proportionately smaller. More important, however, climate, mountains and activity focus make Jumbo Glacier Resort very different. The proposed resort will not focus its market attraction and financial success on lifestyle, fashion and commercial entertainment, where it could not compete with the larger centres advertised across the continent as such, but it will focus on the quality of the skiing, of the climate, and the beauty of the mountains. The proponent group believes that these are more lasting and valuable attributes to market. The projections for commercial and service activities are based on what is expected to be a preliminary reasonable response to the appropriate needs in the planned growth of this type of resort, which will bring resort design concepts to a new level.

Table 4.5: Preliminary Projection of Commercial and Service Uses Located at Ground Floor Space or in Separate Buildings

(sq. ft.)	IN DAYLODGE[11]			IN OTHER BUILDINGS			
TYPE OF RETAIL & SERVICE	**Phase 1**	**Phase 2**	**Phase 3**	**Phase 1**	**Phase 2**	**Phase 3**	**Total**
Ski rentals /servicing shop	2,000	2000	3,000				**7,000**
Guest relations /Administration	1,000	1000	500				**2,500**
Ski school /Guides	800	500	500				**1,800**
Ski patrol /First aid	1,000	1000	500				**2,500**
Tourist packages /Activities	250	500	250				**1,000**
Interpretive Centre /Environmental control				250	1,000	4,000	**5,250**
Cafeteria	2,000	2000	2,000				**6,000**
Security/Police		500				2,500	**3,000**
Clinic/First-Aid						2,500	**2,500**
Garbage collection building						1,500	**1,500**
Family restaurant /Coffee shop				500	1,000		**1,500**
Deli /Café /Juice bar				500			**500**
Alpine café					1,000		**1,000**
Specialty restaurants (Italian, French, Japanese, Thai, Indian…)					3,000	3,000	**6,000**
Lounge bar				250	1,000	2,000	**3,250**
Delicatessen /Chocolates				500			**500**
Pub /Restaurant					500	1,000	**1,500**
Family arcade /Play area					500	1,000	**1,500**
Arts and crafts /Gallery					1,000	1,000	**2,000**
Convenience food retailing and					1,000	3,000	**4,000**
Liquor store					250	1,000	**1,250**
Retail access /Fashion						1,000	**1,000**
Sports /Brand items						1,000	**1,000**
Body & skin care /Hair dresser					500	2,000	**2,500**
Optical /Photo /Gifts				500	1,000	1,000	**2,500**
Native arts /Gallery						3,000	**3,000**
Special retail				250	500	1,000	**1,750**
TOTAL	**7,050**	**7500**	**6,750**	**2,750**	**12,250**	**31,500**	**46,500**

[11] The Daylodge space is to be accommodated in the two Daylodges at the resort base (buildings A2 and B27) and their expansion.

4.3.7 Interpretive Centre and Environmental Monitoring Station

The resort is planned to start with an interpretive theme in the interior design of the initial Daylodge. Opportunities will be taken throughout the development period of the project to generate further interest in interpretive aspects. An emphasis will be placed on communicating the history of the First Nations and assisting the First Nations as hosts in their traditional lands.

As the project develops, a dedicated building will become the Interpretive Centre (building B9) and will have a variety of functions assisting the First Nations in asserting their presence, from a formal museum area to a centre for guided tours and various booking facilities, including managing and renting the resort tourist accommodation to be developed by the First Nations, such as the first condotel to be developed next to the first Daylodge.

As currently planned, the Interpretive centre building will also house the Environmental Monitoring Station, which will be expected to be managed jointly by the First Nations and by the resort's Safety Management personnel and to produce information and yearly reports on the environmental conditions of the valley and the surrounding region. The baseline information produced in the studies to date will be the initial step in an on-going data collection and environmental monitoring program.

4.3.8 Place of Worship

A suitable location in cooperation with the religious community in the region will be found in order to facilitate the development of a place of worship acceptable to skiers and visitors. This will be conveniently located both for winter and summer access. Due to the small size of the overall development, it is expected that it will serve primarily as a skier's chapel for the various Christian denominations that will probably represent the majority of the anticipated visitors. It may be available also for other religious services to the extent that it will be possible in order to serve the entire spectrum of religious services.

4.3.9 Parking Calculations

Parking considerations are based on the formulas normally utilized according to CASP. It is assumed that on average a full size bus will carry forty people and private vehicles will carry an average of three people among day skiers. Parking requirements and provisions are outlined in the tables below:

Table 4.6: Parking Required for Phase One

	Percent	People	People/ vehicle	No. of Vehicles
CCC (SAOT) Maximum	100%	2,730	-	-
Car	90%	2,457	3	819
Bus	10%	273	40	7

Table 4.7: Parking Provided for Phase One

UNDERGROUND/ ENCLOSED PARKING	Stalls/ unit	Units	Parking Stalls	People
Condominium	1.00	144	144	432
Townhouse	1.00	114	114	342
Single Family Chalet	2.00	50	100	300
Bed and Breakfast	8.00	3	24	72
Hotel Room	0.75	69	52	155
Employee Housing	0.75	32	24	72
Subtotal			**458**	**1,373**

Above Ground/ Day Skier Parking		Parking Stalls		People
Lot	**Phase**	**Cars**	**Buses**	
A		72	0	216
A-Temp.		*200*	*22*	*1,480*
B		40	0	120
C (Guest Parking)		-	0	-
D (Guest Parking)		-	0	-
Subtotal		**312**	**22**	**1,816**
Total Underground and Above Ground parking for Phase 1:		**770**	**22**	**3,189**

Table 4.8: Parking Required for Phase Two

	Percent	People	People/ vehicle	No. of Vehicles
CCC (SAOT) Maximum	100%	5,629	-	-
Car	90%	5,066	3	1,689
Bus	10%	563	40	14

Table 4.9: Parking Provided for Phase Two

Underground/ Enclosed Parking	Stalls/ unit	Units	Parking Stalls	People
Condominium	1.00	504	504	1,512
Townhouse	1.00	240	240	720
Single Family Chalet	2.00	84	168	504
Bed and Breakfast	8.00	3	24	72
Hotel Room	0.75	69	52	155
Employee Housing	0.75	378	284	851
Subtotal			1,271	3,814
Above Ground/ Day Skier Parking		**Parking Stalls**		**People**
Lot	Phase	Cars	Buses	-
A		72	0	216
B		40	0	120
C		684	25	3,052
D		-	0	-
Subtotal		796	25	3,388
Total Underground and Above Ground parking for Phase 2:		**2,067**	**25**	**7,202**

Table 4.10: Parking Required for Phase Three

	Percent	People	People/ vehicle	No. of Vehicles
CCC (SAOT) Maximum	100%	10,049	-	-
Car	90%	9,044	3	3,015
Bus	10%	1,005	40	25

Table 4.11: Parking Provided for Phase Three

Underground/ Enclosed Parking	Stalls/ unit	Units	Parking Stalls	People
Condominium	1.00	974	974	2,922
Townhouse	1.00	240	240	720
Single Family Chalet	2.00	143	286	858
Bed and Breakfast	8.00	3	24	72
Hotel Room	0.75	369	277	830
Employee Housing	0.75	750	563	1,688
Subtotal			**2,363**	**7,090**

Above Ground/ Day Skier Parking		Parking Stalls		People
Lot	**Phase**	**Cars**	**Buses**	
A		72	0	216
B		40	0	120
C (Guest Parking)		684	25	3,052
D (Guest Parking)		30	0	90
Misc. Lots Through Resort		150	0	490
Subtotal		**976**	**25**	**3,968**
Total Underground and Above Ground parking for Phase 3:		**3,339**	**25**	**11,058**

4.3.10 Design Guidelines and Design Control

The intent of the Design Guidelines is to provide direction so that the architectural concept and execution of each building will be in keeping with the standards and with the overall plan for the Jumbo Glacier Resort.

The Design Guidelines will not restrict or confine the freedom of the designers and builders, but rather ensure that the architectural concept and execution of each building is in keeping with the basic standards and with the overall plan that the developer and its designer have set for the resort. To ensure the appropriate year round aesthetic character and environmental and conservation objectives at the base area of the resort, a high level of care in the landscaping and servicing details will also be called for.

Control will be achieved via two sources of authority:

1) By the developer, Glacier Resorts Inc., through a covenant registering the requirement to comply with a building scheme as outlined in the Master Plan and Design Guidelines. Glacier Resort's approval will be a condition precedent to any application for permit; and

2) By the Government in cooperation with the developer through the administration of the Development Permit process.

Quality control in design will be a fundamental concern of Jumbo Glacier Resort in order to achieve a quality tourist product that will position the resort on the tourist map of international visitors. This is planned both with a design that will return the upper Jumbo Creek valley to a more natural configuration and park-like setting, nestling in a forested high alpine valley amidst towering peaks and glaciers, and with design controls through design guidelines, that will ensure that all private development will follow the planned architectural theme.

Detailed design guidelines will be finalized prior to registering building schemes on title. The guidelines are intended to help achieve the creation of a high quality alpine atmosphere. Heavy timbers, warm, natural finishing materials, and large interior spaces will be emphasized to combine a grand impression and a warm mountain atmosphere. Authentic style and character will be derived from the successful design tradition of the National Parks architecture (from the mountain lodge tradition to the majesty of the Canadian Pacific hotels). Such a character will reflect a recognized Western Canadian heritage and mountain tradition.

Design Guidelines are included as Schedule B of this Master Plan.

4.3.10.1 Design Review and Approval Authority Requirements - Site Plan And Conceptual Drawings

Each building component must be designed to fit within the building envelope designated in the Master Plan and must comply with other Master Plan requirements and guidelines.

The designers of buildings, signs and incidental development components must submit a site plan and conceptual building drawings to a Design Review and Approval Authority (DRAA) prior to submitting drawings for a Development Permit. Upon approval, the DRAA will provide a written statement confirming to the local government that the project is in compliance with the Master Plan Guidelines. Subject to compliance with the B.C. Building Code and any relevant local bylaws, the local authority having jurisdiction (which initially may be administered through the developer of the resort) will then issue a Development Permit and, subject to receiving satisfactory Letters of Assurance and supporting documentation from the design professionals, a Building Permit.

It is proposed that the DRAA will have one or more staff persons who will be overseen by a panel that may comprise a British Columbia registered architect named by the proponent, a British Columbia professional Engineer named by the proponent, and a Planner named by the local government. The principles in the guidelines may be reinforced through covenants, a statutory building scheme and the possible creation of a Development Permit area within a special Mountain Resort Area or Official Community Plan Area in the RDEK.

4.3.10.2 Enforcement

Two concurrent methods of enforcement are planned. Firstly, design guidelines will be incorporated in a Registered Building Scheme to be filed against the title of each parcel of land in the resort. In this case the other benefiting properties may take action against a property owner who fails to comply with the guidelines. Secondly, a restrictive covenant may also be placed on title in favour of the authority having jurisdiction, to provide for enforcement as to the form and character of the buildings to be constructed on privately owned parcels. A system of fines may also be devised in areas where a strata corporation administers bare land strata parcels, or strata title units.

4.3.11 Leave Strips – Riparian Zone Guidelines

"Leave Strips" or "Riparian Zones" as defined by the Department of Fisheries and Oceans and the Ministry of Environment, Lands and Parks in the 1992 "Land Development Guidelines for the Protection of Aquatic Habitat" and more recently in the *Fish Protection Act* – Streamside Protection Regulations (January 2001), are fisheries sensitive zones located next to streams, rivers, lakes and wetlands and have direct influence on aquatic habitat values. Typically, the federal / provincial guidelines require a minimum leave strip of 15 metres for residential / low density areas and 30 metres for a commercial / high-density area. The "Leave Strips" for the proposed Jumbo Glacier Resort development will meet or exceed the above criteria and are part of the mandatory design guidelines.

See also Vegetation Management Plan in Section 3.7.

4.3.12 Water Conservation Guidelines

The water conservation strategy for Jumbo Glacier Resort will consider a range of measures at the levels of planning, design, construction, operation and maintenance by the water utility company, as well as public awareness and education. These will include:

- Universal water metering;
- Water accounting and loss control;
- Incentive producing water costing and pricing practices;
- Non-combustible building construction where possible;
- Impounding of runoff and snow melt water;
- Landscape efficiency;
- Water re-use and recycling;
- Landscape efficiency;
- Water system pressure management;
- Water saving plumbing fixtures;
- Water saving domestic/ commercial appliances and building envelope equipment, and
- Water conservation awareness program.

Water Conservation Measures are described in detail in the Water Management Plan included in Section 3.11 of this Master Plan.

4.3.13 Fire Prevention and Control

The resort will create its own fire prevention program leading to a volunteer Fire Department with its own station (see Section 9.1.3.7 of this Master Plan). The B.C. Building Code and Fire Code will be followed in the resort development. It is planned that there will be a Mountain Resort Association managing the interests of all the independent participants in the development.

The resort is situated in a forested and high alpine environment, and particular consideration will be given to fire prevention and protection. A variety of guidelines to reduce and control the threat of fire will be incorporated into the design and materials used in the resort. These guidelines are included as part of the Design Guidelines (see Schedule B) and are intended to meet or exceed the BC Forest Service's *FireSmart* standards. They include a consideration of:

- Defensible Space
- Building Location
- Roofing
- Vents
- Siding
- Isolated Structures
- Sprinklers

In addition, a Community Fire Protection Strategy has been prepared and is included as Appendix 9-A.

4.3.13.1 Additional Protection Against Forest Fires

The project site is protected by forest cuts produced by avalanches that are a kilometre or more wide upstream of the site. Downstream, near the junction of Leona Creek and Jumbo Creek, where the earlier fire stopped, a forest cut over a kilometre wide protects the project site. Avalanche tracts may be easily connected to form a series of fire breaks more than a kilometre wide.

The proposed resort will be managed within the context of the *Forest Practices Code Act* of B.C. to prevent and control wildfire. Cooperation with Ministry of Forests activities will facilitate the disposal of logging slash in the mountain area of the Controlled Recreation Area. Slash cleanup will be performed on old skid trails in a 50m zone surrounding the resort core area. Such activities should have only minimal impact on the operation of the resort. Precaution in design will be necessary to avoid or reduce resort interface fire as part of the plan to take precaution against forest fires.

There are several main options available to bring about a reduction of the fire hazard on the mountain, which can be summarized as follows:

- vegetation management
- water sources
- structural options
- emergency procedures

Each of these topics will be discussed in more detail in the following paragraphs.

The goal of vegetation management is to reduce or eliminate flammable vegetation around existing or new structures. Surrounding the resort's core development area are large openings in the forest created through either avalanche activity or past harvesting practices. In most cases these areas contain brush species such as alder or immature coniferous species such as spruce.

Fire hazard protection will be enhanced through the creation of fire breaks connecting these existing openings. It is proposed that all mature green timber and any standing snags be removed from these zones. All slash and debris would also be removed.

The healthy understory of immature trees less than 15 cm should be reserved wherever possible. The width of such firebreaks should be approximately 100 metres.

Extensive logging has occurred immediately adjacent to the location of the proposed resort core area. A myriad of skid trails were constructed to facilitate this harvesting. In order to provide additional fire protection for the resort, all logging slash remaining on these trail will be skidded to a central location and burned under appropriate conditions. The area to be treated will be a zone of 100 metres in width extending uphill from the edge of the resort.

An examination of the natural and man-made openings downstream of the resort area has revealed that the forest cover has been sufficiently modified so as to reduce the potential for spread from a wildfire burning lower in the valley. Numerous avalanche tracks on both sides of the valley also act as natural fire breaks.

Exhibit 4.23: Forest Cover in Jumbo Creek Valley

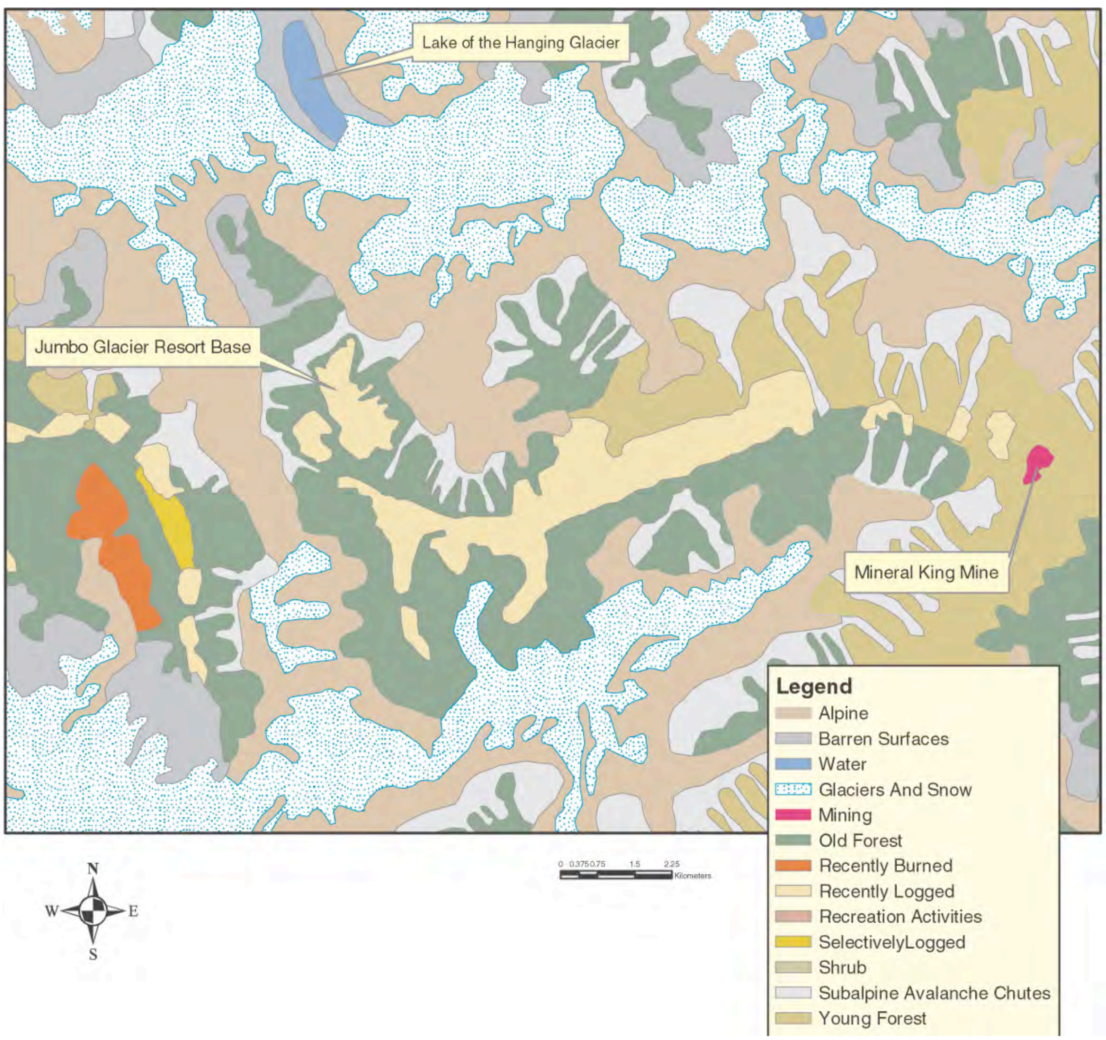


Exhibit 4.24: Forest Cover at Resort Base Area (Upper Jumbo Creek)

Exhibit 4.25: Forest Cover Downstream of Resort Area (Confluence of Jumbo and Leona Creeks)

Exhibit 4.26: Avalanche Chutes Downstream of Resort Area (Confluence of Jumbo and Leona Creeks)

Based on some of the factors contributing to the spread of the Okanagan Mtn fire of 2003, it is recognized that the volume of fuel on the ground accelerates the spread of any large wildfire. For that reason, Jumbo Glacier Resort will reduce the fuel loading of those forested lands immediately adjacent to the resort core area. This may be accomplished through the use of cleared fire breaks, which in some cases may be ski runs, located in strategic locations surrounding the proposed resort.

The resort developer will need to implement clearing practices removing all debris from a 10 metre area surrounding the resort, ensuring a series of fire safe zones surrounding the structures. It is also important to reduce the fire hazard in the wooded areas between the runs through fuel reduction measures such as the cleaning out of all dead and down material on the forest floor. In conjunction with this procedure, these areas should be spaced to ensure that there is a reasonable space of about three metres between each tree to be retained. Pruning of the lower limbs to a height of 2.5-3.0 metres will further reduce the hazard.

Water is the most effective firefighting tool available. The construction of small holding ponds throughout the area surrounding would provide a ready source of water in case of fire. The ski runs should be assessed in order to locate natural depressions, sources of run-off water, intermittent streams and other areas where cisterns could be constructed to provide a uniformly spaced network of available water supplies. It is recommended that Jumbo Glacier Resort initially consider the purchase of an older skidder equipped with a 500-gallon tank, a forestry fire pump, 2-3 lengths of 30m hose, an approved nozzle and some basic fire-fighting tools such as shovels and polaskis. The purchase of a high volume gasoline powered pump for filling the tank would also be a valuable asset. This will ensure that resort employees would be able to quickly respond to a fire anywhere around the resort area. A portable fire cache containing the required number of fire tools should be assembled for use by a larger crew should conditions warrant.

Next to the construction and maintenance of a defensible space, use of fire-safe structural options are the most important fire protection measure that the resort could implement. The roof is the most vulnerable component of the structure and seems to indicate whether or not a fire will consume the building. It would be important to consider Class A rating roofing materials such as fiberglass composition shingles or metal for installation on the buildings to aid in their protection should a fire occur. Construction materials such as rock, concrete or cement stucco as siding material may increase the ability of the building to withstand the damage caused by airborne firebrands and embers that may come to rest against the walls of the structure. It would be prudent to use non-combustible or fire-resistant materials on the decks to minimize the chance of any burning embers starting an even larger fire in the building. Sprinklering buildings is an alternative to many of the above noted measures, but they may be used in combination for added protection of sprinklered buildings.

A major forest fire near the resort is unlikely because of the many vegetative breaks downstream and upstream, but if it were to occur it would create an immediate emergency. Since the resort will be outside the nearest Fire Protection District, responsibility to control the fire rests with the Ministry of Forests. Response time by professional fire-fighters would be dependent on other fires burning, aircraft availability, or driving time of over one hour for a crew based in Invermere. Jumbo Glacier Resort will develop an Emergency Response Procedure Manual and have copies of a summary document available to every employee. Topics covered could include such items as:

- key personnel and phone numbers
- critical shut-off locations for power & fuels
- marshaling points
- disaster warning system (fire alarm)
- evacuation routes and destinations

These are but a few of the necessary topics, however a complete manual would be far more comprehensive.

Following approval of the Master Plan, and prior to the advent of any construction a detailed Fire Hazard Assessment will be conducted and a comprehensive report prepared. Such a document will guide the activities of the resort development and minimize the potential danger to the facilities from wildfire.

In summary **protection against wildfire** will be implemented in a number of ways including:

1. Coordinating with emergency services in the valley base.

2. Connecting and utilizing avalanche runs and ski runs across the valley to create large wildfire breaks.

3. Creating a number of water collection areas around the resort to aid fire fighting.

4. Maintaining a forested area around the resort that is managed with a minimization of combustibles.

4.4 PHASING PLAN AND DEVELOPMENT VISION

The resort will be centred on an abandoned sawmill site and will be designed to develop gradually over a number of phases. Its phased development is an integral part of the concept.

The birth of a new ski resort is dependent on the correct relationship between the development of the infrastructure, particularly the ski lift infrastructure and the bed base. A successful model requires a gradual start to the project with a preponderance of equity financing of the infrastructure and early repayment of the initial financing through the sale of the initial development of “cold beds” vacation homes. This has successfully been done at Kicking Horse Mountain Resort as well as at established resorts wishing to expand, such as Panorama, Fernie, Big White and Kimberley.

“Cold bed” vacation homes do not contribute significantly to the skier days but contribute to establishing the resort and to pay off the initial cost of the infrastructure. This ensures that the project is economically sustainable and minimizes the risk in the initial years with a relatively low number of skier days. The cold beds of vacation homes do not require a large work force of tourist service employees, consequently, the initial bed base required for the employees, which are to be housed at the resort, is proportionately smaller, with a smaller initial capital cost. As the infrastructure is paid substantially off with the initial real estate components, the development can move into the development of “warm beds”, the condos and finally the hotels, which depend on a more mature resort for their marketing, and which also require major financing efforts.

The condos and the hotels generate the higher employment ratios and the higher occupancy numbers that bring the resort into the final stage. In this process the financing risk of the “warm beds” comes at the time of the resort growth when the risk of the initial stage has been overcome with a minimum of debt financing. In this economic model the development of shopping and “street” commercial activities is pushed back to the end of the project and becomes secondary to the remote destination experience. This generates important savings to the developer of the resort that otherwise would have to subsidize the space for “street” commercial activities that are not fundamental for a true destination ski resort. It is a model that allows a project to grow prudently and to be designed to be capable to survive the inevitable ups and downs of the tourist industry cycles (similar to all other industries) without incurring excessive debts and promoting the real marketing benefits of “low density” skiing, rather than the unnecessary concept (when the mountains are sufficiently attractive) of shopping in the mountains.

4.4.1 First Phase

4.4.1.1 The Original Vision

A number of different concepts for the opening phase, including utilizing different access routes through Toby Creek and through Horsethief Creek have been considered since the beginning of the project.

As discussed in earlier reports and elsewhere in this report, it became apparent that the long-term solution for efficient economical access and to maintain the mutual benefit opportunity with Panorama was to be achieved with access from the Toby Creek drainage. The Toby Creek access route is the primary choice of the consultants and experts who have studied the project.

Following suggestions from the initial mountain planning consultants, Alpentech Inc., the plan in the early 1990s was to create various development nodes in separate locations, with day skier transportation being handled by shuttle buses. It was thought that the first development would consist of a base hotel-lodge at the head of Jumbo Valley, with a gondola to Glacier Dome and summer skiing there.

Unfortunately, the public presentation of the initial concepts was carried out in an unstructured forum full of philosophical controversy that resulted in a large degree of misinformation and misunderstanding that characterized the project as something that would ultimately cover the entire Jumbo Creek Valley and that the valley would be "privatized", none of which was ever proposed.

The initial plans were revised and in the 1995 Master Plan Proposal, the project was planned to start with Glacier Dome Lodge at the headwaters of Jumbo Valley at elevation 1,900 metres (6,234 feet) as an initial forward base, with the Glacier Dome gondola as the first major lift. The subsequent phases would see the creation of the resort at the abandoned sawmill site in upper Jumbo Creek, at elevation 1,700 metres (5,577 feet). Reduction of automobile traffic in the Jumbo Creek drainage was planned by means of shuttle buses from a parking area at the Mineral King Mine site at the confluence of Jumbo and Toby Creek. Shuttle buses were also planned from Panorama and Invermere. The lift network was planned to expand from the resort to Jumbo and Commander Glaciers, with the final phase extending into Farnham Glacier.

In the final phase direct day skier access to Farnham Glacier would be provided with a high capacity detachable chairlift from lower Jumbo Creek to lessen automobile access and traffic into the Jumbo Creek Valley. It was noted that shuttle buses have been a successful solution in many locations (they could even provide a capacity that is equivalent to that of the trains in automobile-free Zermatt and Wengen in Switzerland).

Significant efforts were made to plan for the minimization of automobile traffic in the Jumbo Creek drainage from the outset of the planning process. However, these concepts seemed to attract no interest and even antagonism during the many years of government and public processes. The project has since been redesigned to be dependent on automobile transportation for access from the opening phase on, although the option of shuttle busses will not be forgotten and will be presented again as an important service when the project goes ahead. Even the concept of a narrow gauge rail line to Invermere and to Fairmont Airport was discussed at various times, but this is clearly not within the economic reality of the project.

4.4.1.2 The Current Vision

The current vision for the first phase consists in creating an initial base located at the abandoned sawmill site at 1,700 metres (5,577 feet) elevation and providing access to Glacier Dome for year round skiing and sightseeing.

The site will be accessed by automobile and a parking area will form an initial plaza in front of the first daylodge/hotel/condo. It is an excellent resort location in the proximity of Jumbo Creek with a view of the surrounding mountains and an open view of the Leona Creek drainage with its mountains and glaciers to the south. Red Top Mountain and Bastille Mountain frame the picture.

Because the valley is south facing and opens up to the Leona Creek drainage, it is also exceptionally sunny for an alpine valley. The elevations and climatic conditions in the Upper Jumbo Creek make it possible to locate a ski resort with plenty of powder snow in winter with a sunny southern exposure. The project area's microclimate and elevation is a unique feature and it has an exceptional value for health purposes as well, similar to places such as St. Moritz, Arosa and Davos in Switzerland, which became legendary for their climate and for their health restoration potential.

The first chairlift will depart from the resort base, and will provide access to the skiable terrain immediately above the resort. The lift will also provide a connection to the base of another chairlift in the upper Jumbo valley, which in turn will give access to the gondola to Glacier Dome (which will be the centrepiece lift of the resort), as well as allowing skiers to return to the resort base.

A shuttle bus, especially convenient for sightseers, will also link the gondola to the resort base. Three glacier T-bars for winter and summer skiing will be placed on Glacier Dome.

The Glacier Dome gondola will be the main focus of the opening phase. It will be a winter and summer attraction for both skiing and sightseeing. Initial planning calls for a moderate capacity lift, which will allow for an economical mid-station. A mid-station will make it possible to ski into the Jumbo Creek drainage from early fall through to early summer. A detachable gondola system of similar capacity may be an alternative lift choice for first phase, postponing the mid-station to a second stage, and allowing for higher speed and future greater capacity. Detailed lift planning will be completed prior to construction.

The Glacier Dome gondola will provide access to a large skiable terrain from a single lift and will cover a significant vertical drop. At 3,020 metres (9,908 ft) elevation, its mountain top station will be the highest ever achieved in Canada with mechanical lifts, and it will offer both unparalleled views and exceptional skiing. The vertical drop from the top of Glacier Dome, at approximately 3,020 metres (9,908 ft), to the resort base elevation at approximately 1,700 metres (5,577 ft), is 1,320 metres (4,331 ft). Even in the opening phase this will be the second highest vertical drop in Canada and the highest in the Canadian Rockies.

A teahouse is planned at the Glacier Dome gondola arrival station in order to allow tourists and skiers to enjoy the view from a protected location and to have an opportunity to spend some time in comfort enjoying food and beverages before returning with the gondola or skiing down. A facility similar to the Eagle's Eye Restaurant at the top of Kicking Horse Mountain Resort's gondola, slightly below the mountaintop on the Jumbo Creek side, is planned.

The location of the gondola was surveyed by Pat Boyle and a crew from Poma Lift Company during the project studies and is well suited for easy construction. The mountaintop, although overlooking glaciers, is loose exposed rock that will be excavated allowing the positioning of the arrival station in solid bearing. It is planned that the arrival station and the teahouse will also be partially excavated in the rock overlooking the Jumbo Valley. This will keep the visual profile of the arrival point to a small scale and will conceal it completely from the drainage of the Lake of the Hanging Glacier.

Visitors will have access to a parapet that will give a view of the southern end of the lake. It will be an exceptional viewpoint; it will be possible to see the Lake of the Hanging Glacier and Jumbo Mountain (which is not visible from below) in one view.

In winter, the Glacier Dome arrival point will open access to spectacular skiing in two directions, towards the glacier T-bars to the North or towards the huge, two kilometre wide, open bowl of the glacier‘s moraine leading into Jumbo Creek to the South. A variety of runs are possible, as well as skiing in the wide-open high alpine terrain. This will be a unique sunny area gifted with powder snow in winter despite the southern sun because of its climate and elevation.

The first phase is planned to start with a joint venture with the Kinbasket Development Corporation, which will be operating the public utility company that will supply water and sewer to the development and is planning other forms of partnership (see Sections 7.3 and 7.7.3 of this Master Plan). First Nations will also provide an interpretive theme to the Daylodge and will operate a small Interpretive centre, which will expand as the project grows.

The size of the first phase will be dictated by market absorption and by the number of beds allocated to the first Lodge/Hotel/Condo and to the heli-ski lodge, but is expected to be in the range of three to five hundred beds.

Resort services will be designed so that they can be built and expanded in phases. The sewer system tertiary treatment plant so that it matches the project’s phasing. The emergency power generator may be activated with the same propane source that is planned as a preferred source of energy for the heating system for the resort. The electrical line is planned as an extension of the line to Panorama, following the alignments of the forestry roads, and to supply the initial group of vacation homes to be constructed. Groundwater from the first well will be collected in reservoirs and distributed throughout the resort.

4.4.1.2.1 First Phase Summary List

Lifts and Ski Areas:

- Glacier Dome gondola (pulse - fixed grip)
- Two chairlifts in Jumbo Valley
- Three glacier T-bars on Glacier Dome
- Mountain top restaurant/refuge
- Glacier Dome mid-station
- Glacier Dome base Daylodge
- Main resort Daylodge

Services:

- Tertiary sewer treatment plant
- Emergency power generation
- Water wells
- Piped propane system

- BC Hydro connection

<u>Development:</u>

- B&B Lodge/Hotel/condominium
- 30 townhouses condominium
- 25 chalets
- A heli-ski lodge location with overnight accommodation for guests will be offered to R.K. Heli-Ski to provide for a base of operations in the heart of its territory.

4.4.1.2.2 Summer Ski Training Opening Phase

Alpine Canada Alpin – CODA and other Canadian Athletes' Summer Training Opportunity as an Alternative or Additional Proposed Opening Phase.

While the general concept for an opening phase that will provide access to Glacier Dome has remained consistent since it was first presented in the *Formal Proposal* of 1991, and in the *Master Plan Concept* of 1995, alternative opening phases have also been considered. An opening phase access to Farnham Glacier is one of the alternatives that has been considered.

Access from both the Jumbo Creek and from the Farnham Creek drainages have been considered. In the 1995 Master Plan, an access lift to the crestline of Farnham Glacier was considered for the purpose of decreasing the pressure of day skiers on the Upper Jumbo valley access and to decrease automobile traffic in the Jumbo Creek valley.

The proponent has been in touch with Alpine Canada Alpin (the national ski team association) over the last ten years and has confirmed that Alpine Canada Alpin, in conjunction with the Calgary Olympic Development Association (CODA) would like to initiate ski training on Farnham Glacier. CODA organized an exploratory training camp on Farnham Glacier in June and July 2003, utilizing helicopter access and snowcats for uphill transportation.

The 2003 CODA sponsored training on Farnham glacier gave physical evidence to the concept of summer skiing on the glaciers of the Study Area outlined in the Interim Agreement with Glacier Resorts Ltd., originally signed in 1993, and which is one of the objectives of the project.

The interest of the Canadian national team in this program has been cultivated by the proponent since the beginning of the project and is now coming to fruition. In the light of these circumstances the opening phase of the project could start as soon as permitted with lift FT1 and FT2 to give access to the Canadian athletes to training on Farnham Glacier from the start of the project and to facilitate the preparation of the best possible team for 2010 Olympics.

Access by helicopter and lift service by snowcats is not economical or sustainable in the long run. Providing prompt lift access as proposed will ensure that the athletes have reliable access and evacuation in all weather conditions. The proponent may not only be able to provide the initial lifts, but may also be able to allocate another section of the glacier with another T-bar lift so that both the national team and other Canadian senior and junior teams may train without having to share the same area.

This scenario may modify the opening phase with the installation of a long, low capacity lift that may utilize retrofitted components (FT2, 200pph). The departure point would be at the Jumbo Creek base of Farnham Glacier. A small parking area and a lodge for the ski team could then be provided at that location. This modification of the opening phase may reverse the order of the project and of the lift system or may simply be an addition to the opening phase described above.

The proponent is awaiting clarifications from the Government and from CODA in order to determine the most appropriate opening phase and to service the requirements of Alpine Canada Alpin and other ski teams. Current plans are to facilitate the CODA objectives and to provide direct access from lower Jumbo Creek to the crest of Farnham Glacier, and to reserve summer use of this glacier to the athletes. This would provide the benefit of advertising exposure to the Jumbo Glacier area and benefit the Canadian teams. In the final development of the ski area it may be appropriate to replace the chairlift that provides access to the crest of Farnham Glacier with a gondola that may offer winter access for day skiers, coupled with a shuttle bus to the resort, thereby decreasing the time needed to move skiers to and from the Farnham Glacier area.

Tourists and ski school may be limited to Glacier Dome and upper Jumbo and Commander Glacier, which are ideal areas for recreational skiing and are expected to meet the demands and expectations of the tourism population. In this plan the lift from the Cleaver into upper Farnham Creek (Lift 3.8) would be redundant and may not need to be built.

An alternative summer ski training opportunity exists if Alpine Canada Alpin desires to make use of the public lifts on Glacier Dome in the opening phase.

4.4.2 Second Phase

The second phase will open access to Jumbo Mountain and Commander Glacier and will add approximately two thousand seven hundred beds to the resort. The speed of the development will depend on market acceptance, but a reasonable time for this phase would be five to seven years.

The second phase will start with a new day skiers' parking area towards the south end of the resort base, with a new and expanded Daylodge and a new lift in the direction of Jumbo Mountain from the day skiers' parking area. The resort will then begin to grow from the opposite end towards the centre.

The concept of growth from two opposing points is based on the notion that the major hotel should be at the centre of the project and be its final focus, but major hotels are difficult to finance and tend to be constructed towards the end rather than at the beginning of the project's build-out period. The main hotel and plaza must therefore be planned as if they would be built towards the end of the project, and yet the base area must be designed in a linear progression that avoids leaving open construction areas in the path of tourists. This goal can be achieved by having construction converge towards the centre of the resort from two opposite ends.

A detailed ski area plan and lift design will be proposed prior to development. Conceptual plans are outlined in the CRA drawings included in Schedule A to this Master Plan. The lifts of the second phase are labelled starting with number two.

A new gondola (lift 2.3) will provide access to the Jumbo Mountain ski area. Its terminus will be in the saddle area South of Jumbo Mountain's peak. The gondola will also provide access to a beginner ski terrain from its mid-station, and a detachable chairlift (lift 2.7) may be provided from the mid-station for beginner skiing and ski school services. It is envisioned that ski school services could be provided from the mid-station in a fashion similar to Whistler at the Whistler Village Gondola mid-station.

An additional beginner lift (lift 2.1), detachable for convenience rather than for speed or capacity, will be installed on the west side of the resort, opposite to the first chairlift. It is expected that snow coverage will allow easy movement from the Daylodge and Ski School to this lift in winter.

An optional chairlift (lift 2.6) will add capacity for the day skiers and will open up a larger skiable terrain directly above the resort.

Depending on market acceptance, an initial low-capacity tram (lift 2.4) will be installed to provide access to the top of Jumbo Mountain and Jumbo Glacier. The tram would run from the saddle below Jumbo Mountain (the terminus of the gondola – lift 2.3) to the top of Jumbo Mountain.

The capacities for the initial Jumbo Mountain tram will be low since access to Jumbo Mountain and Jumbo Glacier will for sightseers and ski schooling primarily, particularly in the summer on the glacier saddle connecting Jumbo and Commander Glaciers. The tram will be designed with sufficient redundancies and emergency power capabilities to be able restart operations and to operate safely even in case of loss of power.

Three T-bar lifts (lifts 2.8, 2.9 and 2.10) serving the top area of the glacier may also be introduced at this time.

4.4.3 Third Phase

The third phase will see the final expansion of the day skiers' parking area and a further expansion of the new Daylodge and guest relations facilities. The expanded final parking area may be roofed in order to ease snow management and reduce visual impacts, or it may be moved below ground. The ski facilities will be completed with the ultimate access to Commander Glacier and the grandest ski area in North America, perhaps in the world.

The combination of scenery, vertical drop and climatic conditions will make the Commander Glacier descent one of the, if not the most desirable ski run or *piste* in the world.

A second aerial tram to the top of Jumbo Mountain (parallel to lift 2.4 of Phase 2) will provide increased capacity and additional redundancy for easy and safe return to the resort. The tram arrival station will be in the rock outcrop at the top of the glacier at elevation 3,419 metres (11,217 ft.) in the same station already built for Phase 2. It is expected that at this point of the project the gondola from the resort to the saddle (lift 2.3) that provides access to Jumbo Mountain will be converted to a higher capacity and higher speed gondola.

The top of Jumbo Mountain will provide access to a remarkable glaciated domain – in some respects it will be evocative of the ice-capped mountains of Greenland, but with much better sun exposure and climate. The most spectacular and longest ski run will commence from Jumbo Mountain.

Originally, a pulse single cable gondola that would connect the peaks of Jumbo Mountain to the Guardsman and to the Cleaver was considered. However, further planning has indicated that the option of a bicable pulse gondola (lift 3.1) linking Jumbo Mountain to the Cleaver in a straight line may be a better and more spectacular construction option.[12] A second pulse gondola lift (lift 3.5) will run from the toe of Commander Glacier to the top of the Cleaver. This gondola will pass over a series of rock outcrops in the glaciers which will allow the installation of a mid-station that can be utilized as a summer skiing base station.

Skiing on Jumbo Glacier and on upper Commander Glacier will also be facilitated by up to six glacier T-bars. A chairlift (lift 3.7) will serve the lower part of the Commander drainage, below the glacier, on the mountain shoulder that divides Commander from the Farnham basin. From there it will be possible to access two chairlifts and a T-bar to the top of Farnham Glacier (lifts 3.9, 3.10 and 3.11). Lift 3.8, the continuation of the bicable gondola from the Cleaver to the toe of Farnham Glacier, is optional and will not be necessary if the summer glacier skiing component on Farnham Glacier will be reserved to athletes training, and the athletes will arrive with their own chairlift directly from lower Jumbo Creek (lift FT1).

The third phase expansion into Farnham Creek will allow the construction of the Farnham Creek Daylodge, assuming that this will not have been built before to accommodate Alpine Canada Alpin as discussed above. Skier access to Farnham Glacier is currently assumed to be limited to access from the Commander Glacier ski area in the winter months, following the trails connecting the chairlifts, as the proponent expects to define an operational agreement whereby CODA (which is planning to train athletes in winter on the slopes of Panorama, more easily prepared with icing conditions) will utilize Farnham Glacier for summer training of athletes. The lifts leading to the top of Farnham Glacier may be utilized by the athletes training in summer and by the recreational skiers in winter.

As part of the final development, if demand warrants, a gondola in combination with a shuttle bus would be an appropriate option to replace the FT1 chairlift initially expected to serve the needs of summer ski training. This would be subject to a positive review of the study outlining potential impacts on mountain goats required under the terms of the EA Certificate. A gondola, in combination with a shuttle bus, would improve access to and from the Farnham Glacier ski area, and would prove especially convenient for day visitors.

The third phase will see the completion of the services and of the commercial space in the resort as well as of the tourist accommodation. A total of approximately 5,500 tourist beds and 750 employee beds will be constructed. The third phase will take approximately five to seven

[12] Pulse gondolas are the most reliable lift type at high elevations. They are more resistant to wind conditions, sudden cable icing, etc. and have lower maintenance requirements. Lift 3.1 is an important sightseeing lift and a pulse gondola provides a much better and more comfortable viewing platform than an aerial tram, for example. Aerial trams are efficient people movers, but are relatively poor sightseeing vehicles. The majority of riders end up standing uncomfortably in the middle of the tram with an obstructed view to the outside. In addition, a slightly longer ride time is not a concern for what will undoubtedly be the most spectacular gondola ride in North America. As an example, the designers are not aware of anyone who has complained about the 40 minute ride time of the Télécabine Panoramic of Mont Blanc. This is the highest gondola lift in Europe and it connects the famous Aiguille du Midi of Mont Blanc with the Helbronner Point in Italy. It offers a spectacular view that has been described as “your own private glacial dream world.” It is a pulse gondola lift.

years to complete. The total project may take between fifteen and twenty years, if there are no major pauses in the development sequence.

4.4.4 Lift Phasing and Capacity

Table 4.12:
Lift Phasing and Capacity

No.	Type	Elevation (m) Base	Elevation (m) Top	Lift Vertical (Meters)	Lift Vertical (Feet)	Cable Length (Meters)	Cable Length (Feet)	Design Capacity (pph)[13]	CCC/ SAOT[14]
Jumbo Creek/ Glacier Dome Area									
1.1	Fixed Grip Quad Chair[15]	1,710	2,210	500	1,640	1,419	4,656	1,000	650
1.2	Fixed Grip Quad Chair	1,790	2,280	490	1,608	1,052	3,452	1,000	650
1.3	Glacier Dome Pulse Gondola[16]	1,910	3,010	1,100	3,609	3,436	11,272	400	260
1.4	T-Bar	2,750	3,010	260	853	1,371	4,498	600	390
1.5	T-Bar	2,420	2,800	380	1,247	1,285	4,217	600	390
1.6	T-Bar	2,430	2,830	400	1,312	1,663	5,455	600	390
Phase 1 Subtotal								**4,200**	**2,730**
Jumbo Creek/ Glacier Dome/ Jumbo Mountain Area									
2.1	Detachable Quad Chair	1,710	1,900	190	623	661	2,168	1,000	650
2.1a alternative	*Detachable Quad Chair*	*1,710*	*1,820*	*110*	*361*	*359*	*1,179*	*1,000*	*650*
2.2 optional	*Fixed Grip Quad Chair*	*1,910*	*2,600*	*690*	*2,264*	*1,451*	*4,759*	*1,200*	*780*
2.3	Jumbo Mtn Pulse Gondola[17]	1,710	2,650	940	3,669	3,817	12,522	460	300
2.4	Jumbo Glacier Tram[18]	2,650	3,410	760	2,493	1,285	4,215	(600)[19]	0

---

[13] pph = persons per hour

[14] CCC = Comfortable Carrying Capacity / SAOT = Skiers At One Time

[15] Fixed grip chairs could be made capable of a greater design capacity and higher speed by the addition of rolling departure mats.

[16] Pulse lifts may be upgraded to a detachable lift of greater capacity if demand warrants. Design capacity may be increased. An upgrade to 1,500 pph in Phase 3 would also increase the CCC by 715.

[17] Initial design capacity may be for only 460 pph, final design capacity may increase to 1,500 pph in Phase 3 and design will change to detachable gondolas. This would increase the CCC by 675.

[18] The tram will be used for transportation only; a parallel tram will increase capacity in Phase 3. The

2.5 optional	*Fixed Grip Quad Chair*	*1,720*	*2,300*	*580*	*1,903*	*1,764*	*5,788*	*1,000*	*650*
2.6 optional	*Fixed Grip Quad Chair*	*1,710*	*2,320*	*610*	*2,001*	*1,293*	*4,242*	*800*	*520*
2.7	Detachable Quad Chair	1,970	2,130	160	625	563	1,848	1,000	650
2.8	Surface People Mover	3,290	3,410	120	394	910	2,985	600	390
2.9	T-Bar	3,140	3,290	150	492	909	2,984	(600)	0
2.10	T-Bar	3,000	3,290	120	394	896	2,940	600	390
Phase 2 Subtotal							**Without Optional Lifts:**	**3,660**	**2,380**
							With Optional Lifts:	***6,660***	***4,330***
				Commander Area					
3.1	Cleaver Pulse Gondola[20]	3,170	3,410	240	787	2,971	9,746	(600)	0
3.2	Tram	2,650	3,410	760	2,493	1,285	4,215	1,500	0
3.3	T-Bar	2,750	3,170	420	1,378	1,261	4,137	600	390
3.4	T-Bar	2,910	3,160	250	820	814	2,672	600	390
3.5	Commander Pulse Gondola	1,820	3,170	1,350	4,429	3,447	11,310	400	260
3.6	T-Bar	2,660	3,030	370	1,214	1,162	3,811	600	390
3.7	Fixed Grip Quad Chair	1,710	2,250	540	1,772	1,547	5,076	900	585
				Farnham Area					
3.8 optional	*Farnham Pulse Gondola*	*2,200*	*3,170*	*970*	*3,182*	*2,105*	*6,906*	*(600)*	*0*
3.9	Fixed Grip Quad Chair	2,200	2,830	630	2,067	2,006	6,583	600	390
3.10	T-Bar	2,460	2,830	370	1,214	1,256	4,120	900	585
3.11	Fixed Grip Quad Chair	1,860	2,570	710	2,329	1,889	6,196	600	390
1.3 optional upgrade	*Glacier Dome Detachable Gondola*[21]	*1,910*	*3,010*	*1,100*	*3,609*	*3,436*	*11,272*	*1,500*	*975*

departure/arrival stations will be designed to accommodate a twin tram configuration from the beginning. The total combined capacity at buildout may be in the 1,500 pph range, allowing easy access to and from the Jumbo/Commander Glacier ski area.

[19] This lift will be a people mover, not contributing to skier traffic on the slopes. The lift capacity of people mover lifts is not totalled to determine total capacity of the lift system.

[20] May be upgraded later to a higher capacity if required.

[21] Initial Phase 1 lift design capacity was 400 pph – 260 CCC/SAOT

2.3 optional upgrade	*Jumbo Mtn Detachable Gondola*[22]	*1,710*	*2,650*	*940*	*3,084*	*4,006*	*13,143*	*1,500*	*975*

Phase 3 Subtotal	**Without Optional Lifts:**	**6,700**	**3,380**
	With Optional and Upgraded Lifts:[23]	***8,840***	***4,770***

GRAND TOTAL	**Without Optional Lifts:**	**14,560**	**8,490**
	With Optional and Upgraded Lifts:	***19,700***	***11,830***

NOTE: Maximum mountain capacity is at an approximately 50% utilization rate, which translates into a peak user day of approximately 4,245 skiers at one time on the mountains (5,337 with optional lifts included).
NOTE: Average peak capacity is 25% to 30%, which means the approximate number of skiers on the mountain at one time will be in the range of 2,110 to 2,547 (2,668 to 3,202 with optional lifts included).

Table 4.13: C.O.D.A. – Farnham Training Area

No.	Type	Elevation (m)		Lift Vertical		Cable Length		Design Capacity	CCC/ SAOT[24]
		Base	Top	(Meters)	(Feet)	(Meters)	(Feet)		
FT.1	Fixed Grip Chair[25]	1,410	2,930	1,520	4,987	3,785	12,417	(200)	0
FT.2	T-Bar	2,440	2,930	490	1,608	1,517	4,978	400	300

[22] Initial Phase 1 lift design capacity was 460 pph – 300 CCC/SAOT

[23] includes upgrades to lifts 1.3 and 2.3 minus initial (Phase 1) design capacity (400 pph/ 260 CCC & 460 pph/ 300 CCC respectively).

[24] CCC = Comfortable Carrying Capacity / SAOT = Skiers At One Time

[25] Lift FT.1 may eventually be replaced by a detachable gondola.

4.4.5 Resort Construction Phasing and Bed Unit Calculations

Table 4.14: Phase One Buildings- Bed Unit Breakdown

No.	Building	Designation	Suites	Bed Units /Suite	Total Bed Units
A1	Service Buildings	Service	-	-	-
A2	Daylodge + Accommodation	Condotel	38	3	114
A3	Accommodation	Condo	42	3	126
A4	Accommodation	Townhome	5	4	20
A5	Accommodation	Townhome	4	4	16
A6	Employee Housing*	Condo	32	3	96
A7	Accommodation	Townhome	2	4	8
A8	Accommodation	Townhome	2	4	8
A9	Accommodation	Townhome	4	4	16
A10	Accommodation	Townhome	2	4	8
A11	Accommodation	Townhome	5	4	20
A12	Accommodation	Townhome	4	4	16
A13	Accommodation	Townhome	4	4	16
A14	Accommodation	Townhome	2	4	8
A15	Accommodation	Townhome	2	4	8
A16	Accommodation	Townhome	4	4	16
A17	Accommodation	Bed and Breakfast	1	8	8
A18	Accommodation	Townhome	2	4	8
A19	Accommodation	Townhome	2	4	8
A20	Accommodation	Townhome	2	4	8
A21	Accommodation	Townhome	4	4	16
A22	Accommodation	Townhome	2	4	8
A23	Accommodation	Townhome	2	4	8
A24	Accommodation	Townhome	4	4	16
A25	Accommodation	Townhome	2	4	8
A26	Commercial	Commercial/ Retail	-	-	-
A27	Commercial	Commercial/ Retail	-		-
A28	Accommodation	Condo	32	3	96
A29	Accommodation	Condo	32	3	96
A30	Accommodation	Single Family Chalet	9	6	54
A31	Accommodation	Townhome	4	4	16
A32	Accommodation	Townhome	4	4	16
A33	Accommodation	Townhome	4	4	16
A34	Accommodation	Townhome	4	4	16
A35	Accommodation	Bed and Breakfast	1	8	8

A36	Accommodation	Townhome	4	4	16
A37	Accommodation	Townhome	2	4	8
A38	Accommodation	Townhome	4	4	16
A39	Heli-Ski Lodge	Hotel	69	2	138
A40	Accommodation	Single Family Chalet	5	6	30
A41	Accommodation	Single Family Chalet	3	6	18
A42	Accommodation	Single Family Chalet	8	6	48
A43	Accommodation	Single Family Chalet	12	6	72
A44	Accommodation	Townhome	4	4	16
A45	Accommodation	Townhome	4	4	16
A46	Accommodation	Bed and Breakfast	1	8	8
A47	Accommodation	Townhome	4	4	16
A48	Accommodation	Townhome	4	4	16
A49	Accommodation	Townhome	4	4	16
A50	Accommodation	Townhome	4	4	16
A51	Accommodation	Townhome	4	4	16
A52	Accommodation	Single Family Chalet	6	6	36
A53	Accommodation	Single Family Chalet	2	6	12
A54	Accommodation	Single Family Chalet	5	6	30
	TOTAL PHASE 1		**412**		**1,446**
	Subtotal - Employee Housing		32	3	96
	Subtotal - Hotel		69	2	138
	Subtotal - Bed & Breakfast		3	8	24
	Subtotal - Townhomes		114	4	456
	Subtotal - Single Family Chalets		50	6	300
	Subtotal - Condominiums		144	3	432

Table 4.15: Phase Two Buildings- Bed Unit Breakdown

No.	Building	Designation	Suites	Bed Units /Suite	Total Bed Units
B1	Accommodation	Employee Housing	96	1	96
B2	Accommodation	Condo	32	3	96
B3	Accommodation	Condo	30	3	90
B4	Accommodation	Condo	40	3	120
B5	Accommodation	Condo	30	3	90
B6	Accommodation	Condo	40	3	120
B7	Accommodation	Condo	40	3	120
B8	Accommodation	Condo	30	3	90
B9	First Nation Interpretive Centre	Service	-	-	-
B10	Accommodation	Condo	18	3	54
B11	Accommodation	Employee Housing	54	1	54
B12	Accommodation	Employee Housing	66	1	66
B13	Accommodation	Employee Housing	66	1	66
B14	Accommodation	Condo	32	3	96
B15	Accommodation	Condo	36	3	108
B16	Accommodation	Townhome	4	4	16
B17	Accommodation	Townhome	4	4	16
B18	Accommodation	Townhome	4	4	16
B19	Accommodation	Townhome	2	4	8
B20	Accommodation	Townhome	4	4	16
B21	Accommodation	Townhome	2	4	8
B22	Accommodation	Townhome	4	4	16
B23	Accommodation	Townhome	4	4	16
B24	Accommodation	Townhome	2	4	8
B25	Accommodation	Townhome	4	4	16
B26	Accommodation	Townhome	4	4	16
B27	Daylodge+Employee Housing	Employee Housing	96	1	96
B28	Firehall				-
B29	Service Facility				-
B30	Accommodation	Townhome	2	4	8
B31	Accommodation	Townhome	2	4	8
B32	Accommodation	Townhome	2	4	8
B33	Accommodation	Townhome	2	4	8
B34	Accommodation	Townhome	4	4	16
B35	Accommodation	Townhome	4	4	16
B36	Accommodation	Townhome	4	4	16

B37	Accommodation	Townhome	2	4	8
B38	Accommodation	Townhome	4	4	16
B39	Accommodation	Townhome	2	4	8
B40	Accommodation	Townhome	2	4	8
B41	Accommodation	Townhome	4	4	16
B42	Accommodation	Townhome	2	4	8
B43	Accommodation	Townhome	4	4	16
B44	Accommodation	Townhome	2	4	8
B45	Accommodation	Townhome	2	4	8
B46	Accommodation	Townhome	4	4	16
B47	Accommodation	Townhome	4	4	16
B48	Accommodation	Townhome	4	4	16
B49	Accommodation	Townhome	4	4	16
B50	Accommodation	Townhome	4	4	16
B51	Accommodation	Townhome	2	4	8
B52	Accommodation	Townhome	2	4	8
B53	Accommodation	Townhome	2	4	8
B54	Accommodation	Townhome	2	4	8
B55	Accommodation	Townhome	2	4	8
B56	Accommodation	Townhome	2	4	8
B57	Accommodation	Townhome	4	4	16
B58	Accommodation	Townhome	4	4	16
B59	Accommodation	Townhome	4	4	16
B60	Accommodation	Single Family Chalet	17	6	102
B61	Accommodation	Single Family Chalet	17	6	102
	TOTAL PHASE 2		**866**		**2,070**
	Subtotal - Employee Housing		378	1	378
	Subtotal - Hotel		-	2	-
	Subtotal - Bed & Breakfast		-	8	-
	Subtotal - Townhomes		126	4	504
	Subtotal - Single Family Chalets		34	6	204
	Subtotal - Condominiums		328	3	984
	TOTAL PHASES 1 & 2		*1,278*		***3,516***

Table 4.16: Phase Three Buildings- Bed Unit Breakdown

No.	Building	Designation	Suites	Bed Units /Suite	Total Bed Units
C1	Accommodation	Hotel	200	2	400
C2	Accommodation	Condo	114	3	342
C3	Accommodation	Condo	80	3	240
C4	Accommodation / Commercial	Condo / Retail	53	3	159
C5	Accommodation	Condo	20	3	60
C6	Accommodation	Condo	63	3	189
C7	Accommodation	Hotel	100	2	200
C8	Accommodation	Condo	116	3	348
C9	Place of Worship	Amenity	-	-	-
C10	Accommodation	Condo	24	3	72
C11	Accommodation	Employee Housing	66	1	66
C12	Accommodation	Employee Housing	63	1	63
C13	Accommodation	Employee Housing	54	1	54
C14	Accommodation	Employee Housing	66	1	66
C15	Accommodation	Employee Housing	57	1	57
C16	Accommodation	Employee Housing	66	1	66
C17	Service Facility	Service	-	-	-
C18	Accommodation	Single Family Chalet	9	6	54
C19	Accommodation	Single Family Chalet	10	6	60
C20	Accommodation	Single Family Chalet	10	6	60
C21	Accommodation	Single Family Chalet	13	6	78
C22	Accommodation	Single Family Chalet	17	6	102
	TOTAL PHASE 3		**1,201**		**2,736**
	Subtotal - Employee Housing		372	1	372
	Subtotal - Hotel		300	2	600
	Subtotal - Bed & Breakfast		-	8	-
	Subtotal - Townhomes		-	4	-
	Subtotal - Single Family Chalets		59	6	354
	Subtotal - Condominiums		470	3	1,410

Table 4.17: Total Bed Units Phases 1, 2 and 3

	Suites	Bed Units /Suite	Total Bed Units
TOTAL EMPLOYEE HOUSING:			**750**
TOTAL TOURISTS ACCOMMODATION:			**5,502**
Subtotal - Hotel	369	2	738
Subtotal - Bed & Breakfast	3	8	24
Subtotal - Townhomes	240	4	960
Subtotal - Single Family Chalets	143	6	858
Subtotal - Condominiums	974	3	2,922
TOTAL BED UNITS			**6,252**

Exhibit 4.27: Conceptual Phasing Plan – Phase One

Exhibit 4.28: Conceptual Phasing Plan – Phase Two

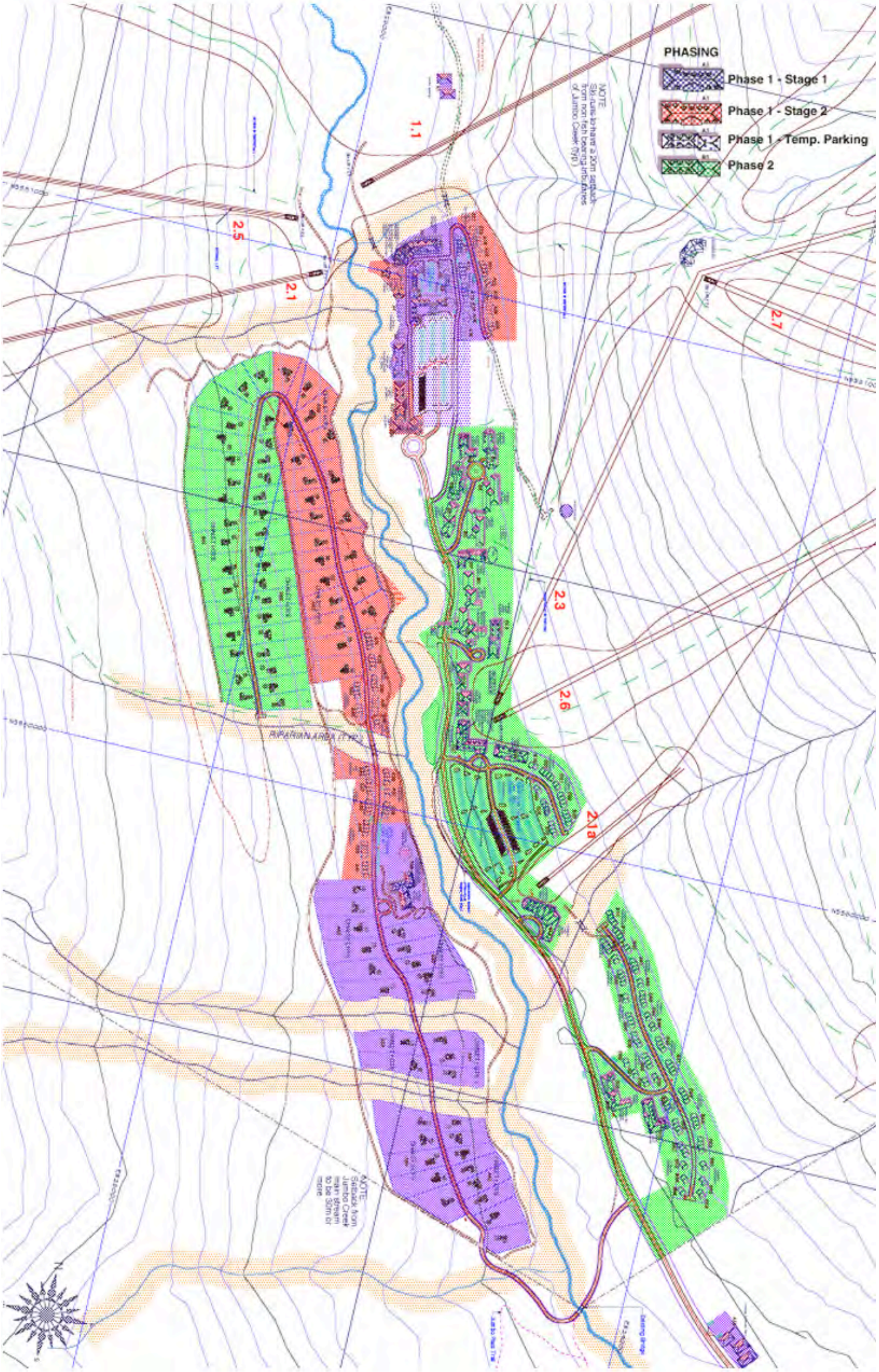
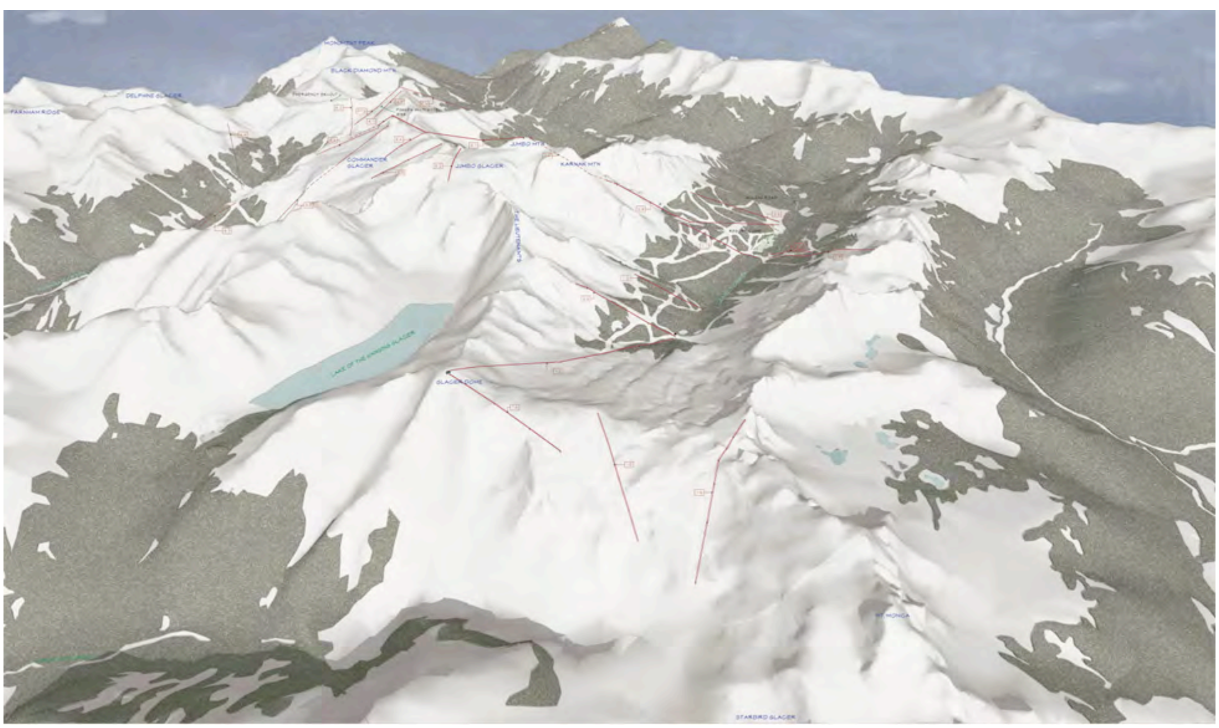


Exhibit 4.29: Conceptual Phasing Plan – Phase Three

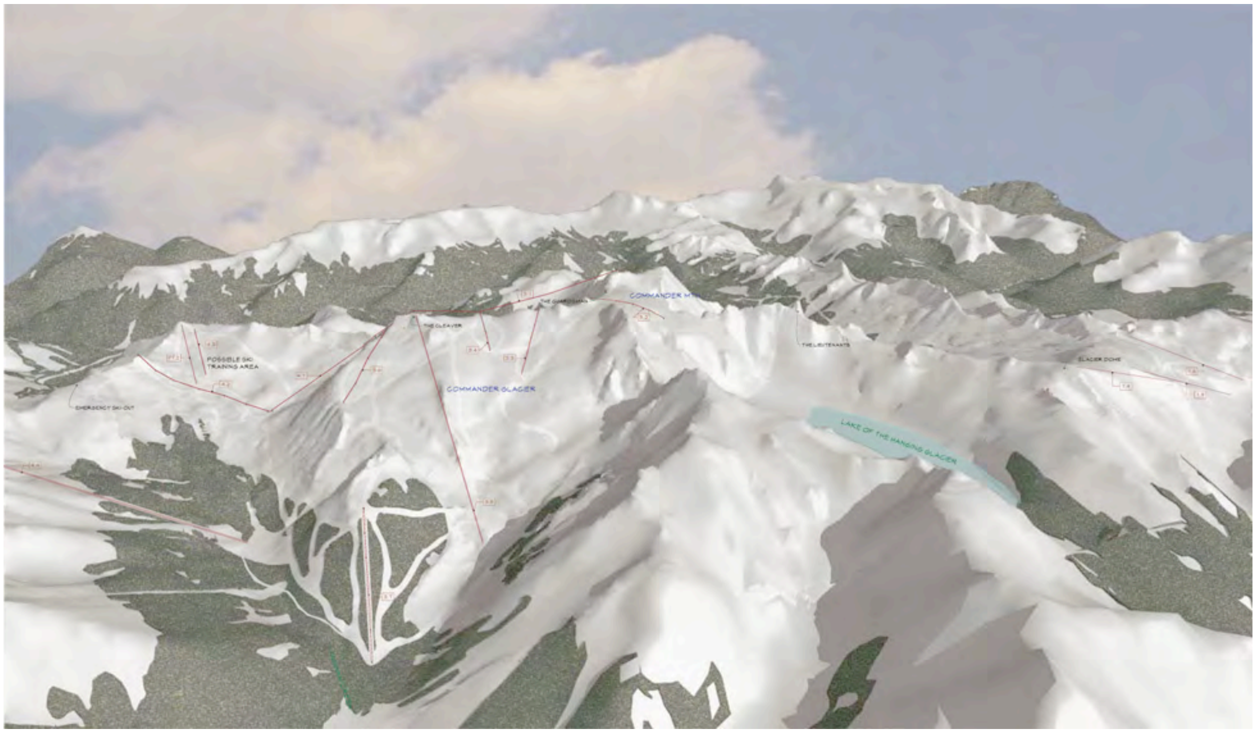
Exhibit 4.30: Conceptual View of Lift Layout at Full Buildout (1)

Aerial view of the upper Jumbo Creek Valley showing the resort base, Jumbo Mountain and Glacier Dome.



Looking in a southerly direction at Glacier Dome and the upper Jumbo Creek valley and resort base. Commander Glacier is visible in the upper left hand corner of the picture.

Exhibit 4.31: Conceptual View of Lift Layout at Full Buildout (2)



Looking south towards proposed lifts on Commander Glacier and Farnham Glacier. Glacier Dome is on the far right hand side of this picture.

4.5 RECREATION COMPONENTS

Jumbo Glacier Resort will be developed as a year round destination resort focused on snow sports and sightseeing. Accordingly, visitors and Columbia Valley residents will have access to recreational activities focused on skiing throughout the year both at the site itself and on glaciers within easy reach of the site.

4.5.1 Sightseeing

Sightseeing will be one of the two primary activities at the resort, and it will consist on access to the viewpoints of Glacier Dome and of Jumbo Mountain. Although this may appear to be limited, it compares well with a location like Jungfraujoch, which draws visitors from the entire world simply to have a view of the glaciers from there. The experience from the two mountain tops, Glacier Dome and Jumbo Mountain, will be unparalleled in North America and will be more than adequate to satisfy visitors from the entire world, as the investors experienced in their visits by helicopter. Wheelchair access to the mountaintops is also planned for this project. As noted above, the average Canadian has never seen the spectacular vistas and high-mountain glaciers that cover a large extent of western Canada.

4.5.2 Skiing and Snowboarding

Skiing and snowboarding will be the main snow sports of the project. The resort is designed to provide convenient ski in/ski access throughout. In winter, the quality and the abundance of natural snow are already legendary. In summer, the resort’s major glaciers will be the only place for substantial skiing in North America. Significant snowfalls have been known to occur on Jumbo Mountain and Commander Glacier even in August.

According Peter Lev, a world-experienced mountaineer, heli-ski guide, skiing and climbing instructor at Montana State University, and a member of the Exum Mountain Guides of Jackson Hole, the skiing opportunity provided by this project **may be only described as the best in the world.**

4.5.3 Nordic Skiing

Nordic sports facilities will not be included at Jumbo Glacier Resort, unless a proven public demand will generate the necessary support for a future application. As a response to environmental concerns over the development and cutting of new trails in the Jumbo Valley, initial plans of offering Nordic ski trails, including recreational and racing trails for classic and skate skiing along the Jumbo Creek drainage and up Leona Creek have been withdrawn. Nordic skiing is available at the Beckie Scott Nordic Centre at Panorama Mountain Village.

4.5.4 Heli-Skiing

Statistics on mechanized access to backcountry skiing and touring show a remarkable growth rate in the past twenty years. Skier visits in British Columbia more than tripled from 23,115 in

1984 to 90,354 in 2000 for heli-ski and snowcat skiing operators. Revenues jumped from $9.200.000 to $91.435.849 in a mere sixteen years.[26] Public appetite for high alpine adventure is demonstrable, and it is commonly known that many ski touring expeditions begin with helicopter transfer to remote locations.

Jumbo Glacier Resort can function as an ideal base of operations for helicopter skiing. The existing heli-skiing company has been considering moving its base of operations to this area, and reportedly made an application for a heli-ski lodge in the Jumbo Creek Valley in 1997. This would allow more economical access to the other surrounding glaciers, thereby adding another exciting dimension to the recreational winter opportunities offered by the resort. The heli-ski activities and the proposed resort will complement each other.

4.5.5 Snowmobiling

Snowmobiling is not proposed as part of the activities of Jumbo Glacier Resort and the Jumbo Creek drainage already has restrictions regarding snowmobile uses. As of January 1, 1996, the Upper Jumbo Creek valley has been closed to snowmobilers above kilometre 14 in order to avoid conflicts with heli-skiers and other backcountry recreational users. However, numerous unploughed forestry and mining roads are easily accessible and popular with day riders who can park their vehicles at the existing parking lot near the Mineral King Mine site at the confluence of Jumbo and Toby Creeks.

Guided snowmobile tours are currently provided by Toby Creek Adventures Ltd. from Panorama Mountain Village, Fairmont Hot Springs and Radium Hot Springs. Daily transportation from Banff hotels is available and excursions range anywhere from a few hours to a week in duration.

Given the rapidly growing popularity of snowmobiling in Canada, and the not inconsiderable avalanche and severe injury risk[27] associated with snowmobiling (especially for novice riders) the availability of established, reputable snowmobile guides is an important and valuable service. Visitors to Jumbo Glacier Resort who wanted to experience snowmobiling would have an excellent opportunity to arrange for a pick up at the resort and go for guided tours in other drainages and permitted areas with the local companies.

A description of current snowmobiling land use regulations and details of nearby snowmobiling recreation areas is provided in Section 2.7.1.2 of this Master Plan. The impact of the resort on snowmobiling is outlined in Section 6.3.8.3 of this Master Plan.

4.5.6 Ski Touring

Ski touring is not one of the activities that are expected to originate from the resort, which is focused on year round downhill skiing and snowboarding, and on sight seeing for the general public.

Jumbo Glacier Resort as a departure point for ski touring is possible, but it is unlikely that it

---

[26] Land and Water British Columbia Inc., *Ski Super Natural British Columbia, End of Season Ski Review 1999/2000*, “Heliski and Snowcat Summary 1984 – 2000”, (page 11).

[27] Canadian Institute for Health Information, *NATIONAL TRAUMA REGISTRY MAJOR INJURY IN CANADA REPORT*, 2002

will have a significant attraction for overnight stay for ski tourers. In addition, the departure points at the top of Glacier Dome and of Jumbo Mountain do not appear to provide a significant advantage to reach most ski touring destinations.

Current ski touring land use, as well as regional ski touring destinations, is described in detail in Section 2.7.1.3 of this Master Plan.

4.5.7 Other Winter Activities

Tobogganing in a designated area and open air skating are expected to be popular winter activities. Jumbo Glacier Resort will be one of the very few B.C. resorts to feature open air ice-skating at its resort base through winter.

4.5.8 Mountaineering

Mountaineering will not be actively encouraged at Jumbo Glacier Resort, but the resort will be open to mountain guides who may wish to operate independently at the resort in the tradition of the resorts in the European Alps such as Chamonix and Zermatt. Unlike at the European resorts, guiding to nearby mountains is not expected to be a significant activity because of the larger distances involved, the rugged terrain to cross and the type of urban clientele expected at the resort, a clientele that is not trained for extended mountaineering trips and for outdoor overnight accommodation. The focus of the resort will be on sightseeing from the lift accessible mountaintops and on year round skiing, with rest and physical recreation offered as complementary activities at the resort.

The proponents recognize that unlike many current ski resorts in North America, some of the peaks within the Controlled Recreation Area may be of a particular challenge and interest to mountaineers. The resort would welcome experienced climbers to climb any of the peaks within the Controlled Recreation Area, as this would be in keeping with the alpine oriented nature of this proposal and is similar to how mountaineering has been practised for over a century in the European Alps in legendary places such as Mont Blanc, Monte Rosa and the Matterhorn.

4.5.9 Golf

Golf will not be provided at Jumbo Glacier Resort. Award winning Greywolf golf course at Panorama Mountain Village, which is 36 kilometres away, will be the nearest golfing facility.

4.5.10 Hiking

Resort guests are not expected to go hiking into the wilderness. The project is not planned for this clientele and is specifically designed to counter any interests in such activities which are unnecessary for the enjoyment of the mountains and for the skiing experience and which only create uncontrollable hazards and liabilities.

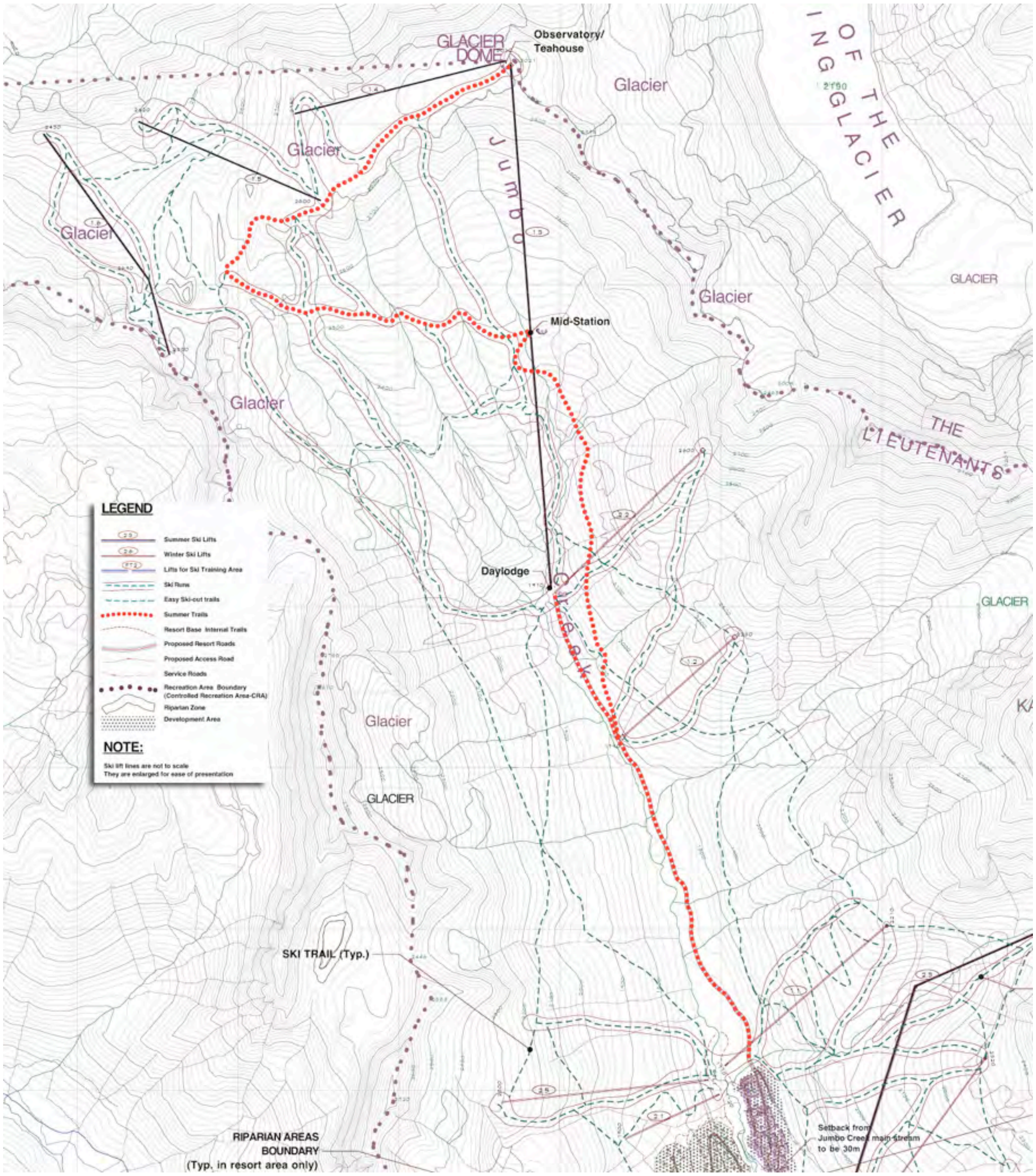
A single hiking trail is planned for the resort (see Exhibit 4.32, below). It will connect the resort to the Glacier Dome gondola, and will utilize the low part of the winter gliding trail connecting the ski runs to the resort. The hiking trail will allow visitors to hike to and from the Glacier Dome gondola base, or from the valley base to the top of Glacier Dome. The top section of the trail will be on snow. The resort will not facilitate and will actively discourage hiking outside the marked trail.

Venturing outside the Controlled Recreation Area will be difficult and dangerous for most resort visitors. The orography of area is such that the Controlled Recreation Area boundary is also a natural boundary and the lift system is the limit of the exploration available to resort visitors.

See also Section 3.7.5 Trail Management Plan.

For a review and map of current hiking destinations and routes within the Invermere Forest District (now Rocky Mountain Forest District), please refer to Section 2.7.1.4.

Exhibit 4.32: Summer Hiking Trail at Jumbo Glacier Resort



4.5.11 Other Summer Activities

Mountain biking and whitewater rafting in Toby Creek are currently popular summer activities in the area.

The region is also a popular soaring or gliding centre. The Columbia Valley is reportedly one of the best mountain soaring sites in the world. A number of world record-breaking 1000km+ soaring flights have been flown from Invermere.

4.6 SKIER, VISITOR AND OCCUPANCY PROJECTIONS

4.6.1 Projected Skier Visits and Accommodation Occupancy[28]

The projected skier visits and accommodation occupancy schedule has several purposes:

1. Balance lift capacity to projected skier visits

2. Balance skier visits to demand for accommodation

3. Project the timing of the phasing of real estate and lift capacity additions

Major Assumptions:

1. Lift utilization over the winter is projected to range from 27% to 39%. Typically in most ski resorts when lift utilization reaches over 45% lift lines become excessive. The lower utilization figures suggests there will be few lift lines except on busy days and the slopes will be relatively uncrowded offering a high quality ski experience.

2. Skier visits are projected to reach 500,000 skier visits in the winter after 20 years. This level of growth is comparable to other successful resorts. Whistler/Blackcomb achieved this level of growth after 15 years. Big White has achieved a similar level of growth in approximately 25 years. Lake Louise and Sunshine Village are currently in the 550,000/ 600,000 skier visits range.

3. The % of local skiers is expected to drop from 70% in the first year down to 33% at the end of the projection period. Note that this includes overnight visitors from Panorama and Invermere coming for the day to Jumbo.

4. The percentage of non-skiers is estimated to be up to 20%. This allows for persons that are participating in other activities such as sightseeing, health or other forms of recreation.

5. The average number of visitors per unit of accommodation is projected to range from 2.0 to 4.5 persons per unit with an average of 2.8. This is consistent with other resorts, understanding that this includes single chalets that tend to have a larger multiple occupancy factor.

6. The projected occupancies are consistent with other resorts' recognizing that this includes single family chalets. Single-family chalets have lower occupancies than condominiums and hotels. For comparison, in recent years Whistler/Blackcomb occupancies ranged from 57 to 63% for hotels and condominiums in the winter season.

There is a reasonable balance between lift capacity, skier demand and occupancy of accommodation units.

[28] Lynnpeaks Consulting Ltd.

Table 4.18: Visitor Projections: Years 1 – 5

	Year 1	Year 2	Year 3	Year 4	Year 5[29]
Lift Phasing	I	I	I	I	I
Winter skier visits	70,000	112,320	129,168	148,543	141,116
Summer visits	15,000	17,250	19,838	22,813	26,235
Total	85,000	129,570	149,006	171,356	167,351
Winter CCC/SAOT	1,690	2,730	2,730	2,730	2,730
Length of season – winter	150	150	150	150	150
Utilization – winter	28%	27%	32%	36%	34%
Summer CCC/SAOT	780	1,170	1,170	1,170	1,170
Length of season – summer	60	60	60	60	60
Utilization – summer	32%	25%	28%	32%	37%

Table 4.19: Visitor Projections: Years 6 – 10

	Year 6	Year 7	Year 8	Year 9	Year 10
Lift Phasing	II	II	II	II	III
Winter skier visits	170,825	196,448	225,916	259,803	246,813
Summer visits	30,170	33,187	36,506	39,427	42,581
Total	200,995	229,636	262,422	299,230	289,394
Winter CCC/SAOT	4,199	4,199	4,199	4,199	6,864
Length of season – winter	150	150	150	150	150
Utilization – winter	27%	31%	36%	41%	24%
Summer CCC/SAOT	1,469	1,469	1,469	1,469	1,469
Length of season – summer	60	60	60	60	60
Utilization – summer	34%	38%	41%	45%	48%

[29] Inevitable “problem weather” years are factored in every five years.

Table 4.20: Visitor Projections: Years 11 – 15

	Year 11	Year 12	Year 13	Year 14	Year 15
Lift Phasing	III	III	III	III	III
Winter skier visits	298,773	337,614	381,504	431,099	409,544
Summer visits	45,987	49,666	51,653	53,719	55,868
Total	344,761	387,280	433,157	484,818	465,412
Winter CCC/SAOT	6,864	6,864	6,864	6,864	6,864
Length of season – winter	150	150	150	150	150
Utilization – winter	29%	33%	37%	42%	40%
Summer CCC/SAOT	3,159	3,159	3,159	3,159	3,159
Length of season – summer	60	60	60	60	60
Utilization – summer	24%	26%	27%	28%	29%

Table 4.21: Visitor Projections: Years 16 – 20

	Year 16	Year 17	Year 18	Year 19	Year 20
Lift Phasing	III	III	III	III	III
Winter skier visits	442,308	473,269	501,666	526,749	500,411
Summer visits	58,102	58,683	59,270	59,863	60,462
Total	500,410	531,953	560,936	586,612	560,873
Winter CCC/SAOT	8,229	8,229	8,229	8,229	8,229
Length of season – winter	150	150	150	150	150
Utilization – winter	36%	38%	41%	43%	41%
Summer CCC/SAOT	4,134	4,134	4,134	4,134	4,134
Length of season – summer	60	60	60	60	60
Utilization – summer	23%	24%	24%	24%	24%

Table 4.22: Visitor Projections Chart: Years 1 – 20

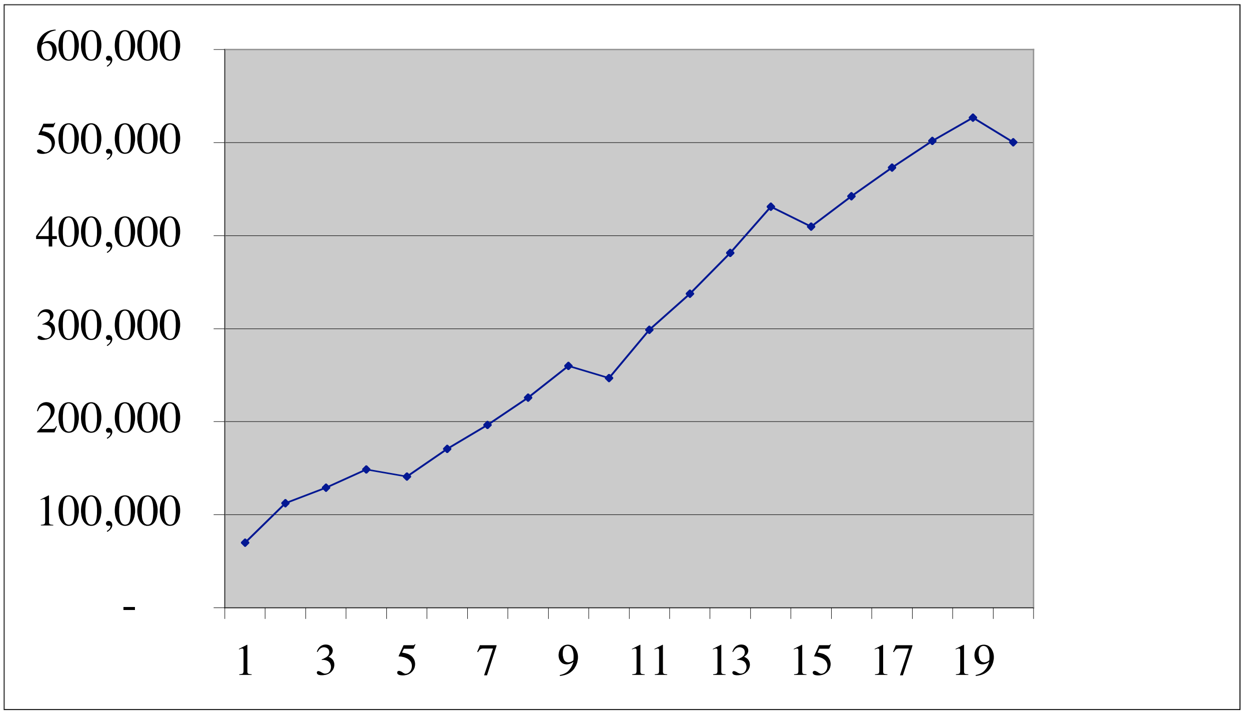


Table 4.23: Projected Winter Skier Visits and Accommodation Occupancy: Years 1 – 5

	Year 1	Year 2	Year 3	Year 4	Year 5
Lift Phasing	I	I	I	I	I
Real Estate Phasing	I	I	I	I	I
Lift Capacity					
CCC/SAOT	1,690	2,730	2,730	2,730	2,730
Length of season – winter	150	150	150	150	150
Utilization – winter	28%	27%	32%	36%	34%
Skier Visits					
Skier visits	70,000	112,320	129,168	148,543	141,116
% of local skiers	70%	65%	64%	63%	62%
Less local	49,000	73,008	82,668	93,582	87,492
Skiers in Accommodation	21,000	39,312	46,500	54,961	53,624
Add non skiers (15%)	3,150	5,897	6,975	8,244	8,044
Total Visitors in Accommodation	24,150	45,209	53,476	63,205	61,668
Average day visitors/ day	327	487	551	624	583
Average overnight visitors/ day	161	301	357	421	411
Accommodation Units Completed					
Condo/ hotel	38		31		
Condo	40	42	30	32	32
Townhomes	25	32	32	25	0
Chalets	14	15	12	12	0
	117	89	105	69	32
Units-to-date					
Condo/ hotel (2 people/ unit)	38	38	69	69	69
Condo (2.8 people/ unit)	40	82	112	144	176
Townhomes (3.8 people per unit)	25	57	89	114	114
Chalets (4.5 people/ unit)	14	29	41	53	53
	117	206	311	380	412
Visitors at 100% Occupancy	51,900	97,905	146,145	181,935	195,375
Occupancy Winter	47%	46%	37%	35%	32%
Average # of visitors/ unit	3.2	3.4	3.4	3.4	3.4

Table 4.24: Projected Winter Skier Visits and Accommodation Occupancy: Years 6 – 10

	Year 6	Year 7	Year 8	Year 9	Year 10
Lift Phasing	II	II	II	II	III
Real Estate Phasing	II	II	II	II	II
Lift Capacity					
CCC/SAOT	4,199	4,199	4,199	4,199	6,864
Length of season – winter	150	150	150	150	150
Utilization – winter	27%	31%	36%	41%	24%
Skier Visits					
Skier visits	170,825	196,448	225,916	259,803	246,813
% of local skiers	59%	56%	54%	50%	46%
Less local	100,787	110,011	121,994	129,901	113,534
Skiers in Accommodation	70,038	86,437	103,921	129,901	133,279
Add non skiers (15%)	10,506	12,966	15,588	19,485	19,992
Total Visitors in Accommodation	80,544	99,403	119,509	149,387	153,271
Average day visitors/ day	672	733	813	866	757
Average overnight visitors/ day	537	663	797	996	1,022
Accommodation Units Completed					
Condo/ hotel					
Condo	60	80	40	18	68
Townhomes	20	20	20	20	20
Chalets	0	0	12	12	10
	80	100	72	50	98
Units-to-date					
Condo/ hotel (2 people/ unit)	69	69	69	69	69
Condo (2.8 people/ unit)	236	316	356	374	442
Townhomes (3.8 people per unit)	134	154	174	194	214
Chalets (4.5 people/ unit)	53	53	65	77	87
	492	592	664	714	812
Visitors at 100% Occupancy	231,975	276,975	313,275	340,335	387,045
Occupancy Winter	35%	36%	38%	44%	40%
Average # of visitors/ unit	3.4	3.3	3.4	3.4	3.4

Table 4.25: Projected Winter Skier Visits and Accommodation Occupancy: Years 11 – 15

	Year 11	Year 12	Year 13	Year 14	Year 15
Lift Phasing	III	III	III	III	III
Real Estate Phasing	II	II	II	III	III
Lift Capacity					
CCC/SAOT	6,864	6,864	6,864	6,864	6,864
Length of season – winter	150	150	150	150	150
Utilization – winter	29%	33%	37%	42%	40%
Skier Visits					
Skier visits	298,773	337,614	381,504	431,099	409,544
% of local skiers	43%	40%	37%	34%	33%
Less local	128,473	135,046	141,156	146,574	135,150
Skiers in Accommodation	170,301	202,568	240,347	284,526	274,395
Add non skiers (15%)	25,545	30,385	36,052	42,679	41,159
Total Visitors in Accommodation	195,846	232,954	276,400	327,204	315,554
Average day visitors/ day	856	900	941	977	901
Average overnight visitors/ day	1,306	1,553	1,843	2,181	2,104
Accommodation Units Completed					
Condo/ hotel		200			
Condo	30	0	107	154	104
Townhomes	26				
Chalets			29	13	17
	56	200	136	167	121
Units-to-date					
Condo/ hotel (2 people/ unit)	69	269	269	269	269
Condo (2.8 people/ unit)	472	472	579	733	837
Townhomes (3.8 people per unit)	240	240	240	240	240
Chalets (4.5 people/ unit)	87	87	116	129	146
	868	1068	1204	1371	1492
Visitors at 100% Occupancy	414,465	474,465	538,980	612,435	667,590
Occupancy Winter	47%	49%	51%	53%	47%
Average # of visitors/ unit	3.4	3.2	3.2	3.2	3.2

Table 4.26: Projected Winter Skier Visits and Accommodation Occupancy: Years 16 – 20

	Year 16	Year 17	Year 18	Year 19	Year 20
Lift Phasing	III	III	III	III	III
Real Estate Phasing	III	III	III	III	III
Lift Capacity					
CCC/SAOT	8,229	8,229	8,229	8,229	8,229
Length of season – winter	150	150	150	150	150
Utilization – winter	36%	38%	41%	43%	41%
Skier Visits					
Skier visits	442,308	473,269	501,666	526,749	500,411
% of local skiers	33%	33%	33%	33%	33%
Less local	145,962	156,179	165,550	173,827	165,136
Skiers in Accommodation	296,346	317,091	336,116	352,922	335,276
Add non skiers (15%)	44,452	47,564	50,417	52,938	50,291
Total Visitors in Accommodation	340,798	364,654	386,533	405,860	385,567
Average day visitors/ day	973	1,041	1,104	1,159	1,101
Average overnight visitors/ day	2,272	2,431	2,577	2,706	2,570
Accommodation Units Completed					
Condo/ hotel	100				
Condo	0	81	24		
Townhomes					
Chalets					
	100	81	24	0	0
Units-to-date					
Condo/ hotel (2 people/ unit)	369	369	369	369	369
Condo (2.8 people/ unit)	837	918	942	942	942
Townhomes (3.8 people per unit)	240	240	240	240	240
Chalets (4.5 people/ unit)	146	146	146	146	146
	1592	1673	1697	1697	1697
Visitors at 100% Occupancy	697,590	731,610	741,690	741,690	741,690
Occupancy Winter	49%	50%	52%	55%	52%
Average # of visitors/ unit	3.1	3.1	3.1	3.1	3.1

Table 4.27: Projected Summer Skier Visits and Accommodation Occupancy: Years 1 – 5

	Year 1	Year 2	Year 3	Year 4	Year 5
Lift Phasing	I	I	I	I	I
Real Estate Phasing	I	I	I	I	II
Lift Capacity					
CCC/SAOT	780	1,170	1,170	1,170	1,170
Length of season – summer	60	60	60	60	60
Utilization	32%	25%	28%	32%	37%
Skier Visits					
Skier visits	15,000	17,250	19,838	22,813	26,235
# of gondola visits	0	0	0	0	0
Total mountain visits	15,000	17,250	19,838	22,813	26,235
% of local skiers	70%	68%	66%	64%	62%
Less local	10,500	11,730	13,093	14,600	16,266
Skiers in Accommodation	4,500	5,520	6,745	8,213	9,969
Add non skiers	7,002	17,744	28,102	35,038	36,402
Total Visitors in Accommodation	11,502	23,264	34,847	43,251	46,371
Average day visitors/ day	175	196	218	243	271
Average overnight visitors/ day	192	388	581	721	773
Accommodation Units Completed					
Condo/ hotel	38		31		
Condo	40	42	30	32	32
Townhomes	25	32	32	25	0
Chalets	14	15	12	12	0
	117	89	105	69	32
Units-to-date					
Condo/ hotel (2 people/ unit)	38	38	69	69	69
Condo (2.8 people/ unit)	40	82	112	144	176
Townhomes (3.8 people per unit)	25	57	89	114	114
Chalets (4.5 people/ unit)	14	29	41	53	53
	117	206	311	380	412
Visitors at 100% Occupancy	19,170	35,790	53,610	66,540	71,340
Occupancy Summer	60%	65%	65%	65%	65%
Average # of visitors/ unit	2.7	2.9	2.9	2.9	2.9
Projected # of visitors	11,502	23,264	34,847	43,251	46,371

Table 4.28: Projected Summer Skier Visits and Accommodation Occupancy: Years 6 – 10

	Year 6	Year 7	Year 8	Year 9	Year 10
Lift Phasing	II	II	II	II	III
Real Estate Phasing	II	II	II	II	II
Lift Capacity					
CCC/SAOT	1,469	1,469	1,469	1,469	1,469
Length of season – summer	60	60	60	60	60
Utilization	34%	38%	41%	45%	48%
Skier Visits					
Skier visits	30,170	33,187	36,506	39,427	42,581
# of gondola visits	21,441	25,771	28,960	31,102	35,411
Total mountain visits	51,612	58,959	65,466	70,529	77,991
% of local skiers	60%	58%	56%	54%	52%
Less local	18,102	19,249	20,443	21,290	22,142
Skiers in Accommodation	12,068	13,939	16,063	18,136	20,439
Add non skiers	42,883	51,542	57,920	62,204	70,821
Total Visitors in Accommodation	54,951	65,481	73,983	80,340	91,260
Average day visitors/ day	480	536	582	614	664
Average overnight visitors/ day	916	1,091	1,233	1,339	1,521
Accommodation Units Completed					
Condo/ hotel					
Condo	60	80	40	18	68
Townhomes	20	20	20	20	20
Chalets	0	0	12	12	10
	80	100	72	50	98
Units-to-date					
Condo/ hotel (2 people/ unit)	69	69	69	69	69
Condo (2.8 people/ unit)	236	316	356	374	442
Townhomes (3.8 people per unit)	134	154	174	194	214
Chalets (4.5 people/ unit)	53	53	65	77	87
	492	592	664	714	812
Visitors at 100% Occupancy	84,540	100,740	113,820	123,600	140,400
Occupancy Summer	65%	65%	65%	65%	65%
Average # of visitors/ unit	2.9	2.8	2.9	2.9	2.9
Projected # of visitors	54,951	65,481	73,983	80,340	91,260

Table 4.29: Projected Summer Skier Visits and Accommodation Occupancy: Years 11 – 15

	Year 11	Year 12	Year 13	Year 14	Year 15
Lift Phasing	III	III	III	III	III
Real Estate Phasing	II	III	III	III	III
Lift Capacity					
CCC/SAOT	3,159	3,159	3,159	3,159	3,159
Length of season – summer	60	60	60	60	60
Utilization	24%	26%	27%	28%	29%
Skier Visits					
Skier visits	45,987	49,666	51,653	53,719	55,868
# of gondola visits	37,370	43,754	50,199	57,625	62,861
Total mountain visits	83,357	93,420	101,852	111,344	118,729
% of local skiers	50%	48%	46%	44%	42%
Less local	22,994	23,840	23,760	23,636	23,464
Skiers in Accommodation	22,994	25,826	27,893	30,083	32,403
Add non skiers	74,740	87,508	100,398	115,251	125,722
Total Visitors in Accommodation	97,734	113,334	128,291	145,334	158,126
Average day visitors/ day	695	762	814	874	915
Average overnight visitors/ day	1,629	1,889	2,138	2,422	2,635
Accommodation Units Completed					
Condo/ hotel		200			
Condo	30	0	107	154	104
Townhomes	26				
Chalets			29	13	17
	56	200	136	167	121
Units-to-date					
Condo/ hotel (2 people/ unit)	69	269	269	269	269
Condo (2.8 people/ unit)	472	472	579	733	837
Townhomes (3.8 people per unit)	240	240	240	240	240
Chalets (4.5 people/ unit)	87	87	116	129	146
	868	1068	1204	1371	1492
Visitors at 100% Occupancy	150,360	174,360	197,370	223,590	243,270
Occupancy Summer	65%	65%	65%	65%	65%
Average # of visitors/ unit	2.9	2.7	2.7	2.7	2.7
Projected # of visitors	97,734	113,334	128,291	145,334	158,126

Table 4.30: Projected Summer Skier Visits and Accommodation Occupancy: Years 16 – 20

	Year 16	Year 17	Year 18	Year 19	Year 20
Lift Phasing	III	III	III	III	III
Real Estate Phasing	III	III	III	III	III
Lift Capacity					
CCC/SAOT	4,134	4,134	4,134	4,134	4,134
Length of season – summer	60	60	60	60	60
Utilization	23%	24%	24%	24%	24%
Skier Visits					
Skier visits	58,102	58,683	59,270	59,863	60,462
# of gondola visits	65,532	68,720	69,115	68,327	67,525
Total mountain visits	123,634	127,403	128,385	128,190	127,986
% of local skiers	40%	38%	36%	34%	32%
Less local	23,241	22,300	21,337	20,353	19,348
Skiers in Accommodation	34,861	36,384	37,933	39,510	41,114
Add non skiers	131,064	137,439	138,230	136,653	135,049
Total Visitors in Accommodation	165,926	173,823	176,163	176,163	176,163
Average day visitors/ day	933	944	932	909	885
Average overnight visitors/ day	2,765	2,897	2,936	2,936	2,936
Accommodation Units Completed					
Condo/ hotel	100				
Condo	0	81	24		
Townhomes					
Chalets					
	100	81	24	0	0
Units-to-date					
Condo/ hotel (2 people/ unit)	369	369	369	369	369
Condo (2.8 people/ unit)	837	918	942	942	942
Townhomes (3.8 people per unit)	240	240	240	240	240
Chalets (4.5 people/ unit)	146	146	146	146	146
	1592	1673	1697	1697	1697
Visitors at 100% Occupancy	255,270	267,420	271,020	271,020	271,020
Occupancy Summer	65%	65%	65%	65%	65%
Average # of visitors/ unit	2.7	2.7	2.7	2.7	2.7
Projected # of visitors	165,926	173,823	176,163	176,163	176,163

5. INFRASTRUCTURE COMPONENTS

5.1 INTRODUCTION

The project requires two types of infrastructure developments, the recreational infrastructure which consists of the lift system that provides access to the skiable terrain and viewpoints, and the resort infrastructure, which services the overnight accommodation and day visitor facilities. The two infrastructures must be compatible and mutually supportive, but they belong to different aspects of engineering.

The recreational infrastructure is discussed in Section 4 of this Master Plan. The resort infrastructure examined in this section includes civil engineering services. Specifically, roads, water demand and supply, sewer, storm water and snow melt management, garbage collection and disposal systems, hazardous and special wastes, electrical power, and communications infrastructure for Jumbo Glacier Resort are detailed in this section.

5.2 ROADS

5.2.1 Existing Access Road

From Invermere to Panorama:

From Invermere, the road to Panorama follows the Toby Creek drainage and is serviced by the provincial government (Ministry of Transportation) (km 0 to km 20/mile 12.4). It is a paved, two-lane road, approximately 9 metres (29.5 feet) wide with an approximate design speed of 60 km/h (40 miles/hour) and a posted speed limit of 60km/hr (40 miles/hour). Two new crossing over Toby Creek near Invermere and near Panorama were built at provincial expense in the last decade, at a cost of approximately $2 million each. MoT is planning to invest another $2 million in road maintenance over the next four years for the road to Panorama. Compared to other resorts, such as Whistler, these provincial investments are small.

From Panorama to the Mineral King Mine:

The existing road continues from Panorama to the Mineral King Mine site, along the Toby Creek drainage up to the confluence with Jumbo Creek (km. 20/mile 12.4 to km. 39/mile 24.3). This section of road is unpaved, but is classified as a highway and is maintained by the Ministry of Transportation. A number of alignment and regrading improvements have been carried out since 1991. During the summer of 1992 all bridges were replaced with new bridges capable of supporting fully loaded 50 ton trucks. The road is used regularly in winter by busses carrying heli-skiers to a pick up point at the Mineral King Mine site. Avalanche closures are rare. The current safe speed is 30 to 40km/hr (20 to 27 miles/hour). The average grade of the existing roadway along this section is in the order of one to two percent (1% - 2%). There is one area that is slide prone and needs some maintenance almost every year.

From the Mineral King Mine to the proposed resort area:

An improved forestry road enters the Jumbo Creek drainage from the Mineral King Mine location at the confluence of Jumbo and Toby Creek and continues to the site of a former sawmill (km. 39/mile 24.2 to km. 57/mile 35.4), which was at the centre of renewed logging in the 1990s.

Upgrading, realignment and installation of new bridges for logging purposes was carried out in 1991, with new ditches and culverts and a wider roadway, ranging approximately from 3.5 to 6 metres (12 to 20 feet) in width, allowing convenient truck access to the proposed resort site near where renewed logging operations were centred. Additional minor improvements have been carried out since then.

The current road alignment crosses from the north side to the south side of Jumbo Creek approximately 6.5 kilometres (4 miles) upstream from the Mineral King Mine, with a new bridge capable of supporting fully loaded 50 ton trucks. It then crosses Leona Creek (where large multiple culverts were replaced by a bridge in 1994) turning north. The new alignment has been found to require maintenance work because of numerous minor slides in the area approximately 9 kilometres (5.6 miles) upstream from the Mineral King Mine. A different alignment utilizing the previous forestry road on the north side of the drainage is proposed for the final road improvements.

Another new bridge brings the road from the West to the East side of Jumbo Creek after crossing Leona Creek, about 2 kilometres (1.2 miles) before the proposed resort base site in the area of the renewed logging operations.

The average grades through the section of roadway in the Jumbo Creek drainage vary between 3% and 6% with a possible maximum of 8% over one small section northwest of the Mineral King Mine.

5.2.2 Improved Access Road Design Concept[1]

The goal of the proposed resort is to be a tourist destination. The access road design will attempt to enhance the natural rebirth of the valley and the beauty of the area by avoiding unnecessary cuts generated by overbuilding the road, and by conforming to natural terrain contours rather than employing tangent alignments and grades that slash across the valley. The road will be a scenic route with a relaxed tourist pace.

The Duffy Lake road, Highway 99 between Pemberton and Lilloet, can be considered as an appropriate example of future work requirements for the access road to Jumbo Glacier resort. However, the Duffy lake road has steeper grades (over 13%), sharper turns, and one-way forestry bridges. It is widely used in winter and summer and its popularity is growing. It was also planned to be the access road for the EA Act approved ski resort at Cayoosh Creek, planned for 15,000 Bed Units.

[1] The road improvements and stream crossings for the project must be reviewed in the light of the approval process of the EA Act of B.C. and of the CASP policy process leading to a Master Plan Approval and a Master Development Agreement. The EA Act review is carried out in consultation with the federal Department of Fisheries and Oceans where applicable. The timing of each construction phase and the detailed design required for each phase is specified prior to construction following the Master Development Agreement.

While the Jumbo Glacier Resort road will not be designed for intense or high-speed traffic, the grades and the curves are generally quite gentle and appropriate for easy and comfortable driving, even for full size buses.

As noted above, ease of access was a major reason for the selection of the project site. The proposed site is a short distance from an existing resort with a finished blacktopped road, the existing access road is capable of automobile access, and upgrades are possible without excessive difficulties.

The fact that forestry or mining roads are available on both sides of the riparian areas make multiple alignment options possible with minimum disruption to the valley. A route selection that avoids any creek crossings or interference with riparian areas is possible. This option will allow the elimination of bridges, with considerable cost savings at buildout when traffic in the opinion of MoT would otherwise require two-way bridges.

Initially, work may be undertaken to widen and gravel the existing road as a two-way seven or eight-metre road with one-way bridges as presently installed. The road could then be further upgraded over the course of the following development stages. Paving of the entire length of road, from Panorama to the resort is recommended only when economically feasible noting that even a resort like Whistler utilized an unpaved road for many years in its initial stages (and even after having achieved 52,000 Bed Units the access road still utilized a portion of the former forestry road, simply blacktopped, without shoulders or guardrails). A roadway finished with asphalt paving would create the feeling of "door to door" vehicular access to the destination for overnight guests, but, as previously noted, it is intended that vehicular movement will be discouraged in the resort.

Limiting traffic on the access road should be one of the management objectives. Many examples indicate that a public transportation access mode, by means of bus, train, tram or gondola is a conceptually sound possibility and that over time it may gain wide public acceptance. Among the examples, one may think of Wengen or Zermatt in Switzerland where access is permitted by train only, and Sunshine Village in Banff National Park, where access was originally by bus, and is now provided by gondolas. Wengen and Zermatt offer a full resort with sleeping accommodation at the top, while Sunshine requires daily commuting. Jumbo Glacier Resort is planned to be more similar to the Swiss model, with accommodation at the base of the skiable terrain. While access to the resort by train or gondola may not be economically feasible, partial access by shuttle bus would be feasible[2].

5.2.3 Route Study

A *Route Study* (Appendix 5-A) has been prepared as a preliminary engineering basis for the Master Development Agreement to be finalized prior to the final design phase.[3] As a

---

[2] A shuttle bus is currently operated by the heli-ski company between Panorama and the Mineral King Mine site. As an alternative concept, there could be advantages in having the resort open, at least in the initial stages, with access being provided by a bus system from the Columbia River Valley and from Panorama. The most important benefit derived from access by bus would be a delay in the construction of automobile parking and delaying the cost of major road improvements.

[3] The project consultants expect that detailed design and construction pricing will prove that the preliminary concepts required by MoT are exceedingly conservative (the initially proposed standards for a 6,000 bed resort were superior to the current road standards for accessing both the town of Squamish and Whistler's 52,000 bed base). In addition, the experience of developing the improved road for Kicking Horse Mountain Resort, with a 40km/hr switchback, indicates that it is possible to improve the relationship between needs and engineering

preparation for the *Route Study*, McElhanney Consulting produced a *Traffic Study* based on the 1995 preliminary Master Plan that has since been updated and incorporated into the new *Route Study*.

The preliminary design for the access road improvements required for Jumbo Glacier Resort indicate one of the easier road projects in B.C. The road improvement project has been reviewed by a large number of people over a long period of time. Meetings between MoT staff and the proponent's consultants started over ten years ago and continued at MoT offices in Nelson, in Cranbrook, in Victoria and on site with a large group of Government staff and consultants.

Conclusive meetings began with a site review on August 23, 2000, including a group of MoT staff led by Don Barcham and the consulting team led by Rob Parkinson. This was followed by another detailed site review by the consulting team with Rob Parkinson on September 19, 2000. As a result a *Route Study* was produced by McElhanney in March 2001, reviewed in 2002, and following a number of meetings and discussions with MoTH, the *Route Study* was finally revised, and resubmitted. It is included in Appendix 5-A.

Existing forestry and mining roads offer alignments that can be chosen and improved on each side of the creeks, meaning that a wise choice of alignments makes it possible to avoid all major avalanche paths, and if required, to switch from one side to the other of the valley to avoid even minor areas of potential exposure. Alternatively, and again with only minor exposure to some avalanche areas, which can be monitored with normal highways maintenance techniques, the selected route may continue on the north side of the drainages all the way to the resort site, thus eliminating all bridges. This is the currently selected option.

On a comparative basis, an easier access to a mountain resort at the base of a major mountain with a vertical rise of 1,700 metres (5,577 ft.) reaching 3,400 metres (11,155 ft.) above sea level has not been found. The available routes, with an elevation rise of roughly 600 metres (1,968 ft.) from Panorama to the resort site at approximately 1,700 metres (5,577 ft.) are so gentle that they do not require switchbacks to reach the resort site without ever exceeding a maximum 8% grade.

5.2.4 Traffic Volumes

Projected traffic volumes have been calculated By McElhanny Consulting and are discussed in Section 3.3 of the *Route Study* (Appendix 5-A). Projected traffic volumes are based on a correlation between existing traffic volumes at surveyed ski resorts as well as the respective numbers of beds provided and overall lift capacity. The Average Annual Daily Traffic (AADT) for the Jumbo Glacier Resort access road has been estimated to be 943 trips at buildout.

5.2.5 Environmental Issues Regarding the Access Road

The detailed description of the existing fishing resource values of Jumbo Creek which could potentially be affected by the proposed work or activities is included in the environmental work included in Section 3 of this Master Plan. The proponent's commitments have been clarified and will be further confirmed in the Master Development Agreement with the Province of B.C.

---

response to accommodate new traffic to tourism destinations. The project consultants understand that MoT is interested in looking at better ways to serve the public and that new road design standards for mountain resorts are being considered.

A follow up monitoring program has been proposed. The onsite independent environmental monitoring group may be part of the First Nations activities connected with the Interpretive centre. Monitoring will be planned to comply with the requirements of the relevant Ministries (Provincial and/or Federal).

A summary of the fundamental reasons why it is expected that the impact on Fisheries and Fish Habitat will be controlled and adequately mitigated is presented below. The impact should not be significant for the following reasons:

<u>Drainage</u>:

1. All drainage will be controlled, as indicated in the Master Plan and in the *Project Report* prepared under the EA Act review process and further confirmed in the normal undertakings of the current Master Development Agreements between the Province and ski resort proponents.

2. All construction work and maintenance work will be upstream of the drainage control system, both during and after construction.

3. All potential spillage will be protected with preventive and containment measures, there is no unusually hazardous activity proposed or contemplated.

Mining and forestry activities of the past have left an uncontrolled situation with evident erosion, debris and leaching into the creeks in the Jumbo and Toby Creek drainages. Collapsed and abandoned bridges are still visible in Jumbo Creek. The proposed work will vastly improve the situation and help to restore the natural conditions of the drainage.

<u>Road alignments</u>

Existing roads on both sides of Toby and of Jumbo Creek offer a choice of alignments and access to both sides of the creeks for bridge repair, installation or removal if needed. The alignments chosen will allow road improvements without any widening or interference into riparian areas. Roadwork will be controlled to avoid any drainage or loss of material directly into the creeks. Road widening will be directed to the cut or upstream side of the road. Road alignments that will eliminate the requirement to replace or relocate the bridges are possible and currently favoured by the engineers and by MoT.

<u>Bridges:</u>

There is no plan to build new bridges.

5.2.6 Access Road Upgrade Costs

The proposed road improvements are for a road with light traffic, initially a gravel bed improved road substantially following existing alignments. Discussions with McElhanney indicate that the road would be of a type similar to the improved road sections recently built at Kicking Horse Mountain Resort, costing in the $200,000 – $250,000 per kilometre range including paving. A more detailed analysis and conservative preliminary estimates are provided in the *Route Study*, included as Appendix 5-A.

During the process leading to the EA Act review much discussion was generated regarding a past, unrelated proposal for a highway over/through Jumbo Pass linking the East and West Kootenays and the costs associated with it. Figures ranging from $40 to $70 million dollars for the road improvements to upper Jumbo Creek and of up to $2 million dollars per kilometre were reported. These figures are unrelated to the Jumbo Glacier Resort project. A highway over/through Jumbo Pass was disallowed by the Commission on Resources and the Environment (CORE) and has nothing to do with the proposed project. The traffic type, volume, and construction standards of such a road are completely unrelated to the type of project and of road improvements proposed for a mountain resort.

The developer has agreed to pay for the road improvements according to government policy and has never asked for government grants for road and infrastructure similar to other resorts, but it expects that current policies on road financing will be applied equally across the Province. There has been discussion of a perceived “cost to the taxpayer” for the road. There is no cost to the taxpayer foreseeable for this project; the road users will, however, generate revenues to governments. It is worth noting as well that the Province is again funding improvements to the access to Whistler for over $600 million, not as a loan, but as a long-term investment. This is just one example of how different areas of the province can see disproportionate benefits. Nothing even remotely similar is being spent in the East Kootenay or the Purcells, where there is arguably a more sustainable long-term opportunity for tourism growth in the mountains.

5.2.7 Subdivision Roads

The project is designed to give access to clusters of strata title development sites in condominium from the public road. Initially there may be a single condominium. The public access road will fork approximately one kilometre before the resort base, in order to utilize an existing forestry bridge to access the west side of the drainage where the single family chalets will be located. The main access road will continue in a northerly direction to the resort base, near the former sawmill location, bisecting into two accesses for the various condominium developments and the two hotel sites. The subdivision roads are planned to be designed as public condominium roads, operated and maintained by the strata corporation of the condominium.

5.2.8 Snow Removal and Maintenance

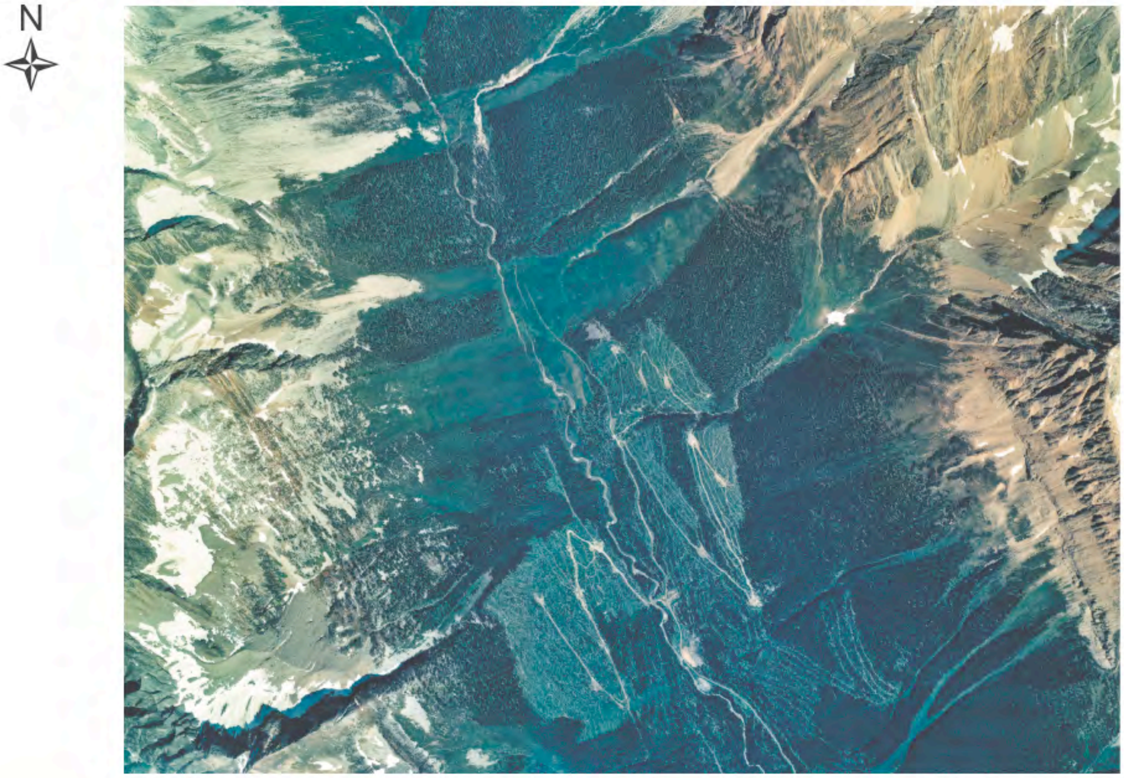
The road to Panorama and to the Mineral King Mine is currently maintained year round by MoT. Winter access to the mine site is kept open in winter in order to transfer heli-skiers by bus to a more cost-effective helicopter pick-up point (the same skiers would be able to transfer from the buses to the helicopters at Jumbo Glacier Resort at the proposed new R.K. Heli-Ski heli-plex saving precious helicopter flight time, once the resort starts development).

Road maintenance for the Jumbo Creek road has been offered, provided the proponent/developer is not forced into unreasonable standards that would be superior to other examples in the Province and to the rest of the road currently maintained by the Province for Panorama and for the heli-ski company. The details of these negotiations can only be finalized with the Master Development Agreement for the project between the proponent and the Province, but the principle that every company and proponent has the right to be treated equally needs to reaffirmed so that disturbing inequalities do not become a norm for the Province. The criteria applied by the Province to Panorama and to R.K. Heli-Ski should be applied also to the new resort.

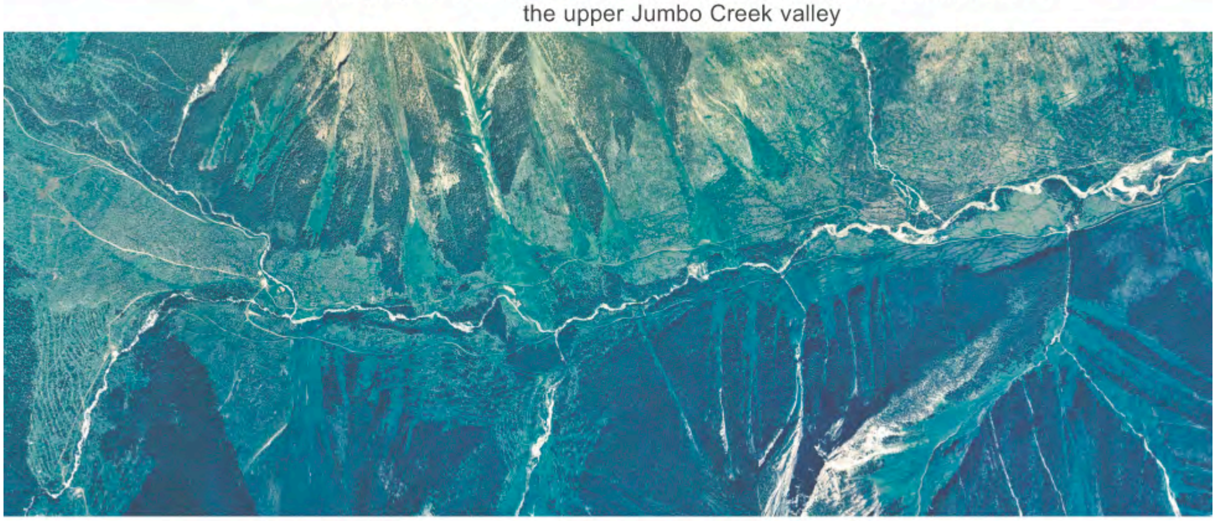
The private road areas in the resort subdivision will be maintained by the owners, which in most cases will be a strata corporation. Maintenance will include snow removal. The dedicated public roads within the base area will form part of the eventual jurisdiction of the Mountain Resort Improvement District or similar local government authority. The proponent, Glacier

Resorts Ltd., will negotiate with the Province to resolve maintenance and snow removal until such time as an improvement district or other local jurisdiction is established and until the road is completed to agreed standards.

Exhibit 5.1: Aerial Overview of Roads in Jumbo Creek Valley



The proposed resort base location is in an abandoned sawmill site in the upper Jumbo Creek valley



Aerial view of existing road alignments through the lower Jumbo Creek valley. Note the junction between Leona Creek and Jumbo Creek on the left hand side of the picture. Jumbo Creek turns North and Leona Creek turns South.

Exhibit 5.2: Sawmill Site and Roads in Upper Jumbo Creek Valley

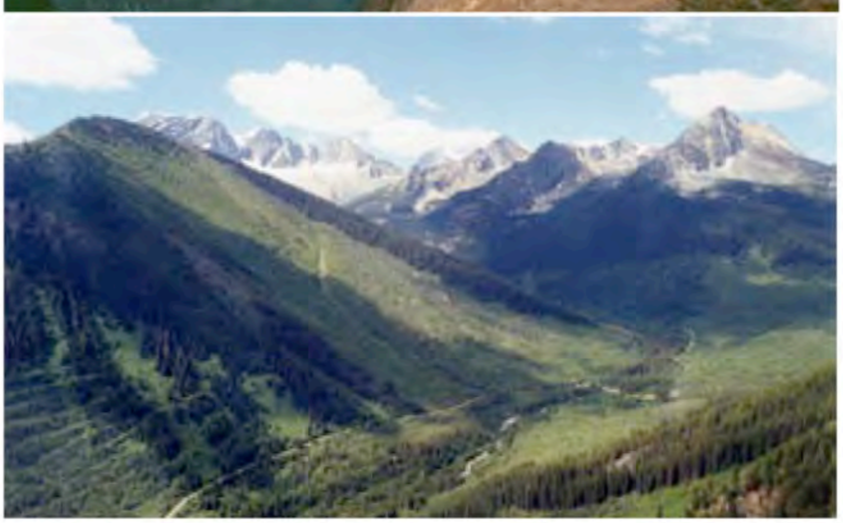
The abandoned sawmill site looking northwest in summer and early winter.

Looking in an east/ south-easterly direction. It is possible to see the turn into the Lower Jumbo Creek Valley on the right hand side of the picture. The sawmill site (the proposed resort base) is at an elevation of 1700m. No switchbacks are necessary in order to reach this site.

Exhibit 5.3: Upper Jumbo Creek and Leona Creek Valleys

Looking south. The Lower Jumbo Creek Valley opens up to the right (east).

The transition between the Leona Creek confluence and the Lower Jumbo Creek Valley showing the road into Leona Creek and the bad weather heliski zones. The Upper Jumbo Creek Valley is off the bottom right of this photo and the lower valley is off the lower left portion of this photo. A road to the west side of Upper Jumbo Creek runs along the bottom part of this photo, dividing the clearcut and the treed portions of the valley.



The same transition, in summer, seen from further east -- down the Lower Jumbo Creek Valley. Upper Jumbo Creek is off to the right.

Exhibit 5.4: Upper to Lower Jumbo Creek Valley

A closer view of the transition area between Upper and Lower Jumbo Creek Valley.

The Lower Jumbo Creek Valley. Its gentle rise to reach 1700m in elevation is in marked contrast to the steep approaches to many other comparable alpine centres.

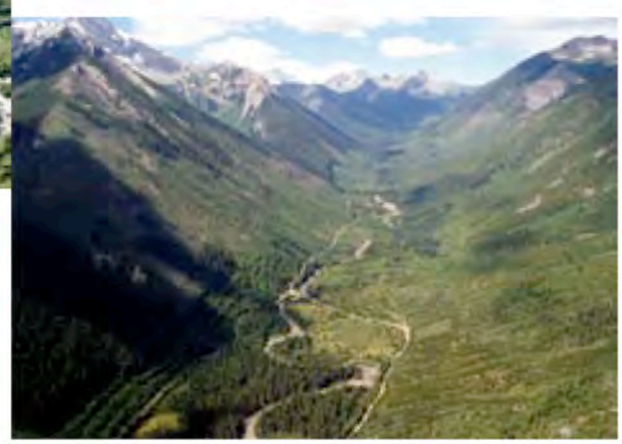


Exhibit 5.5: Lower Jumbo Creek Valley

The Lower Jumbo Creek Valley looking west towards the turn into Upper Jumbo Creek. There are alternate routes on either side of Jumbo Creek.

Alternate routes on either side of Toby Creek. A newly cut road is on the left.

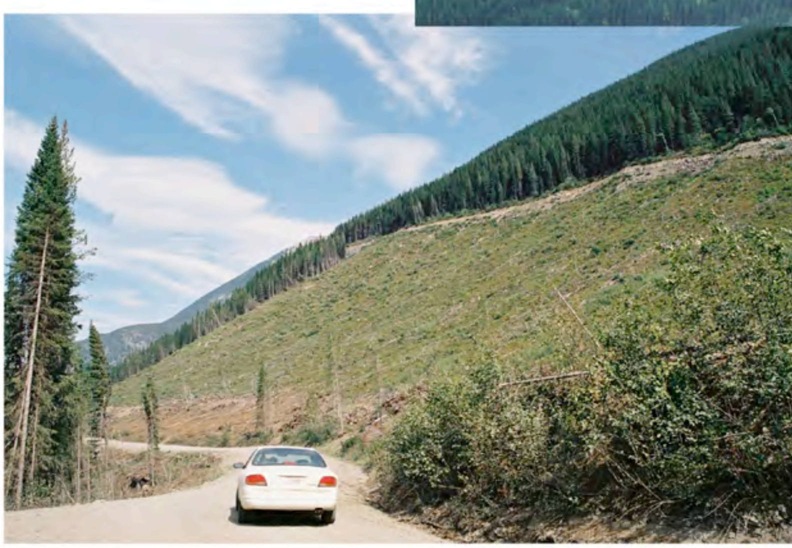
Exhibit 5.6: Mineral King Mine

Lower Jumbo Creek Valley as seen from the Mineral King Mine site near the confluence of Jumbo and Toby Creeks.

Alternate routes are possible around either side of the tailings dump of the Mineral King mine.

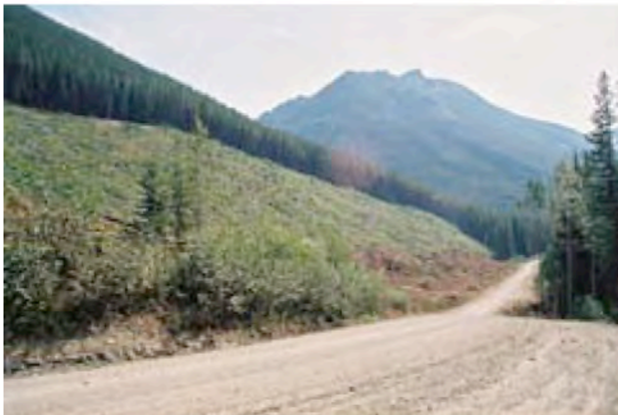
Exhibit 5.7: Toby Creek Valley

Road through the Toby Creek Valley linking the Mineral King Mine with Panorama.

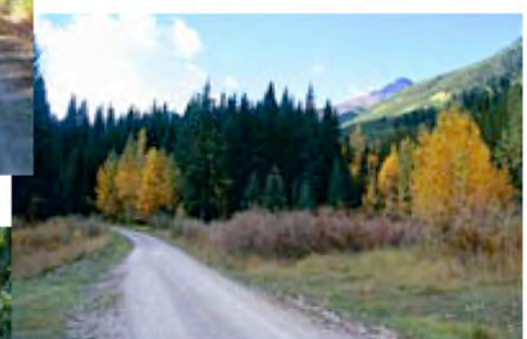


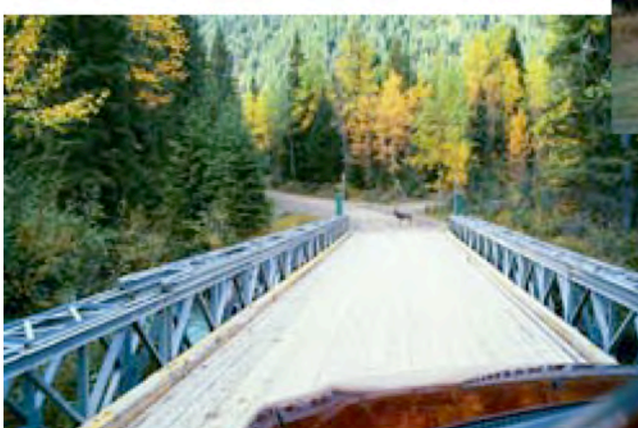
The existing roads are passable by passenger car and the portion between Panorama and the Mineral King Mine is kept open even in winter by the B.C. Ministry of Transportation and Highways to provide access to a forward staging area for heliskiing.

Exhibit 5.8: Existing Roads in Jumbo and Toby Creek Drainages



Existing road conditions in the Jumbo and Toby Creek drainages.





The bridges in the Jumbo and Toby Creek drainages were upgraded in the mid-1990s.

Exhibit 5.9: Sea to Sky Highway

For comparative purposes, these are portions of the 80 km/h road linking Vancouver with Whistler (Sea to Sky highway).

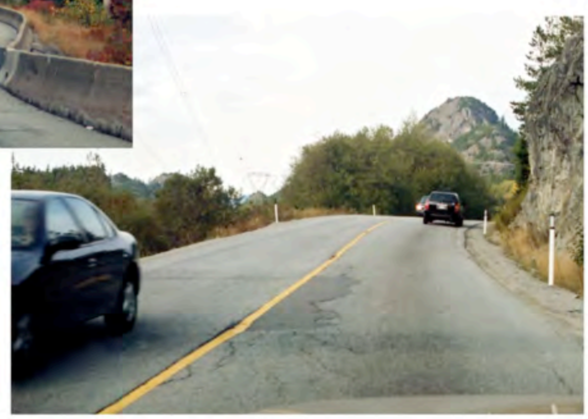
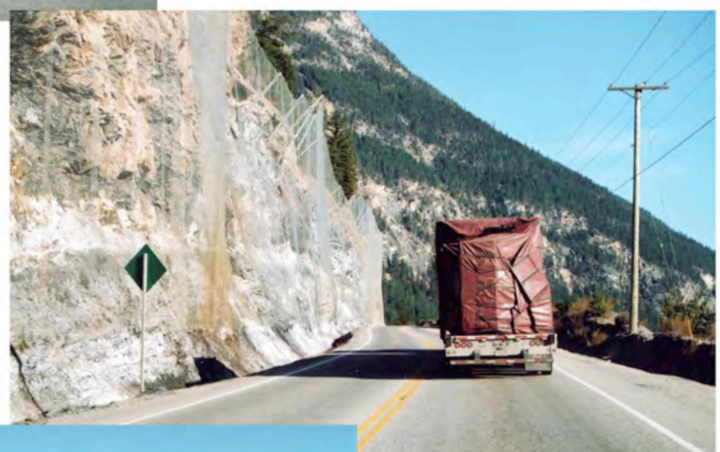
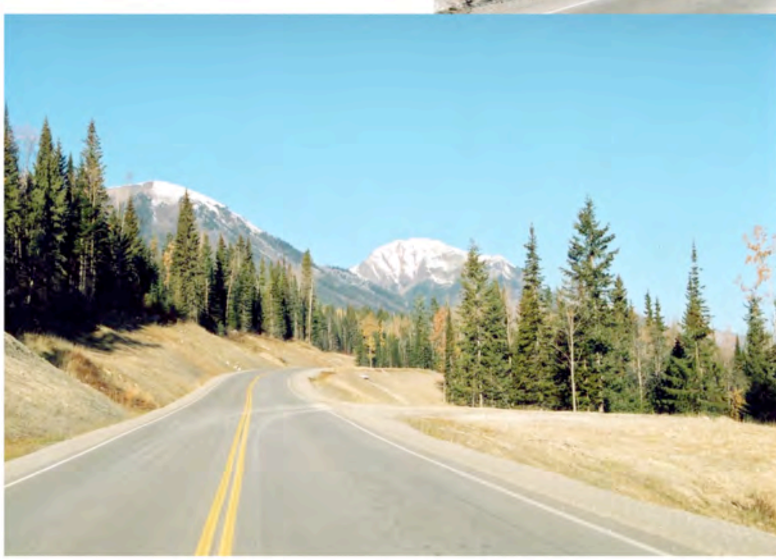


Exhibit 5.10: Trans-Canada Highway



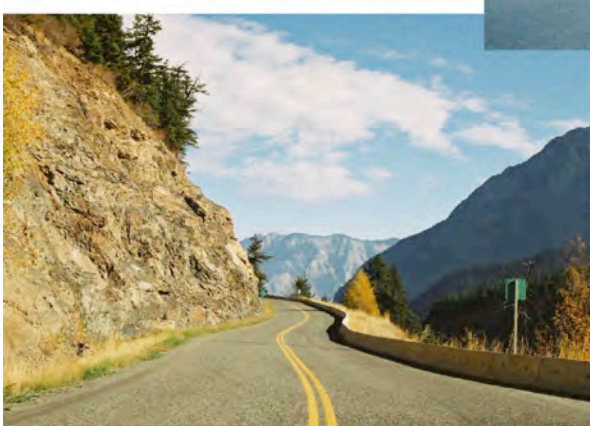
A stretch of the Trans-Canada highway in British Columbia between Golden and Field.

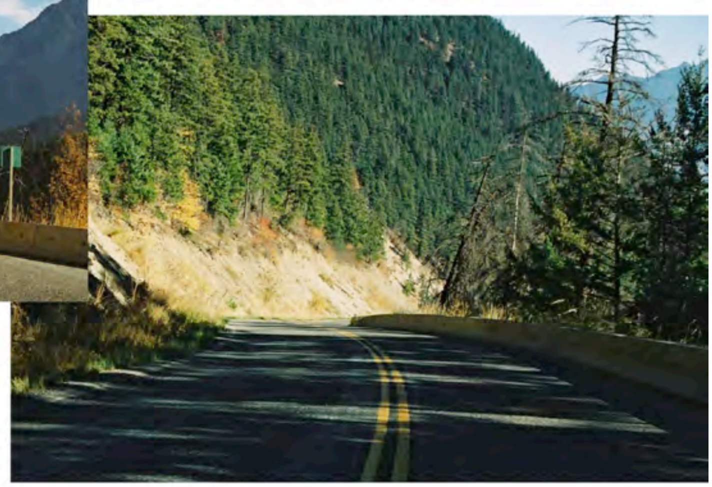


The new 50 km/h road linking Kicking Horse Resort with Golden.

Exhibit 5.11: Whistler to Lillooet

Portions of the highway linking Whistler and Lillooet, including one-way bridges.





5.3 WATER

5.3.1 Annual Water Demand

Water demand estimates for mountain resorts are complicated by the fact that generally accepted requirements and data are not be derived from urbanized areas with a history of water wastage, industrial uses etc[4]. It is an important objective for new resort developments to be designed for conservation objectives. In addition, it is part of the effort of Jumbo Glacier Resort, in response to the issues raised in the Environmental Assessment Office's review, to optimise its design towards green policies and conservation best practices. It is the project's objective to emulate design and water conservation practices of Sun Peaks Resort and to improve them by 10-20% by utilizing more up to date conservation technology. Glacier Resorts Ltd. implements a design model that utilizes landscaping and density more suitable for conservation than that of Sun Peaks for the following reasons:

- Jumbo Glacier Resort covers a smaller footprint with smaller landscaped areas;
- The design guidelines will exclude grass and non-indigenous landscaping;
- The elevation is higher, temperatures lower and the summer season shorter;
- There will be no golf course; and
- There will be no snow making requirements.

Yearly water demand has been calculated by McElhanney and reviewed by Urban Systems, in view of their direct experience with Sun Peaks Resort. It is based on the assumption of previous studies, review of water consumption at projects of similar nature such as Sun Peaks Resort and an analysis of projected demand at Jumbo Glacier Resort. Jumbo Glacier Resort will be focussed on year round skiing on natural snow and sightseeing, therefore water will not be required for golf courses or snow making like at other resorts. It is expected that up to date water conservation measures will be implemented. The Jumbo Creek drainage has an abundance of water partly fed by large glaciers.

Surface water and ground water are available and both options have been reviewed by the consulting group. The selected option is to draw water from the ground, which may result in water that requires minimal or no treatment.

The total amount of water to be drawn yearly at full build out has been calculated to be up to approximately 183,000 m^3 per year. Preliminary investigations by Golder Associates support the expectation of the civil engineers to be able to easily draw water from wells.

---

[4] Water demands are generally grouped in four categories: Residential, Commercial, Industrial, and Institutional. Unlike urbanised areas, a mountain resort such as Jumbo Glacier Resort will not have Industrial and Institutional users. The commercial category will be limited to stores and restaurants in a supporting role to the resort and will not include shopping centres, fast food outlets and other major commercial water users. The residential category will be the largest, with single family chalets, townhomes, condominiums and hotel type of accommodations.

Water for Residential and Commercial users falls into three main sectors: (a) residential and commercial building requirements, (b) fire fighting requirements and (c) landscaping and irrigation requirements. Item (b) is not calculated in daily or annual water requirements because fire flows are regulated by peak demand design considerations, which are attended to by storage and peak flow requirements. Item (c) will not be required at Jumbo Glacier Resort because of landscaping design and covenants which will direct design and maintenance to the regeneration of indigenous forest and vegetation. Calculations are consequently based on the requirements for residential and commercial buildings in a mountain resort area.

5.3.1.1 Design Assumptions and Visitor Calculations

The civil engineering design assumptions have been based on conservative estimates by the engineers (McElhanney and Urban Systems) and verified against the Projected Skier Visits and Accommodation Occupancy calculations by the resort industry economic consultants (Lynnpeaks Consulting), which outline the economic matrix of the Master Plan design concept. Employment numbers have been verified with two independent consultants (Milne Consulting and Lynnpeaks Consulting).

Average and peak overnight and day visitor numbers are estimated by conservative design considerations and by comparison with other resorts in a similar market where data can be compared, even if Jumbo Glacier Resort will be unique in several respects. Engineering assumptions have been reviewed in the light of the number of visitors relative to the project design, in light of market comparisons and in light of applicable precedent. The following shows three ways of calculating yearly water demand:

By Number of Visitors and Design:

Comfortable Carrying Capacity and Utilization Rate calculations: the project is being planned to be capable of achieving approximately 6,375 visitors on a peak winter day. This includes both overnight visitors and day visitors. 6,375 visitors is based on a 50% Utilization Rate (UR) of the maximum Comfortable Carrying Capacity (CCC) of 12,750 people per day at build out[5]. A 50% UR is not planned by design as the actual usage nor is it recommended. A 50% utilization is so high that it is almost never achieved nor wanted because of line ups and overcrowding of critical points of ski runs – not even at Whistler (the Whistler 50% UR translates into approximately 28,000 skiers per day – this is from a bed base of 52,000 BU. Actual UR numbers at Whistler tend to range from 8,000 to 14,000 per day).

Peak capacity: A peak day may achieve 85% room occupancy for overnight accommodation, equal to a theoretical 4463 people. Assuming that at peak season 15% of rooms with two beds have only one occupant, this would translate into 3794 overnight guests. If 10% are non skiers, this would indicate 3415 overnight skiers. Assuming during peak season a high number of 50% day skiers versus overnight skiers, there would be 1707 day skiers for a total of 5122 skiers. This would represent over 40% UR.

Average overnight visitors: At build out there will be 5500 tourist Bed Units. Past and future projections for successful ski resorts indicate that yearly occupancy rates of 35% to 40% are the norm. Although this resort will offer summer skiing, the size of summer skiing will be considerably smaller than the winter area, and summer skiing will remain a smaller operation. If we use a 40% yearly occupancy rate number, this means that there could be 2200 visitors per night over the theoretical 365 nights for a total overnight maximum visitor rate of 803,000. As the resort will be closed for at least 30 days for maintenance and the low season (in the late spring low season the resort may not be shut down, but occupancy is expected to be extremely low- the

[5] To appreciate the relationship between UR and CCC they may be compared to the maximum speed and horsepower of an automobile, which are provided as design data, on the assumption that no one will drive at full speed - the CCC may be compared to the maximum speed of which the automobile may be capable and the UR the average speed at which it is assumed it will be actually driven.

main season is 150 days in winter and 60 days in summer), the total overnight maximum annual accommodation would be 737,000. It is assumed that single individuals will occupy 25% of double occupancy rooms. Therefore rather than the 2200 maximum average number of visitors per night the actual number should be 1650 persons per night. This translates into 552,750 overnight persons per year (converting this number to overnight visitors in the main seasons of 150 days in winter and 60 days in summer this would translate into 2632 overnight visitors per day).

Average skier visits: To determine the number of skier visits we assume that at Jumbo Glacier Resort 85% to 90% of overnight visitors will be skiers and snowboarders. Therefore, overnight visitors will account for a yearly average of 1485 skier visitors per day. Day visitors, because of the proximity of Panorama and of the bed base of the Columbia Valley and even of the Banff region, will be assumed to be a high yearly number of up to 65% of the number of overnight visitors (with a larger component in the summer), or 965 skiers and sightseers per day. This totals 2,450 skier visits per day or 820,750 skier visits per year at build out.

Employees: Jumbo Glacier Resort is planned to be capable of accommodating 750 employees in overnight accommodation at the resort at build out, and this is approximately corresponding to the number of jobs the resort is expected to be generating. Assuming an average occupancy of 100% of the employee beds at buildout, this contributes an additional number of 750 overnight persons at the resort, or 251,250 overnight presences over a 335 day year.

By Market Comparison:

The project should be measured, when completed, against resorts like Lake Louise, Sunshine or Jackson Hole, which may receive approximately 550,000 skier visits per year or 1,500 per day average over the entire year or 3,000 per day over a 180 day main season. Jumbo Glacier Resort will have the advantage of greater utilization of lifts in the summer, because of the ability to complement sightseeing with summer skiing. A reasonably high ultimate target would be to consider 800,000 skier/mountain visitor days per year. 800,000 skier days over a period of 335 days would generate a yearly average of 2,388 skiers/ mountain visitors per day. However, a more appropriate comparison would be created by dividing the total number of visitors by the number of main ski season days, which is estimated at 150 in winter and 60 in summer, as the rest of the year would be marginal. Allowing for 10% for the rest of the year, 720,000 skier visitor days must be divided by 210 season days, which would result in 3,809 skiers/ visitors per day, of which about 38% would be day visitors and the other 62% would be overnight visitors.

Thus the market derived assumption would produce a slightly smaller number of average overnight visitors, therefore confirming that the design assumptions at buildout are conservative. The market projections on the other hand, are generous. Some industry experts doubt that the project may ever achieve a target of 800,000 skier days.

5.3.1.2 Water Demand Calculations

In order to calculate average and peak water demand calculations, the following needs to be considered: Jumbo Glacier Resort is expected to have an average of 1,650 persons per day over a 335 day year. It is also expected to have staff accommodation and staff estimated at 750 people (100% of staff accommodation of

750 beds) over 335 days (only skeleton staff is expected to remain during the closure period). Total overnight population including employees is conservatively estimated to average 2362 persons per day over 335 days. There will be 965 day visitors and an allowance should be made for up to 15% day employees, for a total of 112 day employees.

Water demand calculations are based on an engineering estimate of 200 to 220 L/person (53 to 58 gallons/person) for overnight visitors and on 30 to 40 L/person (8 to 10 gallons/person) per day visitor, as follows:

Table 5.1:
Average Yearly Water Demand
(Based on 335 Days of Operation)

1650 overnight visitors @ 210L/person =	346,500 L/day
750 overnight employees @ 210 L/person =	157,500 L/day
965 day visitors @ 35L/person =	33,775 L/day
112 Day Employees @ 35L/person =	3,920 L/day
Average Day Requirement =	541,695 L/day
Total water required over 335 days of operation =	181,468 m^3
+ up to 200 employees during 30 day closure @ 210 L/person =	1,260 m^3
Total Demand =	182,727 m^3

By comparison, the current yearly water usage reported by Sun Peaks Resort is 110,000 cu metres for 3,500 Bed Units, which translates into 31 cu metres per bed. Jumbo Glacier Resort expects to achieve a 10% improvement over Sun Peaks because of the difference in location and the opportunity of improving water conservation strategies. Multiplying the Master Plan build out target of 6250 beds by 28 cu metres per bed one would calculate 175,000 cu. metres per year, which is reasonably close to the engineering calculation of 182,727 m^3 per year (not including water use during the 30 day closure), and should be an achievable conservation target.

5.3.2 Water Supply

5.3.2.1 Overview

Golder Associates recently reviewed the hydrological assumptions of the water supply and their report is included as Appendix 5-F of this Master Plan and includes the following:

> Groundwater from drilled wells is to supply all of the water needed for the resort, with the wells envisaged as being located at one or more locations approximately 1 km upstream from the resort site. Civil engineering studies have determined that the water supply requirements for all resort uses will be less than about 185,000 cubic metres/year, which can be achieved with a

well water supply of 20 litres/second or less. There is no need or plan for use of surface water from Jumbo Creek or elsewhere in the Jumbo Valley to provide water supply.

Jumbo Creek is located within a "U" shaped valley. Previous air photograph interpretation, site reconnaissance, and on site investigations confirm that the lower portions of this valley where groundwater wells will be located are underlain by variable but typically coarse and permeable granular deposits. These deposits have been derived from the fans of localized tributary drainage channels, avalanches or rockfalls, as well as the alluvial deposits from sediment transport and reworking of the side valley deposits by Jumbo Creek. The granular deposits are expected to be of substantial thickness within the lower, more gently sloping terrain near the bottom of the valley.

Preliminary geotechnical and hydrogeological investigations have confirmed the variable but generally high permeability and the presence of groundwater levels at shallow to moderate depth. In addition, observations of disappearance of tributary streams into the fan deposits provide confirmation of the high permeability and continuing groundwater recharge conditions along the Jumbo Creek valley.

Based on the available information and Golder's extensive experience with comparable deposits and conditions, it is Golder's opinion that the water supply needs for Jumbo Glacier Resort can be readily provided by groundwater well installations. The current indications of a suitable groundwater source location a relatively short distance upgradient (upstream) of the main resort site is also considered beneficial since the risk of an adverse change in the groundwater characteristics resulting from the resort development or other factors is considered very low.

The specific locations and type of the well installation(s), and the desirability or need for one or multiple wells to accommodate the inherent variations in subsurface conditions, control groundwater drawdown, and provide redundancy of supply should be determined as part of more detailed study once the Master Plan has been finalized and accepted.

5.3.2.2 Potable Water Supply and Well Drilling Program

The maximum output required by the wells per day is also considered and is reviewed below. Peak water supply has been the initial engineering concern, with and without reservoirs. According to the preliminary UMA KPA's engineering work during the CASP process between 1990 and 1995, the peak water demand for the resort at full build-out without water conservation measures was expected not to exceed 20 l/s. Maximum Day Demand (MDD) are now expected to be less than 14.5 l/s. A preliminary review of groundwater availability indicates that it is feasible to use groundwater for the resort's water supply (Golder Associates).[6]

A review of the availability of groundwater approximately 1 km upstream of the proposed resort site, has indicated that production wells with individual yields ranging

[6] Please refer also to Appendix 5-G: *Supplementary Groundwater Supply Assessment* by Golder Associates.

from 0.33 l/s to 6.6 l/s is probable. These wells could require drilling to depths of between 20 m (65.6 ft) to 100 m (328 ft). It is further estimated that the total groundwater flow which could be extracted from several wells at this location on a continuous basis would be in the range of 7.5 l/s to 22.5 l/s. Additional available locations in the valley have not been investigated as it appears that it is unlikely to necessitate further exploration.

It is anticipated that the new wells will have a water quality that will be within all the Canadian Drinking Water Standard parameters. Depending on the storage system, the drinking water may have to be disinfected (chlorinated) for health purposes prior to consumption.

Given the abundant availability of groundwater, there is no intention to draw water directly from Jumbo Creek, and therefore it must be emphasized that no surface water is intended to be utilized in the Jumbo Valley. Domestic water, pumped from wells, will be stored in water reservoirs, consumed by residents and visitors of the resort, and discarded as wastewater to the resort’s tertiary wastewater treatment plant. Once treated, the wastewater will be returned to the Jumbo Creek drainage basin via ground infiltration.

Appropriate water conservation measures will be enacted to achieve reasonable service requirements. Ultimate development will require a smaller water volume than initial maximum calculations, but requirements will depend on many design factors that will be determined before construction stage.

The wells will pump water to one or more ground-level reservoirs above the resort in suitable locations hidden among the trees. It will be planned to supply all of the resort by gravity from the reservoirs. Due to the differences in elevation across the site, the service area will be divided into pressure zones; these will be fed by gravity through pressure reducing valve stations.

It is assumed that the resort’s water distribution system will be designed to provide for peak flow requirements, such as instantaneous and daily/ hourly domestic flow variations, fire suppression, etc. This would be accomplished through incorporation of a potable water storage reservoir within the water distribution system. The volume of water stored in a water reservoir is not considered an additional water demand. It represents an “off-line” quantity of water available for withdrawal for operational/ flow equalization purposes, which gets replenished from the water source.

The water distribution system will be designed to deliver water in adequate quantities and at adequate pressures for both domestic use and fire flows. Fire flows will be based on the most recent publication by the Fire Underwriter’s Survey. The water mains throughout the base area will be sized for fire flow as well as domestic use. There will be only limited need for fire hydrants as all buildings are expected to be sprinklered until a fire department is fully established. Buildings over four storeys will be of non-combustible construction, but most buildings in the resort are expected to be of combustible construction.

5.3.2.3 Water Utility

Water will be provided through a Water Utility that may be created by the proponent in partnership with the Kinbasket Development Corporation. The Kinbasket Development Corporation in Invermere, has been successfully operating as a utility providing water and sewer services to the development surrounding Eagle's Ranch golf course and is expanding services for Invermere residents.

According to the Ministry of Environment, Lands and Parks Water Management Branch:

> A water utility can be an individual or a corporation, but not an agency such as a municipality, regional district, improvement district or water users' community. Briefly, a water utility is defined in the *Water Utility Act* as a person who owns or operates waterworks that serve five or more connections. Refer to the Act for a complete definition or for any question about the definition of a water utility.
>
> Water utilities are normally created to serve rural land development where community water service is required and no water service agencies exist. They are usually created by land developers who have no other option to obtaining subdivision approval [for providing water service]. There are approximately 200 utilities in the province that serve some 20,000 households.
>
> Water utilities primarily serve fee simple subdivisions. They also serve strata developments and various other developments found in places such as ski resorts.[7]

The proponent, in conjunction with the public utility company that will provide services to the resort may apply for a Certificate of Public Convenience and Necessity to be obtained from the Comptroller of Water Rights. Reports by professional engineers detailing compliance with the Guidelines for Groundwater Reports and Well Testing will be submitted to the Comptroller of Water Rights as part of the application.

5.3.2.4 Well Drilling Monitoring Program

The engineering consultants have been assessing water supply options at the proposed Jumbo Glacier Resort development. While only preliminary information is available at this time, there is the potential to obtain water supply from drilled wells in the Jumbo Valley for the development. Additional aquifer testing and well drilling will be required in order to confirm the yield of water available from drilled wells for each subdivision component of the project. It is noted that while wells are the preferred source of water for the project, the option of application for permission to access surface water would exist as well.

It is understood that there is public concern regarding the proposed use of groundwater as a water supply source. The concern being that groundwater use may affect surface stream conditions. The purpose of the following is to provide additional information regarding the care that would be taken to determine that the extraction of groundwater for Jumbo Glacier Resort would *not* adversely affect the hydrology of the area.

---

[7] Ministry of Environment, Lands and Parks Water Management Branch, *Water Utilities: Guide to Applying for a Certificate of Public Convenience and Necessity (CPCN),* (2000); page 5

To assess whether wells for Jumbo Glacier Resort would affect the surrounding area, Golder Associates recommends, and the proponent plans to implement, the following components of a hydrogeological study for the first development phase and each subsequent phases:

- Drilling one or more wells in hydrogeologically favourable areas,
- Conducting an aquifer pumping test on each well,
- A thorough analysis of all data by a Registered Professional Geoscientist to assess the long term potential for wells at Jumbo Glacier Resort, with consideration given to environmental requirements in the area,
- If necessary, installation of groundwater monitoring wells to monitor water levels at Jumbo Glacier Resort and downgradient areas over time.

This process has been carried out at other locations and is considered an effective and scientific way to determine the capabilities of an aquifer, such that adverse effects to the local environment do not occur. Golder is confident that this process will also be effective in assessing aquifer capabilities at Jumbo Glacier Resort, and the proponent is planning to follow the above noted procedures as part of its future development process.

5.3.2.5 Hydrology

This baseline hydrology preliminary subsection describes both surface water and groundwater flow components in a wider study area, surrounding the proposed resort development. These descriptions are based on a review of limited available information including:

1) 1:50,000 scale topographic maps (Department of Energy, Mines and Resources 1979);

2) historical stream flow summaries and hydrometric map supplement published by the Water Survey of Canada (Environment Canada 1987, 1989); and

3) generalized descriptions of physiography, geology and climate contained in a recent soil survey report (Wittneben 1980).

The proposed resort development lies in the upper reaches of the Jumbo and Glacier Dome drainage areas. The creek appears to be partly fed by glacial melt waters and ultimately drains eastward into the Columbia River, just downstream of Windermere Lake. There is a drainage divide just west of the study area, beyond which surface drainage flows westward into the Kootenay Lake valley.

Jumbo Creek originates from numerous small glacier-fed streams in the Bastille Mountain to Glacier Dome to Karnak Mountain area, and flows southward and eastward through a steep-sided (V-shaped) valley, into Toby Creek. Toby Creek in turn flows northeastward through a deeply entrenched valley, a canyon, to the Columbia River.

There are no Environment Canada stream-flow gauging stations in the immediate study area. The closest, potentially representative stations are on Bruce Creek near Wilmer (station 08NA060), on Fry Creek and Carney Creek draining into Kootenay Lake (stations 08NH130 and 08NH131) and on Toby Creek near Athalmer (station 08NA012). The stations on Fry Creek and Carney Creek each have more than fifteen years of continuous record since 1974. Monthly and annual extreme records on Carney Creek, with a 188 km^2 drainage area, show that minimum daily discharges typically occur in February and March (0.27 to 0.47 m^3/s) whereas maximum daily discharges typically occur in June (23 to 44 m^3/s) (Environment Canada 1988). Seasonal trends in runoff in Jumbo Creek are expected to be similar to those on Carney Creek. However, flow volumes per unit drainage area would be expected to be lower in Jumbo Creek, reflecting the predominantly eastward rather than westward aspect of the contributing watershed, and generally drier conditions on the east (leeward) side of the Purcell Mountains, in the "East Kootenay" region (Wittneben 1980). About fifteen years of uninterrupted record are available for Toby Creek at Athalmer (just upstream of its outflow to the Columbia River). From a drainage area of 684 km^2, mean annual discharges in this creek are 12.8 m^3/s (with monthly means ranging between 2.1 m^3/s in February and 42.1 m^3/s in June).

The availability of surface water at two locations on Jumbo Creek has been investigated in the first stages of the project studies by KPA Engineering and by Golder Associates. The first location is some 1.3 km upstream of the proposed site for the resort base near elevation 5,600 feet (1,707 metres) and the second site is immediately upstream of the possible area for single family chalets in the lower logged areas near elevation 5,550 feet (1,692 metres). The catchment area of Jumbo Creek at these sites has been measured to be 18.3 km^2 (11.3 sq.m) and 27 km^2 (16.7 sq.m) respectively. The upstream site would be the preferred site as it is located further above the proposed resort facilities and therefore would be less subject to potential contamination.

In order to further investigate low flow data KPA Engineering Ltd. arranged with Pheidias Project Management Corp on March 27, 1991, on site measurements indicative of the low flow period of February to April in the Upper Jumbo Creek Valley. Inspection of the Regional Data suggested that a flow in the range of 10 to 60 l/s might be available at the higher elevation site during a dry year when low flows reflect a 1 in 10 year return frequency. Similarly the lower site might provide flows in the range 15 to 85 l/s. After on site measurements were taken, the 10 year return period low flow estimated for the flow measurement site was adjusted on the basis of the drainage area to yield 10 year low flows of 50 l/s and 80 l/s for the potential upper and lower intake sites, respectively.

However, the abundant availability of groundwater has ruled out the use of surface water, which is not planned as a source for the project. Subsurface and groundwater flow patterns are expected to roughly mirror the surface drainage pattern. Recharge to the groundwater system occurs mainly during early summer snowmelt, throughout the areas of higher elevation (including both ski areas and the resort base portion of the proposed development). Groundwater flow in these areas is expected to be controlled by the fault and fracture systems in the exposed or thinly mantled bedrock, and water table probably occurs at considerable depth. This is where the source of potable water supply is preferably chosen, as recommended for this project.

Locally, where soil covers are present, shallow subsurface flow or "perched" water tables may occur during summer months along the top of the bedrock, but most of the soils that have developed at these higher elevations are coarse-textured, loose, permeable and well drained. Groundwater is expected to discharge throughout the year into the lower reaches of Jumbo Creek east of the resort base but along the probable road access. In these areas, significant groundwater flow probably occurs through the coarse-textured colluvial deposits (more than 1.5 m thick in lower creek reaches). Water table is expected to be at or close to ground surface in portions of the creek valley bottoms, and groundwater seepage faces may develop on some of the lower valley slopes. However, initial soil testing indicates a variety of very different conditions, depending on location.

Geotechnical and hydrogeological information is summarized in Appendices 5-F and 5-G: Geotechnical and Hydrogeological Review and Summary, and Supplementary Groundwater Supply Assessment by Golder Associates.

5.3.3 Water Storage and Distribution System

5.3.3.1 Distribution System

Wells will pump water to one or more ground-level reservoirs above the resort in suitable locations hidden among the trees. Water from the reservoirs will supply all of the resort by gravity. Due to the differences in elevation across the site, the service area will be divided into pressure zones, which will be fed by gravity through pressure reducing valve stations.

The water distribution system will be designed to deliver water in adequate quantities and at adequate pressures for both domestic use and fire flows. Fire flow requirements will be based on the most recent publication by the Fire Underwriter's Survey. The waterworks system will be designed with input from the Fire Commissioner's Office, the East Kootenay Regional District, the Town of Invermere Fire Department, and from other existing mountain resort communities.

The watermain network will generally follow the proposed roadways. Sufficient watermain looping will be provided for better flow/pressure balancing and elimination of stagnant water problems. Due to the difference in ground elevation of the various parts of the development, the distribution system may operate in at least two different pressure zones.

5.3.3.2 Storage Facilities

The resort's water distribution system will be designed to provide for peak flow requirements, such as instantaneous and daily/ hourly domestic flow variations, irrigation, fire suppression, etc. This will accomplished by incorporating a potable water storage reservoir within the water distribution system. The reservoir volume will include fire storage, balancing or equalizing storage, and an emergency storage.

The minimum reservoir volumes are recommended by Fire Underwriters Survey (F.U.S.). Automatic sprinkler systems will be employed for all building types, except for the single-family chalets, to substantially reduce the fire flow demand. The highest fire flow demand on completion for the proposed development is estimated at 150 L/s.

In addition, the required reservoir storage volume is based on the estimated average daily water demand at buildout. This volume has been estimated at 544 m^3/d. The determination of reservoir storage capacity is as follows:

Total Average Day Demand (ADD)	=	542,000 L
Maximum Day Demand (MDD) = 2.3x ADD[8]	=	1,246,600 L
A. Equalization Storage = 25% MDD	=	311,650 L
B. Fire Storage = 150 lps x 120 min. x 60 sec./m	=	1,080,000 L
C. Emergency Storage = 25% (A & B) *	=	347,913 L
Total Reservoir Storage		1,739,563 L ($1,740\ m^3$)

One or more reservoirs will be located above the resort base site, at an approximate elevation of 1800 m. A separate reservoir at an approximate elevation of 1920 m may serve the single family dwellings and heli-plex development area west of the creek. These locations may provide gravity service for the entire resort development.

5.3.3.3 Isolated Water Supply Facilities

The Teahouse/Restaurant located on the top of Glacier Dome may be supplied separately with water from a 25 m^3 reservoir installed in the restaurant. The potable water demand for Teahouse/Restaurant will range from 10 m3/day to 20 m3/day in Phase 1, depending on the number of visitors. For the first few years, demand is expected to be around 10 m3/day, increasing to 20 m3/day within five years. Initially, potable water may be hauled from the potable water system in the resort base area to the Teahouse/Restaurant water reservoir by snow cat or similar service. Eventually, this means of potable water transport will be replaced with a pumped system.

Daylodges of similar size to the Teahouse/Restaurant are planned for the midstation of the Glacier Dome gondola and in appropriate locations in the Commander/Farnham drainage. It is expected that wells of adequate capacity will serve the daylodges from appropriate locations nearby.

5.3.4 Water Treatment

It is anticipated that the new wells will have a water quality that meets all the Canadian Drinking Water Standard parameters. Therefore, minimal, if any, treatment will be required. Depending on the storage system, the drinking water may need to be disinfected (chlorinated) for health purposes prior to consumption.

5.3.5 Water Management Plan and Conservation Measures

A **Water Management Plan** including a listing of water conservation measures is included in Section 3.11 of this Master Plan.

[8] 3794 overnight peak visitors / 1650 overnight average visitors = 2.3

5.3.6 Water Licenses

There are currently no existing water licences on Jumbo Creek. There have been licences in the past, including an industrial license on Jumbo Creek for a mine (Mountain Minerals), but the last licence was abandoned in June 1989. There are currently three licences on Toby Creek near its mouth for average withdrawals of 20 l/s or 0.02 m^3/s during the April to September period. This is only a small fraction of the flows available in that period and less than the average minimum low flow of 1.61 m^3/s which usually occurs in February. As the Jumbo Creek resort will be withdrawing small quantities of water from underground aquifers, existing licences are not a constraint on the development. In addition to these existing licences, the Town of Invermere has a Reserve on Toby Creek for waterworks purposes. The Water Management Branch in Nelson has advised that the Reserve would not impact on a water licence application for the Jumbo Creek project.

While there are no water licences on Jumbo Creek or the upper portions of Toby Creek, numerous licences exist on the lower reaches of Toby Creek. There are several water licences on Neave Creek, which is a tributary to Toby Creek – just before Toby Creek flows into the Columbia River. These licenses and associated mapping are outlined in Appendix 5-C.

5.4 LIQUID WASTE/SEWER

5.4.1 Wastewater and Discharges

Jumbo Glacier Resort will not directly discharge wastewater into Jumbo Creek (see Liquid Management Plan below). While there are no currently known wastewater discharges in Jumbo Creek, some industrial remains and abandoned infrastructure from past forestry and mining operations can be found in the creek.

The last known waste discharges under waste management permit was by the Mountain Minerals Ltd. discharge of tailing pond effluent to Toby Creek at the confluence with Jumbo Creek. The operation ceased in September 1980 and there are no plans to reopen. The mine reprocessed tailings from the old Mineral King silver-lead-zinc mine at the same location, to obtain barium sulphate. Although at the time of closure several contaminants including iron, lead and zinc exceeded permit limits for the effluent, dilution in Toby Creek during the period of discharge (May to November) reduced ambient concentrations to below levels significant to aquatic life.

5.4.2 Tertiary Treatment Plan

A tertiary treatment plant with in-ground treated water disposal has been selected as the preferred liquid waste treatment system for Jumbo Glacier Resort.

UMA KPA Engineering studied the project during the CASP process between 1990 and 1995 and issued the following summary for the project at the preliminary stage:

> All domestic wastewater produced will be collected and treated by a tertiary treatment plant. Only tertiary treatment systems with proven track records of performance are being considered for this development. In order to make the reuse of wastewater

possible for toilet/urinal flush water and obtain the necessary permits from the regulatory agencies, a high level of treatment and disinfection is required. For the Jumbo Glacier Resort, the treatment objectives as set by the proponent are for the BOD_5 and suspended solids levels to be less than 10 mg/L, removal of nutrients (total nitrogen less than 5 mg/L and phosphorus less than 1 mg/L) and disinfection (coliform count of less than 5 MPN/100 mL). This level of treatment largely exceeds the pollution control objectives for municipal treatment plant effluent discharges to receiving waters established by the B.C. Ministry of Environment, Land and Parks. In fact, for Jumbo Glacier Resort, the treated effluent will be comparable in quality to the waters of Jumbo Creek.

Given the effluent quality after the tertiary treatment process, a conventional disposal field will not achieve further treatment of the effluent. It is thus proposed to dispose of the non-recycled effluent through ground infiltration trenches or ground irrigation. Although the proponent believes that a conventional disposal field would not be required, a suitable site has been identified for the construction of a conventional tile field. This site is located approximately 1 km from the resort base site.

To conclude, from a design perspective, this project will be a model for sustainable development in terms of its use of water resources.

The sewage treatment plant will be constructed in phases matching the development pursuant to a design/build proposal from the wastewater industry. A possible option, at this time, is a modern sewage treatment system similar to those produced by Ecofluid, the company that recently constructed a plant at Kicking Horse Mountain Resort in Golden, B.C. The Ecofluid system in Golden uses an Upflow Sludge Blanket Filtration (USBF) process. The performance guarantee is for: BOD5<<10mg/l; TSS<<10mg/l; NH4-N<1mg/l; and, P (total) <1mg/l. Sludge concentration is estimated at a fairly high 4.5 to 6% resulting in relatively low costs for trucking the sludge away. The system includes UV disinfection. The Ecofluid's USBF process system was also recently installed at the Sun Peaks Ski Resort near Kamloops. Jumbo Glacier Resort is expected to receive the most up to date tertiary treatment plant available at the time of construction. An example of the kind of tertiary treatment plant proposed is the one installed at Mill Bay as seen below:

Exhibit 5.12: Sample Tertiary Treatment Plant

MILL SPRINGS WASTEWATER TREATMENT PLANT, MILL BAY, B.C.

This residential subdivision advanced wastewater treatment plant is to serve initially 60 and ultimately 400 residences and a school. Since the effluent is discharged in the vicinity of an aquifer, **Class A reclaimed water quality effluent** was stipulated: BOD_5, TSS and Total Nitrogen of less than 10 mg/l, median fecal coliform of less than 2.2/100 ml and average turbidity of 2 NTU.

The plant consists of manual bar screen, USBF clarifiers, microfiltration, stand-by sand filters and UV disinfection. It includes two bioreactor modules and a provision has been made for future modular expansion.

Phase 1 Average Day Flow:	Design:	80 m^3/day, 22,000 GPD
	Current:	10-15 m^3/day, 2,600 – 4,000 GPD

The plant was built in 1998 but due to slow progress of the residential development it was started up only in May 2002. The plant is operated by Ecofluid under contract with the owner.

A more complete description of the Mill Bay Wastewater Treatment Plant, including operating results is attached as Appendix 5-D.

For Jumbo Glacier Resort, the most advanced available system, including tertiary treatment, is proposed. The following preliminary information for a typical proposal has been provided by Ecofluid:

5.4.2.1 Process and Plant Description

The plant is to produce Class A effluent as stipulated by the Municipal Sewage Regulation (MSR) under the *Waste Management Act*. It will be designed to meet Equipment and Process Reliability Category I as set out in Appendix 1 to Schedule 7 of the MSR.

5.4.2.1.1 Headworks

Sewage delivered by gravity first enters a concrete screening chamber consisting of manually cleaned bar screens. The first coarse bar screen has 40 mm openings and serves to remove the largest debris entering the plant. The second bar screen has 12 mm openings.

Ecofluid has successfully used similar screening system in several plants in British Columbia (Coal Harbour, Bowen Island, Beecher Bay). Based on experience with plants of similar capacity, the system does not require attendance more than 1-2 times per week.

Bowen Island USBF clarifier

Screened influent flows by gravity into the influent pump tank provided with duplex influent pumps, a coarse bubble sparger and a high/high overflow into the anoxic compartment. From the pump tank, the influent is pumped to the anoxic compartments of the USBF bioreactors.

The tank is provided with level switches and two pumps. Controlled by the level switches, the influent is pumped from the pump tank to the flow splitter where the flow is divided into the respective anoxic compartments of the bioreactor modules. The screen is regularly inspected and cleaned as required.

5.4.2.1.2 Biological Treatment

The anoxic compartments are equipped with low RPM mixers designed to move the liquor in a plug flow manner and to provide conditions for the sewage mixing with activated sludge, recycled by means of a RAS airlift pump from the bottom of the clarifier compartment. From the anoxic compartment the mixed liquor flows to an aeration compartment equipped with fine bubble aeration elements. Aerated, it eventually enters the USBF prism shaped clarifier.

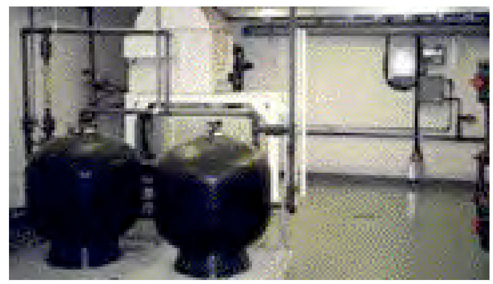
The mixture of microbial cells and water enters the clarifier at the bottom and, as it rises, upward velocity decreases until the flocs of cells become stationary and thus form a filtering media. A high degree of filtration efficiency is achieved as colloid and very fine particles are filtered out. As the flocs become large and heavy, they descend to the bottom of the clarifier and subsequently are transferred back into the anoxic zone. Upflow sludge blanket filtration has a substantially higher specific rate of separation than sedimentation. In addition, the technology accommodates high peak flows and flow swings in a self-regulating manner - the higher the flow, the higher sludge flocs rise and the larger the filtration area becomes.

To comply with the requirements of Appendix I to Schedule 7 of the MSR each bioreactor is capable of processing 75% of the design maximum flow with one unit out of service.

Clarified treated effluent is collected in a trough on top of the clarifiers before flowing by gravity to post-treatment consisting of sand filtration and UV disinfection.

5.4.2.1.3 Sand Filters

Two pressure sand filters each capable of processing 100% of the maximum design flow will be installed. The system is designed to ensure a high degree of process and mechanical flexibility. Thus the units are designed to accommodate monomedia and multimedia beds at 5 usgpm/ft^2 of media to accept flows directly from the clarifier and for parallel or series operations.



Process room showing sand filters at Mill Bay

Backwash is accomplished using treated effluent. Automatic backwash is initiated by a pressure switch ahead of the filters. On high pressure, three way solenoid valves of the filter in operation will shut and backwash will be initiated. Standby filter valves will open to accept effluent.

5.4.2.1.4 UV Disinfection

This pressure system is designed to operate two units each capable of processing 75% of maximum design flow either individually, in series or in parallel. The system is provided with a UV intensity monitor, temperature sensors and an alarm.

5.4.2.1.5 Sludge Handling

Excess sludge generated in the bioreactors is transferred by means of airlift pumps from the bottom of the clarifiers to a sludge storage tank. Since the age of activated sludge in the bioreactors is in excess of 25 days, less excess sludge is generated, it is stabilized and its dewatering characteristics significantly improve. Pre-thickened in the bioreactor pre-thickeners, the sludge in the storage tank typically further thickens by gravity to as high as 4-6%. Thickened stabilized sludge is periodically pumped out of the storage tank and hauled away for disposal. Sludge storage decant is returned to the influent pump tank

5.4.2.1.6 General

The plant is provided with emergency power generator designed to start automatically on grid power interruption and to supply power to all essential equipment and emergency lighting for a period of four hours.

Aerobic conditions throughout the bioreactors and stabilized sludge, dramatically reduce the potential for odour. Noise conditions are effectively mitigated by having all noise emanating equipment installed within a sound insulated room of the control/maintenance building and by incorporating low RPM rotating equipment selection.

5.4.3.2 Key Plant Components

5.4.2.2.1 Sand Filters PF (2)

Objective:	Remove residual suspended solids from clarified effluent.
Design Considerations:	The units are designed to accommodate monomedia and multimedia beds at 5 usgpm/ft2 of media. Backwash is automatic, it is accomplished using treated effluent and initiated by pressure switch ahead of the filters. On high pressure, three way solenoid valves of the filter in operation will shut and backwash will be initiated. Standby filter valves will open to accept effluent.

5.4.2.2.2 UV Disinfection UV (1)

Objective:	Effluent disinfection to less than 2.2 MPN/100 ml (fecal coliform)
Design Considerations:	Two high intensity pressure systems are provided.
Fecal Coliform:	<2.2 MPN / 100 ml
Accessories:	UV intensity monitor, elapsed time meter, ground fault interrupter, hour meter, thermal protection, cleaning rack

5.4.2.2.3 Emergency Power Generator EPG (1)

Objective:	Provide emergency power.
Design Considerations:	The generator is sized to supply power to all essential equipment and for emergency lighting.
Drive:	Diesel engine

Accessories:	Sound attenuating outdoor enclosure, inlet/outlet silencer

5.4.2.2.4 Control System

The plant is provided with a SCADA system, which monitors equipment operating status and receives data from transmitting instruments. The entire process and operation control and alarm system consists of the following:

Influent Pump Tank	Level switches	Lo	-pumps stop
		Hi	-pump starts
		Hi/Hi	-lag pumps starts and alarm
		Hi/Hi/Hi	-alarm
Influent Pumps	Motor Overload		-alarm
	Hour Meter		
Filter Feed Tank	Level switches	Hi	-pump starts
		Lo	-pump stops
		Hi/Hi	-alarm
Filter Feed Pumps	Motor Overload		-alarm
	Hour Meter		
Sand Filters	Pressure switch	Hi	-rearranges filter valves
		Hi/Hi	-alarm
Post Filter Line	Turbidity Monitor	Hi	-alarm
UV Disinfection	UV Intensity	Lo	-alarm
	Hour Meter		
	Temperature	Hi	-alarm
Air Blowers	Pressure Indicator		
	Pressure Relief Valve		
	Pressure Switch	Lo	-alarm
	Motor Overload		-alarm
	Hour Meter		

The operation and maintenance of the sewage treatment plant by the public utility company providing services to Jumbo Glacier Resort will comply with the Assurance Plans Under the Municipal Sewage Regulation that are described in Appendix 5-B of this Master Plan.

In conclusion, an advanced tertiary treatment will be provided for the sewage of Jumbo Glacier Resort, as required prior to discharge. The sewage plant will be built in stages to keep up with the progress of development. The treated water will drain by way of pipe to an approved drainage field according to the Ministry of Water, Land and Air Protection application requirements based on the recommendations of the Environmental Impact Study required for permission to build and operate the plant.

The objective is that the treated water flowing from the tertiary treatment plant will be near the required conditions for potable water and that it will be drained back into the ground with no negative impact.

5.4.3 In-Ground Disposal of Treated Water

Golder Associates Ltd. (Golder) has previously carried out a series of geotechnical, glaciology, hydrogeology, and natural hazard studies over a period of several years from about 1993 onwards as input to development of the Master Plan for the proposed Jumbo Glacier Resort. As requested, Golder has reviewed these previous reports and information, together with relevant available reports prepared by other consultants. This review also included the current preliminary conceptual resort area plans and the *Master Plan Concept* document prepared by Pheidias Project Management Corporation, as well as colour stereo air photographs providing coverage of the proposed resort site, plus the upstream and downstream portions of the Jumbo Creek valley.

The *Master Plan Concept* and the 1995 report by KPA confirm that all sanitary and greywater discharge will be collected and directed to a treatment plant located downstream from the resort site. The effluent will be treated to tertiary standards before being carried by gravity flow in water-tight piping to one or more in-ground disposal sites located adjacent to the upgraded access road to the resort, which is roughly parallel to but offset north of Jumbo Creek.

As described above, current assessment and review of previous reports indicates that suitable, permeable granular soils are present along and at least locally upslope of the proposed access road. It is Golder's opinion that in-ground disposal of the tertiary treated wastewater can be achieved using either or a combination of conventional tile fields or deeper "rock pit" infiltration chambers, with the selection of the disposal method depending upon local subsoil and groundwater conditions, as well as topography.

Since there is a generally consistent downslope gradient along the Jumbo Valley below the proposed resort and treatment plant, it is considered feasible and practical, if desired or needed, to spread the in-ground disposal sites over a significant distance to the south and east along the valley. Further, the location of the discharge line and disposal sites along or parallel to the road will provide ready access for inspection and maintenance, if required.

The use of in-ground disposal of the sewage discharge from the resort after tertiary treatment will also result in return to the groundwater regime of an equivalent volume to that obtained from the water supply wells, which are to be located a short distance upstream of the resort site. As such, it is Golder's opinion that there will be no significant or detrimental impact on the groundwater conditions within the Jumbo Valley. Equally, there will be no impact on the surface water condition.

See Appendix 5-E for Golder's summary report on in-ground disposal of treated wastewater. The report includes preliminary mapping of suitable locations for treated water infiltration.

5.5 STORMWATER AND SNOW MELT MANAGEMENT

The proposed resort development lies in the upper reaches of the Jumbo and Glacier Dome drainage areas. The resort base is located on the western flank of Karnak and Jumbo Mountains along the eastern bank of Jumbo Creek. The area encompasses a series of steep ridges and bowls. It is a closed valley with a Southern orientation bounded by a series of high alpine ridges and large glaciers to the Northeast and the Northwest of the development area. This is predominantly an alpine area with some small treed areas mixed within.

From the ski resort base area, which is situated approximately at elevation 1,700 m., the terrain slopes towards the southeast to an elevation of approximately 900 m. at the Columbia River. The overall drainage in the area of the resort is southwest along Jumbo Creek following a sloping topography toward a confluence with Toby Creek. Toby Creek ultimately drains eastward into the Columbia River, just downstream of Windermere Lake. There is a drainage divide just west of the study area, beyond which surface drainage flows westward into the Kootenay Lake valley. Jumbo Creek originates from numerous small glacier-fed streams in the Red Mountain to Bastille Mountain area, which collect into its tributary Leona Creek and from streams coming from the Glacier Dome to Karnak Mountain area. It flows initially southward and then eastward through a valley shaped by glacier flows, entering into Toby Creek through a steep area similar to a short canyon. Toby Creek in turn flows north-eastward through a deeply entrenched valley in the lower section, and finally through a spectacular canyon to the Columbia River. The region is generally well drained.

Major drainage catchments will be delineated and shown in the engineering drawings (see Schedule A: Map Volume for preliminary drawings) for the water and snowmelt management plans. Based on a review of the local and regional hydrology it is believed that design run-off conditions for large areas (in excess of 5 square kilometres) will result from snowmelt events. Drainage services for small areas, such as parking lots and building envelopes, will most likely be designed based on rainfall events as estimated from regional intensity-duration-frequency curves (IDF curves).

5.5.1 General Considerations

Stormwater and snowmelt run-off from the uphill ski areas will occur primarily as overland sheet flow and concentrated flow in numerous channels and small creeks criss-crossing the development site. This run-off will be intercepted by cut-off ditches on the uphill side of the development and routed around into the closest receiving streams. In open areas outside of the development the run-off will be intercepted by roadside ditches and pass through culverts under the roads.

The concentrated base area of development near the central resort will be serviced with piped storm drains. Where possible, the discharge from ditches and storm drains will be routed through the system of natural and man-made features downstream of the development site. This will provide a certain measure of storm water quality and quantity control through natural biofiltration and uncontrolled detention. Opportunities will be explored to enhance this detention or to provide additional detention elsewhere at the site to mitigate the effects of an increase in run-off due to the proposed development.

Efforts will be made to maintain existing hydrologic patterns at the site by reducing the amount of diversions. Drainage areas, which will be delineated in the Stormwater and Snowmelt Management Plan – to be submitted with the detailed engineering design – will remain unchanged. Although, local diversions near the base facilities will be provided to reduce the risk of erosion and water quality problems, overall run-off patterns will be maintained. This is important with respect to maintaining base flows in creeks.

Interceptor cut-off ditches, creek or channel diversions and ditches in general will be designed with minimal gradients, where possible. Where necessary, check dams, riprap armouring and other means of erosion protection will be utilized to ensure erosion does not occur during periods of substantial run-off.

The Master Plan ensures that no land disturbance will occur within a 200 year flood plain. Jumbo Creek runs from north to south and turns east for several kilometres before encountering potential flood plains.

The civil engineering design following the Master Plan and the Master Development Agreement will ensure that potential for storm water contamination by automotive petroleum products is minimized. This may be accomplished by construction of biofiltration swales intercepting run-off from parking lots and maintenance areas and by implementation of oil separators. Segregation of run-off that could be contaminated from run-off that is not exposed to contaminants will help reduce the cost of treatment facilities.

5.5.2 Implementation Considerations

The proponent recognises that storm water and snowmelt run-off can have a significant impact on the receiving environment. Hence the development will incorporate erosion control and pollution control measures to prevent deterioration of the watershed (see Environmental Management Plans in Section 3 of this Master Plan). During both the construction and post-construction phases of the project, the proponent will focus on implementing the most applicable Best Management Practices (BMPs) to control the quality of run-off water. These will be in accordance with the project's Environmental Analysis as well as the "Land Development Guidelines for the Protection of Aquatic Habitat" (DFO/MoELP, 1992).

Soil erosion and subsequent downstream deposition during construction is of particular concern since construction activity has the potential for significant impacts on water quality and aquatic habitat. During the construction period, at-source erosion control techniques will include:

- Minimum land clearing in advance of construction
- Timely revegetation of bare areas after construction
- Diversion ditches
- Riprap and other protection at locations most susceptible to erosion
- Limiting land clearing operations to dryer seasons.

The environmental analysis, together with the results of the hydrological study, will provide the basis for the design of drainage facilities, such as culverts, stream crossings, storm drains, sediment control facilities and other aspects of the Stormwater and Snowmelt Management Plan.

5.6 GARBAGE COLLECTION AND DISPOSAL SYSTEMS

See Section 3.6: Solid Waste Management Plan for a description of the garbage collection and disposal systems for Jumbo Glacier Resort.

5.7 HAZARDOUS AND SPECIAL WASTES

See Section 3.6: Solid Waste Management Plan for a discussion on the disposal of hazardous and special waste at Jumbo Glacier Resort.

5.8 ELECTRICAL POWER

The resort and the ski area will utilize the existing line to Panorama to build an initial 25 kva power line to the project. The project will be proceeding on the basis of assurances of adequate supply of power by B.C. Hydro at normal rates. B.C. Hydro is expected to supply the necessary power from the Columbia Valley through Panorama and to provide local distribution in the resort. The availability of forestry road access on the opposite side of the valley may offer the option of constructing the power line away from the tourist access road. A possible alternative to electrical distribution by B.C. Hydro will be the creation of an independent utility to distribute power and charge customers directly. In that scenario, the power line and right of way would be retained by the new independent utility. Emergency power will be provided by on site generators.

5.9 COMMUNICATIONS

The installation of appropriate telephone lines along the existing alignment of the power lines by Telus is a possible form of service. An alternative is a satellite telephone system that could be provided by Telus or an independent utility.

6. SOCIO-ECONOMIC AND MARKET ANALYSIS

NOTE: *The data and statistics in this section were compiled at the time of submission of this Master Plan to the approving authorities. Some statistics and data may now be out of date, but are included here for reference purposes.*

The purpose of this section is to provide a general description of the economic characteristics of the region and an assessment of key socio-economic aspects. Preliminary estimates of the number of workers that will be required to construct and then operate the resort and the ski facilities are included; the potential for local recruitment is discussed; possible settlement options for non-resident workers are considered; and the potential social issues that should be taken into consideration as part of the planning process are noted. Initial work on this section was done by R-Dac Group of Invermere and Norecol Environmental and Management Consultants of Vancouver. Pheidias Project Management Corp. updated this material with the assistance of Milne Consulting of Invermere and Lynnpeaks Consulting of Vancouver.

The resort, as previously described, will be near the District of Invermere in the Columbia Valley Sub Region of the Regional District of East Kootenay. This sub region includes the District of Invermere, and the communities of Brisco, Edgewater, Fairmont Hot Springs, Radium Hot Springs, Wilmer and Windermere.

The economy of the area is not large but is relatively well diversified. Forestry and mining are the key resource industries, but tourism is playing an increasingly important role and is the largest employer in Invermere. There are a few mining operations in the area employing about 100 people. The forest industry is largely based on logging within the Invermere Timber Supply Area. Agriculture plays a smaller role in the upper valley area, primarily based on grazing lands.

The area contains a number of provincially designated parks and has developed a tourist industry based on its scenery, hot springs, golf courses and skiing facilities. It is also a noted summer vacation area, primarily for Alberta residents, and increasingly Americans, many of whom have summer cottages around the lakes.

Invermere is serviced by a gravity fed water system supplied from local lakes. The system has the capacity to serve a population of 6,100. The sewer system includes a secondary treatment system and has the capacity to serve a population of 3,000 people. The smaller communities such as Radium, Edgewater, and Windermere also have water supply systems with excess capacity. Sewer systems are in place in Radium and Edgewater. The Shuswap Band in Invermere has established its own water and sewer system as part of the services offered by the Kinbasket Development Corporation and the Eagle Ranch Golf course development.

In addition to the tourist and vacation services noted above, the area has a hospital with 21 acute care beds, and 4 extended care beds. Although funding has been reduced the hospital has maintained its operations. Other limited social services are available including a dentist, and a small public health clinic.

Policing in the area is provided by the R.C.M.P. with a detachment of 9 Officers in Invermere and another 3 in Radium. Volunteer fire brigades in the communities provide fire protection services. Each community has a reasonable level of equipment to support its needs given the current population.

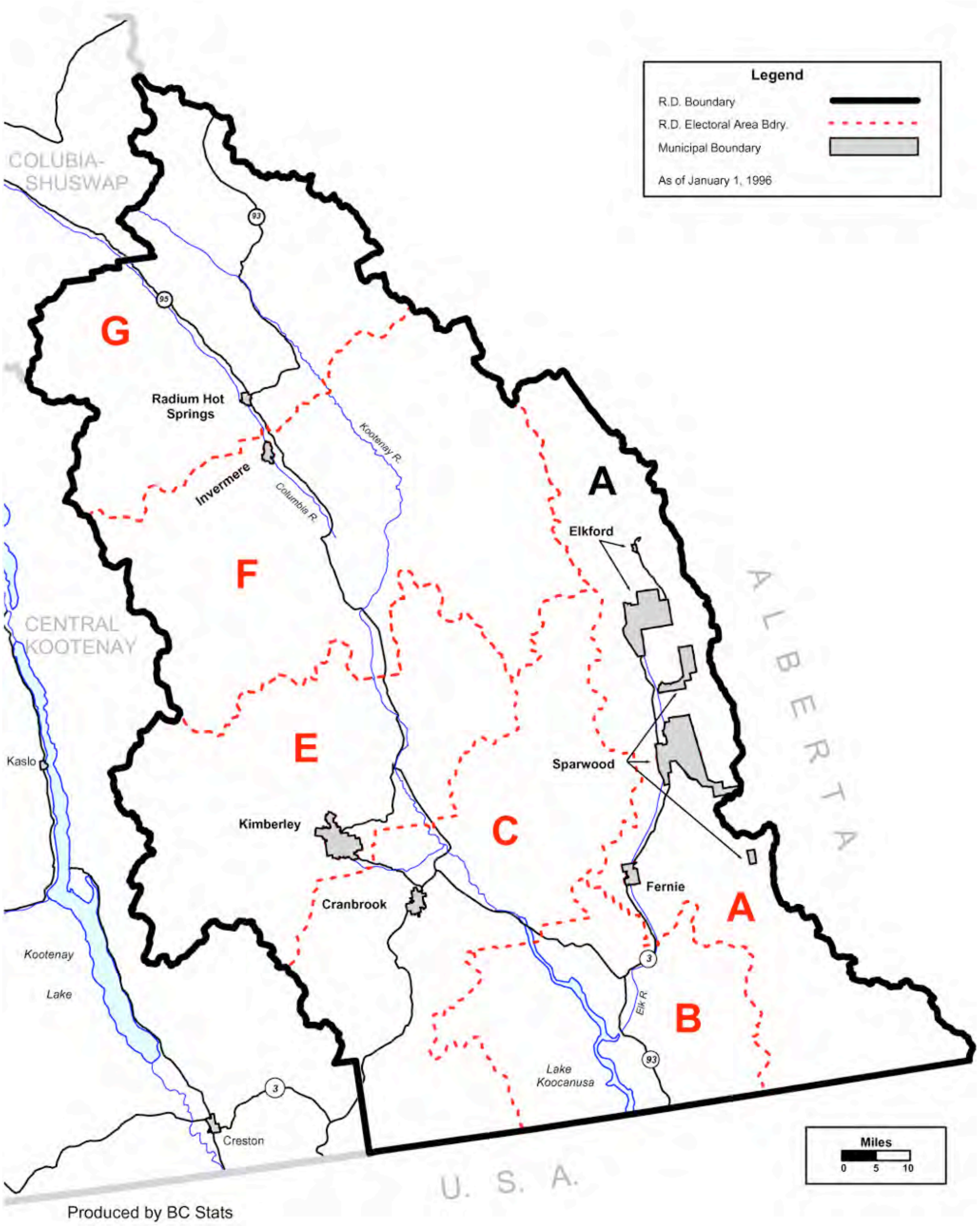
There are six elementary schools in the area supporting an enrolment of approximately 1,200 students, and a high school, David Thompson Secondary School, with a capacity of about 550 students.

The Socio-Economic portion of this study concerns itself primarily with the Regional District of the East Kootenay and particularly with Electoral Areas F and G (see Exhibit 6.1, below).

6.1. POPULATION AND DEMOGRAPHIC PROFILE OF THE EAST KOOTENAY

The resident population base in Electoral Area F and G is estimated to comprise approximately 10,000 people. About 20,000/25,000 beds of vacation homes and about 3,000 beds of tourist accommodation may be added to the population base. This seems to confirm an estimate of a potential population basin of 30,000 people on a peak vacation day in this part of the Columbia Valley, the portion that is closest to the Jumbo Valley mountains. The project is in Area F according to RDEK boundaries.

Exhibit 6.1: Regional District of the East Kootenay Map



6.1.1 Resident Population Base

Full time resident population and dwelling data from the 2001 Census:

Table 6.1: 2001 Full Time Resident Population (Unadjusted)

Location	Population	Dwellings
Electoral Area F		
Invermere	2,858	1,334

Municipal Total	**2,858**	**1,334**
Toby Benches/ Westside Rd/ Panorama	422	317
Windermere/ Juniper Heights / Windermere Loop Rd	1,267	1,633
Fairmont Hot Springs	504	514
Dutch Creek/ Columere Park/ West Side Columbia Lake	389	410
Canal Flats	714	312
Whiteswan/ Settlers Rd.	60	75
Rural Total	**3,356**	**3,261**
Shuswap IR #0	176	71
Columbia Lake IR #3	165	187
Area F Total	**6,555**	**4,853**
Electoral Area G		
Radium Hot Springs	583	330
Radium Rural/ Dry Gulch/ Kootenay Nat. Park	398	256
Edgewater	369	169
Wilmer	264	119
Brisco/ Spillmacheen/ Luxor/ Spur Valley/ Westside Rd	604	352
Area G Total	**2,218**	**1,226**
Regional District of East Kootenay		
Rural Areas	16,284	10,045
Municipalities	39,413	18,252
First Nations	594	352
RDEK Total	**56,291**	**28,649**

Source: Statistics Canada, 2001 Census

Starting with the 1991 census, Statistics Canada made the decision to adjust official population estimates to include a measure of net census undercoverage (persons missed less persons counted more than once). After each census, Statistics Canada undertakes an extensive evaluation of the quality of the census using statistical methods and studies including a Reverse Record Check, an Automated Match Study and a Collective Dwelling Study in order to determine the undercoverage rate of the census for each province in Canada. This process, and how it applies to British Columbia, is described in a feature article "How many people were missed in the Census?" published by BC Stats[1].

Table 6.2: 2001 Full Time Resident Population (Adjusted for Undercount)

[1] Feature Article, Population Section, BC STATS, Finance and Corporate Relations, September 1998

Location	Population
Invermere	2,965
Radium Hot Springs	705
Regional District of East Kootenay	63,644
British Columbia	4,095,934

Source: BC Stats

6.1.2 Second Homes and Fixed Roof Tourist Accommodation

6.1.2.1 Second Homes

The area surrounding Lake Windermere has a long history as a summer destination for many southern Albertans. A large shadow population of second homes exists, particularly in the area ranging from Radium Hot Springs to Fairmont Hot Springs. According to the Columbia Valley Chamber of Commerce roughly 65% of all the homes along the east side of Lake Windermere are second homes. As is further outlined in the following section, numerous lodges, hotels and bread and breakfasts have also been established in the in recent years in order to accommodate the growing tourism demand.

The total second home resident population for the area (Radium, Fairmont, Invermere, Windermere, Edgewater) is estimated to range from a low of approximately 10,000 individuals to a high of 25,000.

While the valley has been historically popular with southern Albertans, it also is seen as the southern gateway to the National parks, and has experienced significant American and overseas interest and investment in the last few years. It is like Banff or Lake Louise, with the exception that it is possible to buy and live in the Columbia Valley.

High-profile projects such as Kicking Horse Mountain Resort near Golden and the expansion of Panorama Mountain Village by Intrawest, as well as the publicity and general awareness generated by this project proposal have been an influencing factor in the Columbia Valley's rising popularity and status as a recreation destination in the last few years.

Demand for second homes has reached new heights. In order to meet the demand for second homes, a significant number of resort/second home developments are underway, many of which quickly sold out and some of which are priced as high as $300[2] a square foot. Lakeview Meadows is an alpine-style development on the east side of Lake Windermere projected to be sold out within five years. It includes 120 cluster homes and 165 single-family lots. The first phase of single-family lots sold out.

[2] This is still seen as a bargain when compared to comparable properties in the U.S. Rockies, where the average price of a ski-in ski-out condo was $US 850 a square foot in 2001. As local infrastructure has become more accessible and international travel has become more affordable, we are now seeing international buyers arriving from the U.S., U.K. and Europe to buy world-class resort real estate at bargain prices.

Eagle Ranch, a gated resort community includes 70 single-family lots and plans for 250 townhomes. Timber Rock Village is another significant development.

Plans for a 1,000 home development (about 6,000 Bed Units) called CastleRock Estates in the recently expanded municipal area of the District of Invermere were announced in the fall of 2003. This development will be about the size of Jumbo Glacier Resort at full build-out.

Panorama Mountain Village is also undergoing a dramatic expansion that is progressing at a rate of 60 to 100 dwelling units a year. At full build-out it will reach 7,000 Bed Units and will include 35,000 sq ft of commercial space contained in three neighbourhoods: Grey Wolf, a low-density golf community, Trapper Ridge, a low-density ski-in ski-out mountain centre, and Ski Tip Village, a high-density condo-style core.

6.1.2.2 Fixed Roof Tourist Accommodation

The communities in the Regional District of East Kootenay experienced significant growth in tourism within the last five years, as has been illustrated a corresponding increase in fixed roof tourist accommodation. According to the “Mountain Region Fixed Roof Accommodation Assessment” report commissioned by Alberta Economic Development in March 2002, the increased demand is influenced by the “spillover” demand generated by their close proximity to the National Parks. This demand and growth was accurately forecasted in the 1991 application and in the 1995 Jumbo Glacier Resort Master Plan.

At present Invermere and Panorama have a combined 650 fixed-roof tourist rooms. Another 340 rooms are planned in the District while the resort has the capacity to accommodated another 352 rooms before it reaches its approved Bed Unit ceiling of 7,000 beds.

Radium Hot Springs has a total of 877 rooms with plans (currently on hold) for another 450.

Table 6.3: East Kootenay Tourism Properties, Rooms and Revenue: 1997-2001

	1997	1998	1999	2000	2001
Total Properties[3]	**123**	**124**	**123**	**135**	**136**
Hotels	25	26	27	29	32
Motels	63	66	63	69	61
Vacation Rentals	16	14	15	19	22
Miscellaneous[4]	18	17	18	18	21
Number of Rooms	**3,569**	**3,761**	**3,817**	**4,242**	**4,692**
Annual % change	--	5.4	1.5	11.1	10.6
Revenue ($'000s)	**27,594**	**29,194**	**34,222**	**41,029**	**42,044**
As % of Region	61.1	61.8	63.8	64.3	65.5
As % of Province	2.4	2.4	2.6	2.8	2.9

Source: BC Stats, Hotel Room Tax Database, Consumer Taxation Branch, Ministry of Finance and Corporate Relations

6.1.3 Population Growth

According to the 1996 Census, between 1991 and 1996 the population of the Province of British Columbia grew at a rate of 13.5% while the East Kootenay grew at a rate of 7.6%. The Regional District of East Kootenay saw the second slowest growth rate (26th out of 27 Regional Districts) for this period in the province. This slow growth rate (relative to the rest of the province) has caused concern over the region's ability to attract government dollars for the support of essential services and has also brought into question the continued political representation of the region at its current levels.

In the mid-1990s, a particularly difficult period for communities dependant on forestry-based economies, appeals for special circumstances were made to the provincial legislature (following committee hearings on the redistribution of seats) in order to ensure that political representation at the provincial level was maintained at current levels.

As part of a regular redistribution[5] of federal ridings to compensate for higher population growth in other parts of the province, the Kootenay-Columbia Electoral District has been expanded to include Nakusp, Sicamous, and the Arrow Lakes to Fauquier. Revelstoke was added in 1996. Notwithstanding these substantial territorial additions, Kootenay-Columbia still has the smallest federal electoral district population in the province and is at risk of further territorial expansion. Because of the region's inability to maintain its natural political boundaries, access to constituency representatives has been severely affected, especially for

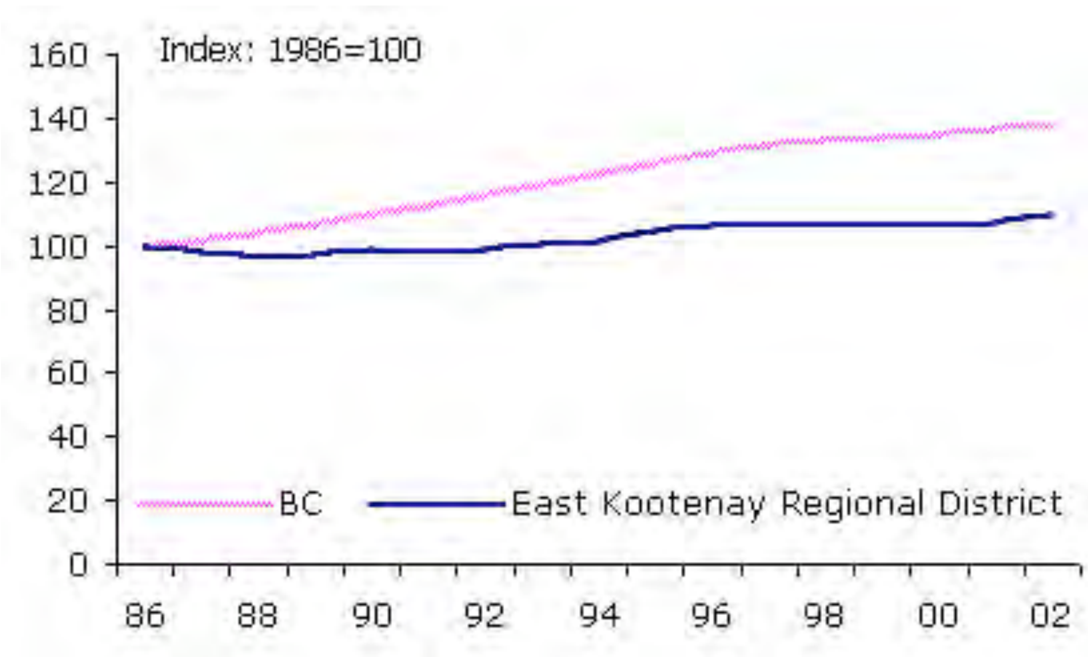
[3] The numbers of types of properties do not sum to the total number of properties. For protection of confidentiality reasons property types containing less than four properties are not displayed.

[4] Includes guest ranches, skiing lodges, bed & breakfasts and related.

[5] On March 17, 2003, the Federal Electoral Boundaries Commission's report was tabled in the House of Commons following the regular decennial (10-year) review of federal electoral boundaries.

communities such as Nakusp and Fauquier which are now seven to eight hours' driving time from the political and population centre in Cranbrook. The current Member of Parliament only manages about three trips per year to Revelstoke, a significant regional community.

Table 6.4: Population Growth (1986-2002)



Source: BC Stats

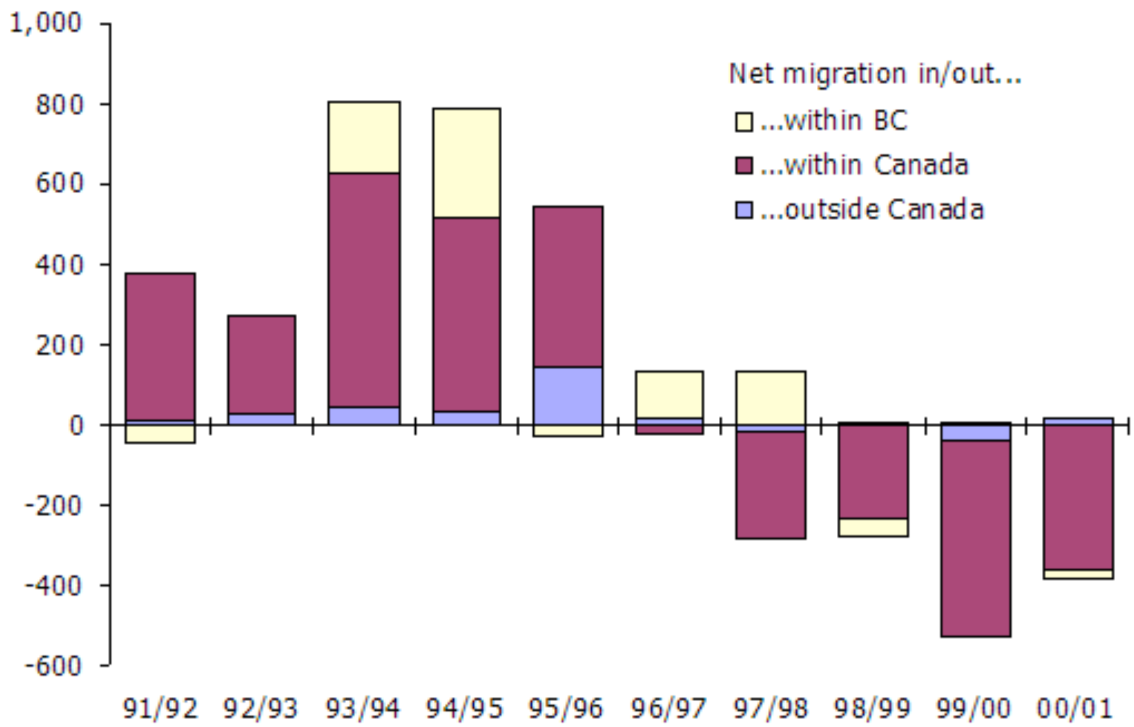
There was considerable internal variation in population change throughout the region. The municipalities of Kimberley, Sparwood, Elkford, Fernie all had a drop in population while Invermere, and Radium Hot Springs had an increase. Cranbrook grew also but only marginally at 0.8%. These geographic and demographic variations point to the reduction in activity in the resource sector while tourism and retirement continue to grow in the region.

The population growth trend of the last few years has been slightly more encouraging, however, and is beginning to show a reversal of the trend witnessed in the previous 10 years. Population growth in the East Kootenay has begun to outpace the provincial average and recently ranked second on a regional basis in British Columbia. This trend has closely paralleled the development of major tourism-related projects, such as the expansion of Fernie and Panorama, and the development of the new Kicking Horse Mountain Resort, as the tourism economy has begun to supplement and even replace the region's historic reliance on primary resource based industries.

The population of the Regional District of East Kootenay rose marginally by 0.2 per cent from 48,116 in 1996 to 48,220 in 2001 – modestly lower than the 4.9 per cent population growth recorded for the province as a whole in the same period.

During the time period from 1991 to 2001, migration patterns changed. In the second half of the decade, the growth experienced in the first half was replaced with negative net migration. Migration between the region and the rest of Canada became negative in 1996/97 and remained so until the end of the period. Net migration between the region and the rest of the world fluctuated slightly above and below zero over the last three years of the period while migration between the region and the rest of the province has become more frequent in recent years.

Table 6.5: Migration Components of Population Change in the East Kootenay[6]



Source: BC Stats

6.1.4 Age Distribution

The average age of the population in communities in the East Kootenay is interestingly diverse. Population ages range between 31 years in Elkford to 45 years in Creston. Communities such as Invemere, Golden and Fernie/Sparwodd have been attracting a younger population (32 – 35 average age) as their economies have begun developing around tourism and sports/recreation.

[6] The migration components of population change include the number of persons coming from, or leaving to go to (a) other localities within BC, (b) other localities within Canada or (c) other countries. This chart displays the net number of persons migrating-in to or migrating-out of this area from/to the rest of BC, Canada or the world for each of the years reviewed.

***Table 6.6: Age Distribution in Invermere*[7]**

	Invermere		% Distribution	
	Male	Female	Invermere	B.C.
All ages	1,385	1,470	100	100
0-14	260	260	18.2	18.1
15-24	230	225	15.9	13.2
25-44	360	400	26.6	30.1
45-64	370	360	25.7	25.1
65+	170	230	14.2	13.6

Source: BC Stats

Table 6.7: Current and Forecasted Age Distribution in the East Kootenay

	East Kootenay	East Kootenay		British Columbia	
	2001	2001	2011	2001	2011
		(Percent Distribution)			
0-17 years	14,248	22.4	17.5	21.7	18.6
18-24 years	6,644	10.4	8.9	9.4	8.9
25-64 years	35,380	55.6	58	55.7	58
65+ years	7,372	11.6	15.6	13.2	14.5
Total	63,644				
	Dependency Rate (%)				
	Child	33.9	26.1	33.3	27.8
	Elderly	17.5	23.3	20.3	21.7
	Total	51.4	49.4	53.6	49.4

Source: BC Stats

All age groups below 45 years of age experienced a drop in population. Age groups above 45 years of age rose by nearly 4000 people. There was a slight lowering in the percentage of males while there was a slight increase in the percent of females.

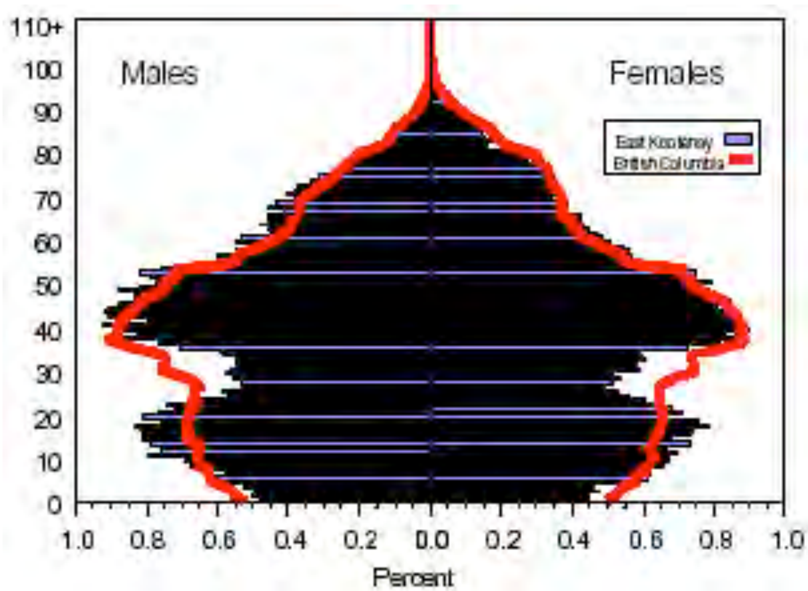
The number of seniors, while currently lower than the provincial average, is expected to grow substantially over the next ten years, faster than the rest of the province and surpassing the average for British Columbia. The number of children and young adults in the 0-24 age category is expected to fall substantially.

In the East Kootenay Population Pyramid below we see a high percentage of residents are in

[7] Based on Statistics Canada 2001 Census

the 35 - 55 age group. As elsewhere in North America this is largely due to the post-war baby boom, a demographic that will progressively move towards a more elderly age group. Immediately below the bulge of baby boomers, we see a notable indent for the East Kootenay (when compared to the rest of British Columbia) roughly representing the 22 – 35 age group. Because this indentation is more pronounced than the province as a whole, it is presumed that it is related to a net emigration of young persons shortly following their graduation from high school.

Table 6.8: East Kootenay Population Pyramid (2000)[8]



6.1.5 Population Density

The population density of the Regional District of East Kootenay is less than half (2.2 persons/km^2) of the overall average (4.6 persons/km^2) for the province of British Columbia. The entire area of the East Kootenay is classified by Health Canada as rural or remote.

Table 6.9: Population Density[9]

	Population	Land Area (km^2)	Population Density (persons/km^2)
British Columbia	4,095,934	892677.1	4.6
East Kootenay	63,644	28344.3	2.2

Source: BC Stats

[8] From the East Kootenay Community Health Services Society, Health Planning and Research, Health Status Profile; data source: BC Stats

[9] Based on Statistics Canada 2001 Census

6.1.6 Ethnic Identity and Immigration

Population growth is largely dependant on immigration, whose largest age demographic is composed of elderly people and more specifically, retirees. This trend, combined with the current emigration of young people, places additional stresses on regional tax-funded services, including health care.

***Table 6.10: Ethnic Identity*[10]**

	E. Koot.	E. Koot.	B.C.
		Percent Distribution	
Total Visible Minorities	1,305	**2.3**	**17.9**
Single Origins	1,240	2.2	17.6
Chinese	235	0.4	8.1
South Asian	350	0.6	4.3
Filipino	125	0.2	1.3
Japanese	245	0.4	0.8
Other	285	0.5	3.1
Multiple Origins	65	0.1	0.3
Total Aboriginal People	2,110	3.8	3.8

Source: BC Stats

***Table 6.11: Immigrant Population*[11]**

	1986	1991	1996	Chg 91-96
East Kootenay				
Total Population	53,085	52,368	56,366	**8%**
Immigrant Population	6,070	5,900	5,395	**-9%**
Immigrants Share of Pop.	11.4%	11.3%	10.4%	
British Columbia				
Total Population	2,883,365	3,282,061	3,724,500	**13%**
Immigrant Population	630,665	723,170	903,190	**25%**
Immigrants Share of Pop.	21.9%	22%	24.2%	

Source: BC Stats

[10] Based on Statistics Canada 1996 Census

[11] Based on Statistics Canada 1996 Census

Table 6.12: Immigration Age Distribution[12]

	Invermere	East Kootenay	Whistler	British Columbia
Age	(%)	(%)	(%)	(%)
Less than 14	0	3	4	6
15 to 24 years	4	4	5	9
25 to 44 years	10	24	**61**	**34**
45 to 54 years	29	26	15	19
55 to 64 years	12	18	11	14
65 + years	**37**	**27**	2	19

Source: BC Stats

6.1.7 Income and Safety Net Dependency

Table 6.13: Regional Income Levels

	East Kootenay	Squamish-Lillooet	British Columbia
Average Family Income 1995 ($)			
All Families	54,044	58,075	56,527
Husband/Wife	57,717	62,489	60,612
Female Lone Parent	23,837	27,073	28,448
Income Distribution Among Families (%)			
< $20,000	14.3	12.7	15.2
$20,000 - $79,000	67.6	65.9	64.5
$80,000+	18.1	21.4	20.3

Source: BC Stats

Table 6.14: Income Dependency

	East Kootenay	British Columbia
Composition of Total Income 1995		
Employment	77.0	75.5
Government Transfers	13.7	12.7
Other	9.3	11.8
Income Dependency 1996		

[12] Based on Statistics Canada 1996 Census

Forestry	14%	9%
Mining	20%	2%
Fishing and Trapping	0%	1%
Agriculture	1%	2%
Tourism	8%	6%
Public Sector	21%	25%

Source: BC Stats

The East Kootenay region has been historically dependent on primary resources. This dependency is beginning to be alleviated by a greater focus on tourism.

Table 6.15: Personal Income Levels

	Invermere		**Whistler**		**British Columbia**	
Year	Average Income ($)	% Change	Average Income ($)	% Change	Average Income ($)	% Change
1994	38,157	-	33,872	-	38,883	-
1995	31.747	-16.8	31,731	-6.3	36,126	-7.1
1996	32,347	1.9	35,206	11.0	36,961	2.3
1997	33,178	2.6	36,099	2.5	37,894	2.5
1998	33,543	1.1	35,408	-1.9	38,398	1.3
1999	35,592	6.1	38,663	9.2	39,758	3.5

Source: BC Stats

The difficulties faced by primary resource-based economies in the mid 1990s are particularly noticeable by looking at income levels. A comparison between Whistler and Invermere in 1994 and 1998 demonstrates some of the changing economic realities in the province. Invermere in 1994, with an economy that was substantially based on primary resources, was at the provincial average while Whistler, with a tourism-based economy, was substantially below. In 1999, as its tourism-based economy matured, Whistler was almost at the provincial average and gaining, while Invermere had fallen significantly below average. Invermere's average income growth in the late 1990s, however, exceeds that of the province. This is an interesting trend that matches the increased tourism-based investment and initiatives that began during the same period, and are expected to continue (as outlined in Section 6.1.2 above).

Table 6.16: Safety Net Dependency[13]

	Basic BC Assistance			Employment Insurance			Total BC Assistance and EI Beneficiaries		
Age Group	Invermere	Whistler	B.C.	Invermere	Whistler	B.C.	Inver.	Whis.	B.C.
Under 19	3.3	0.4	7.5	-	-	-	-	-	-
19-24	3.0	1.2	5.9	5.6	5.0	3.7	8.3	5.8	9.3
25-54	0.9	0.2	4.3	3.5	3.5	4.5	4.3	3.7	8.7
55-64	-	-	2.8	1.1	0.9	2.5	-	-	5.3
19 - 64	1.1	0.3	4.3	3.4	3.5	4.1	4.4	3.8	8.2

Source: BC Stats

The dependence on the safety net for residents of both Invermere and Whistler is below the provincial average, notwithstanding the high variability of their tourism-based economies. The industries employing the most people in Invermere are Accommodation, Food & Beverage Services, Construction and Retail Trade. Similarly, in Whistler, Accommodation, Food & Beverage Services, Retail Trade and Construction were the industries that employed the most people[14].

For the East Kootenay region as a whole, whose economy is still highly dependant on primary resources, the number of people dependant on the safety net is also below the provincial average.

The amount of poverty in the region, however, is an issue and a concern that emerged at a recent regional Premier's Economic Summit (Castlegar, November 1998). Human Resource Development Canada stated that poverty is evident among people on employment insurance and BC Benefits Assistance. Females head a large proportion of single parent families on BC Benefits in the Kootenay region. The income levels for single women in the East Kootenay are consistently less than the provincial average, and this is in part a reflection on the limited employment opportunities for women due to a historical dependence on traditionally male-dominated primary resource sector jobs.

Issues affecting or increasing the problems caused by poverty also include the rural nature of communities in the East Kootenay and lack of public transit, the highly seasonal nature of current tourism-based initiatives, and the lack of certain specialized trades which have been required for the expansion of the tourism industry, necessitating an influx of outside workers.

The lack of public transit, especially for travel between communities, makes it difficult and expensive for low-income workers to travel to available jobs. In recognition of this situation, and in order to mitigate other concerns including environmental impact, this resort proposal will encourage the use of shuttle buses, which are planned to be provided free of charge to resort facility workers and clients to the maximum extent economically possible.

[13] Percentage of Population by Age Receiving Benefits – December 2001

[14] BC Stats, Community Facts

Related to this issue is the lack of population growth (addressed in Section 6.1.3 above). This has caused concern over the region's ability to attract government dollars for services such as public transit. It is believed that increased investment in the region, specifically the kind of investment that would reverse the trend of net emigration of younger workers (see Section 6.1.4 above), would improve the region's ability to attract government dollars, increase the tax base, and alleviate some of the burdens that an acutely aging population places on government services. Additionally, the continued efforts to meet the demand for second homes (Section 6.1.2.1) both increases local tax revenue and ensures that a larger proportion of property tax revenue (that which is generated from non-residents) benefits the local resident population while maintaining the current base of affordable housing for the existing resident population.

The seasonal nature of current tourism-based initiatives raises questions of stability for low-income earners. The high season occurs overwhelmingly in summer. The existing tourism infrastructure is largely centred on the lakes, championship golf courses and hot springs and draws a substantial amount of visitors from the National Parks, whose high season is also in summer. A smaller "high season" additionally occurs during the months of January to March, primarily based on regional skier visits to Panorama. Following the creation of the golf course, Panorama is beginning to become a year round destination, with August reportedly becoming almost as busy as the peak of the winter season. The region, however, lacks a significant international quality destination that can attract visitors from the continent and overseas on a year-round basis, such as occurs in many areas in the Alps, and now at Whistler. Currently the international quality destination activity that attracts a constant flow of visitors throughout the winter is heli-skiing, which covers a huge area but cannot generate enough visits or jobs to impact the seasonal nature of the tourism economy as a whole, nor the tourism deficit relative to the imbalance of tourism revenues in Canada when compared with Canadian spending for tourism abroad.

The Jumbo Glacier Resort project fulfils a unique need for an international quality destination of the highest calibre offering year-round skiing and sightseeing. It is an opportunity to create a new balance in the seasonal trends, complementing a high season in winter with a strong summer, but strengthening the much needed winter tourism opportunity. At Jumbo Glacier Resort it is expected that most of the low to middle income jobs, ranging from ski lift operators to shuttle bus drivers, to Level 1 ski school instructors will be year-round jobs. It will substantially augment the winter tourism season of the region while adding a new and special dimension to the existing and varied summer tourism possibilities.

The lack of sufficient local trades-people necessitating the import of outside workers, specifically in terms of resort construction, has also been identified as an issue impacting negatively on local employment and therefore potentially obstructing efforts to reduce poverty. However, following nearly ten years of substantial tourism-related development in the region, this has become less of an issue, and it is expected to become even less of an issue by the time this project proposal is ready to begin construction. The last ten years have seen a large, capable work force develop in the region. As seen in the following section (6.1.8), the East Kootenays now have a slightly higher than average percentage of people employed in the construction and technical trades occupations than the rest of the province. Invermere, for example, has a slightly larger proportion of its residents working in the construction industry than Whistler, a town that has witnessed a 20-year construction boom.

It is commonly accepted that the best way to defeat poverty is through job-generating investment and through increased educational training and skill development. Initiatives have been undertaken to provide better skills training to local residents in recent years (see Section 6.1.9 below). Literacy programs and increased career counselling are areas that have been targeted for improvement in order to encourage displaced and unemployed workers to initiate and follow through on personal education plans. This project provides a substantial job-generating investment opportunity for the region. The proponent group has indicated a serious interest in providing and facilitating significant job-training opportunities for both mountain oriented jobs and technical skill development. The proponent's consultants have held discussions since the mid-1990s with the International Union of Operating Engineers, which has expressed an interest in training programs and support for the creation of a local work force. The proposed program would be particularly based on interested First Nations members.

6.1.8 Labour Market

Table 6.17: Labour Demand

		E. Kootenay	B.C.
Labour Force 1996			
Industrial Structure (% Distribution)			
Goods	*Primary*	16.9	5.7
	Manufacturing	7.7	10.4
	Construction	7.6	7.5
Services	*Non-Government*	62.7	70.6
	Government	4.9	5.9
Occupational Structure (% Distribution)			
Management and Professions			
	Business & Finance	1.0	1.8
	Natural & Applied Science	1.6	2.3
	Health	2.1	2.6
	Judges	1.8	2.0
	Teachers	3.7	3.7
	Art & Culture	0.6	1.2
	Total	10.7	13.7
Technical Trades and Skilled Occupations			
	Finance & Insurance Admin.	2.0	1.6
	Techs in Natural & Applied Sciences	2.3	2.5
	Techs in Health	0.9	1.0
	Paraprofs. In Soc Sci Educ etc.	0.7	0.9
	Techs in Art Culture & Rec.	1.6	1.6
	Skilled Sales & Service	3.9	5.2
	Trades & Skilled Trans. & Equip Ops.	20.0	15.1
	Total	31.5	27.9
Intermediate & Lesser Skilled Occups.		50.4	48.8

Source: BC Stats

As of January, 2002, the unadjusted, 3 month averaged unemployment rate in the Kootenay Region 940 which includes the Central Kootenay, East Kootenay and Kootenay Boundary Regional Districts was 10.4% in January 2002 compared to 11.1% in December 2001, the third highest in BC. The year before the unemployment rate was significantly higher at 11.9% in the Kootenays.

The unadjusted 3 month averaged unemployment rate for youth aged 15-29 in the Kootenays during January 2002 was 13.7% compared to 26.7% the year before. The gap between the national and provincial unemployment rates compared to the Kootenays is closing.

The total labour force during January 2002 was 78,900 a decrease of 1,500 compared to December 2001. The big decrease in the labour force and the decrease in the number unemployed contributed to the lower unemployment rate in the Kootenays.

6.1.9 Education

Education levels are slightly below the provincial average in the East Kootenay region. While high school and post-secondary education completion rates are very close to the provincial average, an area of concern are the below average Provincial Exam completion rates in Math, Chemistry, and English, as well as the below average reading, writing, and math test score results. These may be indicators of future difficulties for local students to complete post-secondary or specialized education after high school, and may also impact the ability for regional post secondary schools to capture a sufficiently large number of graduating students to maintain current funding levels and programs.

A declining enrolment is being experienced by school districts in the region. As noted in 6.1.4, this is likely due to an aging population and the net emigration of young families from the region. The College of the Rockies has noted that enrolment projections for the three school districts in its region show a marked decline in full time enrolments. This situation severely weakens the region's ability to attract government dollars. Partly due to cuts to education funding, the College of the Rockies is expecting an $8.1 million shortfall over the next three years.

One area of growth is on-line education. A pilot project sponsored by the East Kootenay Educational Partnership to provide French online for secondary school students has been labelled a success. Major Internet communications upgrade programs are underway. The Columbia Mountain Open Network announced in January 2003 that they had secured $320,000 in funding from Industry Canada for its initiatives to deliver an affordable high-bandwidth network to the region. They have also received $592,000 from the Columbia Basin Trust and are hoping that regional communities will match that amount.

In other recent education initiatives, the Columbia Basin Trust announced $60,000 in funding for a Training Fee Support Program to help Basin students towards tuition and $500,000 in fees for short training courses. The College of the Rockies is offering an Emergency Personnel Training Program that started in October 2002.

Table 6.18: General Education

	East Kootenay	British Columbia
	% Population Age 25-54 (1996)	
Without High School Completion	24.0	22.6
Without Completed Post-Secondary	47.2	46.0

Source: BC Stats

Table 6.19: Provincial Exam Non-Completion Rate

	East Kootenay	British Columbia
	Grade 12 Provincial Exam Non-Completion Rate (Avg. 1999 – 2001)	
Math	75.8	64.9
Chemistry	84.2	78.4
English	38.9	33.0

Source: BC Stats

Table 6.20: Test Scores (Students Below Standard)

	East Kootenay	British Columbia
	Assessment Results:% of Students Below Standard (2000/01)	
<u>Reading</u>		
Grade 4	21.8	22.2
Grade 7	23.5	24.2
Grade 10	26.2	25.3
Avg. Gr. 4,7 & 10	23.8	23.9
<u>Writing</u>		
Grade 4	12.0	9.3
Grade 7	26.6	19.1
Grade 10	18.3	13.8
Avg. Gr. 4, 7 & 10	19.0	14.1
<u>Math</u>		
Grade 4	18.0	16.2
Grade 7	21.9	18.8
Grade 10	26.3	23.3
Avg. Gr. 4, 7 & 10	22.0	19.5

Source: BC Stats

6.1.10 Health

The general health status of the East Kootenay compares favourably with the rest of the province.

Table 6.21: Health Indicators

	E. Kootenay	B.C.
Life Expectancy – Avg. 1996-00	79.8	79.5
Infant Mortality (per 1000 births) 1996-2000	5.4	4.4
Potential Years of Life Lost (per 1000 population) – Avg. 1996-00		
Natural Causes	34.6	35.8
Accidental Causes	10.3	10.4

Source: BC Stats

There are a number of concerns with respect to health care in the region. As elsewhere in the nation, shortages in qualified personnel and funding are an issue. These problems may be amplified in the East Kootenay region where the recent trend of slow growth relative to the rest of the province contributes to a smaller share of funding while an acutely aging population places an increasing burden on existing health care resources. The inability to attract and retain health care professionals in the region has also been cited as an area of concern, compounding the problems of shortages in personnel.

Access is an issue. The East Kootenay region is physically large, sparsely populated and contains a number of geographic barriers. Access to medical facilities in a reasonable time frame is an issue for residents living in rural areas.

The absence of a consistent information technology system that would allow branches and institutions to coordinate and share information has also been cited as an issue. We have seen in Section 6.1.9 above that this issue is beginning to be addressed.

There is a high rate of unintentional injury hospitalisations when compared to more urban health regions. Unintentional injuries are responsible for about $12 million in direct health care costs in the East Kootenay Health Region. This is slightly less than half the annual direct cost due to cardiovascular disease ($27.5 million) and about the same as the costs attributable to all cancers.[15] Both the East Kootenay and West Kootenay Health Regions have similarly high hospitalisation rates when compared to more urban regions such as the Simon Fraser Health Region or the South Okanagan Health Region.

The hospitalisation rate for East Kootenay is higher than that for Simon Fraser in every age group. This is particularly true for the 15 – 24 age group (109% higher) and for the 25 – 44 year old age group (120% higher).[16] There are numerous possible explanations for these differences. It may reflect differences in medical practice and health system capacity around which patients need to be admitted and which can be managed as outpatients, especially in rural settings where access can be an issue. Or, it reflects differences in lifestyles led by

[15] Medical Health Officer's *East Kootenay Health Status Profile*, 2000

[16] It should be noted that the East Kootenay Health Region encompasses a much larger area than the Regional District of the East Kootenay. The East Kootenay Health Region includes the town of Golden (part of the Columbia Shuswap Regional District), which is self-described as the "Ultimate Canadian Rocky Mountain Destination for Outdoor Recreation Adventure!" – it is an area that is particularly popular for "extreme sports" and snowmobiling, which are generally recognized as being very high-risk for unintentional injuries.

people in urban and rural areas, and the risks associated with the types of occupation that predominate in these regions.

The predominant economic activities in the East Kootenay Health Region are mining and forestry. These are inherently riskier than the predominantly service-based industries seen in the urban health regions.

High participation in relatively high-risk outdoor recreation, including snowmobiling, climbing and hand gliding has been cited as contributing to the high rate of unintentional injuries. Ski resorts have also been noted as generating high usage levels of medical facilities for unintentional injuries. Other factors to be considered are the large number of second home residents and visitors to the region, who largely participate in outdoor recreation and sporting activities and may skew the statistical base on injury reporting relative to the resident population.

Finally, while unintentional injuries are high and of concern, the general health indicators for the region are better than the provincial average, as may be expected of an active population. Over the long term this is a positive indicator that may offset some of the costs associated with short-term unintentional injuries.

In other health indicators, the East Kootenay region ranks poorly relative to other regions in waterborne disease outbreaks, child abuse, infant mortality, and exposure to second-hand smoke. Sadly the confirmed proportion of children in the East Kootenay that are victims of abuse or neglect is at least twice that of the neighboring West Kootenay and of the province as a whole.[17] This brings into question the ability of certain communities of providing the necessary environment for healthy child development.

As a point of strength the region has low rates of sexually transmitted diseases and HIV. Low birth weights occur at a rate that is lower than other health regions and the provincial average. Over the past decade the low birth weight rate in the East Kootenay has steadily declined, a general indicator of an increasingly healthy environment.

6.1.11 Crime

Overall crime rates in the East Kootenay are amongst the lowest in the province and have shown a downward trend in the recent past, notwithstanding a significant transient population and a large number of second-home residents who are not considered statistically when compiling crime rates per resident population. The region also has the lowest rate of illicit drug deaths in the province.

Of some concern is the high rate of property crime by juveniles in the region. While this phenomenon occurs due to multifaceted reasons including individual, sociological and ecological circumstances, social pathologists and criminologists often characterize these crimes as occurring when legitimate or institutionalised means (getting a good education and job) of achieving cultural goals (becoming wealthy/living a comfortable life or achieving status) are impeded. It can be argued that improved and increased investment in the region can help alleviate these conditions.

In terms of resorts, past review of the incidence of crime in resorts such as Whistler and Banff

[17] Data Analysis Branch, BC Ministry for Children and Families

erroneously related statistical data with the small resident population and gave a distorted view of prime resorts as if crime were greater than in urban areas. In reality, when related with the total population present in tourist resorts, including the much larger number of visitors as well as residents, the crime rate of tourist resorts appears to be consistently much lower than that of urbanized areas, as would be expected when considering the demographic make up of resort visitors.

Table 6.22: Serious Crime

	E. Kootenay	B.C.
Serious Crime Rate – Avg 1998-00		
Violent	1.6	3.1
Property	9.9	14.5
Total Serious	11.5	17.6
# of Serious Crimes per Police Officer	10.6	13.3
Serious Juvenile (Age 12-17) Crime Rate – Avg. 1998-00		
Violent	2.6	3.2
Property	11.1	5.0
Total Serious	13.6	8.2

Source: BC Stats

6.1.12 Housing

Although real estate values are rising in the Windermere Valley, housing costs in the East Kootenay in general are amongst the lowest in the province. Residents of the East Kootenay are in the enviable position of spending a smaller proportion of their income in order to obtain shelter and a smaller percentage of the population are renters as compared to the provincial average.

6.2 COLUMBIA VALLEY AND DISTRICT ECONOMY

6.2.1 General

The economy of the project area has been driven by activity in the mineral, forestry, and most recently, tourism sectors. Economic activity in the East Kootenay Region has been cyclical, primarily due to resource sector dependence. As a result of downsizing, mine closures and various other factors affecting primary resource based industries the region suffers from one of the highest unemployment rates in the province.

Due to technological change, environmental considerations, and a shrinking wood supply throughout the Province of British Columbia, there has been a long-term decline in traditional forestry employment.

Mining is one of the project area’s oldest economic activities, and a traditionally its most significant employer; however, mining development in the region has declined significantly.

The East Kootenay economy remains largely un-diversified. There has been a strong effort to create a tourism sector in recent years, but the industry is still in its infancy and it will take more investment and time before it will provide sufficiently large numbers of high paying, non-seasonal employment to the local population, in order to begin to replace the level of wages lost to downsizing in the resource based industries.

Census data on the experienced labour force in the Regional District of East Kootenay show that since 1991 manufacturing and mining employment have fallen significantly as a share of total regional employment. Mining nevertheless continues to hold the top spot in terms of employment for the region, followed by retail trade and accommodation, food and beverage services.

Employment in forest and logging activities remain about constant, while employment in construction, transportation and communication, retail, accommodation and other service sectors have increased. A trend towards diversification of the economy is beginning to take shape, but forestry and mining continue to dominate.

16% of the Kootenay labour force is directly employed in primary industries as compared to 6% provincially and 10% outside the Lower Mainland. Population growth is slower than the provincial average and incomes are also slightly below the provincial average. There are generally more males than females (except Invermere) due to traditional job-types.

The economy of the Columbia Valley, particularly in the Radium Hot Springs – Invermere – Fairmont Hot Springs corridor, has a large tourism sector that accounts for almost one-third of the area’s employment, whereas forestry accounts for 20 per cent. Employment in the public sector is the other large sector in the economy. Forestry employment includes timber harvesting, silviculture and wood products manufacturing.

Cranbrook is the most diversified economy in the Kootenays, relying on transportation, tourism, forestry mining, agriculture, government, professional services, manufacturing, government and retail. Cranbrook calls itself the “Key City of the Kootenays” and services the whole region. The city’s airport is currently undergoing an important expansion.

6.2.1.1 Competitive Advantages

According to the BC Chamber of Commerce the East Kootenays have several competitive advantages:[18]

- climate is milder than anywhere in the Rocky Mountains
- proximity to U.S. markets
- inexpensive housing
- skilled labour force because of the many industrial jobs
- abundance of hydro electric power, natural gas, water and land
- quality of life, low crime rate, good schools (including post-secondary)
- small quaint communities with unusually appealing ambience in most
- good climate & growing conditions
- accessible natural resources (minerals & timber)
- accessible and diverse outdoor recreation
- natural beauty of the mountains, lakes, rivers and forests
- proximity to Alberta; investment and tourism from Alberta increasing
- proximity to Banff, Lake Louise & Jasper (tourism connections)
- excellent air transportation (Cranbrook-Kimberley & Castlegar)
- excellent highway connections from U.S. & western Canada
- excellent golf courses & lots of them! At least 16 are considered world class and have made the Kootenays a top golf vacation destination; Fairmont Hot Springs Resort named top golf course resort in Canada in 1998
- world class hot springs in Fairmont and Radium
- world class fishing, hunting, snowmobiling, hiking, climbing and heli-skiing
- lower development and construction costs than urban areas

6.2.1.2 Competitive Disadvantages

The East Kootenays have some competitive disadvantages:[19]

- lack of venture capital lending and investment
- provincial financial community views Kootenays as weak economic region
- decline of forest and mining industries
- reduced access to land by resource sector
- Commercial Backcountry Recreation application process cumbersome and unrewarding
- continued dependence on resource sector exposes certain of the smaller one industry communities to cyclical pricing and world economic fluctuations (i.e. Asian crisis)
- unwillingness or incapacity of communities (long time residents & municipal governments) to diversify into tourism and manufacturing
- proximity to Alberta creates retail leakage problems for East Kootenays

---

[18] BC Chamber of Commerce, *Revitalizing Our Regions - Regional Economic Summaries for the BC Business Summit, 1998*; www.bcchamber.org

[19] BC Chamber of Commerce

- low profile elsewhere in BC and the world (re. attracting new residents, tourists and new industry)
- lack of telecommunication global connections and poor cell phone service
- stifling regulatory environment

6.2.2 Forestry

The two major forestry companies operating in the region are Crestbrook Forest Industries and Slocan Forest Products. There are also a multitude of smaller companies, all sharing an annual allowable cut of 657,626 square metres of wood fibre. There are two large and several smaller-scale lumber mills in the Invermere timber supply area. In addition, there is a pulp mill and a pole/post plant in the timber supply area.

Recent years have seen difficulties for the forest industry. A poor lumber market, spiralling utility costs and pine beetle destruction of hectares of timber have been affecting factors. The softwood lumber dispute with the United States**Error! Bookmark not defined.** created additional hardship. Meanwhile provincial stumpage fees jumped an average of 36 per cent in the Interior adding stress as local forest industries try to absorb these additional costs. Negotiations on the softwood lumber dispute with the US are continuing. The low Canadian dollar has helped keep the Kootenay region forest industry viable in recent years despite market competition.

Slocan Forest Products (SFP) received the highest anti-dumping duty from the United States of any Canadian company at a 38.5% penalty. An appeal by SFP is under consideration. SFP in Radium laid off 86 contractors December 14/01 to January 2/02. Approximately 125 were laid off from Dec 24 to Jan 2 for the usual Christmas shutdown at the Slocan operation. SFP is now ISO 14001 certified at the company's 10 sawmills.

Other regional companies facing reduced earnings, shifting markets and layoffs are Kalesnikoff Lumber, which was already down 50% from its normal operations before the anti-dumping duties were imposed, and J.H. Huscroft Ltd in Creston, whose temporary shutdowns affected 125 workers.

Tembec's Kootenay division is responding to the demand for certified lumber products, as companies such as Home Depot and Lowe's Building Centre require them. Tembec Inc. reported net earnings for the quarter that ended September 29 2002 at $4.9 million compared with $68.8 million in the corresponding quarter the year before. Tembec Inc. (Value Added) Cranbrook shut down 5 November 2002 affecting 37 employees. They will remain closed until the lumber market improves and the complete impacts of the US softwood lumber penalties are known.

The Land Conservancy of BC is purchasing land near Wycliffe from Teck Cominco in six phases over three years. TLC purchased 310 acres in 2002 and is now purchasing the second phase bringing the total protected areas to 557 acres. The total deal involves 1,896 acres and will cost $2,493,750.

Optimistic developments around the potential Chinese adoption of Canadian standards for home building were announced by the Council of Forest Industries (COFI). The resulting demand for wood products could prove vital to the B.C. forest industry by reducing dependency on the American market.

The current Allowable Annual Cut (AAC) in the Invermere Timber Supply Area is calculated by the Ministry of Forests to be about the same as the Ministry of Forests' latest calculation of the long-term sustainable harvest rate.

The total timber value of the Jumbo Creek drainage has been recently estimated by Slocan Forest Products at $9.8 million (see Appendix 6-D: Summary of Jumbo Creek Timber Values). The Jumbo Glacier Resort would remove approximately 105 hectares (260 acres) from the working forest, entirely in a recently logged area, for the development of the resort. Another portion of the valley, upstream of the resort in the upper end of the drainage, would likely see future logging limited to ski runs and trails; however this area would represent less than ten per cent of the forest in the drainage.

6.2.3 Mining

Base and precious metals (lead, zinc, silver, gold), industrial minerals (gypsum, magnesite, dimension stone, barite, silica) and coal are all mined in the East Kootenay region. The base and precious metals are generally found in the Purcells and western portion of the region. Industrial minerals are found along the edge of the Rockies. All the coal deposits are found in the Elk and Flathead valleys, on the eastern portion of the region.

There are six industrial mineral and five coal mines currently in production in the East Kootenay. The last operational base metal mine in the East Kootenay, the Sullivan Mine in Kimberley, closed officially on December 21, 2002. Salvage and reclamation operations will continue on the site until 2005. Thirty-one employees will stay on for the next year to perform post-closure activities. Sullivan had been in operation since 1909, it employed a peak of 1500 workers in 1981 and approximately 640 in the late 1990s. 85% of the mine’s labour force resided in Kimberly.

The six industrial mineral mines in the East Kootenay are relatively small and provide approximately 100 jobs. The five major coal mines (Fording River, Fording Greenhills, Line Creek, Elkview Coal and Coal Mountain) employed approx. 2,340 people in the late 1990s, a drop from 3,700 in 1991. These five mines produce approximately 75% of the coal mined in BC, or about 25 million tonnes in 2001.[20]

The history of mining activity in the East Kootenay clearly shows the high mineral potential of the area. Net mining revenues for the Kootenays in 2001 were more than $1.6 billion. The Kootenay region receives more than a third of all reported exploration and development expenditures in BC, representing one of the region’s most significant sources of investment.

However, mineral exploration and development activities reached an extremely low level throughout the province in 2001. In the Kootenays, reported exploration expenditures fell from $13 million in 1997 to $4 million in 2001. This trend has caused significant concern over the well being of the industry, a trend that is compounded by the closure of significant mines such Sullivan, which will not likely be replaced.

PricewaterhouseCoopers has conducted a yearly survey called The Mining Industry in British Columbia since 1968. They preface the 2001 edition with a statement on the significance of the Sullivan mine closing:

> 2001 was the year that the Sullivan mine closed. The Sullivan mine, located in

[20] The Mining Industry in British Columbia - 2001, PricewaterhouseCoopers LLP

Kimberley, was discovered in 1892 and began production in 1909. Over its 92 years of operation, the average number of employees exceeded 1,000 people. Over the term of the mine life, annual salary plus benefits were estimated to average $68,000 per employee and the total contribution from the mine to employees was estimated to exceed $5 billion. Taxes, payment to suppliers and the purchase of local and provincial services, along with smelting and refining of concentrates in Trail, have contributed to the mine's $20 billion direct contribution to the local and provincial economies. British Columbia needs to find more mines like Sullivan to help bolster its economy, Unfortunately, in 2001 exploration expenditures totalled only $10 million, representing the lowest level of exploration reported since the inception of this Survey. Without further exploration, it is unlikely that there will be another Sullivan mine.

While mining will continue to play a substantial role in the economy of the region, recent trends indicate that it is highly unlikely that mining will continue to play as large and important a role, or provide as many jobs, in proportion to the overall economy as it has in the past.

Higher risk and specialized mining jobs have provided high salaries (almost double the provincial average), however, these jobs have begun to dwindle noticeably as workers are replaced by technology, mines close or curtail production due to increased costs, market conditions, and increased competition (particularly from developing nations), and social and environmental factors are considered more intently.

The regional economy has accordingly begun to diversify over the last decade and proposals such as this one will provide at least a partial relief for the closing of projects such as the Sullivan mine, and, when carefully designed and planned, will have a comparatively negligible environmental impact.

6.2.4 Manufacturing

The region's manufacturing industries are largely resource-based with a major emphasis on forest products, dominated by the sawmilling industry, and mining (see above). A small but increasingly well regarded fine art crafts industry also exists in the region.

Because regional and domestic markets are limited, manufacturers must look to export markets in order to remain competitive. A major focus is the American market. The Pacific Rim and Europe are emerging markets. At a regional level, Alberta represents an important market for small manufacturers.

Increased tourism is expected to have a positive impact on the local manufacturing industry, especially for arts and crafts, textile and clothing, sporting equipment, furniture, foodstuffs, and publishing/printing industries.

Table 6.23: East Kootenay Manufacturers, 2002

Type of Manufacturing	No. of Manufacturers
Food Manufacturing	5
Beverage and Tobacco Product Mfg	3
Textile Mills	1
Textile Product Mills	1
Clothing Manufacturing	7

Leather and Allied Product Mfg	1
Wood Product Manufacturing	19
Paper Manufacturing	1
Printing and Related Support Activities	6
Chemical Manufacturing	2
Plastics and Rubber Products Mfg	2
Non-Metallic Mineral Product Mfg	13
Primary Metal Manufacturing	1
Fabricated Metal Product Mfg	8
Machinery Manufacturing	5
Computer and Electronic Product Mfg	2
Electrical Equipment, Appliance ... Mfg	1
Transportation Equipment Mfg	2
Furniture and Related Product Mfg	5
Miscellaneous Manufacturing	12
Publishing Industries	9

Source: BC Stats, BC Manufacturers' Directory

6.2.5 Agriculture

The Kootenay region is a mixed farming district with much of the production marketed locally. Beef cattle are the main source of revenue; however, climatic conditions hinder development of the industry, as the winter feeding period is long.

Forest takeover of grasslands has been cited as an additional hindrance. In 1990 the East Kootenay Trench/ Agriculture Wildlife Committee was formed and over the next several years they systematically gathered data on wildlife and cattle grazing patterns and on forest encroachment of grasslands, reaching a conclusion that forest fire suppression had resulted in forest takeover of grasslands and that "prescribed fires" had to be increased. They also cited pasture rotation and protection of riparian areas as two important elements in protecting land from damage.

Beef cattle constitute the main source of farming income in the Invermere area; in 1991 cattle and calves totalled 7,031 head. Most of the stock is shipped to Alberta feedlots for finishing, being sold directly or through the auction yard at Cranbrook. Summer ranges are reported to be stocked to capacity, with the result that expansion possibilities are limited. In fact, cattle numbers declined 3 per cent in the early 1990s, while increases were realized elsewhere in the East Kootenay region. Hay is produced under irrigation for on-farm use. In 1991 there were 94 census farms (those with sales of $250 or more) in the Invermere area containing 51,581 acres of land. Sales of $10,000 or more were reported by 45 farms. Of 5,792 acres under crops in 1991, 5,177 acres were in hay, and 443 acres were in oats. Total farm capital value was estimated at $37.4 million, and sales receipts at $4.3 million.

Table 6.24: Agricultural Statistics in the Kootenay Region

Type of Farm	% of Farms	% of Farm Receipts	% of Farm Capital	% of Farm Area	Average Farm size (acres)
Tree Fruit	8.35	5.35	5.19	0.53	17
Grain and Oilseed	1.2	3.2	1.89	1.6	353

Other Field Crop	11.65	6.24	9.81	7.28	321
Potato and Vegetable	4.99	7.28	2.81	0.84	44
Berry and Nut	1.13	0.15	0.55	0.08	19
Grapes	0.28	0.11	0.28	0.04	35
Greenhouse Vegetables	0.5	0.54	0.31	0.07	35
Other Crops (Specialty)	2.6	1.18	2.71	5.07	559
Floriculture and Nursery	4.57	10.06	2.66	0.66	41
All Other Crops	2.88				
Total Crops	**38.15**	**34.11**	**26.21**	**16.17**	**117**
Dairy	4.14	17.82	6.36	3.92	249
Cattle	30.04	33.38	47.10	69.9	612
Hog	0.85	0.23	0.43	0.12	35
Poultry	1.06	0.87	0.54	0.13	32
Egg	3.44	2.75	1.96	0.66	50
Horses	13.69	5.24	10.17	5.33	102
Bees	0.99	0.6	0.49	0.09	23
Other Livestock (Specialty)	3.3	1.36	2.02	0.85	68
All Other Livestock	4.43	1.84	3.08	2.13	126
Total Livestock	**61.94**	**64.09**	**72.15**	**83.13**	**353**

Source: Statscan 1996 Census

6.2.6 Construction

Following strong activity in 2000, construction was down in both the East and West Kootenay regions in 2001. Kootenay Boundary saw an increase in construction. Building reports for 2002 show a decrease in construction values over 2001 for the Regional District of Central Kootenay at -32.7% and the Regional District of East Kootenay at -36.9%. The Kootenay/Boundary Regional District reported an increase of 24.3%. Nelson's building permits decreased by -64.5% below 2001 values. The biggest drop in values was in Fernie at -79.5%. Construction values did see an increase over 2001 in Castlegar at 34.8%, Grand Forks at 24.3% and Cranbrook at 44.3%. The biggest increases in permit values were in Radium at 50.5% and Golden at 66.4%. Construction values remained stable in Kimberley and the Invermere/Windermere areas.

Some significant regional construction projects include the fourth generator at Waneta (Seven Mile) Dam costing $91 million scheduled for completion by 2004, the turbine upgrade at Brilliant Dam (completed ahead of schedule and under budget), a 100-megawatt hydroelectric expansion power plant adjacent to the existing Brilliant Generating Station, and a 34 kilometre long pipeline built by Trans Canada Pipeline running south of Cranbrook.

New golf courses are under construction, or have been recently completed in the Grand Forks area, Kimberly and Fairmont Hot Springs.

Significant tourism related construction continues in Panorama, Radium Hot Springs, Invermere, at the St. Eugene Resort, Kicking Horse Resort, Fernie and Kimberley. Much of this construction activity is further described above in Section 6.1.2.

Jumbo Glacier Resort will significantly increase construction activity in the Invermere area. Presented the table below is an historical summary of the value of building permits issued in Invermere over the last five years. Once the Jumbo Glacier Resort is underway, building activity will increase by $15 to $30 million per year for a period of ten to twenty years. The project is expected to generate about 300 construction jobs per year. Impact on the construction work force and local contractors will be dramatic and it will be a major boost to the economy of the Columbia valley.

As Panorama reaches its bed base limit, and construction activity slows down, this project will provide similar and continued construction activity over a 20-year period. Maintenance and renovations will continue to sustain the construction employment base even after build out, as the first buildings and lifts may be twenty years old or older by the time build out is achieved.

Table 6.25: Value of Building Permits (Invermere)

	Residential				**Non Residential**		**Total**	
	Number of Units		**Value $'000**		**Value $'000**		**Value $'000**	
Year	Invermere	BC	Invermere	BC	Invermere	BC	Invermere	BC
1997	32	28,659	4,296	3,578,558	786	1,958,610	5,082	5,537,168
1998	13	20,943	2,034	2,717,270	1,527	2,022,374	3,561	4,739,644
1999	24	18,630	2,737	2,591,861	927	2,104,009	3,664	4,695,870
2000	43	15,739	3,473	2,403,140	1,624	2,088,857	5,097	4,491,917
2001	23	17,542	4,104	2,829,874	1,332	2,124,898	5,436	4,954,772

Source: BC Stats

Table 6.26: Residential and Non-residential Construction Activity (Regional District of East Kootenay)

($'000s)	1997	1998	1999	2000	2001
Residential Construction Permits - Dwellings and Value					
Dwelling Units	408	711	710	619	418
Value of Permits	45,391	67,135	84,383	73,342	60,363
Non-Residential Construction Permits – Value					
Commercial	9,879	18,082	48,378	25,894	10,108
Industrial	2,410	1,146	3,983	4,722	3,351
Institutional	17,520	6,585	5,400	1,644	19,125
Value by Community					
Cranbrook	15,931	23,841	34,472	13,514	23,195
East Kootenay*	28,649	47,604	69,861	49,324	47,438
Elkford	1,382	997	463	690	906
Fernie	18,855	7,239	9,792	22,501	4,566
Invermere	5,082	3,561	3,664	5,097	5,436
Kimberley	3,392	8,093	22,834	10,390	10,255
Value of All Construction Permits					
Total	75,200	92,948	142,144	105,602	92,947
As % of Region	42.2	49.7	58.1	48.2	53.3
As % of Province	1.4	2.0	3.0	2.4	1.9

Source: BC Stats and Statistics Canada

6.2.7 Communications

British Columbia has a modern communications infrastructure comprised of facilities for providing telephone, broadcasting, cable, Internet, and other telecommunications and information services. The broadcasting cable and telecommunications industries in BC are under federal jurisdiction and are regulated by the Canadian Radio-television and Telecommunications Commission (CRTC).

The communications industry is undergoing a major transition as a result of two factors: the increasing competition in telecommunications service and the convergence of the broadcasting, cable, computing and telecommunications industries.

The CRTC is planning on changing the rules that limit local calling areas in the Kootenays. A local dial network system would mean free calling between all towns in the area. Telus will also expand high-speed Internet to a large part of the West Kootenay and parts of the Kootenay Boundary area including Grand Forks.

An area of deficiency for the East Kootenay is affordable high-speed Internet connectivity; however, major Internet communications upgrade programs and proposals are underway. The Columbia Mountain Open Network announced in January 2003 that they had secured $320,000 in funding from Industry Canada for its initiatives to deliver an affordable high-bandwidth network to the East Kootenay. They have also received $592,000 from the Columbia Basin Trust and are hoping that regional communities will match that amount. As demand for affordable high speed Internet from businesses, residents, second home residents and visitors increases, these kinds of services become more realistic, notwithstanding the small full-time resident population of the area.

6.2.8 Utilities

Utility companies provide the third highest average weekly wages after mining and forestry in the province.

Since 1998, the Columbia Power Corporation and the Columbia Basin Trust joint ventures have initiated two major projects – construction of the Arrow Lakes Generating Station, including a 49 km transmission line, and upgrade to the turbines, seismic upgrade and rehabilitation work at Brilliant Dam.

A multi-year program was initiated in 2001 by West Kootenay Power to upgrade the voltage of its transmission lines from 63kV to 230 kV.

BC Gas built a $396 million 303km gas pipeline from Yahk to Oliver (the Southern Crossing Pipeline Project).

The Columbia Basin Trust (CBT) wants to dissolve its partnership with the provincial government. CBT wants the power projects to focus on becoming an operating company managed locally.

As previously mentioned, the Kinbasket Development Corporation of the Shuswap Band operates a local utility, initially developed for the Eagle Ranch subdivision and then expanded to serve the surrounding area.

6.2.9 Retail

Retail sector activity in the Kootenays has been mixed. In 1997 and 1998 incorporations throughout the Kootenays declined, while bankruptcies increased. However, a recent strengthening of the regional economy stimulated business activity. Retail trade accounted for $40 billion in British Columbia in 2002, only slightly ahead of Alberta's $37.5 billion notwithstanding BC's significantly larger resident population. On a per capita basis, retail sales in British Columbia are slightly lower than the Canadian average per person, and rely heavily on tourist spending.

Invermere is the largest retail hub in the vicinity of the study area, and the creation of the Jumbo Glacier Resort as a new tourist destination is expected to provide an influx of visitors that will help bolster the local retail sector.

6.2.10 Transportation

Road construction and maintenance is an important industry in the region, with several local contractors actively involved. Emil Anderson Ltd. of Cranbrook was recently awarded the initial $2.6 million worth of road construction work for the improved access road to Kicking Horse Mountain Resort. Mainroad East Kootenay Contracting Ltd won the road and bridge maintenance contract in the East Kootenays for the next five years.

6.2.11 Film Industry

Fort Steele, Campbell Lake and Bull River locations were used in Filming *The Snow Queen*. More than 500 local people were extras and there were 20 locals hired in construction and costuming. An estimated $750,000 was generated in the local economy.

The movie *Out Cold* opened in November. Part of the movie was filmed in the West Kootenay community of Salmo. The Salmo Hotel, Silver Dollar Hotel, museum and businesses were used in the movie.

Dave Perrin, a Kootenay Veterinarian, has produced two books, the first titled *Don't Turn Your Back in the Barn* is a Canadian best seller sold by Chapters. TV producers from Hollywood and Vancouver are interested in the book. The Vancouver producer is considering making the book into a TV series. Perrin's new book, *Dr Dave's Stall Side Manner*, is available, and Perrin has started another.

The movie *Alive* was shot on Delphine Glacier, immediately east of Farnham Glacier and about 8 kilometres east of Jumbo Glacier. It was shot in the early nineties with the assistance of the local heli-ski company, R.K. Heli-Ski.

Improved investment in regional infrastructure and improved access to the region's spectacular scenery would positively impact the region's ability to attract business from the film and entertainment industries.

6.2.12 Existing Employment Programs

A project piloted for three years in selected BC regions including the Kootenay Boundary region has led to regulation making "small weeks" a permanent and national feature of the Employment Insurance program. Effective November 18, 2001, the new initiative is expected to encourage people to take all available work and strengthen their attachment to the labour force.

The Federal Government recently announced a five-year initiative to provide funding for First Nations training.

6.3 COMMUNITY AND ECONOMIC IMPACTS

The project has been described by the Executive Director and Deputy Minister of the Environmental Assessment Office as being "in the broad public interest in that it provides significant economic benefits to government and the region."[21] This section explores the project's economic impacts and its impacts on its surrounding communities.

6.3.1 General

A major impact on the region and particularly on the District of Invermere will be the

[21] See item 10 of the *Recommendations of the Executive Director and Reasons for Recommendations* (for an Environmental Assessment Certificate) included as Appendix 1-B.

generation of employment. As currently planned, the project is expected to generate approximately 750 to 900 jobs at build out, mostly permanent. It is planned that at least 750 employees will choose or be required to have accommodation at the resort, and that up to 100/150 will prefer to commute from Panorama, Invermere and the Windermere Valley.

The region benefits from a highly mobile population and workforce. According to Statistics Canada,[22] the East Kootenay region experiences one of the higher percentages of internal migrant mobility in British Columbia, where 20.5% of the regional population are classified as internal migrants over a five year period, as compared to 17.6% for the province as a whole.

6.3.2 The Transition Economy

Participation to the East Kootenay CORE Table in 1993/94 made obvious the profound transformation that is anticipated in the economy of the region as well as of the Province.

While the primary industries depending on the Province's resources will continue for the foreseeable future to play a dominant role in the economy, it is clear that industrial diversification is the common goal of the Province. Reduction on dependence from the consumption of natural resources is one of the objectives of the transition economy, the scenario where out of Province dollars are acquired in greater and greater numbers without resorting to sales of primary resources.

By reviewing the personal income levels of the residents of Invermere and Whistler (see Section 6.1.7), it is possible to see the difficulties faced by a transitional economy (Invermere), whose average income levels have fallen dramatically versus the provincial average in the past ten years, in comparison to the strength of a maturing resort-based economy of Whistler, whose average income levels have risen dramatically versus the provincial average during the same period.

Commercial tourism is the only industry that may offer an immediate, even if partial, solution to the problems of the transition economy for British Columbia. However, one must qualify this statement by noting that still today more tourist dollars exit British Columbia than come in, as our facilities, with few exceptions, do not compete with the combined draw of climate and enjoyable locations of the United States, Mexico and Europe, the primary destinations of vacationing Western Canadians.

It is therefore very necessary to begin to counter this outflow of British Columbia dollars with a tourist product that can attract out of Province visitors. Vancouver, Victoria and Whistler have successfully marketed themselves out of Province, and there are locations in the rest of the Province that cater to out of Province visitors, from Fairmont Hot Springs to April Point, from Bugaboo Lodge to Three Bar Ranch, but the proposed project would be a significant contribution to place a less known part of British Columbia on the world map.

The East Kootenays do not have any other significant project that is specifically designed to bring commercial tourism into a substantial role for the transition economy, and the proposed project will fill a clear need.

---

[22] Statistics Canada, Health Indicators, May 2003

Table 6.27: Impact of Tourism in Mountain Areas: Positive Outcomes

ECOLOGY	SOCIO-CULTURAL	ECONOMIC
Encourages	**Preserves**	**Creates**
-Ecological awareness	-Cultural monuments/ ruins	-Job opportunities
-Conservation measures	-Folk traditions	-Foreign Exchange
-Measures to contain pollution	-Cultural properties	-Additional income/ tax
-Cleanliness in Campgrounds/ Parks trails and woodlands	-Art and history	-Better multiplier
		-Diversification of economy
		-Jobs for unskilled/ semiskilled workers
Helps	**Responsible for**	**Improves**
-Safe travel	-Space organization	-Infrastructure
-Maintenance of sceic landscape	-Increased communication	-Local arts/ crafts
-Research/ Environmental Impact studies and data accumulation	-Modernization of public facilities	-Regional development
-Retreat from marginal land use		-Standard of living
	Encourages	
	-Education	
	-Job skills Training	
	-Knowledge of the natural world	
	-Contact with different nations/ peoples	
	-Rediscovery of last traditions	
	-Funds mobilization	
	-Fitness and physical well-being	

6.3.3 Employment

Employment creation is a critical feature and benefit of this project. It is the only significant project in the region designed to create employment in an area that has been suffering from the loss of major employers and reductions of staff. This has resulted from the closure of major employers in the region such as Teck Cominco's Sullivan Mine in Kimberley, Ministry of Forests reduction throughout the East Kootenay and the slow down of the forest industry in general. There is an obvious need to create employment opportunities in the East Kootenay.

It is recognized that tourism employment within the province is growing. From 1995 to 2000, the sector grew by 4%. Other reports indicate this rate of growth will increase in the future.

Employment creation has impacts on the local economy, regional economy and the economy of the Province in general. Employment creation injects money into the economy while removing people from assistance programs. By making people self sufficient it removes strains on the provincial safety net and generates not only spending in the region, but also positively contributes to the provincial and federal income tax systems.

Within five years, the direct permanent employment generated should be approximately 320 full time and part time operational positions, with an additional 750 person years of employment generated during the construction of Phase 1 of the development.

Table 6.28:
Workforce Requirements at Build Out
(Full & Part-Time Positions)

Ski area	350
Hotels	400
Support services	115
Total	**865**

These positions will be made up of:

- Management
- Supervisors
- Lift operations
- Ticket sellers/checkers
- Clerks
- Ski/board instructors
- Ski technicians
- Rental technicians
- Ski patrol
- Grooming
- Trades
- Labourers
- Food & beverage servers
- Bartenders
- Chefs
- Kitchen workers
- Room attendants
- Front Desk
- Reservations
- Transportation

Estimates of the construction and operations workforce requirements will be refined as planning for this project is finalized. However, recognizing the need to establish some level of scope for preliminary purposes, early estimates are provided here. They are based on a preliminary assumption of estimated capital expenditures during construction and the phased development plans for the operations of the resort.

6.3.3.1 Construction Workforce Estimates

The initial stage of the first phase of the project may be limited to a hotel and the lifts to Glacier Dome. However, the capital costs of construction for the initial development may total an estimated $35 million in one of the probable phasing scenarios. Assuming the labour component of this is in the order of 35 – 40%[23] an estimated construction workforce of 50 would be required. The workforce requirements will include carpenters, electricians, pipefitters, boilermakers, plumbers, heavy equipment operators and labourers. In reality, due to the short season available, even with overtime work it will be necessary to employ a larger work force to complete construction on time. A workforce of 70 will be a more likely scenario.

For the following stages of development it is anticipated that the capital investment will increase, and it might grow to reach at some point an order of magnitude of $100 million. This could result in 150 construction jobs during a particular construction period.

This construction workforce will generate local income that may range between $4 and $8 million per year in wages.

[23] Horwath & Horwath, Tourism Multipliers Explained

6.3.3.2 Operations Workforce Estimates

The operations workforce generated by this project will essentially be constituted of two components including those directly employed in the operation of the ski facilities and those working in the resort base, in what is referred to here as the accommodation industry.

Ski lift operations will be partly seasonal with a possibility of slightly more employees in the winter than in the summer according to current thinking. During the seven months winter operating period from November through May the employment for ski operations will be in the order of 120 - 125 people in the first year. In the summer period, from June to October the employment will likely be in the order of 80 - 90 people. These levels will increase over the first few years to stabilize to about 250 - 300 once the resort is in full operation.

Estimates for the workforce required in the accommodation services at the resort will be refined as further planning proceeds. The levels of employment can vary with the quality of service desired. For this preliminary report a working assumption based on a ratio of one service employee for each six guests has been used according to current industry levels. This would suggest a total employment level in the order of 350-500 employees based on 2000 to 3000 guests per day at build out.

This may be a low estimate that probably does not reflect the higher quality type of operation that may be proposed for the prime hotel operation. A rough preliminary estimate of a higher end operation would predicate a ratio of one employee for each three anticipated guests. The higher end hotel may add another 100 employees.

Estimates of the required jobs will be refined as the planning proceeds and the market information is more clearly determined once each project component goes ahead. However, current estimates tend to anticipate a total of 750 to 800 employees at build out.

The number of full-time direct employees at British Columbia ski resorts was estimated to be in excess of 4,500 following the 1999/2000 season, up from 3,460 in 1990/91. This employment growth in the mountain resorts was focused on full-time winter employees and to a lesser extent – part time winter employees. Ski resort payrolls were estimated at about $87 million in 1999, a rise from $54 million in 1997, $53 million in 1994 and $40 million in 1991. A simple average annual salary on this basis was more than $20,000 in 1999/2000. The largest employers following the 1999/2000 season were Whistler/Blackcomb, Panorama, Grouse Mountain, Cypress Bowl and Big White.[24]

Jumbo Glacier Resort is expected to generate a payroll of about $17 million dollars per year at build out, based on current plans.

In development projects, the creation of direct jobs leads to secondary effects referred to as indirect or induced employment generation. The Jumbo Creek development will generate extensive economic and social benefits. The measurement of the economic effects on a region produced by the introduction of a new resort entails recognition not only of the revenues produced and employment generated by the facility itself, but

[24] British Columbia Ski Industry End of Ski Season Review 1999/2000, BC Assets and Lands Corporation

recognition of secondary effects that are equally significant.

6.3.3.3 Indirect Employment

A significant secondary effect that cannot be estimated is the spin off of other tourism related projects that this particular project, as a significant tourist magnet, will encourage in the East Kootenay base, from Cranbrook to Golden. We understand that initiatives directly or indirectly induced by the publicity derived from this project are already taking place. Interest in the expansion of Whitetooth near Golden, ultimately resulting in Kicking Horse Mountain Resort, is a prime example of this.

We see examples of these initiatives in secondary home developments such as Lakeview Meadows, The Highlands, Pineridge Estates, Westridge Estates, Bella Vista Estates and Riverstone Villas.

There are also a number of small businesses that have commenced in the region in the last few years that will be positively influenced by this project as well as numerous new ones that will start up once development starts.

It can be anticipated, based on other developments of this nature, that there will be other tourism/recreation businesses developed in the Columbia Valley as a result of this project. This could include:

- Guiding services – skiing, mountaineering,
- Heli-skiing
- Snowmobiling
- Interpretive services
- Bed & breakfasts/lodges
- Restaurants
- Pubs
- Ski shops
- Retail stores – clothing, arts, souvenirs, etc.
- Light manufacturing – clothing, souvenirs, etc.

The employment created by such new businesses will be considerable. As well, many of the jobs created by these businesses are higher paying. For example, most ski and mountaineering guides are currently paid $200 to $500 per day; interpretive services are paid $125 - $150 per day.

As well, this project will have a significant positive impact on the use of the proposed expanded Cranbrook Airport, thus creating more job opportunities.

Of the total revenues generated by the subject resort, it is expected the majority will remain in the Kootenay Region economy because the tourist/employee activity will be centralized around the Jumbo -Windermere Valley spine.

6.3.3.4 Employment Types and Wages

The employment generated will cover a broad range of skill sets. In resort proposals concern is often expressed that the compensation levels of the tourism workers does not match that of forestry workers. Although many of the part-time and junior level worker's wages are below forestry industry workers, many of the managerial and supervisory positions produce levels of compensation of between $50,000-$80,000 per year that are reasonable when compared with the forestry sector.

Tourism is not a replacement for the loss of well paid mining and forestry workers, although a four season, destination tourism project can provide valuable employment and economic activity in a mountain region, with additional opportunities for business development by local entrepreneurs.

The diminishing number of steady jobs in both the forestry and mining sectors, as noted above in Sections 6.2.2 and 6.2.3, is a regional concern that is not expected to be reversed. Continued high unemployment rates in the region are also a concern. Initiatives that give rise to alternative employment opportunities can therefore be a valuable boon for the region on a social and economic level. While wages in the tourism industry are not as high as those of the mining and forestry industries, which are respectively the highest and second highest in the province, they compare well with provincial averages, particularly as the tourism economy of a region matures.

Specific job breakdowns and wage structures for Jumbo Glacier Resort will be detailed by future development and operations management in conjunction with human resource personnel. An outline of average weekly earnings for jobs typically associated with the resort industry is outlined below.

Table 6.29: Average Weekly Earnings for Typical Resort-related Jobs

British Columbia (all salaried and hourly employees)		
Industry	**Average weekly earnings (incl. overtime)**	
	Jan. 2002	**Jan. 2001**
All Service producing industries in BC	***626.01***	***625.51***
Industrial aggregate (including unclassified) for BC	***662.87***	***663.12***
Construction	770.33	783.90
Prime contracting	801.94	817.72
Building construction	759.28	742.37
Trade contracting	741.07	752.90
Site preparation work	809.06	772.19
Building structure work	687.86	689.77
Building exterior finishing work	630.48	690.38
Building interior finishing work	614.88	623.03
Building equipment installation	808.16	819.76
Transportation and Warehousing	815.55	792.25
Air transportation	911.32	894.33
Scheduled air transportation	873.92	858.50
Non-scheduled air transportation	1,063.60	1,036.98
Truck transportation	779.09	755.68
General freight trucking	758.60	726.02

Taxi and limousine service[25]	496.36	437.83
School and employee bus transportation	368.29	349.63
Charter bus industry	610.09	569.23
Scenic and sightseeing transportation, land	N/A	567.37
Support activities for transport	934.71	917.90
Support activities for air transportation	1,031.68	1,022.67
Support activities for road transportation	679.40	654.54
Freight transportation arrangement	1,064.79	1,041.77
Information and Cultural Industries	766.91	735.25
Newspaper, periodical, book & database publishers	748.11	704.30
Radio and Television broadcasting	788.42	756.06
Information and data processing services	581.55	557.08
Arts, Entertainment and Recreation	515.90	494.52
Performing arts, spectator sports & related industries	636.28	635.14
Spectator sports	1,057.25	1,091.80
Promoters of performing arts and sports events	606.66	592.45
Independent artists, writers and performers	384.03	360.86
Heritage Institutions	522.83	498.67
Management of Companies & Enterprises	847.42	846.99
Admin & Support, Waste Management & Remediation Services	549.25	550.70
Admin and support services	528.37	529.78
Employment services	548.10	545.83
Travel arrangement & reservation services	619.57	612.69
Services to buildings & dwellings	426.87	425.26
Waste management & remediation services	868.52	871.54
Waste treatment & disposal	853.01	856.40
Remediation & other waste management services	917.70	923.72
Accommodation & Food Services[26]	318.69	299.52
Accommodation services	430.64	420.32
Traveller accommodation	436.04	428.06
Food services & drinking places	291.21	272.07
Full-service restaurants	282.63	265.62
Limited-service eating places	290.37	268.60
Real Estate & Rental & Leasing	643.46	641.78
Real estate	663.14	674.08
Lessors of real estate	563.02	595.69
Offices of real estate agents & brokers	898.01	817.00
Activities related to real estate	711.41	703.13
Rental & leasing services	610.94	578.52

Source: Statistics Canada, Employment Earnings and Hours, 2002

[25] excludes gratuities

[26] excludes gratuities

A survey of ski area wages conducted in 2002 provides the following up-to-date wage comparison [for the Kootenay Region]:

Table 6.30: 2002 Kootenay Region Ski Area Wages

Position	Base Wage Rate	Top Wage Rate
Lift Operator	$8.14	$9.75
Rental Attendant	8.25	9.86
Repair Technician	8.68	10.80
Labourer	8.25	9.07
Janitor	8.60	10.85
Ticket Seller/Cashier	8.49	10.69
Guest Services Clerk	8.68	9.93
Short Order Cook	8.68	10.84
Busser/Dishwasher	8.28	9.04
Server	8.21	8.49
Bartender	8.29	9.29
Day Care Worker	8.46	9.80
Reception	9.21	10.78
Ski Patrol	9.45	15.38
Cook	10.01	11.85
Groomer	10.60	16.06
Journeyman Lift Mechanic	18.33	20.38
Journeyman Heavy Duty Mechanic	18.40	20.43
Journeyman Electrician	18.50	20.61
Non-Ticketed Tradesperson	10.03	13.85
Level 1 Ski/Board Instructor	9.00	10.06
Level 2	10.14	12.22
Level 3	11.68	13.63
Level 4	14.13	15.35
Entry Level Sup'r.	10.88	15.46

Table 6.31: Average Hourly Earnings for Typical Resort-related Jobs

British Columbia (hourly employees only)		
Industry	Average hourly earnings (incl. overtime) Jan. 2002	Average weekly hours Jan. 2002
All Service producing industries in BC	***16.28***	***28.9***
Industrial aggregate (including unclassified) for BC	***17.33***	***31.0***
Construction	20.54	36.5
Prime contracting	19.94	38.4
Building construction	19.59	38.1
Trade contracting	21.03	35.1
Site preparation work	22.46	35.7
Building structure work	19.80	35.3
Building exterior finishing work	19.03	33.2
Building interior finishing work	19.33	33.1
Building equipment installation	22.01	36.1
Transportation and Warehousing	18.55	40.8
Air transportation	23.80	36.6
Non-scheduled air transportation	30.24	34.2
Truck transportation	17.16	42.9
General freight trucking	17.06	42.8
Taxi and limousine service[27]	13.47	42.2
Scenic and sightseeing transportation, land	17.17	32.3
Support activities for transport	19.16	41.7
Support activities for air transportation	19.28	44.1
Support activities for road transportation	15.98	38.2
Freight transportation arrangement	22.27	40.9
Trade – Commerce	14.86	28.1
Retail trade	14.30	26.4
Food & beverage stores	14.69	25.1
Grocery stores	14.35	24.9
Sporting goods, hobby, book & music stores	13.33	25.3
Vending machine operators	13.68	27.2
Arts, Entertainment and Recreation	16.54	22.7
Performing arts, spectator sports & related industries	16.49	25.7
Heritage Institutions	16.13	24.6
Admin & Support, Waste Management & Remediation Services	14.13	30.0
Admin and support services	13.74	31.3
Employment services	13.16	31.3
Travel arrangement & reservation services	16.94	29.2
Services to buildings & dwellings	12.70	27.6

[27] excludes gratuities

Waste management & remediation services	22.31	29.4
Accommodation & Food Services[28]	13.04	21.8
Accommodation services	14.01	27.2
Traveller accommodation	14.19	27.3
Food services & drinking places	12.72	20.5
Full-service restaurants	12.57	20.2
Limited-service eating places	13.17	19.7
Real Estate & Rental & Leasing	14.12	29.9
Real estate	14.50	29.9
Lessors of real estate	12.52	29.8
Offices of real estate agents & brokers	17.94	30.8
Activities related to real estate	16.15	29.6
Rental & leasing services	13.51	30.4

Source: Statistics Canada, Employment Earnings and Hours, 2002

Table 6.32: Average Weekly Earnings for Forestry and Mining Industries in BC

British Columbia (all salaried and hourly employees)		
	Average weekly earnings (incl. overtime)	
Industry	**Jan. 2002**	**Jan. 2001**
All Service producing industries in BC	*$626.01*	*$625.51*
Industrial aggregate (including unclassified) for BC	*662.87*	*663.12*
Forestry, logging & support[29]	962.56	915.83
Forestry and logging	1,030.44	980.94
Forest nurseries & gathering of forest products	591.43	556.05
Logging	1,044.57	993.40
Support activities for forestry	834.54	805.61
Mining & oil & gas extraction[30]	1,181.28	1,169.60
Oil & gas extraction	1,184.07	1,118.90
Mining (except oil & gas)	1,226.75	1,234.79
Metal ore mining	1,247.17	1,264.68
Support activities for mining & oil & gas extraction	1,036.22	1,019.55

Source: Statistics Canada, Employment Earnings and Hours, 2002

[28] excludes gratuities

[29] Second highest (after mining) average weekly earnings per industry segment in the province.

[30] Highest average weekly earnings per industry segment in the province.

Table 6.33: Average Hourly Earnings for Forestry and Mining Industry Jobs

British Columbia (hourly employees only)		
Industry	Average hourly earnings (incl. overtime) Jan. 2002	Average weekly hours Jan. 2002
All Service producing industries in BC	***16.28***	***28.9***
Industrial aggregate (including unclassified) for BC	***17.33***	***31.0***
Forestry, logging & support	23.23	39.7
Forestry and logging	24.69	39.9
Logging	24.93	40.1
Support activities for forestry	20.28	39.3
Mining & oil & gas extraction	23.95	42.6
Oil & gas extraction	25.83	42.4
Mining (except oil & gas)	24.47	42.1
Metal ore mining	24.70	41.9
Support activities for mining & oil & gas extraction	21.79	44.0

Source: Statistics Canada, Employment Earnings and Hours, 2002

6.3.3.5 Worker Origin and In-migration Mitigation

The current construction activity at Panorama and in the Windermere Valley (which has been particularly strong in the last five years), is expected to indicate the kind of activity that will be generated by the start of Jumbo Glacier Resort.

The construction at Jumbo Glacier is expected to initially progress in small increments. The birth of Jumbo Glacier Resort will present continued opportunity for the work force developed for the construction of Panorama. Jumbo Glacier Resort will be a new source of activity after Panorama reaches completion of its own Master Plan and to slow down in terms of construction. Additional work force that may be attracted by the project is expected to accelerate the construction rhythm.

While local trades comprising of Columbia Valley residents from the nearby communities may be expected to commute, it is anticipated that the majority of workers will have to find accommodation at the project site while the development is being built, either with temporary units or with an earlier expansion of employee housing. In order to facilitate the accommodation of construction crews, up to 300 beds of employee housing at the south end of the project may be constructed in the first phases to accommodate construction workers. These units will then be converted to accommodate resort employees once the project nears build out.

As for the origin of the work force, one can only draw from the experience of places such as Fernie, Panorama and Kicking Horse. Experience shows that the local work force has an advantage and will be the first to be employed. As the size of development components and the production requirements increase, crews from the rest of the province have to be expected, from as far as Cranbrook and Kamloops, and even further. The mix of jobs to be filled by local residents, regional residents and by in-migration is impossible to predict accurately, but if the previous examples provide an indication it should be expected that there will be a fairly even split between the three components of local, regional and rest of the province. The availability of worker accommodation at the resort should mitigate the effects that the in-migration of outside workers might otherwise have in the base valley.

6.3.3.6 Seasonal Employment

The project is designed for year round skiing and sightseeing, with sightseeing as a greater component of summer visitors. It is expected that management will concentrate in generating a stable work force, which is better to provide good service and to rationalize the use of human resources, but a small component of seasonal workers is also to be expected. Current expectations are that the seasonal component may be in the order of 10% of the work force at the resort, and it is anticipated that two thirds of the seasonal workforce would be of local residents who would be commuting from the Columbia Valley. As the permanent workforce at build out is estimated in the range of 750 people, the seasonal group may be between 50 and a 100 people. The character of the resort, with continuous year-round operations, and the availability of abundant employee housing at the resort, which should allow for a number of vacant units from time to time available to temporary workers, are expected to minimize and mitigate the adverse effects and the problems of seasonal employment.

6.3.3.7 Employment Policies and Programs

Management will play a key role shaping employment policies. They are expected to be driven by the intent of creating a higher level of professionalism at the resort, due to its ability to operate year round and to attract an international clientele. It is expected that hiring practices will favour the local population, which is familiar with local conditions, has a variety of tourism experience and is willing and ready to work. Training the work force for the specific requirements of the resort will be part of the mandate of management. The proponent has been discussing with the First Nations special employment and training opportunities with regard to ski area operations, and the International Union of Operating Engineers appears to be ready to cooperate in this program. Other activities that have been discussed with First Nations range from specific tourism projects orientated to the hospitality industry, such as the first condo/tourist rental accommodation project attached to the first Daylodge, to the management and operation of an interpretive centre, to guiding and ski patrol activities. These programs will be more clearly defined once specific agreements along the preliminary lines proposed may be finalized.

Tourism projects tend to generate the impression of low wage jobs and poorly trained staff. While this may have been a trend of the early days of skiing in the province, a competitive resort of today that will attempt to draw not only from the local market but also from the international clientele, and attract the tourists from the National Parks. A modern, international quality resort cannot expect to try to compete with poorly paid and poorly trained staff, especially considering that Jumbo Glacier Resort will have primarily permanent staff, able to deliver service for several years after being trained.

6.3.3.7.1 Training

Jumbo Glacier Resort is expected to develop an educational/training support program for all employees. The resort management team will develop the details of the program. This ensures the level of service to guests remains high, staff remain motivated, staff continue to improve their skills and the resort is operated effectively. The training will take place and be encouraged at all levels of the organization.

Jumbo Glacier Resort expects to commit to training opportunities that will have long term benefits and impacts. With an established training program in place it will allow employees access to the means to further develop their education and skills. With improved skills it opens further doors for advancement within the organization. Training opportunities will be provided for:

- Supervision
- General Tourism
- Sport/Recreation
- Natural Sciences/Research
- Trades:
  - Electrician
  - Millwright
  - Mechanic – Heavy Duty and Lift
  - Chef/Cook

6.3.3.7.2 Certified Training Programs

There are opportunities for staff to participate in certified programs well as through the involvement of specialized experts who will be contracted to work with the Resort. These consultants will work with staff and management on guest service, safety, supervision, management, and business planning, to name a few.

Certified programs are offered at a variety of schools throughout Canada. Below is a sampling of the opportunities currently available to future staff that show an interest and aptitude.

1. Apprenticeships:

It is an established fact there is currently a shortage of trained Journeypersons, in most trades, in Canada. There is also a shortage of people entering the trades. One reason for this has been a lack of employers prepared to undertake apprenticeship training. Jumbo Glacier Resort is committed to being actively involved in the training of apprentices. Specific trades will include, lift mechanics, heavy-duty mechanics, electricians, plumbers and chefs.

Apprenticeship training is a form of education that incorporates paid workplace training with technical, in-school training. The in-school portion generally lasts 4 – 8 weeks per year, depending on the trade. This portion provides the theory and supports the practical, on-the-job training. A formal training agreement is implemented between the employer and the employee.

Most apprenticeships are four years in length. During the first year, apprentices are paid 60% of the Journeyperson rate. This pay rate increases 10% each year until the apprentice reaches the Journeyperson status.

Journeypersons also have the opportunity to take their “Red Seal” exam. The “Red Seal” allows qualified tradespersons to practice their trade in any province or territory in Canada. This certification is also respected throughout the world and opens many interesting opportunities to Trades people.

2. Tourism Management:

The College of the Rockies, Cranbrook Campus, offers a First Nations Tourism Management Certificate. The focus of this program is to teach First Nation learners effective tourism service to visitors. The program is 10 months in length and allows access to other courses related to Tourism. The goals of the program are to:

- Reinforce cultural and Aboriginal pride;
- Demonstrate a commitment to the protection and preservation of Aboriginal traditions and ways of life;
- Teach how to have a positive first impression with tourist clientele;
- Teach practical front-line client service skills, and
- Teach entrepreneurial skills needed to seize the tourism dollars that come into Canada.

The College of the Rockies, Cranbrook Campus, offers a two year diploma program that is based on the B.C. Provincial Tourism Management curriculum and meets all the requirements of the Tourism Management common core curriculum.

The College of the Rockies, Fernie Campus, offers a Winter Guide/Patrol Training Program. This is an intensive four-month training program that provides relevant certifications. It is aimed at individuals interested in pursuing a career as a ski guide or professional mountain patroller.

Selkirk College, Nelson Campus, offers a Ski Resort Operations and Management Program. In this program, students are provided with “a knowledge and skills base that allows them to develop into competent ski industry professionals”. The aim is to accelerate the movement of graduates into supervisory and management positions.

The University of Calgary offers a Degree Program in Leisure, Tourism and Society. The program is intended to “integrate theories and research methodologies with their practical applications in the fields of study”.

6.3.3.7.2 Employment Equity

An Employment Equity Program is planned for Jumbo Glacier Resort. While numerous businesses, organizations and governments in Canada use these programs, it will be an innovative and unique approach in the ski and resort industry. It provides assurances that all efforts possible will be made to ensure that First Nations and local residents are given priority of hiring at all levels within the resort. A sample First Nations Employment Equity Plan has been attached as Appendix 7-A to this Master Plan. A similar employment equity plan will be developed for local residents.

6.3.4 Economic Impact

Jumbo Glacier Resort will have a major positive economic impact on the Town of Invermere and the surrounding area. To estimate the economic impact, the total direct spending was projected, based upon visitor volumes after five years of operation.

Table 6.34: Estimated Visitor Volumes

Winter	
Day Skiers	87,450
Overnight Skiers/Visitors	53,700
Non Skiers	7,950
Total	**149,100**
Summer	
Overnight Skiers/Visitors	15,000
Non Skiers	3,600
Day Skiers/Visitors	39,000
Total	**57,600**

The projected spending for summer and winter is presented below. Note the lift ticket price reflects season passes, children rates and discounting. The estimated spending dollars are based upon 2003 levels and are not adjusted for future inflation.

Table 6.35:
Average Spending per Day After Five Years of Operations

	Day Visitor	Overnight Visitor
Winter		
Lift tickets	$35.00	$40.00
Transportation	$5.00	$5.00
Ski rentals & lessons	$3.90	$4.50
Entertainment	$5.00	$15.00
Food & beverage	$15.00	$50.00
Retail & others	$4.00	$15.00
Accommodation		$80.00
Totals	$67.90	$189.50
Summer		
Lift tickets	$20.00	$25.00
Transportation	$7.50	$5.00
Ski rentals & lessons	$4.00	$7.50
Entertainment	$0.00	$15.00
Food & beverage	$10.00	$50.00
Retail & others	$4.00	$15.00
Accommodation		$80.00
Totals	$45.50	$197.50

The average season is calculated on the basis of 150 days in winter and 60 days in summer, at average visitations as calculated. It is expected that the season may vary in length, but the totals would still be based on the averages calculated on the main seasons days. The total direct spending resulting from the visitor volumes and spending per visitors is shown in the table below. The total direct spending in the fifth year of operations is conservatively projected to be $22.7 million per year based on 2003 dollars. The majority of this direct spending will flow into Jumbo Glacier Resort and the Town of Invermere primarily due to the labour intensive nature of tourism.

The indirect and induced economic impacts have been projected using relationships derived from the Tourism Vancouver economic impact model that has been used successfully for many years in estimating tourism impacts.

Table 6.36: Estimates of Per Capita Spending After Five Years of Operation

Winter Assumptions (150 days main season)		
Average Day Skiers	583 x 150 days = 87,450 x $67.90 =	$5,937,855
Average Day Overnight Skiers	358 x 150 days = 53,700 x $189.50 =	10,176,150
Average Day Overnight Non Skiers	53 x 150 days = 7,950 x $170.00 =	1,351,500
Winter Total		**$17,465,505**
Summer Assumptions (60 days main season)		
Average Day Skiers/ Visitors	650 x 60 days = 39,000 x $45.50 =	$1,774,500
Average Day Overnight Skiers	250 x 60 days = 15,000 x $197.50 =	2,962,500
Average Day Overnight Non Visitors	60 x 60 days = 3,600 x $190.00 =	684,500
Summer Total		$5,421,000
Total Direct Spending		**$22,886,505**

Presented in the table below are the direct, indirect and induced economic impacts. The approach used is very conservative with a total impact only 1.4 times direct spending. Many tourism economic models assume gross multipliers of between 1.6 to 2.5 times direct spending.

Table 6.37:
Direct, Induced and Indirect Economic Impacts

Direct Impact	$22,886,000
Indirect Impact	6,819,000

Induced Impact	2,046,000
Total Impact	**$31,751,505**

The total economic impact on the Town of Invermere and surrounding region will be significant. Total construction spending of $80 to 100 million should occur in the first five to eight years of the project. The total ongoing economic impact will be approximately $32 million dollars at the Gross Domestic Product level.

The benefits of the project to all levels of government will be significant. Presented below is the annual projected return to government. The direct increase to the tax base of the Regional District of East Kootenay has been estimated at $1.0 million after five years of development at Jumbo Glacier Resort. This projection was prepared based upon current mill rates and anticipated assessed values. The total annual tax generated to all levels of government is estimated to be in the range of $11.4 million or greater.

Table 6.38: Annual Taxes Generated

Federal	$6,364,000
Provincial	3,409,000
Local	1,591,000
Total Taxes	$11,364,000

6.3.4.1 Payroll Impact

The direct impact of Jumbo Creek Resort consists of those salaries received by employees (direct) and the portion they subsequently spend in local communities on goods and services (indirect). It is assumed that all employees will live on site or in local communities and the employees will spend a substantial amount of their salaries in this vicinity, as the location of the resort requires.

Payroll Assumptions:

The maximum total of full time employees at build out will be 750 in residence plus 10% commuting for a total of 825 full time employees. An additional 5% of the total full time workforce will be part time employees, for a total of 41 part time employees at full build out, assumed at 50% of the time and 50% salary. Average full time yearly salary is assumed at $20,000.

Table 6.39: Total Payroll at Build Out

Full Time Payroll	Part Time Payroll	Total Payroll at Buildout
825 x $20,000 = $16,500,000	41 x $10,000 = $410,000	$16,919,000

Table 6.40: Payroll Impact by Phase

	Employees	Direct Income	Indirect Income	Total
Phase I	140	$3,385,700	$2,303,300	$5,689,000
Phase II	388	$7,948,000	$5,405,000	$13,353,000
Phase III	825 + 41 part time	$16,910,000	$11,499,000	$28,409,000

Based upon tourism related economic impact analysis within the western Canadian economies, the household income multiplier used for the Kootenay Region is 1.68.

6.3.4.2 Impact of Visitor Spending

The businesses primarily affected in Invermere will include hotels, restaurants, retail sector, transportation and activity based recreation companies. A portion of the resort visitors, particularly in the wintertime, will stay in hotels in Invermere and Panorama for two reasons:

1. The bed base at the resort is limited in size; and

2. Lower priced accommodation offerings in Invermere may be attractive to a particular market niche of visitors.

Assuming 30% of the overnight visitors to Jumbo Glacier Resort (357 per day, average) in the third year of development stay in hotels in Invermere and Panorama, this would translate into 16,065 people per winter, or approximately 10,000 room nights (including one quarter single occupancy) during the winter after the third year of operation, resulting in a substantial increase in occupancy in hotels in both Invermere and Panorama.

Restaurant and retail shops will obtain business from overnight visitors and visitors travelling through to the resort. Jumbo Glacier Resort will offer no gas station and will generally rely upon the major services in the District of Invermere. Assuming 20% of the direct expenditures by visitors, which may total $20 million annually after the third year, occur in the District of Invermere, this translates into annual direct spending of up to $4 million.

The largest impact on the region will be felt during the peak periods including Christmas, Spring Break, weekends and the middle of summer. Accommodations can be expected to be in short supply during these peak periods. The positive economic impact of resort areas on nearby towns is demonstrated by the success of Canmore in Alberta and Squamish in British Columbia.

6.3.4.3 Impact on Suppliers

Jumbo Glacier Resort will require a broad range of supplies including food, equipment, repair parts, fuel and services. A significant portion of these should be available through suppliers in the District of Inveremere. The ski area operator alone is expected to spend approximately $1 million a year on supplies for the business. Other resort businesses will also expend significant amounts on supplies.

6.3.4.4 Construction Impacts

The total value of construction of the Jumbo Glacier Resort will exceed $150 million over the first ten years of development. A broad range of construction materials will be required, many of which can be obtained from local suppliers in the District of Invermere.

Services such as contractors and equipment suppliers from the Columbia Valley area will likely be utilized for many phases of the construction. Operations such as the digging of wells, installation of telephone and water lines can be performed by local contractors. A significant portion of the construction labourers can be accessed from the Invermere area as previously mentioned in the employment section. Construction workers will require food services, meals and a broad range of support services during the construction period. The impact of the construction will be felt throughout the District of Invermere over a period of at least ten years.

6.3.5 Community Impacts

6.3.5.1 Population

The population impact associated with the workforce requirements noted above will be dependent upon the age of the workers and the ability to recruit locally. It is likely that the workforce for both the ski lift operations and the resort will be primarily young and largely single, except for management, maintenance and marketing personnel. The result of this is that the population impact on the area will be primarily limited to the direct workforce only, rather than the workforce and their dependents.

While the development provides good employment opportunities for the immediate area, the number of employable people in the area may not be sufficient to meet all the needs of the entire development for either construction or operations. Therefore, to meet the construction and operational employment needs of the project, some additional workers may have to migrate to the area. While many of these people will likely be found in the neighbouring East Kootenay communities such as Golden, Kimberley and Cranbrook, commuting to Jumbo Creek may be too long. Therefore, a number of people may have to relocate and utilize the planned accommodation at the project site area.

Taking these items together would indicate that the population impact will likely be in proportion to the number of jobs created. The impact will be primarily on housing requirements in the area of the ski development. Services such as schools, hospitals and other social service requirements will not be significantly affected, as the numbers of people involved requiring the community services of Invermere and vicinity would be below the ranges of anticipated normal population growth. If for example after the first five years of operations there will be two hundred permanent employees at Jumbo Glacier Resort, it may be assumed that a maximum of 50 employees would look for accommodation and services in Invermere and surrounding area. This would be 1.6% of the current population of Invermere. Projections over the following fifteen years of growth up to build out of the resort would likely be similar.

6.3.5.2 Schools

The current school system in Invermere is expected to have the ability to absorb the impact of the additional families attracted to Invermere due to the construction of the resort. In recent years the School District has experienced declining enrolment in the school system. See Section 6.1.9 above.

6.3.5.3 Hospitals

Despite cutbacks and changing policies, the Invermere & District medical facilities are not expected to be found with insufficient beds and capacity to absorb the additional demands that may be generated by Jumbo Glacier Resort. The resort will develop its own emergency procedures and facilities to handle the accidents that will result from skier activity at the ski area. The majority of these accidents will be minor in nature and will be treated at the resort's medical clinic, but it should be anticipated that some serious injury victims might require transfer to hospitals. However, experience at other resorts in British Columbia has shown that serious injuries are typically transferred to major urban hospitals, and it is anticipated that major injury victims will be transferred directly to Calgary.

According to the Canadian Ski Council, statistically skiing is no more dangerous than riding a bicycle. The most common ski injury is a sprained thumb.[31]

The Invermere and District Hospital is currently equipped with 21 acute care beds, 4 extended care beds and 4 bassinets.

Other Public Hospitals in the Regional District of East Kootenay are as follows:

- Cranbrook Regional Hospital: 73 acute care beds, 50 extended care beds, 10 bassinets
- Kimberley and District Hospital: 35 acute care beds, 18 extended care beds, 4 bassinets
- Fernie District Hospital: 42 acute care beds, 8 extended care beds, 7 bassinets
- Sparwood General Hospital: 20 acute care beds, 4 bassinets
- Elkford and District Diagnostic and Treatment Centre: 3 holding beds

6.3.5.4 Traffic

Traffic**Error! Bookmark not defined.** will increase along the access roads. The Average Annual Daily Traffic (AADT) for the Jumbo Glacier Resort access road has been estimated to be 943 trips at buildout, anticipated to take approximately 20 years. The approach roads do not travel through residential neighbourhoods and hve more than sufficient capacity to accommodate the additional volume of traffic. A *Route Study* by McElhanney Consulting Services, has been completed and is included as Appendix 5-A to the Master Plan. Traffic Volumes are also discussed in Section 5.2 of this Master Plan.

In order to manage any impacts on air quality due to employee or visitor traffic, an Air Quality Management Plan will be implemented. Potential impacts on wildlife along the access road have also been considered and a number of mitigation/prevention measures are planned.

6.3.5.5 Emergency Services

Please refer to Section 9.1.3.6 – 9.1.3.9 of this Master Plan.

The resort would be largely self-sufficient in terms of emergency services. It will be provided with emergency power and provisions to last for the number of days that would be considered prudent by the emergency preparedness team of the resort, including the Ski Patrol and the Volunteer Fire Fighters, and would have an evacuation plan ready for a worst-case scenario.

[31] Canadian Ski Council, 2002 Canadian Ski & Snowboard Industry Facts & Stats

6.3.5.6 Social and General Considerations

The proposed project will increase employment opportunities in the Invermere Valley and will make available some of the ski runs of helicopter skiing to a wider public, while enhancing the facilities of the helicopter operators by giving them a needed and more enjoyable base at Jumbo Creek. It will draw tourists to the Jumbo Creek Valley in a way only prime destination viewpoints can, and therefore it would enhance the status, exposure and business of Panorama, of Invermere, and of the East Kootenay region in general.

The resort will provide the only affordable, safe access to 3,000 metre high glaciers and mountaintops to schoolchildren, the elderly, and the physically challenged in North America.

6.3.6 Impact on Skiing in British Columbia

6.3.6.1 General

Skier visitation levels have reached new records in both British Columbia and the US in recent years, notwithstanding significant setbacks to world tourism due to the events of 9/11 and other global events, including the recent SARS outbreak.

Expert opinion, however, is sometimes supportive of the opinion that the skier market, particularly in the US, may have levelled off, even when the snow boarding phenomenon is taken into account. This view has been known since the beginning of the Jumbo Glacier Resort project in the early nineties, and has been evaluated by the proponent’s experts. Some of the main points are as follows:

- It is erroneous to speak of a single “skier market”. The skier market is not homogeneous.
- Industry often refers to the skier market as the market of the people who look at skiing as an athletic sport, and primarily as that of day skiers, who go for a daily trip to a ski area, normally not more than two hours’ driving distance away.
- In North America there are regions that grow in populations and others that do not grow or decrease. Even the day skier market generally is a percentage of population.
- British Columbia has defied the predictions, posting an impressive and solid growth of skier days for over twenty years, while the American market remained level and even neighboring areas like Alberta and Washington State did not grow at a similar rate. Whistler and its interesting new products are one of the main reasons for the difference.
- B.C. skier visits grew from 1,319,703 in 1978 to 5,656,871 in 2000.
- In the Pacific Northwest region, where skier visits grew from 5.9 million to 11.7 million in the 20 years between 1978 and 1998, B.C. grew in market share from 22% to 48%.
- Whistler, with the longest vertical drop in North America, grew faster than the rest of B.C. resorts, and it outgrew its original market, which is Vancouver. Today “Whistler/Blackcomb “represents the only international destination mountain resort in B.C.”, despite its notorious bad weather.
- Destination resorts are different from day destinations.

- Colorado could be classified as a State that is a destination with many resorts. However Colorado despite its good weather and snow does not have impressive and varied mountains, it has limited vertical drops and has valley base elevations that are so high that a sporting holiday there can be unhealthy for the vacationers who come from the low elevations of most North American metropolitan areas
- British Columbia, in the interior, has the climate and the snow of Colorado with greater mountains and vertical drops without the health and stress problem of the excessive height of the valley base.
- It is necessary to differentiate between the market of the North Americans who are looking for skiing and the enjoyment of the beauty of the mountains during a vacation and those who are looking for a day of skiing as a pure sport within commuting distance of their home.
- It is necessary to distinguish between skiing on ski runs cut into the forest on the two sides of a chairlift and skiing a mountain from top to bottom with the help of a lift.
- There is a growing demand for new and better product in terms of combination of skiing, mountain views and vacations on this continent. That is why destination resorts are growing while conventional ski areas are struggling.
- British Columbia has the unique ingredients that can make it the new and the best ski destination in North America because of its latitude, mountains, climate (in the interior) and elevations, both at the resort base and at the mountaintops. B.C.'s potential is vast; it is not just for one more resort, but for several more good quality destinations.
- These destinations will make the entire Province a destination like Colorado is now or better. Colorado has more than double the skier visits of B.C.
- Destination resorts in North America are a supply driven market, because, unlike Europe where hundreds of quality destinations have been developed over several generations, we are only starting now, and we have the same size of continental population base as Europe has, but with greater mobility at less cost.
- Part of this history is due to the fact that in Europe travel started by train over a century ago, but now travel by plane has replaced the train and the automobile as a normal means of travel to vacation areas, with a cost and time factor that is similar to that of a train a century ago.
- Kicking Horse Mountain Resort was generated by the above noted considerations and it has received a surprisingly favorable response in light of its small size, with great reviews going as far as Europe.
- Jumbo Glacier Resort should be seen as a unique opportunity to expand a market that is supply driven for the foreseeable future and to expand it where it is most suitable and needed, which is the interior of B.C.

From the above notes, and many other considerations, it is fair to say that a new destination with the longest vertical drop in North America, excellent climate and impressive scenery would be ideally positioned to place the interior of B.C. on the continent's skier map and continue the growth of the industry, to the benefit of all resorts, particularly in the interior and in its proximity. It will contribute to repeat the Whistler marketing phenomenon in the interior of the Province, without taking away from existing resorts, but instead creating a more favourable and unique exposure to them.

6.3.6.2 Impact on Panorama Mountain Village

Panorama Mountain village is located 18 km (11 miles) west of Invermere in the Toby Creek drainage.

The resort is owned and operated by Intrawest Corporation and consists of a resort village, a ski hill, a Nordic centre, and a championship golf course.

The resort village has been approved for 7,084 Bed Units over 336 ha. The resort currently contains approximately 2,500 Bed Units on about 200 ha., and is in the midst of a significant expansion cycle.

For skiing, the resort's vertical drop is 1,220m (4,000 ft.). The lift system includes 9 lifts, 1 "people mover" village gondola, 2 high-speed quad chairs, 1 quad, 1 triple, 1 double and 3 surface lifts. Two of the quad chairs were added in 2003. The ski terrain was recently expanded to include Taynton Bowl, former heli-skiing terrain operated by R.K. Heli-Ski. The ski terrain now includes almost 3,000 acres of total area.

The Becky Scott Nordic Centre features 20.5 km of groomed trails. The Nordic centre's lodge doubles as the clubhouse for the Greywolf Golf Course. The Greywolf Golf Course opened in May 1999, and is an 18-hole, 7,140-yard, par 72 course designed by Doug Carrick. It has been ranked amongst the top 50 golf courses in Canada.

Panorama is approximately 36 kilometres Southeast of the sawmill site that is proposed as the base of Jumbo Glacier Resort which is in the heart of the territory that people currently access by bus and helicopter to ski.

It is to be expected that the new resort will be a logical extension of the amenities offered by Panorama, both in terms of skiable territory and in terms of overnight accommodation. One example that comes to mind is what Blackcomb did for Whistler. The synergy between the two projects was one of the examples and of the premises on which Bill Loyd, the first local consultant, approached the project.

Information received from Bill Lloyd in the initial stages of the project seems to be confirmed by discussions with each of the managers of Panorama over many years, and with the current local consultants. These discussions indicated a potential mutual interest in many forms of collaboration between the two projects, from the establishment of a shuttle bus service, to joint ticketing and reservation facilities, possibly similar to forms of collaboration among Mount Norquay, Sunshine and Lake Louise.

Panorama would also assist Jumbo Glacier Resort in providing a greater variety of accommodation and of services than could be achieved by a single resort. The Beckie Scott Nordic Centre and the Greywolf Golf Course are two features at Panorama, for example, that are not planned for and would have no comparable equivalent at Jumbo Glacier Resort. Panorama, on the other hand, cannot offer glacier skiing or summer skiing.

The above noted discussions confirmed the opinion of the proponent's consultants that the creation of a resort in upper Jumbo would be beneficial to Panorama for several reasons:

- The two resorts in combination will provide a greater variety of skiable terrain.
- Panorama offers excellent race-training terrain with hard-packed ski runs, but it depends heavily on artificial snow, while Jumbo will be known for powder snow quality, and a large number of easy and intermediate ski runs, as well as opportunities for extreme skiing.
- The two resorts will complement each other, achieving a greater variety of sleeping accommodation and commercial services.
- The two combined resorts will achieve a critical mass that none of the two could hope to achieve separately.
- Joint marketing would greatly benefit the entire region.
- Current summer activities at Panorama would benefit from the opportunity to ski on the glaciers accessed with an easy shuttle bus ride from Jumbo Glacier Resort nearby.
- National team athletes based in Panorama will be able to go to Jumbo for summer training, rather than going to Europe or Chile.

Intrawest/Panorama submitted a letter in support of the project to the Environmental Assessment Office indicating that, “based on the facts of the Jumbo Glacier Resort proposal to date, we recognize that it is a unique proposal in the North American ski industry that could work well with Panorama.” The letter is included in Appendix 1-C of this Master Plan.

6.3.7 Impact on R.K. Heli-Ski

6.3.7.1 Overview

A heli-skiing operation is managed by R.K. Heli-Ski Panorama Inc. (Radium Hot Springs Glacier Skiing Ltd.) from a base in Panorama over the entire area under study. It is understood that this company has been proposing at various times to expand its facilities with a lodge near the junction of Leona and Jumbo Creeks and with other improvements, particularly to permit more and safer skiing in bad weather. The Jumbo Glacier Resort Master Plan includes a proposed location for a new base for heli-ski operation and a lodge in Jumbo Creek, in a location that should help both the heli-skiing and the resort operations and keep it away from the Jumbo Pass trail.

The area under consideration is entirely Crown land that is owned by the Province of British Columbia. As in most of North America, Government land is subject to a multiplicity of existing controls and uses, and any new project raises very complex land use issues. This is one of the reasons why new projects, in most of North America, are not proposed. In British Columbia, CASP was established to create a system whereby the Province facilitates the creation of new projects. The provincial objective has been, and continues to be, to achieve the highest and best use of the land for the benefit of the public.

The proponent has been invited by five different provincial Governments and the Province has long standing policies inviting multiple use of Crown land by the public and by license holders. Overlapping of tenures under different provincial policies is not a novelty and is encouraged by the Province, which acts in a similar fashion to a landlord. Where compatibility is not achievable the Province regulates the separation of uses and if compensation becomes an issue it is expected to be arbitrated fairly according to real economic data. The proponent has discussed future operations with the license holders since the beginning of the application in 1990 and it expects that the Province will provide for a fair arbitration if an agreement cannot be found. It is the proponent’s stated objective to cooperate with the license holders to enhance their business, and this topic has been discussed at various times particularly with the heli-ski operator.

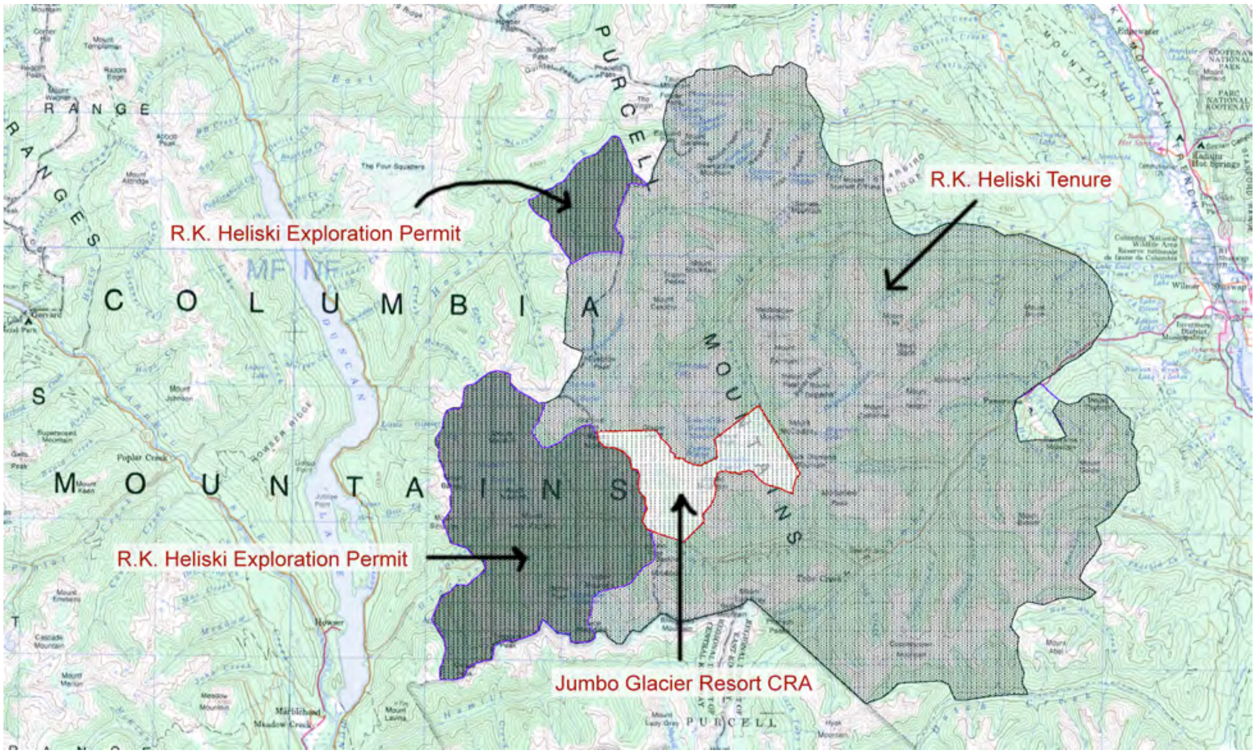
It is the proponent’s objective to offer mutual advantages by the creation of a new base of operations and a lodge near the proposed resort in the Jumbo Creek valley, which is near the centre of the expanded heli-ski tenure, thus reducing considerably the cost of helicopter time and allowing to judge the weather on site. The heli-ski operator has raised concerns over the loss of bad weather terrain in the Jumbo Creek Valley, as well as the use of Farnham Glacier. To help mitigate these concerns the tenure of R.K. Heli-Ski was substantially enlarged by the Province following the Interim Agreement with the proponent, and with the support of the proponent. It is the proponent’s understanding that this area, which is larger than Leona, Jumbo and Farnham Creek drainages combined, would more than compensate R.K. Heli-Ski for the loss of the area involved in this proposal. The expanded R.K. Heli-Ski terrain appears to have areas that are excellent for gladed tree skiing in bad weather, are suitable for heli-ski lodges and would be easily accessible if operations are to be staged from Jumbo Creek with cooperation from the resort.

The area given by the Province to the heli-ski company when the Interim Agreement was granted to the proponent is a much larger area than the one offered by the Province to the proponent for lift serviced skiing.

Table 6.41: Comparative Analysis of R.K. Heli-Ski Tenure and Expansion

Tenure/Application	Size
R.K. Heli-Ski Tenure	127,392 ha
Exploration Permits:	
Howser Creek	4,014 ha
Glacier Creek	22,615 ha
Total R.K. Heli-Ski Expanded Territory	**26,629 ha**
Total R.K. Heli-Ski Territory	**154,021 ha**

Exhibit 6.2: R.K. Heli-Ski Tenure Expansion



Total R.K. Heli-Ski Territory	**154,021 ha**
Total R.K. Heli-Ski Expanded Territory	**26,629 ha**
Total Controlled Recreation Area for Jumbo Glacier Resort	**5,961 ha**

In the 1989/1990 season, the Jumbo ski zone accounted for **less than 2.4%** of all skier days for R.K. Heli-Ski. In 1991 logging resumed in the upper Jumbo Creek drainage and cutting ski runs became an on going business which generated significant additional cash flow to the heli-ski company and refocused the company on Jumbo Creek as a primary destination in good and bad weather. Also, actual percentage use of the expanded territory decreased, rather than increased, after the official expansion was granted and logging in Jumbo and Leona Creek drainages was expanded. Over the last fifteen years the heli-ski company has steadily developed heli-ski runs in Jumbo Creek. No runs have been cut in the Glacier Creek area after that expansion was granted.

Exhibit 6.3: Jumbo and Glacier Creek Drainages

The Jumbo Creek drainage is on the left, and the Glacier Creek drainage is on the right. The Glacier Creek area was granted to R.K. Heli-Ski as part of the expanded territory given in consideration for the possible loss of terrain to Jumbo Glacier Resort following the 1993 Interim Agreement.

The Radium Hot Springs Glacier Skiing Ltd. (R.K. Heli-Ski) Management Plan of March 1990 listed the skier days per zone as follows:

Table 6.42: R.K. Heli-Ski Skier Visits to Jumbo Ski Zone at the Time of the Application

Ski Zone	85/86	86/87	87/88	88/89	89/90
Paradise	65	70	118	124	125
Farnham	327	675	508	494	625
Cauldron	653	1,048	678	1,029	1,250
Jumbo	**33**	**109**	**102**	**103**	**63**
Copper Crown	197	303	169	206	375
Eyebrow	32	124	119	101	202

Source: Radium Hot Springs Glacier Skiing Ltd. (R.K. Heli-Ski) Management Plan, March 1990, Page 4

Jumbo Glacier Resort can function as an ideal base of operations for helicopter skiing. In fact, the existing heli-skiing company has been considering moving its base of operations to this area. This would allow more economical access to the other surrounding glaciers, thereby adding another exciting dimension to the recreational winter opportunities offered by the resort. The heli-ski activities and the proposed resort will complement each other.

In the summer, using the Jumbo Glacier Resort base, heli-sightseeing has the potential to be a popular and complementary activity, as it is in places as different and diverse as Zermatt and Maui.

It is also commonly accepted that a resort allowing non heli-skiers to vacation alongside heli-skiers makes the heli-skiing opportunity more attractive and expands the market of the heli-ski company.

The proponent's consultants plan to continue to attempt to discuss with R.K. Heli-Ski the alternative of phased approaches to development of lift serviced skiing that would minimize any impact on the heli-ski company, and develop the areas of conflict with a business plan for mutual advantage prepared in agreement with the heli-ski company.

As noted before, a cooperation meeting discussing the above noted points was held in 1993 with Roger Madson, the heli-ski operator, and with representatives of the proponent and of Vail Associates, including Jim Chamberlain, Bob Buckley, Peter Seibert and David Corbin. It was the proponent's understanding from these discussions that relocating heli-ski operations at the resort in upper Jumbo Creek Valley would be very beneficial to heli-ski operations. An increased and readily accessible clientele, reduced marketing and transportation costs and reduced operating costs through the establishment of a helicopter departure point at Jumbo Glacier Resort were some of the benefits for the heli-ski company. This was confirmed in discussions with prominent heli-ski and mountaineering guides, Dan Griffiths, who was the head guide for R.K. Heli-Ski for many years and who assisted the proponent's team since 1990, Sep Renner, and John Hogg who were a heli-ski guides for many years, including in the current R.K. Heli-Ski territory.

However, the length of the subsequent review process did not give the proponent an opportunity to achieve a constructive follow up. Discussions with the owner/operator initially indicated the possibility to achieve the ideal integration of heli-skiing and the proposed resort in the Jumbo Creek Valley, but no agreement was achieved and in later years there was opposition to the project. Roger Madson, the owner/operator passed away suddenly in November 2002. The basis for cooperation established at the 1993 meeting, however, is still valid, and the proponent expects that once the project goes ahead it will be recognized.

The Environmental Assessment Office commissioned a report in 1999 on the heli-ski company that ended up being based on wrong assumptions, particularly that the heli-ski operations would continue only from Panorama after the proponent's opening of the resort in Jumbo Creek, something that does not make economic or operational sense. The issue and the response to this report are included in Appendix 6-A.

A subsequent independent report was commissioned by the EAO in 2004 and is included in Appendix 6-B.

6.3.7.2 Discussion Stages and Relationship History

Fifteen years of discussions have occurred between the proponent and the owners of R.K. Heli-Ski. The discussions have gone through three different stages, and following the passing of Roger Madson, the original operator, discussions with the new owners from Calgary were stopped by them in February 2004.

Stage 1. From 1990 to 1994:

During this period of time the owner seemed to be fundamentally inclined to negotiate a price for the sale of the license and operations to the proponent. This started from the first exploration of the glaciers with Roger Madson in the early days of April 1990, when the owner immediately hinted to the proponent that the best way to do a ski resort in Jumbo Valley would be to integrate it with the heli-ski operations. These discussions culminated with the above-noted dinner meeting at Radium Hot Springs Resort on March 6, 1993, attended by Jim Chamberlain, David Corbin, Bob Buckley, Peter Seibert, Bill Lloyd and Oberto Oberti, during which Roger Madson explained with convincing figures over several hours the advantages of combining the resort proposal with heli-ski operations, under one ownership, and how both would greatly benefit. In particular the following arguments were made:

- R.K. Heli-Ski was planning a heli-ski lodge in Jumbo Valley to relocate its operations in the heart of the heli-ski territory, thus reducing greatly the cost of operations, as well as achieving a bed base for week long or extended bookings. The development of the resort would greatly facilitate the relocation, with an improved road and necessary services.
- The owner operator emphasized the cost of the travel time for the helicopter from the Panorama location, as well as the complications and loss of time due to the need to ferry heli-skiers by bus to the Mineral King Mine. Basically operating from Panorama restricts the company to day operations primarily, rather than extended stay operations. Even the departure point at the Mineral King Mine is not as central as in the Upper Jumbo Creek drainage and costs precious minutes of helicopter travel time. The refueling tank in the Jumbo Creek drainage cannot be refilled in winter because the road is not kept open.
- Bad weather options for the clients would include skiing by lift on excellent bad weather ski runs near the lodge, as well as a better assessment of the weather from a location in the heart of the territory.
- Combining operations with a ski resort would encourage a large clientele of heli-skiers to come for extended holidays with partners and family members who do not heli-ski. It would also directly expose the heli-ski business to a new and substantial international clientele that may wish to try heli-skiing for the first time.
- Servicing the helicopters and dealing with weather issues and emergencies would be easier from a base in the heart of the territory.
- An expansion into the area west of Jumbo Creek seemed assured by Government intentions. Cutting bad weather heli-ski runs there as it was being done in Jumbo and Leona Creek and the establishment of remote lodges could be an additional alternative to the loss of terrain for heli-skiing due to the project.
- Joint marketing of the resort and of the skiing potential of the glaciers in the Purcell range would benefit greatly both operations.

The conclusion of these discussions was that the value of the offering for the heli-ski company was raised to the fifteen million dollars range (at one point the figure seventeen million dollars was mentioned).

In 1993 the Province and the proponent signed an Interim Agreement and the Province granted a large expansion to the R.K. Heli-Ski operations west of the Jumbo drainage, much larger than the proposed future CRA of the project, as per the map and tables outlined above.

Stage 2. From 1994 to 2002:

The proponent did not want to negotiate or conclude an acquisition of a heli-ski operation – which the investors considered a much greater risk than conventional skiing by means of mechanical lifts and on patrolled ski runs – as long as the permission to go ahead with the project was not secured, and the proponent's investors started to make it known that they would not consider the acquisition of the heli-ski operation until when the final permit would be granted, although the proponent was committed to work to the mutual advantage of the heli-ski operation and of the resort as per original discussions.

In 1995, the project was transitioned into the *Environmental Assessment Act* and it quickly became apparent that the final permit to go ahead had been set back by many years. The Heli-ski operator started to demand that the proponent buy the company or it would oppose the project to the point that it would never go ahead.

The position of R.K. Heli-Ski shifted to the viewpoint that the project would put the heli-ski company out of business and that the project should not be permitted unless it had previously acquired the heli-ski company.

In the Summer 1997 R.K. Heli-Ski proposed to B.C. Lands to develop summer skiing on the glaciers of the proponent's Study Area by means of glacier T-bars and came to visit Oberto Oberti and Alan Artibise at their office in Vancouver. It was on this occasion that Roger Madson gave to Oberto Oberti pictures of himself and a group skiing Commander Glacier, and explaining that he had been in the Alps and had verified that skiing on the glaciers as proposed by Oberto Oberti was feasible. He had included Commander Glacier in his company's map of heli-ski runs and asked that the proponent support his proposal for summer skiing on the glaciers. The proponent advised B.C. Lands that this proposal was part of Glacier Resorts Ltd.'s proposal as per Interim Agreement.

In 1998, the EA Office commissioned a study of the implications of the project for the heli-ski company, and the study seemed to repeat the latest position by R.K. Heli-Ski. The study, by Brent Haley and Associates, is in the Public Registry. The proponent objected, and as indicated above, the correspondence is attached as Appendix 6-A. The main flaw of the study was that on the one hand it intended to evaluate the implications of the project on heli-ski operations, but on the other hand it looked at the project without considering the most significant benefit for the heli-ski operations, namely the relocation of the base into the Jumbo Creek Valley. The study was done as if the project would go ahead in Jumbo Creek but R.K. Heli-Ski would continue to operate from Panorama. This is not what is proposed.

R.K. Heli-Ski had used the study to further demand that the proponent buy the Company as a condition for continuing its application, and it generated a further impasse. Oberto Oberti went to see Roger Madson personally during the summer of 2001 and attempted to convince him to look at collaboration in any shape or form that he desired and at that time Roger Madson stated that he was not prepared to change his position but that he would agree to think about the discussion that had taken place. In March 2002, following a skiing trip organized in part with Roger Madson, a statement in an interview with Peter Lev published by the editor of the Valley Echo had the unfortunate consequence of offending Roger Madson. Oberto Oberti spoke over the telephone with Roger Madson and believes that there was an explanation that was satisfactory in terms of personal relationships but there was no opportunity for another meeting before Roger Madson passed away unexpectedly in November

2002. Throughout this long period of time Oberto Oberti felt honoured to maintain a personal friendship and the memory of many happy skiing days with Roger Madson.

<u>Stage 3. From 2002:</u>

The proponent became aware in the summer of 2003 that there is a new ownership of R.K. Heli-Ski and has been looking forward to a renewed effort of cooperation.

The first meeting with the new owners was held in Calgary on October 24, 2003, and at that meeting the new owners indicated that they rely on the expert advice of Rod Gibbons, who has been the head heli-ski guide and company manager in the last few years. Rod Gibbons' advice to the new owners is that the Jumbo Glacier Resort project would put the heli-ski company out of business.

Following a final meeting in Calgary in October 2003, an additional meeting with Rod Gibbons was planned in order to discuss his concerns, but before the meeting could be arranged a presentation to the District of Invermere's Council was made by the Jumbo Creek Conservation Society complaining that the proponent would put the heli-ski company out of business, and this view point was publicized by the local paper. This publicized position made it more difficult to find a common ground, but the proponent is committed to find mutually satisfactory solutions and continued to work in this regard. If the discussion is made in public, however, full disclosure of all relevant business factors should be made, so that a fair assessment is permitted, especially if the proponent is forced into a buy out. The recent sale is a positive factor because it has established an objective market value and should permit a purely financial solution if no other solution can be found.

Representatives of the proponent and of R.K. Heli-Ski met in Victoria on January 16, 2004 along with representatives of the Province in order to continue discussions. R.K. Heli-Ski, however, informed the proponent's representatives that as long as the Jumbo Glacier Resort proposal was proceeding in the approval process, there would be no more discussions.

6.3.7.3 The Sierra Systems Report

In 2004 the Environmental Assessment Office commissioned an independent report by Sierra Systems to investigate the project's impact on R.K. Heli-Ski and the proponent's and heli-ski company's competing claims. The Sierra Systems report is attached as Appendix 6-B to this Master Plan.

The Environmental Assessment Office, in its *Jumbo Glacier Resort Project Assessment Report* summarized the Sierra Systems report as follows:[32]

> Given the disagreements over the impacts to R.K. Heli-Ski, the amount of skiable terrain potentially lost, and the need to provide advice to Ministers, the EAO engaged an independent consultant, Sierra Systems, to review and determine the significance of the potential impacts to R.K. Heli-Ski (i.e., lost

[32] Environmental Assessment Office, *Jumbo Glacier Resort Project Assessment Report (JGRPAR)*; (Page 91). The JGRPAR is included in **Appendix 8-C** to this Master Plan. It is also available for download at: http://www.eao.gov.bc.ca/epic/output/html/deploy/epic_document_18_19292.html

heli-ski terrain and logistics of managing its operations) and the degree to which mitigation measures reduce or eliminate those potential impacts. Sierra Systems was also asked, in the event there might be residual impacts, to help the Province understand how those potential impacts might be quantified.

Sierra Systems looked at the pattern of R.K. Heli-Ski's terrain usage from 1986 to 2004 and reported that based on R.K. Heli-Ski's figures, the Jumbo Valley was used sporadically prior to 1990. In 1990/91, R.K. Heli-Ski's usage of Jumbo Valley shifted dramatically "from 2.4% of volume in 89/90 to 65% of volume in 93/94." Sierra concluded that "while the Brent Harley and Associates (BHA) study correctly signals that the majority of R.K.'s recent operations occur in the Jumbo Creek area, it is clear that the BHA study neglects to identify or effectively analyze historic management plans, terrain usage documents and correspondence critical to assessing the impacts on R.K.'s operations accurately."

Sierra Systems advised that:

- No material impact is expected to occur to R.K. Heli-Ski's operations because R.K. Heli-Ski has reasonable opportunities to mitigate impacts by making better use of other regions of its tenure, in particular Glacier Creek (the latter described by R.K. Heli-Ski, in its application to LWBC for additional tenure, as providing excellent snow conditions and bad weather wind accessibility); and
- While the Project may result in some disruption to R.K. Heli-Ski's operations, a compensable impact is unlikely to occur especially with Proponent commitments to mitigate the disruption to R.K. Heli-Ski's operations.

6.3.8 Impact on Recreation and Parks

6.3.8.1 General

This project has been designed from the outset to improve the recreation possibilities for local residents and to attract international visitors to the region. Its primary intent is to provide access to high alpine glaciers, ideal skiing terrain, and year-round skiing to the average Canadian. Currently, the possibility of skiing or viewing high alpine glaciers in a safe, efficient and affordable manner does not exist in North America. Only those North Americans who can afford helicopter excursions or trips to the European Alps have had the opportunity to experience high alpine glaciers of the likes of Jumbo, Commander and Farnham Glaciers. This project, therefore, presents a unique recreational opportunity for the North American continent, and will inevitably function as a showpiece drawing international attention to the region and its existing recreational opportunities.

Communities in proximity to quality resorts are often perceived as having a "high quality of life". Whistler, for example, contributes to "quality of life" of Vancouver, and its existence was instrumental to Vancouver's winning bid to host the 2010 Olympic Games. Sun Peaks and Big White are likewise often linked to the "quality of life" in Kamloops and Kelowna respectively. This relationship is repeated, in varying degrees of size, in examples throughout the country.

Conversely, there is no evidence to suggest that the development of resorts puts a strain on existing recreation facilities. For example, the development of Sun Peaks has not put a strain on the recreation facilities of Kamloops, nor has the development of Kicking Horse Mountain Resort put a strain on the recreation facilities of Golden, and likewise the development of Panorama has not put a strain on the recreation facilities of Invermere.

Because of the size of the mountains and glaciers at Jumbo Glacier Resort it is possible with a minimum of lifts to give access to entire mountains and an unparalleled recreational opportunity for the North American continent.

Parks and recreation are concerns that are nevertheless normally raised as part of the review process for a new Official Community Plans (OCP) for the creation of new communities that are examined by local governments. However, these OCPs are not normally addressing new ski resort areas, but new urbanized areas, which need parks and recreation facilities in order to soften the impact of densification of urban areas when the fabric supporting part of the community changes.

In the case of the proposed project, parks and recreation are the foundation of the project and the development is created to serve recreation in a park like setting, rather than creating recreation to soften the impact of an urban development. For this reason the resort development is a small fraction of the Controlled Recreation Area of the project, which will include less than 110 hectares of development area over a 5,911 ha Controlled Recreation Area, that is less than 1.9% of development area versus recreation area. In this respect also the project will be unique in North America, in terms of size of recreation and of low density of development relative to recreation area.

6.3.8.2 Ski Touring

The resort development will not infringe on currently accessed ski touring terrain. There will be no direct impact by the resort development on current ski touring.

The closest ski touring destination near the resort area is the recently renovated B.C. Forest Service cabin in Jumbo Pass. It is important to reiterate, as this has been an issue that has caused confusion, that **the resort is not on Jumbo Pass** (it is a couple of kilometres to the northeast in the upper Jumbo Creek valley) and will not interfere in any way with current recreational uses of the pass. The upper Jumbo Creek valley and the resort base location are not visible from Jumbo Pass.

According to the Invermere Forest District (now Rocky Mountain Forest District), there are six prominent ski tour destinations in the region, none of which are infringed upon by the resort. These include: Brewer Creek, Delphine Creek, Jumbo Pass, Catamount / North Star Glacier, Welsh Lakes, and McMurdo / Spillimacheen Glacier . None of the above noted ski touring areas, except for Jumbo Pass, would be more easily accessed from Jumbo Glacier Resort or its lifts. Jumbo Pass also is not more easily accessed from any of the proposed lifts.

Safety, especially with regard to avalanches, is a significant concern as larger segments of the public participate in ski touring and other backcountry activities. Jumbo Glacier Resort will work to encourage safety awareness amongst visitors interested in backcountry activities, and will especially encourage the use of professional and experienced guides such as Mountain Adventures of Invermere, which offers professionally guided ski touring in the Purcells. The Alpine Club of Canada also offers for-hire professional guiding services through its Custom Guiding Program.

Current ski touring land use, as well as regional ski touring destinations and an outline of some of the costs associated with ski touring, are described in detail in Master Plan Section 2.7.1.3.

6.3.8.3 Snowmobiling

While the region features a number of notable snowmobiling destinations, snowmobiling is currently not permitted in the upper portions of the Jumbo Creek valley. There will be no direct impact on snowmobiling by the resort development.

Guided snowmobile tours are currently provided by Toby Creek Adventures Ltd. from Panorama Mountain Village, Fairmont Hot Springs and Radium Hot Springs. Daily transportation from Banff hotels is available and excursions range anywhere from a few hours to a week in duration.

The upper Jumbo Creek valley has been closed to snowmobiles above kilometre 14 since 1996. Snowmobiling areas are well-marked; the above sign is on the road leading towards Glacier Dome

Given the rapidly growing popularity of snowmobiling in Canada, and the not inconsiderable avalanche and severe injury risk[33] associated with snowmobiling (especially for novice riders) the availability of established, reputable snowmobile guides is an important and valuable service. Visitors to Jumbo Glacier Resort who wish to experience snowmobiling would have an excellent opportunity to arrange for a pick up at the resort and go for guided tours in other drainages and permitted areas with the local companies. It is expected that the increased number of visitors that will be attracted by Jumbo Glacier Resort to the region will have a positive impact and will increase the market size for established snowmobile tour businesses.

A description of current snowmobiling land use regulations and details of a number of nearby snowmobiling recreation areas is provided in Section 2.7.1.2 of this Master Plan.

6.3.8.4 Hiking

The resort development will not infringe on currently accessed hiking trails. Current hiking trails and land use are outlined in detail in Section 2.7.1.4. Hiking outside the marked hiking trail to Glacier Dome will be discouraged.

[33] Canadian Institute for Health Information, NATIONAL TRAUMA REGISTRY MAJOR INJURY IN CANADA REPORT, 2002

6.3.8.5 Mountaineering

The proponents recognize that unlike many current ski resorts in North America, some of the peaks within the Controlled Recreation Area (CRA) may be of a particular challenge and interest to mountaineers. The resort would welcome experienced climbers to climb any of the peaks within the CRA, as this would be in keeping with the alpine oriented nature of this proposal and is similar to how mountaineering has been practised for over a century in the European Alps in legendary places such as Mont Blanc, Monte Rosa and the Matterhorn.

While mountaineering will not be actively encouraged at Jumbo Glacier Resort, the resort will be open to mountain guides who may wish to operate independently at the resort in the tradition of the resorts in the European Alps such as Chamonix and Zermatt.

Some visual impact of resort components are to be expected on certain ascents that originate within the CRA. However, computer modelling and a visual impact assessment of peaks within the CRA, including Jumbo Mountain and Mount Karnak has shown that no resort components are visible from the summits of these mountains. None of the surrounding peaks are subjected to a significant visual impact. A full Visual Impact Assessment is included as Appendix 4-A.

Unlike in the European resorts, guiding to nearby mountains is not expected to be a significant activity because of the larger distances involved, the rugged terrain to cross and the type of urban clientele expected at the resort, a clientele that is not trained for extended mountaineering trips and for outdoor overnight accommodation. The focus of the resort will be on sightseeing from the lift accessible mountaintops and on year round skiing, with rest and physical recreation offered as complementary activities at the resort.

A review of current and past mountaineering activity in or near the study area is provided in Section 2.7.1.5 of this Master Plan.

6.3.8.6 Purcell Wilderness Conservancy

The project will be located approximately 16 kilometres (10 miles) away from the Toby Creek access to the Purcell Wilderness Conservancy. With a Controlled Recreation Area of 5,911 ha and easy lift access to interesting mountains, skiing and views, it is not reasonable to expect that access to the PWC would become a significant factor for the resort visitors. Access to the PWC is as easy from Panorama as it will be from Jumbo Glacier Resort. If Panorama is not a major source of tourist penetration into the PWC, it is less likely that Jumbo Glacier Resort, with its superior mountains and skiing attractions, would see a loss of clientele to visits into the PWC, which would require a type of camping and expedition that is ill suited to the urbanized tourist and skier.

The type of clients that the resort will attract is characterized by the clientele of Chateau Lake Louise and the Post Hotel at Lake Louise of Banff National Park. None of the hotel visitors of Chateau Lake Louise and the Post Hotel are expected to penetrate the wilderness of the National Parks, and the clientele of the resort at the base of Jumbo Glacier is expected to be similar. The Banff National Park's clientele currently visits by bus in winter and visits Jumbo Valley as part of heli-skiing excursions from Banff and Lake Louise. There is no intrusion or significant impact to the PWC. The resort would expand this type of clientele, appealing to the people who for many reasons do not heli-ski or have not tried it yet, and who nonetheless seek a safe and comfortable way to experience high alpine environments and glaciers.

The resort will not impact or intrude into the PWC. Its mountains are **at least 10 kilometres (6 miles) away from the closest boundary of the PWC** and there is no easy or safe access to the PWC from the resort area.

The project is designed for an expected peak user day of approximately 3,500 people in winter, of which at least 80% would be skiers. The sightseer component would comprise of urban tourists, who would not dream of venturing unaided into the wilderness. In the summer, the numbers would be slightly smaller, and even if the sightseeing component might be larger by percentage, it will still comprise a majority of urban tourists who would not be interested nor equipped for an exploration in the remote wilderness. Tourism experience and recent statistics indicate that the tourist public is beginning to age quickly and that the middle aged and older segment of the population may prevail among the Jumbo Glacier Resort guests. The Glacier Dome Gondola, and hopefully also the Jumbo Glacier gondola and tram, is planned to be capable of transporting persons in wheelchairs, who would have no other way of ever achieving comparable viewpoints in an affordable, efficient manner.

Rather than encouraging people to penetrate into the wilderness of the PWC, the resort should have a beneficial impact in further reducing the interest and the hazard of the almost inaccessible PWC wilderness. The resort will provide safe access to mountains that are not in a park or protected area and will give equally rewarding experiences. The resort may also assist in the management of the risks inherent with backcountry activities currently enjoyed by the local community by providing a staging area for rescue operations.

A significant factor that will need to be considered in the future is the social cost, in terms of accidents and search and rescue operations, that remote and relatively inaccessible wilderness creates. Loss of life is an infrequent, but tragic occurrence that does create a growing concern. Destination resorts are a logical alternative to allow a more prudent approach to give access to less remote and more easily patrolled wilderness areas to an urbanized society, as well as reducing the population pressures on the National Parks. Recent accidents and loss of life have created a debate in Canada and in the U.S., where the suggestion has been made that wilderness access outside the Controlled Recreation Areas protected by ski patrols should be reduced and planned with greater care.

6.3.8.7 Visual Impact of Development

Particular attention has been paid to visual quality and visual resources at Jumbo Glacier Resort. Visual quality is important to the tourism industry, and especially at Jumbo Glacier Resort, whose vision is to provide a superior level of year round glacier skiing in an awe-inspiring high alpine setting. The resort has been designed in such a manner to present a *none to negligible* visual impact to users of surrounding drainages and mountain peaks. A comprehensive Visual Impact Assessment has been included as Appendix 4-A.

6.3.9 Impact on Primary Industry

6.3.9.1 Forestry

The intent of the proponent is to develop a resort tucked into the upper reaches of the Jumbo Creek drainage in a way that would minimize the impact on forestry operations. Considerable amount of logging has already occurred over the years and more recently, to cut ski runs for heli-skiing. Discussions for many years with the Ministry of Forests office in Invermere indicated that the proposed resort should not have a significant impact on the working forest. Discussions with Slocan Forest Products, the license holder for the area, will be ongoing to preserve the interests of the forestry industry as much as possible.

Boyd Porteous, Manager, Information Systems and GIS, Provincial Agricultural Land Commission reported on July 30, 2003: “There is no private land FLR in the Jumbo Creek valley. The valley is in the Crown FLR, however, under the current legislation this is technically removed awaiting the composition and sign off of an order-in-council.” Information available from the Ministry of Forests and Slocan Forest Products indicates that the only logging planned and carried out in upper Jumbo Creek in the last quarter century has been to cut ski runs and to do some glading for the heli-ski company. Site indices, forest capability, logging and replanting history, and species composition data have not been made available in detail by either the Ministry of Forests or Slocan Forest products.

In terms of viewscapes it is necessary to distinguish between the Farnham Creek drainage and the Jumbo Creek drainage. Some distant view of future logging operations would exist from the ski runs descending from Commander and Farnham Glacier, but from a tourism perspective this view would be insignificant and less noticeable than the cut blocks that are visible from Whistler Mountain, for example. The upper Jumbo Creek and Glacier Dome ski run would have no visual exposure to future logging operations in lower Jumbo Creek and would have minimal exposure to viewscapes in the Leona Creek drainage, which would be hardly visible because of the distance (five kilometres or more). Viewscapes along the access road would be reviewed under the Forest Practices Code, but the Proponent is of the opinion that its clientele would not be affected by the activities of the contemporary forest industry along the Toby and Jumbo Creek drainages. The access route will not have a significant impact on forestry values, as it will utilize primarily existing access corridors of existing roads. Meetings and discussions with Serge Perzeveroff of the Ministry of Forests’ office in Invermere indicated that the Ministry and the local forest products company did not consider the impact of the proposed project significant for local operations or for the forest industry in general.

For specific land quality data and analysis please see Appendix 6-E Supplementary Forestry Information.

Mr. Rory Hromadnick of Slocan Forest Products was contacted to discuss timber values in the Jumbo Creek valley. His calculations are attached as Appendix 6-D. The total development area in hectares to be utilized by the resort will be approximately 105 hectares. The ski runs will involve minimal cutting because most of the skiing will be in high alpine terrain and glaciers, and the heli-ski company has mostly cut the runs to the resort site already. The impact with respect to the anticipated annual allowable cut (AAC) is rated as insignificant by earlier discussions with the Ministry of

Forests. Slocan Forest Products, which in any event would continue to be involved with the management of the forest in the future, has calculated that the Jumbo Creek drainage future timber harvesting land base involved in the Controlled Recreation Area would equal approx. 36% of the total. The actual development area would equal about 10%. Specifically: direct reductions in the forest land base will be approximately 100 ha, potential indirect reduction is negligible and there will be no restrictions to forestry related traffic using the resort access road.

6.3.9.2 Mining

Mining exploration has been historically active in the area and a mine operated until 1991 at the junction of Jumbo and Toby Creeks (Mineral King Mine). However, the project is proposed in a small section of upper Jumbo Creek where there has not been a history of mining exploration or activity. From available information, it would appear that the project as proposed would not have a significant impact on exploration and on potential mining activities. Please refer to Section 2.7.1.9 for information on Mineral Titles/Claims.

The No Staking Reserve (Number 361896) that currently exists reflects the rough size of the original Study Area (except for the Farnham Glacier portion) and goes into part of the Horsethief Creek drainage. The area of the No Staking Reserve may be reduced, in consultation with the Mining Division of the Ministry of Energy and Mines, to the area of CRA or to the proposed resort development area in Upper Jumbo Creek and the part of the drainage that leads to the head waters of Jumbo Creek up to Glacier Dome. The history of the current No Staking Reserve is tied to the approval process of the project. The Formal Proposal was submitted in 1991. When the Province accepted the Formal Proposal and issued an Interim Agreement in March 1993 it also considered the effects of the Study Area that would comprise the future resort and its Controlled Recreation Area for skiing. For this reason the heli-ski tenure was significantly expanded and the area was also marked with a No Staking Reserve. At that time it was thought that within two or three years the Master Plan would be finalized and the area of the No Staking Reserve could be better defined. Please refer Schedule A: Mapping Volume (see Map P5) for a map of the proposed No Staking Reserve.

The proponent agrees with the objectives of the mining industry and does not intend that the project would adversely affect mining opportunities. The proponent recognizes that mining may be permitted in the general areas surrounding the CRA or within certain parts of it and is confident that modern technology and sensitive development make possible the coexistence of tourism, in particular skiing, and mining operations. Many skiing locations in North America, in fact, started as mining operations. Maps showing mineral tenure status in the project area and an overview of mineral tenures in the surrounding drainages are included in Schedule A: Mapping Volume (see Maps P7 and P8).

6.4 THE TOURISM INDUSTRY

6.4.1 Introduction

Tourism is one of the major growing industries in the world. Worldwide, tourism employs more people than any other single industrial sector and makes a significant contribution to the economy of virtually every country.

Tourism has shown itself to be a resilient and stable economic sector. Notwithstanding significant geopolitical challenges, international tourism has shown considerable resiliency, and it has been an industry that has seen constant growth for nearly two decades.

British Columbia is a participant in the world wide movement of tourist traffic. On a world scale, tourism had a phenomenal growth since the last century, and it has grown in parallel with the transportation industry and with the rise in popularity and sophistication of sporting activities, from the oldest ones such as swimming or bathing, to the newer ones, such as snowboarding.

An example near the Purcell Mountains is that of Banff. The early Banff Springs Hotel opened for business in the wilderness of the National Park, without a ski market, in June 1888, because of the vision of William Cornelius Van Horne the Chairman of the Canadian Pacific Railway, who stated: "If we can't export the scenery, we'll import the tourists"[34]. In the first summer season the hotel had 1,503 guests. By 1911 the number had increased to 22,000 and the hotel had to be expanded. Banff has become one of the names by which Canada is best recognized in the world.

Today, tourism is a major part of the provincial economy. In 2001, British Columbia hosted 22.4 million overnight visitors who spent more than $9.2 billion in the province. The impact of visitor spending on the provincial economy is reflected in a variety of ways ranging from Gross Domestic Product (GDP) and business revenues, to employment and incomes.

British Columbia's national, provincial, regional and local parks provide a spectrum of natural beauty, breathtaking scenery and opportunities for outdoor enjoyment and recreation. The province boasts 807 protected areas (provincial parks, ecological reserves, recreation areas and other protected areas) covering 11.4 million hectares. There are 13,302 campsites, 487 day-use areas, 136 boat launch areas and 3,000 km of hiking trails with provincial parks, that serve approximately 24 million park visitors each year. The abundance and variety of wildlife in British Columbia reflect the great diversity of the province's environment. There are more species in total, and more unique species of birds and mammals than in any other Canadian province.[35] However, relative to the size of the area and the number of potential visitors, the available overnight accommodation is scarce.

Canadians continue to spend far more outside their own country on tourism than foreign visitors spend in Canada. In 2001, the nation's travel account deficit totalled $1.3 billion. This **travel deficit rose to $4.3 billion[36]** in 2004.

According to the *Vancouver Sun*, "Canadians spent more than $20 billion traveling outside the country last year, a record high and the biggest increase in more than a decade… The surge in foreign travel and spending by Canadians more than offset a rebound in travel to Canada from a SARS-related decline in 2003 and resulted in the highest travel deficit in a decade…"[37]

---

[34] An Altitude SuperGuide: CANADIAN ROCKIES. pg. 77.

[35] BC Stats, Ministry of Management Services

[36] Statistics Canada

[37] *Vancouver Sun*, February 25, 2005.

This is a very significant fact that indicates the need for destination projects such as Jumbo Glacier Resort, capable of attracting not only out of province but also foreign clientele, and of pointing the Canadian tourism industry in the direction of balancing the travel and tourism spending deficit.

For a more detailed assessment of the tourism industry markets, economic impacts and projections, please see Appendix 6-F: Tourism Industry Assessment: a Master Plan Supplement.

6.4.2 British Columbia and the Resort Sector

In British Columbia, tourism is an important part of the provincial economy and a significant source of provincial government revenue. In 2001[38], the tourism industry in total contributed approximately $990 million in revenue to the provincial treasury. Revenue was earned from taxes paid by tourists, for example hotel tax, liquor tax and provincial sales tax, from corporate and personal income taxes paid by tourism industry businesses and their employees, and from license fees, entry fees and other fees paid by tourists and tourism businesses

The following is an extract from the *British Columbia Resort Strategy and Action Plan*:[39]

> Tourism is an increasingly significant sector of the provincial economy. Within the province, tourism has established itself as a vital economic generator, both in terms of job creation and increased investment. Worldwide, tourism is a US $4.5 trillion industry directly accounting for 67 million jobs and 3.7 per cent of GDP. In 2003, 21.9 million visitors to British Columbia generated tourism revenues of $8.9 billion, which supported the employment of more than 114,000 persons directly and an additional 152,000 persons in tourism-related businesses.
>
> The resort sector represents an enormous opportunity for British Columbia and contributes significantly to the provincial economy. For example, in 2002:
>
> - Approximately $1.9 billion was spent by resort tourists, which represents 20 per cent of the total $9.2 billion spent by tourists in the province;
> - Direct spending by resort tourists creates an equal amount of indirect spending and over $200 million in induced economic effects;
> - British Columbia resorts generated nearly $178 million in tax revenue for governments; and
> - British Columbia resorts employed an estimated 26,000 people.
>
> British Columbia has some 700 resorts, ranging from fishing lodges to ski mountains to eco-tourism operations, but most of the tourism activity and economic impact is occurring in the areas of Vancouver, Whistler and Victoria. Development of new resorts that are capable of attracting new visitors and expansion of existing facilities would provide significant benefits throughout the province.
>
> Trends suggest that resort-based tourism is well positioned to satisfy the demands and desires of a growing portion of the traveling public. This, combined with the

[38] Tourism British Columbia, The Value of Tourism, February 2003

[39] *BC Resort Strategy and Action Plan* (2004): page 5, available online at: http://lwbc.bc.ca/02land/resorts/index.html

inherent beauty and recreational potential of the provincial landscape, highlights a substantial opportunity to respond to a growing market.

6.5 MOUNTAIN RESORTS: MARKET PROFILE

6.5.1 Destination Resorts and Resort Destinations

In many countries throughout the world people now look for a place in which to provide a base for their holiday excursions. These are provided in resorts. Often people will book several days in a resort and depart for various activities from that location. For this reason it is important that resorts be located near areas where many activities are available.

There is a marked difference between destination resorts and resort destinations.

Destination resorts are defined as single, self-contained resorts such as Whistler that provide accommodation, retail, food and beverage, attractions and services within a single area.

Resort destinations, such as Columbia Valley, are larger land areas that may contain several destination resorts or resort properties and services.

Jumbo Glacier Resort would be part of a resort destination, with a specialization for high quality year round glacier skiing, among a number of independent activity centres, focused around Lake Windermere, but it would also be a destination resort, being an extraordinary place for tourism combining year round skiing with access to unique viewpoints.

It is important to note that the Columbia Valley is an area that is within a basin of about ten million people who are within a day's driving distance, or an hour’s flying time, and over twenty million people who are within two days, or two to four hours’ flying time. A magnet such as the one proposed would complement well the attraction presented by the nearby National Parks and the emerging tourism facilities of the Columbia Valley.

6.5.2 The Evolution of Mountain Resorts

Mountain resorts as we understand them today really began in the last century, when the Swiss Alps gained prominence as a location where one could go to find beautiful mountains, lakes and glaciers, and where one could go to for health improvement in the fresh dry air of the mountains, to visit hot springs and to enjoy the sports of the mountains, from hiking and climbing to skating and skiing.

From this perspective, the high Engadina Valley (with its lakes and the villages of Silvaplana, St. Moritz, Celerina, Pontresina, etc) and Zermatt (with its view of the Matterhorn and of Monte Rosa) became the earliest prototypes of the winter and summer mountain vacation. In Canada, Banff and the Rocky Mountains National Parks, with beautiful Lake Louise, soon gained a similar romantic mountain appeal.

The fundamentals have not changed. The Gornergrat of Zermatt and the Corviglia of St.Moritz are still in the right locations and still successfully serve the tourists of today as they did at the turn of the last century. Banff and Lake Louise are dream destinations today as they were in the early 20th century.

One must contrast these destinations with resorts that were born to answer the boom of one specific sport: skiing. The story of these latter resorts is one of great efforts to combat the downturn of the summer and to stay on top of market demands that are very competitive and difficult to foresee. Many resorts installed lifts that had to be removed and relocated after only fifteen years. Contrast this with places not only like the Swiss gems noted above, but like Cervinia or Courmayeur, in Italy, where the lifts installed in the 1930s are still some of the main lines in winter and summer. The difference is that these lifts accessed beautiful mountains as whole mountains; the sport was only a consequence. In fact, skiing came later.

This is why Gary Cargill, of the U.S. Forest Service, Rocky Mountain Region, said, "the role of the mountain resort is changing worldwide. It is shifting from being "real estate sales" driven and managed to one of "resort recreation" and "customer satisfaction"[40]. In reality, the public is moving back from betting on land speculation and the crude motive of sport as a physical exercise, and from skiing for its own sake or for competitive achievement, **to one of whole recreation, to the experience of the mountains, of their beauty, of their spaces, of the pure dry air and the sky**. The gentle adventure and the scenery are what drive the people of today as they drove the British travellers to Switzerland before the turn of the century. Cargill also noted "Nobody in the business talks about ski areas anymore. They are sports resorts. Growth of mountain resorts in the future will be dictated by a number of different and very powerful, factors, such as **quality of mountain** resource experience; most important are the environmental ones. The one season resort is a thing of the past."[41]

This is what draws people to the huge expanse of Western Canadian mountains. Despite Whistler's tremendous success, it is the scenery and the sky of Banff and Lake Louise that still dominates the imagination of the Canadian, American and overseas traveller. The scenery, climate and snow conditions draws people from all over the world to ski in the Bugaboos by helicopter.

European and Japanese travellers often have a vision of the Rocky Mountains and our vast glaciated and snow-capped mountain ranges in mind when thinking of Canada. They imagine a sensation of being immersed in nature, such as the sensation one can feel when standing atop a mountain – this is something that our incredible expanse of mountain ranges can provide.

In the mountains as on the oceans, the vast majority of people desire to sense the vastness of immense spaces from a controlled and safe environment such as a boat, or a mountaintop gondola. People are moving toward this excellence of landscape in their travels and this is the most significant worldwide trend as travel becomes easier, more comfortable and more economical.

The second aspect of the market change is that in skiing, as in the other sports, excellence of product is becoming the most significant element of choice. People are moving away from the icy moguls of mass skiing sport facilities, and looking for mountains with vast expanses of powdery snow under sunny skies. This is what drives people to spend eleven million skier days in Colorado from all over North America. This is why Banff and the Rocky Mountain National Parks remain world-renowned attractions. While at Whistler the village itself has become a magnet, regardless of weather conditions, we must not forget the permanent appeal of high alpine territories endowed with glaciers basking in sunny blue skies, which is also one

[40] Pg 219 Mountain Resort Development Vail. Centre for Tourism Policy and Research, Simon Fraser University, Burnaby, August 1992

[41] ibid, Page 218

of the biggest draws of heli-skiing.

In Europe, people are becoming tired of the endless hours of driving through traffic jams to arrive at equally crowded and tried mega-resorts. There is a strong desire for worry free trips to more remote and peaceful destinations, where it is possible to enjoy the big spaces, predictable weather, big **glaciers that guarantee snow** conditions and the adventure of new mountains accessed from meticulously and tastefully planned small resorts.

A similar background drives the Japanese longing for Canadian mountains, except that Japan does not have a Matterhorn or Mont Blanc to offer as competition. It is important to keep in mind that skiing is just one component of the total travel experience of the tourist who comes to the mountains. This is why the ski component needs to be seen in a bigger context, for example as a part of a trip to the National Parks or to explore the Purcell Mountains as a destination where there is superb skiing and skiing is year round. It is in this context that the available market data statistical information must be interpreted.

British Columbia is uniquely positioned to attract and receive overseas visitors not only because its immense natural landscape, but also because its airline system caters to the needs of the overseas visitors in a way that is unmatched by the United States.

To fly to the American destinations, be it Aspen, Vail, Sun Valley, Jackson Hole or Snowbird, the overseas traveller faces a long and complicated trip, through huge and crowded airports, where lost luggage and missed connections are not an unusual experience. The American airline network, which is based on a network of major hubs such as Chicago, Atlanta, Dallas and Los Angeles that provide connections to smaller airports, are not set for easy travel by overseas tourists to mountain destinations. Contrast this with Calgary, which has an uncrowded airport with an excellent Delta hotel attached to it and is a comfortable and easy drive directly to the National Parks destinations. The European traveller can fly there directly from the major airports with comfortable non-stop flights, and so does the Japanese traveller with non-stop flights from Tokyo.

6.5.3 Meeting Demand

Jumbo Galcier Resort will provide new capital investment of a sizeable nature, creating a new centre of attraction, new improvements, and a new infrastructure for the tourist industry. It will specifically add a needed resort capable to offer year round glacier skiing, a high quality skiing feature that is lacking in the entire continent as previously noted.

Pannell, Kerr, Forster prepared the initial preliminary study that was the basis for the market review as reported in the 1995 Master Plan. Considerable information on the North Western and on the American market has been compiled in several studies commissioned by the Federal and the Provincial Governments. These studies seem to confirm that large and affluent States such as California or New York are an open market yet to be penetrated by the type of resort that is being proposed. However, since this project would cater to a segment of the market that is presently not served in North America, the true market exposure might only be estimated by means of value judgements.

Only the helicopter skiing companies, which provide a similar unique experience, seem to have obtained recognition in the more distant population centres. Interestingly, almost three quarters of the skiers at the nearby Bugaboo Lodge are repeat clients.

In order to understand the skier market for this type of project, one may note that Jumbo Glacier Resort would be a destination similar to Jackson Hole in Wyoming, U.S.A., but of greater quality and with the ability to operate year round with glacier skiing at the outset. The renowned excellence of skiing in the Purcell mountain range and in particular in the Bugaboos, tested and evidenced by the helicopter ski runs, is expected to attract people from all over Canada and the United States, as well as from Japan, Australia and Europe. It is estimated that the skier markets of the United States and Japan alone comprise over twenty million (20,000,000) skiers. Skiers from Australia and Europe would also have reason to come, the Australians because of relative proximity and convenience (relative to the European resorts), and the Europeans because of the novelty and uncrowded beauty of the area. To put numbers in perspective, it would take only 50,000 overseas and American skiers over a high season of 30 weeks (150 days in winter and 60 days in summer), assuming a one week average vacation, to provide a presence of over 1650 overnight skiers per day. This would only be .025% of the above noted skier population of Japan and the U.S. alone and this would not include most of the over 15,000,000 sightseers entering Canada annually from the U.S.

Skiers and tourists looking for a high quality alpine environment and sporting conditions, but not prepared to make use of the helicopter will be a prime marketing target. The proposed resort will derive its marketing strength from its ability to offer the best skiing and alpine experience on a continuous basis, without the risks and limitations associated with helicopter access and without the drawback of the summer closure for almost a half year of the other resorts. But the presence of the resort is considered a prime opportunity for the heli-ski company to introduce a segment of the market to heli-skiing that would have never tried it before, as well as making it possible for groups and families that do not include heli-skiers to travel together to the same destination resort. This is what allowed Whistler to develop a growing heli-ski operation, despite its less desirable location from a climatic point of view. It is believed that the resort and the heli-ski company represent an ideal opportunity to combine market growth and strength for two symbiotic tourism initiatives.

An additional important market segment that is not presently considered in skiing statistical data is also that of the tourist and of the sporting visitor **who are attracted by the incomparable beauty of the area, but who are not offered accommodation of international quality and access to mountain peaks and glaciers**. At the moment the nearest international quality accommodation is located in the Banff National Park. For the time being, although Banff and Lake Louise have been operating detachable gondolas for sightseeing of the valley, and Sunshine has a gondola providing access to high alpine terrain, visual access to the glaciers is possible only by chartered airplane or helicopter from Invermere, Panorama, Golden or Canmore, or by special tour buses over the Columbia Icefields. It must be noted that the tour buses only circle the bottom base of the glacier.

As has been noted many times in this study, a world-class resort capable of year round glacier skiing does not exist in North America. There is an untapped international market niche and an area of world recognition that will be served by the proposed resort. Members of the consulting group for this project have considerable direct experience of glacier skiing as it is offered in Europe. Many European resorts suffer from overcrowding, worsening climatic conditions, rise in costs and decline in quality of hospitality that further demonstrates that North American competition is very possible.

However, if we wish to compare favourably with resorts such as Zermatt, it is essential that glacier height and an outstanding vertical drop be provided by the proposed resort; it is for this reason that access to Jumbo Glacier at 11,150 feet (3,400 metres) elevation and a ski run down to the 5,250 feet (1,600 metres) elevation must be proposed.

Weather and snow conditions will not represent a risk for this resort. The only risk factor is tied to the forecast of occupancy rates. It is felt that if a partnership can be maintained with international financing groups, such as Japanese, European and U.S. companies, and with a major tourist operator committed to deliver a basic number of visitors, the risk would be minimized. This particular project will also have the extraordinary advantage of being capable of operating in exceptionally favourable climatic conditions on a fully year round basis. From an economic point of view this capability alone will ensure the viability of the project at a faster pace than almost any other comparable tourist facility of this kind on the continent.

A final word of comment needs to be made regarding the trend with regard to conventions, mass tourism, glitz or ultimate prestigious appeal as the recipe for the success of the resort of the future, which some experts would almost like to resemble a mini Tahoe or Vegas, rather than a Pontresina or Zermatt. The proponent group is unconvinced by the former and impressed by the latter example, and believes that true quality of experience and tourism by individuals, by small informal groups and by families leads to **the quiet success of all times in the tourist industry**, proven by the Swiss model over a century, and proven by the example of the Post Hotel at Lake Louise in the nearby Canadian Rockies.

6.5.4 The Skier Market in Canada[42]

6.5.4.1 Canadian Skiers and Snowboarders

6.5.4.1.1 Market Size

In total 17.9% of Canadians 12 years+ (4,724,000) participate in one or more forms of skiing; downhill, snowboarding, cross-country, or a combination of disciplines, an increase of 13.4% over 2001 when there were 4,181,000 participants.

In total 13.9% of Canadians 12 years+ (3,655,000) participate in one or more forms of Alpine skiing, an increase of 13.4% over 2001 when there were 3,222,000 participants.

6.1% of Canadians 12 years+ (1,611,000) downhill ski exclusively an increase of 19.8% from 2001 when there 1,345,000 downhill skiers.

2.9% of Canadians 12 years+ (766,000) snowboard exclusively, an increase of 36.1% over 2001, when there were 563,000 snowboarders

6.5.4.1.2 Demographic Profile of Canadian Skiers

Age Profile of Alpine Skiers in 2002 – Base 3,655,000 Participants:

- 24.7% (903,000) are 12-17 years-old (21% in 2001-515,000)
- 20.0% (730,000) are 18-24 years-old (17% in 2001-503,000)
- 20.1% (735,000) are 25-34 years-old (12% in 2001-536,000)
- 24.6% (900,000) are 35-49 years-old (10% in 2001-760,000)
- 8.3% (302,000) are 50-64 years-old (5% in 2001-252,000)
- 2.3% (85,000) are 65 years or older (1% in 2001-53,000)

[42] Canadian Ski Council, 2002 Canadian Ski & Snowboard Industry Facts and Stats

Gender Profile of Alpine Skiers:

- 57.0% (2,079,695) are male (58.5% in 2001- 1,884,870)
- 43.0% (1,575,305) are female (41.5 in 2001- 1,337,130)

Language Profile of Alpine Skiers:

- In 2002- 66.7% English, 22.1% French, 11.2% other
- In 2001- 67% English, 26% French, 6% other
- In 2000- 68% English, 27% French, 5% other

Table 6.43:
Regional Share of Alpine Skiers in Canada (by Province)

Province	% of Alpine Skiers 2002 (3,655,000)	Province	% of Alpine Skiers 2001 (3,222,200)
Ontario	38.06% (1,391,100)	Ontario	30.2% (1,262.700)
Quebec	24.13% (881,900)	Quebec	29.9% (1,250,100)
B.C	13.45% (491,600)	B.C	17.7% (740,000)
Alberta	9.65% (352.700)	Alberta	15.2% (635,500)
Atlantic	2.6% (41,000)	Atlantic	2.6% (108,706)
Man./Sask.	4.0% (65,000)	Man./Sask.	4.0% (167,200)

Source: Canadian Ski Council

Table 6.44:
Regional Share of Alpine Skiers in Canada (by city)

City	% of Alpine Skiers 2002 (3,655,000)	City	% of Alpine Skiers 2001 (3,222,200)
Montreal	12.8% (469,000)	Montreal	14.8% (476,800)
Toronto	12.7% (416,000)	Toronto	13.3% (425,300)
Vancouver	9.0% (328,000)	Vancouver	10.5% (338,300)
Calgary	4.4% (161,000)	Calgary	4.4% (141,800)
Edmonton	4.8% (175,000)	Edmonton	5.8% (174,000)

Source: Canadian Ski Council

34.6% of all alpine skiers live in a community with a population greater than 1 million, 33.3% of all alpine skiers live in a community with a population between 100,000 and 1 million, and 32.1% of all alpine skiers live in a community with a population less than 1 hundred thousand.

Household Income of Alpine Skiers:

- 37.6% of all alpine skiers have household incomes greater than $75,000.
- 28.5% of all alpine skiers have household incomes between $50,000 and $74,999.

- 23.7% of all alpine skiers have household incomes between $35,000 and $49,999.
- 71.6% of all alpine skiers own their dwelling (as opposed to renting)

Employment Profile of Alpine Skiers

46.5% of active alpine skiers are employed full time, 22.2% are employed part time, and 31.3% are students or not employed.

Table 6.45: Alpine Skier Occupations

Occupation	1995	1996	1997	1998	1999	2000	2001	2002
Professional	6.0%	6.0%	5.9%	6.0%	8.0%	6.0%	9.7%	7.3%
Owners/ Management	13.0%	13.0%	14.1%	11.7%	13.0%	4.0%	11.9%	15.0%
Trade/Sales/ Teaching	9.5%	10.0%	10.3%	12.6%	13.0%	11.0%	13.3%	10.9%
Clerical	11.5%	12.0%	13.2%	11.7%	12.0%	10.5%	10.6%	8.3%
Skilled/ Unskilled	28.5%	28.0%	24.0%	28.8%	29.0%	31.5%	24.5%	27.4%
Other	31.0%	30.0%	32.4%	29.1%	25.0%	26.5%	26.3%	31.6%

Source: Canadian Ski Council and 2002 Print Measurement Bureau (PMB) 1 Yr. Study

Education Profile of Alpine Skiers

Table 6.46: Alpine Skier Education Levels

Education	1995	1996	1997	1998	1999	2000	2001	2002
No Certification	34.5%	33.0%	30.0%	29.5%	25.0%	28.0%	26.7%	32.6%
High School grad.	23.5%	25.0%	24.3%	24.6%	25.0%	24.0%	23.2%	26.0%
Trade diploma	7.0%	7.0%	8.5%	7.2%	9.0%	7.5%	8.5%	6.6%
University grad.	28.0%	28.0%	19.1%	32.0%	33.0%	20.0%	19.9%	29.3%
Post graduate+	6.0%	6.0%	11.6%	6.5%	8.0%	13.0%	8.9%	5.6%

Source: Canadian Ski Council and 2002 Print Measurement Bureau (PMB) 1 Yr. Study

6.5.4.2 Skier Visits in British Columbia[43]

6.5.4.2.1 Skier Visit Trends

In Canada, during the 1999/2000 season, there were 17.3 million visits with 283 ski areas in operation (280 in 1998-99) according to the Canadian Ski Council in Mississauga, Ontario.

The Canada West Ski Areas Association (CWSAA) reported total 1999/2000 provincial skier visits of 5.65 million (5.58 million in the previous year) for all British Columbia areas. There are approximately 42 ski areas operating in BC. This is the second consecutive ski season with over 5 million ski days to BC, up dramatically from the record high of the almost 4.7 million skier visits of 1994/95 - the previous best ski season for British Columbia.

BC skier visits for 1999-2000 ski season were over 5.6 million according to the Canada West Ski areas Association (CWSAA). BC skier visits are equivalent to almost 11 percent of the US skier days and represent over 32 percent of total Canadian skier days.

Table 6.47: Estimated Annual Downhill Skier Visits- Pacific Northwest

YEAR	BC	ALBERTA	WASH.	MONT.	OREGON	TOTAL	BC/Total
77/78	1,319,703	1,057,249	1,833,532	750,900	963,303	5,924,687	22.27%
78/79	1,562,554	1,135,892	1,515,077	705,000	975,334	5,893,857	26.51%
79/80	1,793,297	1,368,143	1,531,437	718,300	1,194,614	6,605,791	27.15%
80/81	1,341,632	1,257,870	604,128	522,900	871,637	4,598,167	29.18%
81/82	2,341,439	1,325,923	1,513,523	757,900	1,261,968	7,200,753	32.52%
82/83	2,419,969	1,105,199	1,332,399	779,700	1,228,620	6,865,887	35.25%
83/84	2,391,710	1,089,080	1,354,303	758,441	1,220,405	6,813,939	35.10%
84/85	2,716,799	1,426,069	1,726,221	797,307	1,224,457	7,890,853	34.43%
85/86	2,333,794	1,566,037	1,457,637	642,620	1,025,799	7,025,887	33.22%
86/87	2,682,567	1,696,116	1,699,025	772,145	1,383,495	8,233,348	32.58%
87/88	3,295,140	1,550,131	1,927,783	808,408	1,408,192	8,989,654	36.65%
88/89	3,446,613	1,820,478	2,032,720	885,820	1,537,871	9,723,502	35.45%
89/90	3,269,109	2,037,577	1,449,679	941,036	1,145,719	8,843,120	36.97%
90/91	3,391,792	2,025,262	1,511,788	897,897	1,512,667	9,339,406	36.32%
91/92	3,551,819	1,952,336	1,503,621	972,839	1,199,553	9,180,168	38.69%
92/93	3,969,241	1,695,000	1,696,653	965,800	1,450,150	9,776,844	40.60%
93/94	4,129,196	1,659,986	1,715,092	996,500	1,466,244	9,967,018	41.43%

[43] BC Assets and Land Corporation, 1999/2000 End of Ski Season Review

94/95	4,684,398	2,061,243	1,694,751	1,062,932	1,574,938	11,078,262	42.28%
95/96	4,182,275	2,164,121	1,371,028	968,277	1,340,473	10,026,174	41.71%
96/97	4,521,963	2,178,811	1,602,404	1,053,321	1,527,865	10,884,364	41.55%
97/98	4,397,368	1,999,237	1,571,925	985,097	1,471,919	10,425,546	42.18%
98/99	5,582,454	2,556,308	1,770,210	781,915	1,619,793	12,310,680	45.35%
99/00	5,656,871	2,564,129	1,923,783	N/A	1,556,225	11,701,008	48.35%

Source: BC Assets and Land Corporation, 1999/2000 End of Ski Season Review

Nationally, BC is second only to Quebec as a Canadian destination for skiers. BC is home to 16 percent of Canadian skiers and 21 percent of the ski areas, but received 32 percent of Canadian skier visits last year. The last 2 ski seasons were record years for BC, Whistler and the other mountain resorts across British Columbia - continuing a 20-year growth trend.

Despite year-to-year variations, skier visits to British Columbia continue growing at almost twice the rate of neighbouring jurisdictions around the Pacific North West (PNW).

In 1978, the total skier visits for the PNW region amounted to 5.9 million and BC's Mountain Resorts captured 22 percent of these skier days. Skier days in the PNW increased in the 1998/99 season to more than 11.7 million skier days, and British Columbia captured over 48 percent of these visits, an increase in the regional market share of more than 26 percent over the 1978 season.

6.5.4.2.2 Skier Visits

British Columbia's largest ski areas are distributed throughout British Columbia and vary in size and scope from Whistler Resort to the smaller northern ski areas. Whistler/Blackcomb dominates the ski industry in BC and represents the only international destination mountain resort in BC., despite its poor climate.

This continued growth of BC ski areas can be attributed in part to the unique BC government *Commercial Alpine Ski Policy* (CASP) that encourages ski development and construction of mountain resort villages to provide on-site overnight accommodation, and to the continued improvement of B.C. facilities and resorts, which offer new developments, lifts and exciting ski runs.

The ski season lasted 147 days on average in 1999/2000, well in excess of the long-term average length of 130 days, and ranged from 200 days at Whistler to 100 days in the north and the Kootenays.

Table 6.48: Major BC Mountain Resort Trends 1983-2000

YEAR	1999/00	1998/99	1996/97	1993/94	1990/91	1987/88	1983/84
SKIERS DAYS	5,656,781	5,248,814	4,281,365	3,780,701	3,317,287	3,018,558	2,262,059
SEASON	147	140	129	121	130	125	146
UTILIZATION	Na	0.33	0.28	0.34	0.31	0.27	0.22
HOTE LOCC	0.60	0.67	0.62	0.61	0.63	0.59	
GR.REVENUE	$281 million	$266 million	$191 million	$148 million	$112 million	$83 million	$38 million
LIFT REVENUE	$148 million	$137 million	$99 million	$79 million	$62 million	$46 million	$23 million
GR REV/SKIER	$52.33	$50.72	$44.63	$39.29	$33.83	$23.07	$18.28
LIFT REV/SKIER	$27.57	$26.22	$23.08	$20.96	$18.90	$13.02	$10.74
INVESTMNT	$52,622,306	$99,265,410	$51,661,700	$62,288,000	$37,300,000	$36,729,000	$14,440,000
EMPLOYEES	4300	4,120	3,771	3,501	3,464	2,639	1,443
PAYROLL	$86.9 million	$82.8 million	$58 million	$53.5 million	$40 million		

Source: BC Assets and Land Corporation, 1999/2000 End of Ski Season Review

6.5.4.2.3 Resort Revenues

Gross resort revenues increased to $281 million in 1999/2000, up from $191 million for 1996/97 (comparable numbers were $148 million in 1993/94 and $112 million in 1991).

The BC revenue picture continues to improve and improve substantially for the revenues per skier visit. Skier visits were essentially the same between 1998/99 and 1999/2000 but both gross resort revenues and lift revenues increased. Resort gross revenue and lift revenues have more than doubled in the past decade.

The 1999/00 gross revenue per skier day increased to $52.33 up from $50.72 last year, and well above the $44.63 in 1996/97, $39.29 in 1993/94, and $33.83 per skier day in 1990/91. Other areas excluding Whistler/Blackcomb reported average revenue per skier day of $37.17 in 1999/00, equivalent to the $37.29 of the previous season. Ski lift operation revenues for the 15 reporting areas for the 1999/2000 winter were $141 up again over $137 million reported in 1998/99, $99 million in 1996/97, $79 million in 1993/94 and $62 million in 1991).

Lift revenue per skier day also continued the upward trend, and increased to $27.57 for 1999/2000 compared to $26.22 the winter before, and up $23.08 for 1996/97, $20.96 per skier in 1993/94, and from $18.90 in 1990/91. Lift revenue per day at the smaller areas excluding Whistler was estimated at $19.65 in 2000 (up from $18.35 the year before) with 10 out of 14 areas reporting an increase.

Lift revenues represented 53 percent of gross ski company revenues, compared to 51 percent of the reported gross revenues in 1999, and similar to 53 percent in 1993/94 and 55 percent in 1990/91. An average lift ticket price of $43 was posted in 1999/2000 ($40 outside of Whistler areas), with all but 2 areas reporting increased prices, continuing the trend of regular price increases from $29 in 1990/91. Lift ticket prices have increased on average by 44 percent from 10 years ago.

The lift ticket yield - defined as the revenue per skier day divided by the advertised full price ticket rate - recovered from 49.7 percent in 1996/97 to 66.15 percent in 1998/99 but declined to 65.79 percent in 1999/2000. Average yield has ranged from a high of 72 percent of the posted rate in 1989/90, to a low of 49.70 percent in 1996/97. This 65 percent yield plus an increasing ski lift to gross revenues ratio, suggests less price discounting than in past years (through packaging, passes and promotions), and a return to typical North American industry yields of 65 percent.

The 16 mountain resorts reported marketing expenditures of $12.5 million in 1999/2000, up from past years. This represents an average expenditure of about $2.33 per skier visit, very similar to about $2.39 per skier visit in 1996/97, and $2 per skier visit in 1994. Marketing as a percentage of gross revenue was 4.45 percent. Marketing compared to lift revenue averaged 8.44 percent in 1999/2000 compared to 7.5 percent in 1998/99.

Gross fixed assets for the 16 areas that reported were an estimated value of over $370 million in 1999/2000. This compares to 17 areas and $375 million the year before, 19 areas with $402 million in 1996/97, $345 million in 1993/94 and $227 million in 1990/91). This number does not include real estate associated with the industry. Reported GFA is about $69 of fixed assets per skier visit in 1999/2000 compared to $71 the season before.

New ski operations direct investment at the mountain resorts (excluding private real estate) for 2000 was expected to exceed $52 million ($99 million last year, $51 million in 1996/97, $63 million in 1994/95 and $37 million in 1990/91) averaging over $3.0 million per ski area.

6.5.4.2.4 Employment Trends

BC mountain resorts continue to be major employers. Direct mountain resort employment on full-time equivalency basis amounted to 4302 Full Time Equivalencies (FTE's) in 1999/2000 with one area not reporting. The mountain resorts provided direct, full-time jobs for more than 4300 people in 1999/2000, up from 3,460 people in 1990/91. This employment growth in the mountain resorts was focused on full-time winter employees and to a lesser extent - part time winter employees. If the other resort had reported, (16 of 17 mountain resorts reported in 1999/2000) the employment numbers would most likely have been in excess of 4500 FTE's.

The five largest employers are Whistler/Blackcomb and Panorama Resort (all Intrawest resorts), Grouse mountain, Cypress Bowl and Big White Resort.

Payroll was estimated at $86.9 million in 1999/2000, very similar to the season before but with one less resort reporting. This is a considerable increase from $58 million in 1996/97, $53.5 million in 1993/94, and $40 million in 1990/91. A simple average annual salary on this basis was more than $20,000 in 1999/2000.

6.5.5 Overview of Foreign Ski Markets

6.5.5.1 United States

According to the National Ski Areas Association (NSAA), skier/snowboarder visits at U.S. ski resorts for the 2002/03 season resulted in an estimated 57.6 million visits, a record season. The estimates are based on the Kottke National End of Season Survey, prepared for NSAA by RRC Associates, a Boulder, Colo.-based research firm.

The following are key highlights excerpted from the Kottke National End of Season Survey 2002/03 Preliminary Report:[44]

> In what is likely to be a surprise to many ski industry participants and observers, the 2002/03 season is preliminarily estimated to be a contender for a season record. Based upon responses received to date, visits are currently projected at 57.6 million, 0.5 percent above the 57.3 million visits recorded in the 2000/01 record season. Because of the close margin and the fact that results at this time are preliminary and subject to change in the final report (as resorts make final end-of-season adjustments to their figures, and data is collected from a larger sample of resorts), it is not possible to determine whether 2002/03 will be a record season until final numbers are tabulated. However, the preliminary numbers make it clear that 2002/03 was a very strong season.
>
> The record or near-record performance in 2002/03 was perhaps unanticipated due to a collection of unfavourable conditions which had to be overcome. These included a continued sluggish and uncertain macroeconomic environment (including relatively high unemployment and a slumping stock market), the war in Iraq and related geopolitical tensions, a continued slowdown in travel and tourism after September 11, high gas prices, and less than optimal snow and weather conditions in portions of the country (e.g. below-average snow the Pacific West, excessively cold temperatures during portions of the winter in the Northeast).
>
> The mixed circumstances in 2002/03 contrast with the largely favourable conditions in the 2000/01 record season, when all regions received strong early snow (providing positive momentum), the economy was still relatively robust, and international terrorism was not perceived as a major threat.
>
> The ski industry has performed strongly in the past three seasons, including the record 57.3 million visit 2000/01 season, the relatively strong 54.4 million 2001/02 season (despite September 11th, economic recession, and comparatively poor snow everywhere except the Pacific West), and the

[44] RRC Associates, Kottke National End of Season Survey 2002/03 Preliminary Report, May 23, 2003, pages 1-2

record-contending 2002/03 season. These strong results suggest that the industry may have moved into a new, higher performance range. Whereas in prior years skier visits varied from 46 million in poor season to 54 million in a good season, the performance levels under poor and weak conditions appear to have been elevated the past three seasons. The strong performance demonstrates the resiliency of the industry nationally to handle a variety of adverse conditions which in previous years may have had more serious outcomes, as well as an improved capability to capitalize on favourable snow conditions when they arise.

By region, very strong results were recorded in 2002/03 by the Southeast (second best recorded season ever), Midwest and Northeast (each with their third best seasons ever), and Rocky Mountains (fourth best season). The Pacific West, the only region to record a drop in skier visits this season relative to 2001/02, nonetheless still recorded its 10th best season out of the 25 seasons on record.

6.5.5.2 Europe

The European skier market represents around 240 million skier-days for 32 million skiers, or 60% of the total world market.[45] Four major countries account for most of the skier visits: France, Austria, Italy, and Switzerland. The rest is divided among Scandinavian countries, Eastern Europe, and Spain.

France's position is largely the result of its domestic consumer base, which accounts for 85% of visits, as compared with 50% for Austria and approximately 75% for Switzerland and Italy. The reverse side is that France counts only 15% of skiers coming from other European countries, as opposed to nearly 50% for Austria (there are an estimated 12 million skiers in next-door Germany). This market segment therefore represents a great margin for growth. The international clientele is concentrated in about twenty major French resorts offering the facilities.

In 1998 skier visits, four countries were in the 50 millions: France led the world with 57.6 million skier visits; Austria with 56 million; USA with 52.2 million, and Japan 52 million. Italy had 37 million visits, more than double the Switzerland and Canada figures of 17 million each.

6.5.5.2.1 France[46]

France's ski area is the largest in Europe, with 1,200 km^2 (463 sq. miles), ahead of Switzerland (840 km2 – 324 sq. miles) and Austria (790 km2 – 305 sq. miles).

France also has the world's leading ski-lift infrastructure—4,013 lifts in service, as compared with 3,750 in Austria, 3,100 in Japan and the United States, 2,600 in Italy and 2,300 in Switzerland.

---

[45] Sources: European Travel Monitor 1998 - IPK International and Gottfried Keller Strasse 20 - D 81 245 Munich

[46] Sources: Compagnie Des Alps Annual Report 2002 and The Blue Book of European Resorts, Eighth Edition, 2003

France counts 357 ski centers equipped with at least one lift. Of these, around 250 make annual sales of at least 15,000 euros. But only 100 sites can truly be considered as full-fledged resorts. Among these, 15 are world class, 35 are intermediate-sized resorts and 50 are smaller, regional centers.

During the 2001-2002 winter season, total lift sales for downhill skiing are estimated at 770 million euros (excluding taxes), a 3.7% increase over the 2000-2001 season (source SEATM).

France's ski lift sales are highly concentrated: the country's 12 leading resorts (seven of which belong to Compagnie des Alpes/ Intrawest) account for 50% of total sales and 36 resorts (10% of the total) account for 75% of total sales.

The French have a long and glorious past in winter sports. Because their portion of the Alps contains many world-class ski resorts, France has hosted snowy Olympics on three occasions: the first Winter Games 1924 in Chamonix, Grenoble in 1968, and Albertville in 1992.

The skiing is rated among the best in the world. The Alps themselves are stunning. Majestic vistas are everywhere, each more captivating than the one before. French ski resorts attract foreign skiers for whom natives are happy to parade their amazing facilities. France is renowned for its purpose-built resorts. Old villages were converted to modern resorts and many new communities sprang up in rolling high meadows.

a high percentage of the population skis (more than 13 percent). That's three times the estimated number of skiers in America. France, one-third our size, registers about the same number of skier days.

With so many skiers to move uphill, ski areas have ploughed tons of francs into lift facilities. Some American operations managers think the French are "equipment happy." But skiers delight in the number and types of conveyances; the more the merrier. In the mind-boggling Trois Vallées (Three Valleys), for example, there are more than 200 lifts that can move 200 thousand skiers an hour around the world's largest ski domain.

Beneficiaries of inter-connected mountains and their vast lift networks are families whose members may have different levels of ability. There are trails and slopes for everyone.

6.5.5.2.2 Austria[47]

Austria's 56 million skier visits are astounding, considering its native population base of about 8 million.

Austria has majestic mountains that at first glance may be overwhelming. But skiers need not be intimidated; whatever their level of ability. They have choices of countless acres of untracked powder or miles and miles of well-groomed and marked trails.

[47] Source: The Blue Book of European Resorts, Eighth Edition, 2003

Picture-postcard villages sit below the slopes in an environment where skiing history combines with present-day. More than 700 ski areas dot the landscape. Some are as familiar to us as Julie Andrews in a dirndl, singing that the hills are alive with the sound of music. Lesser-known ones are in tiny farming communities where a local landowner has erected a small lift or two.

Austria offers countless major resorts that have proven popular with skiers over the years. Major and interconnected resorts abound. The vast networks are a unique feature of skiing in the Alps. Rarely in America is it possible to ride up the face of one mountain, ski down its other side, and connect with lifts on another mountain. In Austria skiers often keep going and end up miles from their starting point. They can retrace their routes on the snow or board a bus for a free ride home.

To appreciate the magnitude of the Austrian skiing world, one needs only to consider the state of Tyrol, which twists along Germany's southern border for 160 km (100 miles). Mountainous Tyrol, wedged between Germany and northern Italy, would fit within the state of Connecticut. Yet it is a skier's paradise, with 119 resorts that offer downhill skiing and snowboarding. That's about three times the number of all ski areas combined in Colorado and Utah. Skiers in the Tyrol have more than 2,000 miles of prepared runs, endless off-piste terrain, and nearly 1,200 lifts.

6.5.5.2.3 Italy[48]

Italy has 37 million skier visits from a population of 57 million citizens. Italy is the only country that has a border on the Alps all the way from France, past Switzerland and Austria to Slovenia.

For more than six decades, Italy has been a Mecca for skiers from around the world. It has all the desired features and special attractions for exceptional ski adventures. World class skiing and boarding facilities, coupled with a cosmopolitan atmosphere and extensive choices of artistic and cultural events, make it unique.

Nature has bestowed upon Italy magnificent mountains, abundant snow and ideal winter temperatures. It is the only alpine country to encompass the entire Alpine Arc. The lofty Alps, the most captivating mountains in Europe, divide Italy from France in the northwest, Switzerland and Austria in the north and Slovenia in the northeast.

The immense mountains of Mont Blanc 4,810 m (15,771 ft.), Monte Rosa 4,600 m (15,091 ft.) and Gran Paradiso 4061 m (13,324 ft.) form the back-drops for many of the challenging slopes in the Aosta Valley region. These peaks, possibly the most beautiful of the alpine range, harbour internationally renowned resorts as Courmayeur, Cervinia and La Thuile.

The Dolomites, among the most spectacular mountains in the world, are located in the eastern Alps, a mere hundred miles north of Venice, all within Italy's borders in the provinces of Belluno, Bolzano and Trento. They are a

[48] Source: The Blue Book of European Resorts, Eighth Edition, 2003

phenomenal manifestation of nature with towering peaks of vertical rocky spires shaded in multi-colours. Cortina d'Ampezzo, site of the 1956 Winter Olympics, is one of many outstanding ski resorts in this beautiful natural setting. These mountains, with vast snowfields offer an endless variety of terrain for all skiers. The "Dolomite Super Ski Pass" incorporates one of the largest ski terrains in the world with 464 lifts and 1180 km. (733 miles) of ski runs in 12 valleys and 38 different ski resorts.

A second range of mountains, the Apennines, "The backbone of Italy," traverses the entire length of the peninsula.

6.5.5.3 Japan[49]

The popularity of winter sports in Japan is substantiated by the country's distinction of being the first Asian country to host the Winter Olympics (1972). Further proof was its role as host to both the First and Second Winter Asian Games (1986 and 1990). To these, of course, the 1998 Winter Olympics in Nagano can now be added.

Japan's climate permits a thriving winter sports season. Winters are governed by the coldest air mass in the world, the Siberian air mass. The frequent approach of cold fronts from the Asian mainland causes Japan to experience much lower temperatures than European regions at the same latitude.

Another factor that enhances the winter sports environment is that four fifths of Japan's land area is composed of mountains. The Japan Alps - a range that is divided into Northern, Central and Southern sectors - runs down the central part of Honshu, the largest of the 4 Japanese islands. Many peaks in the Japan Alps are over 2,500 metres high and are covered over with snow during the winter.

Skiing is by far the most popular of winter sports in Japan. In 1996, Japan had about 16.1 million people who skied as a leisure activity. Data compiled by the Leisure Development Center indicates that the number of skiers increased by nearly 4 million since 1988. The average skier in Japan engages in the sport 5.5 times during the winter, and spends over 100 thousand yen (US$ 919.2) per year in pursuit of this activity.

During 1996, the annual consumer market for skis, ski boots, ice skates, snowboards, and related equipment was estimated at 393 billion yen (US$ 3.612 billion). Outlays for the construction and expansion of winter sports facilities and operation of training schools during 1996 came to 142 billion yen (US$ 1.305 billion), nearly double the 1986 figure. This amount also incorporates fees for usage of the slopes and ski lifts, skating rinks, some but not all hotels, and restaurants in connection with such activities. It excludes rail tickets and motor transport to and from winter resorts.

Snowboarding was introduced to Japan around 1980. The Japan Snowboard Association was established in 1983, and the first Japan Snowboard Championship was held in the same year. Now, more than 120 thousand people enjoy this sport in Japan, and the number of ski resorts whose ski runs are open to snow-boarders has been increasing.

---

[49] Source: Japan Information Network (jinjapan.org)

Most of the major winter sports areas on the island of Honshu are easily accessible by railway and are outfitted with chair-lifts and night illumination. A large number of ski resorts are located along the Joetsu line, which terminates in Tokyo. These include Tsuchitaru, Nakazato, Iwappara, Yuzawa, Ishiuchi, Shiozawa, Urasa, Koide, and Ojiya.

Sugadaira Ski Grounds is a ski resort located along the Shinetsu line, between Mt. Azumaya and Mt. Neko.

Zao, a resort on the border of Miyagi and Yamagata Prefectures, has the reputation of being the largest and best equipped ski area in the Tohoku region. It is also famous for its "snow monsters," ice-covered pine trees that make for stunning winter scenery

Some interesting new technology has also brought winter sports closer to consumer markets. In July 1993, the SSAWS (pronounced *zaus*) SKIDOME in Funabashi city, Chiba Prefecture, became the world's first year-round indoor ski facility. The facility, accessible by train from Tokyo in about 40 minutes, can accommodate as many as 2,000 skiers at once, and also features a heated swimming pool. In addition to attracting urban residents who lack the time or funds to travel to distant ski resorts, SSAWS operates training courses to help new learners practice skiing basics before heading out to more challenging slopes. The instructors are certified by the All Japan Ski

6.5.6 The Snowdome Phenomena: Meeting Demand for Off-Season Skiing

Snowdomes are artificial indoor ski hills which make skiing possible in warm climates, or in areas where mountains are not available. Snowdomes are particularly popular in summer in both Europe and Japan.

Though the word "snow dome" makes one immediately think of a large bubble structure, the world's indoor ski slopes have innovative designs in varying shapes and sizes. The concept of an indoor skiing area was first introduced in 1987 in Adelaide, Australia, where Mt. Thebarton was added to an indoor skating center. Today, with a snow slope that is 400ft (120m) long and 40ft (19m) wide, it is considered one of the smaller indoor ski slopes.

Currently there are about thirty snowdomes in operation around the world, with dozens more in the planning or construction phases. Europe is home to most of the operating indoor ski slopes, and several areas in Asia are planning snowdomes to replace the now defunct "Ssaws" center in Japan, previously was the world's largest indoor ski slope. Snowdomes are also being planned or built in Bahrain, U.A.E., South Korea, Indonesia, India and South Africa.

While the United States has been behind the curve in building indoor skiing facilities, several proposals have gained approval and now it's just a question of when and where the first snow dome ski slope or indoor halfpipe will open in the US. Since the $130 million dollar "Gotcha Glacier" indoor park in Anaheim, California was cancelled, it appears that the Las Vegas SnowLab should be the first indoor skiing and snowboarding facility to open, scheduled for late 2003. The SnowLab will be among the largest facilities in the world, with over 200,000 sq. ft. of snow cover. The indoor ski slope will be 1,100 feet long.

Most recently, a letter of intent has been signed for an indoor skiing and a snowboarding halfpipe in Buffalo, New York. A proposal to renovate the old Continental Airlines Arena in East Rutherford, New Jersey into a snow dome for year round skiing and snowboarding recently received approval.

Europe has the most operating indoor ski slopes, though most of the snowdomes are smaller than the Madrid Xanadu, several larger facilities are in the works throughout Europe. Among the most popular is the UK's Tamworth indoor ski dome, recently renovated and upgraded with new activities including snowtubing and snowmobiling. Also in England is the Xscape snow dome in Milton Keynes, where shopping and other fun activities are available.

Germany's AlpinCenter is planning to expand to be Europe's longest slope at 608 metres (1,995 ft.), while Allrounder Winter World is Germany's first indoor ski and snowboard center and also hosts the tallest indoor rock climbing wall in Europe. SnowWorld Landgraaf in the Netherlands is one of the world's premier snow dome facilities, with a 520 metre (1,706 ft.) long slope. There are a total of 5 operating snowdomes in the Netherlands, with a new one under construction near Amsterdam set to open in late 2003. Belgium features 2 snowdomes.

6.5.7 Demand for Summer Visitors

6.5.7.1 Summer Use

The use of glaciers by tourists has been attracting summer visitors in other parts of British Columbia and Alberta; however, no comparable mountain access and transportation plan exists. A unique alpine summer use can be built around a lift network conceived for multi-seasonal sightseeing and skiing as in no other place in North America, giving access high-altitude glacier views and skiing opportunities.

The summer season at Jumbo Glacier Resort cannot readily be compared with other ski area experiences which depend on common summer activities such as mountain biking and hiking. These may only bring an occupancy of facilities inferior to the peak winter sports attendance. At Jumbo Glacier Resort, an opportunity exists to expand the proven concept of heli-skiing and sightseeing to mountain top sight seeing and glacier skiing year round for a larger population. An exciting ski school program is envisioned for the summer as is practised in the Alps.

The visual experience being planned is not offered elsewhere in the entire North American continent, but it has been a popular attraction in the European Alps since the end of the last century, when the Gornergrat Bahn in Zermatt, Switzerland gave access to spectacular views of the glaciers surrounding Monte Rosa from an altitude of over 3000 metres.

It is expected that a 50/50 split of day visits to destination resort guests may be achieved during the summer season. The summer season for destination resort guests will generally end around the end of September when winter quickly approaches. During the fall season, the day visits for sight-seeing may also be at the lowest level. As winter approaches, the resort operation will focus on preventive maintenance, snow and avalanche management to be prepared for winter use of slopes and facilities, utilizing the quieter month of October.

6.5.7.2 Spring and Summer Activities at Nearby Resorts

The Columbia Valley is an unparalleled location for vacations. Organised activities at Panorama and other locations include white water rafting, mountain biking, wildlife viewing, rock climbing, glider plane tours, hang-gliding and paragliding, lake sports such as windsurfing and a variety of other activities.

6.5.7.3 Summer Hotel Demand

At the present time there are a minimum of 50-60 buses during the summer season, travelling the #1 Highway. Hotels located at Banff and Lake Louise have insufficient capacity to deal with the large volume of bus traffic. Hotel properties in Golden are currently servicing a portion of this traffic, with three to four buses per night in Golden, at the Prestige Inn, Best Western, Ramada Inn and Super 8.

Panorama, Invermere and Radium also attract a portion of the National Parks traffic, but it is reasonable to expect that a world class attraction such as Jumbo Glacier resort and its viewpoints would create a strong magnet for the tour buses. In addition, Jumbo Glacier Resort would attract also the upper end of the tourist bus market and not compete directly with the Golden, Radium and Invermere properties for this tourism business.

A sample of tour bus companies travelling this route includes Tauck Tours, Ingrams, Japan Travel Bureau, Maverick Tours, Black Velvet Tours and Brewster Tours.

The resort hotels at Jumbo Glacier Resort will capture a portion of the transient upscale motorist traffic travelling though the National Parks, referred to as “rubber tire” traffic.

There appears to be no lack of demand for quality hotel room nights located in the nearest mountains west of the National Parks. The hotels need to be oriented toward international destination traffic, as these travellers are prepared to pay premium hotel rates.

Demand for hotel accommodation at the resort base should be strong through the summer months between May and October. The current hotels in the National Parks average close to 90% occupancy for this six-month period. Jumbo Glacier Resort should perform with similar occupancies in the 80 to 90% range over the summer period by its fifth year of operation. A reasonable average annual occupancy would be about 75% by the fifth year. Presented in the table below is a summary of the major market segments and the expected number of room nights to be generated for a 200 room hotel that has reached maturity.

As already noted, there are 50 to 60 buses per day travelling through the Trans Canada Highway at Radium Junction. Hotels located at Banff and Lake Louise have insufficient capacity to deal with this large volume of bus traffic and it is reasonable to expect that a new and attractive destination would provide a needed outlet for this overflow of tourism demand.

Table 6.49:
Summer Room Night Demand for a 200 Room Hotel
at Jumbo Glacier Resort

Tour Bus Patrons	12,600	40.0%
Conference Attendees	5,400	17.1%
Transient traffic	5,400	17.1%
Golfers	4,500	14.3%
Rafters & Sightseers	3,600	11.4%
Total	31,500	100.0%
	180 days	
Average summer demand per day	175 rooms	
Average summer Occupancy @ 200 rooms	88%	

The proposed hotel facilities will have some conference and meeting rooms oriented towards the upscale corporate and incentive travel market. Additional conference related commercial facilities might also be available in the resort base area. During the summer period, conferences in the range of 50 to 100 persons should occupy portions of the hotel.

The resort hotel should capture a portion of the transient upscale “rubber tire traffic” traveling through the National Parks.

An allocation has been projected for 25 rooms per day for golfers, representing an estimated number of rounds available at the Panorama Greywolf Golf Course, based on current activity levels.

An allocation of room nights is being provided for sightseeing, rafting and other adventure activities that are available in the Jumbo and Toby Creek area.

6.5.8 Demand for Lift Users: Skiers, Snowboarders and Sightseers

6.5.8.1 Winter Use

Early winter snow conditions will sometimes dictate the date for full area opening or limited area opening. Due to its glaciers, Jumbo Glacier Resort will always be able to provide year round skiing. It will also feature the earliest openings in British Columbia for winter operations because of its climate, latitude, valley base elevation and snowfall conditions.

During the holidays or during mid-winter, when the greatest number of people can use the snow covered slopes, the approximate site capacity by design will range from 4,400 to 12,600 people-at-one-time (PAOT) for Opening and Phase 3 mountain development respectively. In the initial village opening, only approximately one-half of the mid-winter site capacity will be developed at the Jumbo Glacier Resort. The balance for the seasonal peak demand will be offered represented by day visitors, coming from a variety of .off-site accommodation at Panorama, in the Columbia Valley, in Banff or as far Calgary.

The highway from Panorama to Mineral King Mine site is already being kept open in winter. It is expected that the road improvement to a higher standard could take place in phases. In the initial planning phases of the project emphasis was given to potential separation of access for day skiers, decreasing automobile traffic and offering a bus service, possibly from the Mineral King Mine as a favoured option. This did not appear to be received with favour by the local public and is no longer a favoured option. Parking areas in the proximity of the lifts and to be developed in phases matching the progress of the project are presented this Master Plan. They will still provide a degree of separation between the daily skier traffic routine and the pedestrian character of the resort centre. The option of a small parking area for a possible lift giving access directly to Farnham Glacier for ski training camps has been maintained, in consideration of the interest expressed by Alpine Canada Alpin and by CODA to have the shortest possible access from Panorama to Farnham Glacier.

All the experts who studied the project have confirmed that it should be expected that Jumbo Glacier Resort will attract skiers due to better snow quality and a more exciting ski plan at a higher initial rate than any comparable resort. As a consequence, even during the Opening Phase, the projected number of skiers necessary for the resort to operate successfully is already anticipated in the design.

During exceptionally cloudy and windy conditions, if the glacier lifts were to be closed, skiing nearer the Jumbo Creek valley base will be provided to carry the load. It should be noted that the size and the elevation of the mountains as well as the design will allow for a lower density of skiers than in most North American resorts even at the peak of the season. Even in bad weather the lower elevation lifts are expected to be able to absorb additional skier traffic without unacceptable crowding. Although the local microclimate is exceptionally gentle and inclement weather is very rare, as noted elsewhere in this study, the design takes into account the potential for severe winter storms and avalanche control in progress, with closure of some areas and guests limited to specific areas. One must note that these are anticipated to be very rare occurrences, according to observations over the last fifteen years and reports from the heli-ski guides. There are no avalanche conditions similar to those found at the village areas at Alta and Snowbird, in Utah, where the inter-lodge closure (confining people to stay inside lodges) during high avalanche hazard has become a fairy tale promoting powder skiing.

6.5.8.2 Spring Use

Due to the snow amounts and the climate, spring attendance at the Jumbo Glacier Resorts is expected to be at very high levels, with the entire vertical drop skiable until May. Glacier skiing is often at its most spectacular condition in spring time.

6.5.8.3 Summer Glacier Skiing and Sightseeing

Summer skiing at 3,000 metres (9,842 ft.) will be a new experience in North America, comparable to Les Deux Alps, Plateau Rosa, or Passo Stelvio, which have provided skiing and ski schooling in the summer sun to generations of Europeans.

Summer skiing is expected to combine with sightseeing from the mountaintops of Glacier Dome and Jumbo Mountain to create a legendary experience that will attract people worldwide.

Preliminary interviews conducted with different ski organizations, industry experts and ski package tour companies suggest that there is a market in Canada for summer skiing and sightseeing, as well as for competitive ski training. Alpine Canada Alpin, the national ski team organization, has expressed strong interest. Summer ski training at this project location is especially of interest in view of the upcoming winter 2010 Olympics in Vancouver.

Summer glacier skiing by helicopter is not being offered in the Alberta/British Columbia Rocky Mountains. The issue may stem from a "quality/ perception" problem that no matter how superb the ski conditions are, it is difficult to convince sufficient numbers of people to pay the price to ski by helicopter in the summer months. The cost to prudently operate summer skiing by helicopter is prohibitive, because in addition to the normal costs and limitations of heli-skiing, other requirements must be taken into consideration: only a few selected runs, either pre-groomed by snowcat equipment or otherwise previously skied by mountain guides and flagged at critical points, can be safely skied in the summer, due to the much greater crevasse danger; skiing is possible only from the top elevation, with no alternatives when the weather does not permit safe landings at the top; the vertical drop is much shorter, requiring a much greater number of short hauls.

Glacier skiing in Europe has become a popular activity and has enjoyed a spectacular growth. Europe's recent mild winters, which caused many traditional ski resorts to close early in the season, have reinforced the popularity of glacier skiing.

In the Italian Central Alps, as previously mentioned, a mountain guide established a ski school at the Rifugio Livrio, above Passo Stelvio, in the late 1940s, to provide ski instruction in the summer months. What is most noteworthy is that this ski school, called Pirovano after its founder, was established in a relatively remote location to provide summer skiing on the glaciers only and it is closed in winter. Its season is from May to October. It has had a spectacular success and today it is one of the two largest summer skiing operations in the Alps, together with Les Deux Alps, in France, as previously noted. Passo Stelvio recently invested another $10 million (U.S.) in new lifts for glacier skiing. The resort has experienced a growth season for summer skiing mainly for Europeans.

Strong promotion of complementary activities combined with year round glacier skiing have been largely responsible for the increase in foreign visitors to resorts such as Les Deux Alpes and Alpe d'Huez (France).

Zermatt, the outstanding ski resort with glacier skiing for both winter and summer, has recently seen an annual 12 % increase in foreign visitors.

Currently the overseas market for glacier skiing at Blackcomb and at Mount Hood appears to be small, but the winter skiing statistics reveal that overseas skiers to Canada have increased dramatically in the last years. This trend is expected to continue and will likely create demand for summer skiing as well, if adequate facilities are provided. In terms of summer lift capacity, Alberta and British Columbia resorts that do offer gondola lifts in the summer such as Lake Louise, Sunshine and Whistler/ Blackcomb attracted visitations in the range of 50,000 to 60,000 from June 1 to September 1, 1990. The proposed resort could surpass these visitations figures, by offering both unique vistas and a unique experience in this continent, as well as the only good ski race training facility in summer in North America.

6.5.8.4 Other Activities

Other activities will include skating and tobogganing in winter, and bicycle riding along selected trails among the winter ski trails, hiking in Upper Jumbo Valley on dedicated trails selected from the winter ski trails, tennis and swimming in the resort's pools in the warmer seasons. Activities are expected to be similar to those of resorts like Lake Louise, Les Deux Alps in France or Zermatt in Switzerland, with skiing and sightseeing as the two main interests for visitors at the resort, and the other activities as occasional past time.

6.5.8.5 Seasonality

Skiing and sightseeing at the proposed resort will be designed to offer access to year round glacier skiing and sightseeing. This combination of both winter and summer recreation will be a benefit in attracting shoulder season business to the area.

The resort will also be able to capitalize on the growing meetings/conference market and tour group markets. The facility could offer specialized ski programs with corporations to teach their employees how to ski and attend conferences at the same time. The tour group markets could learn to ski on the glaciers during their peak summer season visits to the Canadian Rockies.

Industry experts further agree that future ski growth in Canada is dependent on the ability of Banff, Lake Louise, Golden, Panorama and surrounding areas to capture a greater share of the non-resident skier market. A key focus of this resort should be its ability to attract potential international markets to these areas.

6.5.9 Competition and Comparable Resorts

6.5.9.1 Competitive Downhill Ski Areas

Jumbo Glacier Resort will compete with ski areas in the National Parks, Alberta ski areas sourcing the Calgary market, and B.C. ski areas in the southern Columbia River Valley. Ski areas in the competitive market region are presented in the following tables.

Table 6.50: Regional Destination Resorts

	Kicking Horse Resort	Panorama	Fernie Alpine Resort	Lake Louise	Sunshine	Marmot Basin
Nearest Community	Golden	Invermere	Fernie	Banff	Banff	Jasper
Distance from Local Community	15 km	18 km		55 km	16 km	
Driving Time from Local Community	15 min.	20 min.	10 min.	35 min.	15 min.	
Distance from Calgary	260 km (162 miles)	300 km (186 miles)	305 km (190 miles)	186 km (116 miles)	154 km (96 miles)	414 km (248 miles)
Skiable Acreage	1621 ha (4000 acres)	1157 ha (2847 acres)	1016 ha (2500 acres)	1700 ha (4200 acres)	1282 ha (3168 acres)	607 ha[50] (1500 acres)
Vertical Drop	1260 m (4133 ft)	1220 m (4000 ft)	857 m (2811 ft.)	991 m (3250 ft)	1071 m (3514 ft)	914 m (3000 ft.)
Peak Elevation	2450 m (8033 ft)	2380 m (7800 ft)	1,925 m (6316 ft)	2637 m (8650 feet)	2729 m (8954 ft)	2601 m (8534 ft)
Bottom Elevation	1190 m (3900 ft)	1160 m (3800 ft)	1068 m (3,500 ft)	1646 m (5400 ft)	1658 m (5440 ft)	1686 m (5534 ft)
% of Snowmaking		40%	Patching only	75% of south face	Not required	minimal
Trails % Begin/ Int/ Adv.	20/45/35	15/55/30	30/40/30	25/45/30	20/50/30	30/30/40
Longest Run	10 km (6 miles)	5 km (3 miles)	4.86 km (3.02 miles)	8 km (5 miles)	5 km (3 miles)	5.6 km (3.5 miles)
Avg. Annual Snowfall	7 m (23 ft)	4.5 m (15 ft)	8.75 m (29 ft)	3.6 m (11.8 ft)	10 m (33 ft)	4 m (13 ft)
Lifts	5	10	10	10	12	8
Hourly Lift Capacity	3,000 p/h	7,600 p/h[51]	13,716 p/h	16,920 p/h[52]	20,000 p/h	
Average Opening Day	Mid Dec	Early Dec.	Late Nov.	Early Nov.	Mid Nov.	Nov.
Average Closing Day	Mid April	Mid April	Late April	Mid May	Late May	April
Adult Lift Price Daily 2002/03	$49.75	$52.00	$56.00	$57.00	$59.00	$54.21

[50] Added a new high speed quad chair and 60 hectares of terrain in 2003.

[51] Two new quad chairs and expanded snowmaking will be installed for the 2003/04 ski season, the hourly lift capacity will rise.

[52] New 6 passenger chair in 2003.

Table 6.51: Regional Ski Hills

	Kimberley	Fairmont Hot Springs	Norquay	Fortress Mountain	Nakiska
Nearest Community	Kimberley	Windermere	Banff	Canmore	Banff
Distance from Local Community	2.43 km (1.51 miles)	24 km (15 miles)			83 km (51.6 miles)
Driving Time from Local Community	5 min.		10 min.		
Distance from Calgary	425 km (264 miles)	300 km (186 miles)	138 km (86 miles)	113.4 km (70 miles)	138 km (86 miles)
Skiable Acreage	728 ha (1800 acres)	24 ha (60 acres)	77 ha (190 acres)		
Vertical Drop	751 m (2463 ft)	305 m (1000 ft)	503 m (1650 ft)	329 m (1082 ft)	735 m (2412 ft)
Peak Elevation	1982 m (6500 ft)	1585 m (5200 ft)	2133 m (7000 feet)	2369 m (7775 ft)	2260 m (7415 ft)
Bottom Elevation	1230 m (4035 ft)	1280 m (4200 ft)	1636 m (5350 ft)	2040 m (6692 ft)	1525 m (5003 ft)
% of Snowmaking	10%		90%	60% of front face	85%
Trails % Begin/ Int/ Adv.	20/45/35	25/60/15	11/45/44	20/55/25	
Longest Run	6.4 km (3.97 miles)	1.82 km (1.1 miles)		2 km (1.25 miles)	3.3 km (2 miles)
Avg. Annual Snowfall	4 m (13 ft)	2.3 m (7.5 ft)	3 m (9.8 ft)	6.3 m (21 ft)	2.5 m (8.3 ft)
Lifts	10	2	5	6	5
Hourly Lift Capacity	10,012 p/h		7,000 p/h[53]	8,400 p/h	8,620 p/h
Average Opening Day	Mid Dec	Nov	Dec.	Early Nov.	Early Dec.
Average Closing Day	Mid April	April	April	Late April	Mid April
Adult Lift Price Daily 2002/03	$46.75	$35.00	$49.00	$33.65	$45.00

[53] New 6 passenger chair in 2003.

6.5.9.2 Competitive Summer Sightseeing Lifts

Table 6.52: Summer Sightseeing Lifts

	Jasper Tramway	Lake Louise Lift and Gondola	Sulphur Mountain Lift	Kicking Horse Resort Gondola
Lift Type	Tram	Chairs, Bubble Cars & Gondolas	Gondolas	Gondolas
Estimated # of visits/ year	170,000	100,000	600,000	100,000
Number of cars	2	50	40	40
People/car	30	4	4	8
Travel time	7 mins.	12 mins.	8 mins.	12 mins.
Elevation Gain	973 m (3193 ft)	442 m (1450 ft)	698 m (2292 ft)	1157 m (3796 ft)
Altitude at Upper terminal	2500 m (8202 ft)	2057 m (6749 ft)	2236 m (7336 ft)	2347 m (7700 ft)
Operating season	April to October	June 1 to October 1 for Summer Tourism	Year round except 2 weeks in Jan.	June – September for Summer Tourism
Adult ticket (2003)	$20.00 (incl. GST)	$19.95	$21.50	$17.00

6.5.9.3 Competitive Summer Skiing Lifts

6.5.9.3.1 Summer Skiing Facilities in Canada

There are no year-round ski facilities in Canada. Only one resort in British Columbia (and in all of Canada) offers some summer glacier skiing through July; it is the most prominent ski area, the Whistler/Blackcomb complex:

1) Blackcomb Mountain attracts approximately 24,000 visitors over the summer months for skiing;

2) The usage of the quad chair lifts for summer sightseeing in the Blackcomb ski area attracted approximately 61,000 visitors from June 15 through to September 1, 1990.

4) Facilities are extremely limited, consisting of 2 short T-bar lifts on marginal snow fields.

5) Visitations for summer sightseeing and glacier skiing in this area are considerably less than for winter skiing. This is opposite than in the Rocky Mountains, where visitations are maximum for summer sightseeing. Whistler Resort generated $440 million in tourist expenditures in winter 1993/94, and only $107 million in summer 1993.

6) Rain is a problem for Whistler/Blackcomb even in winter. In the summer,

skiers can be completely drenched by heavy rain pouring over the glacier area and effectively closing skiing facilities.

7) Normally the month of August is not available for skiing because of lack of snow and unsuitable weather, rain and heat. Skiing then closes until the end of November.

8) Top elevation at Blackcomb is 2300m. This compares poorly with European alpine resorts with summer skiing at top elevations on average between 3000m and 3400m, exactly like at Glacier Dome (3000m) and Jumbo Mountain (3400m).

- Total Area: 112 acres / 45 hectares
- Top Elevation: 7642 ft / 2330 m
- Lift Serviced Vertical: 685 ft / 209 m
- Exposure: northwest
- Average Slope: 17 degrees
- Terrain: extremely varied, including groomed terrain, mogul lanes, half pipes and terrain park
- Terrain Park & Pipe: between 4-6 rails/jibs, 2 spine jumps, halfpipe
- Food & Beverage: Horstman Hut is open
- Lifts Available on Glacier: 2 Dopplemyer T-bars: Horstman and Showcase
- Travel Time From Base: 45 minutes to 1 hour. Upload starts at 10:00am at the Wizard Express, base of Blackcomb.

9) In order to access the glacier, skiers & riders must upload on the Wizard and Solar Coaster Express chairs, and then transfer to a bus that travels along Expressway to the base of the 7th Heaven Express. Once at the top of the 7th Heaven Express, skiers & riders can access the Horstman Glacier. Skiers & Riders take the same route to get back down, or can use the skiout from the glacier to the top of the Solar Coaster as long as snow conditions permit. It takes approximately 45 minutes to an hour to reach the glacier.

Canada (1 summer ski area + occasional summer heli-ski/ catski operations)

Whistler-Blackcomb, British Columbia

- 2 lifts, open only through July
- 2,330m/ 7,642ft. elevation
- primarily used for freestyle skiing/snowboarding camps and clinics

6.5.9.3.2 Summer Skiing Facilities in the United States

Mt. Hood, Oregon, notwithstanding its lack of a glacier, is the only year round skiing facility in North America. Timberline's Palmer Snowfield is considered a mecca for Americans for serious summer ski training. While not a glacier, the temperatures dip below freezing at night, giving solid snow at first run (7am) but softening quickly as the summer sun rises, so skiing is only offered until 1:30 pm. Timberline operates year round, with the exception of a short closure in September for lift maintenance.

Mt. Bachelor, also in Oregon, offers limited skiing through June.

<u>United States</u> (1 summer ski resort, several summer ski camps)

Timberline, Oregon:

- 2 lifts
- 2,603m/ 8,540ft. elevation
- Famous Timberline Lodge (Jack Nicholson in *The Shining*)

6.5.9.3.2 Summer Skiing Facilities in Europe

Compared to North America's two year round ski lifts, there are over 100 ski lifts available for year-round skiing in Europe.

Summer skiing in the Alps is one of the most popular activities at the resorts that have access to it, although it is limited by available facilities and by overcrowding. Americans and Canadians have utilized the Alps for training in summer since the early 1960s.

The best known area since the beginning of summer skiing by means of lifts over glaciers is probably the Plateau Rosa at Cervinia. This area has now expanded with access from Zermatt through the Klein Matterhorn aerial tram, and it offers the best overall glacier skiing experience, with a large number of lifts and with the largest vertical drop. Two aerial trams, Cime Bianche to Plateau Rosa and Trockner Steg to Klein Matterhorn, serve the summer ski runs in addition to a large number of surface lifts. Sightseeing is also extremely popular and competes with skiing for the use of lifts, creating noted line-up conditions.

This is the area that initiated the world famous "Kilometro Lanciato" summer ski race, made popular among Canadians several years ago when Steve Podborski won. It has a popular and active ski school.

In Europe there are those who maintain that there is no better way to learn to ski than on the gentle slopes of a glacier in the sun of the summer, where one is relaxed and with warm muscles. This has created a sort of summer skiing legend that is still unknown elsewhere.

The Mont Blanc area of Courmayeur and Chamonix offers summer skiing at the Grand Flambeau, renowned worldwide for its spectacular beauty. But here the competition from sightseers from all over the world is such that the lift companies seem to have mixed feelings about serving the skiing public. Line ups of two hours or longer to reach the summit have become a known complaint. In addition the local clientele complains that summer glacier surface ski lifts here have a tradition of frequent service and operational closures.

Passo Stelvio is one of the most successful and famous summer ski resorts. It operates in **summer only**, due to its difficult access road. It started as a ski training camp operated by the Pirovano couple - racers and mountain climbers who took over the Rifugio Livrio mountain hut in the early 1950's. It became a success story. It generated the well known Ski Club Pirovano and numerous and expanding sporting activities. Today Passo Stelvio boasts three independent ski schools, four hotels, an estimated bed capacity of 5,000, an aerial tram, and a dozen of chairs and surface lifts. It operates on fully prebooked and prepaid ski weeks. Access is very difficult by European standards, being by bus or car only, through the winding roads of the lake region in Northern Italy and afterwards through one of the most famous hair-raising alpine mountain roads. The nearest major city is Milan, some five hours away.

Probably because of the early experience and success of summer skiing at the Plateau Rosa and at Passo Stelvio, no country in Europe has more avid summer skiers than Italy. This has expanded across the alpine borders and now Les Deux Alpes in France has become the newest success story in summer skiing, capturing and expanding a good segment of the Italian clientele as well as the rest of the European community. Les Deux Alpes offers very well organized summer skiing, served by a variety of lifts, including access by fast gondolas and by an underground cable car. Les Deux Alpes is unique also because it offers exceptionally good windsurfing on the lake, with a large and renowned school. Les Deux Alpes is rather remote by European standards, requiring a trip of over three hours from the nearest major cities, and about five hours from Paris or Milan.

A number of ski resorts offer access to summer and glacier skiing in other areas of the Alps and Scandinavia, from France to Austria to Norway, without achieving the notoriety and the facilities of those described above. The following are highlights of some European resorts that offer summer and glacier skiing possibilities:

France (6 summer glacier ski areas)

Alpe D'Huez:

- 3 lifts, 3 km of trails
- 3,350 m/ 10,991 ft. elevation

Les 2 Alpes:

- 17 lifts
- 3,600 m/ 11,811 ft. elevation
- the Girose and Mont de Lans glaciers offer some of the most extensive summer skiing in Europe

Tignes:

- Up to 50 km of trails
- Tignes offers a minimum 1,000 metre vertical for at least 8 months of the year
- 3,500 m/ 11,483 ft. elevation

Switzerland (7 summer glacier destinations)

Les Diablerets (Gstaad):

- 4 lifts, 15 km of trails
- 3,000 m/ 9,843 ft. elevation
- reopened in 2000 after a massive upgrading two new cable cars and mountain restaurant at the top

Saas Fee:

- 5 lifts, 15 km of trails
- 3,600 m/ 11,811 ft. elevation
- a summer training ground for national ski teams, the area is accessed by the world's highest underground railway and cable car

Zermatt:

- 9 lifts, 25 km of trails
- 3,900 m/ 12,795 ft. elevation
- Zermatt has Europe's highest summer skiing (between 2,939 and 3,900 metres) with more skiing in summer, over a bigger vertical, than most resorts in North America have in winter; in British Columbia, only Whistler-Blackcomb, Kicking Horse Mountain Resort, and Panorama have a bigger vertical in winter, than Zermatt has in the summer
- 3 more lifts servicing large glacier terrain located on the Italian side of the border (Breuil-Cervinia)
- framed by the Matterhorn, the most famous "rock" in the Alps

Italy (5 summer glacier ski areas)

Passo Stelvio (Stilfserjoch):

- 8 lifts, 86 runs
- 3,450 m/ 11,319 ft. elevation
- open for summer skiing only!
- operates exclusively on pre-booked visits; its current bed base is almost equal to the total planned bed base for Jumbo Glacier Resort at full build out
- The bottom lift station at Passo Stelvio is the highest lift base in Europe (2,760m/ 9055 ft.)

Breuil – Cervinia:

- 3 lifts
- 3,479 m/ 11,414 ft. elevation (Plateau Rosa)
- summer ski area shares border with Switzerland (Zermatt) where elevation rise continues to 3,900 m/12,795 ft., and a further 9 lifts are available for summer skiing

Austria (8 summer glacier ski areas)

Hintertux:

- 8 lifts, 12 km of trails
- 3,250 m/ 10,663 ft. elevation
- the Tux glacier is one of Europe's largest year-round skiing operations serviced by high-tech lifts, including the Glacier Bus 3 gondola

Sölden:

- 10 lifts, 29 km of trails

- 3,772 m/ 12,375 ft. elevation
- Either the Rettenbach or Tiefenbach glaciers, linked by Europe's highest road tunnel (at 2,800 metres) are open every day of the year.

Stubai:

- 3,210 m/ 10,531 ft. elevation
- 3 lifts
- the Stubai is one of the world's largest summer ski areas

Norway (5 summer ski areas)

Stryn Sommerski:

- 3 lifts, 10 km of trails
- open in summer only, the glacier and ski slopes are an hour away from the town of Stryn, located on Norway's west coast, north of Bergen
- notwithstanding its particularly remote location (requiring at least one day's travel from Oslo), Stryn has a cult following among the winter sports elite from all over Europe, including top snowboarders and Alberto Tomba

Exhibit 6.4: Alpe D'Huez Summer Ski Area, France

Exhibit 6.5: Tignes Summer Ski Area, France

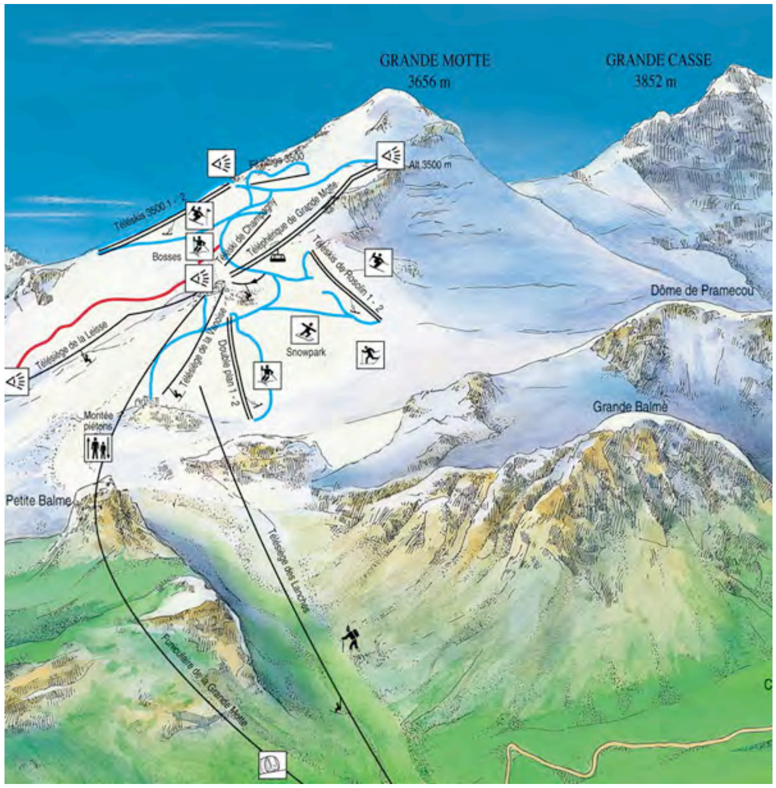
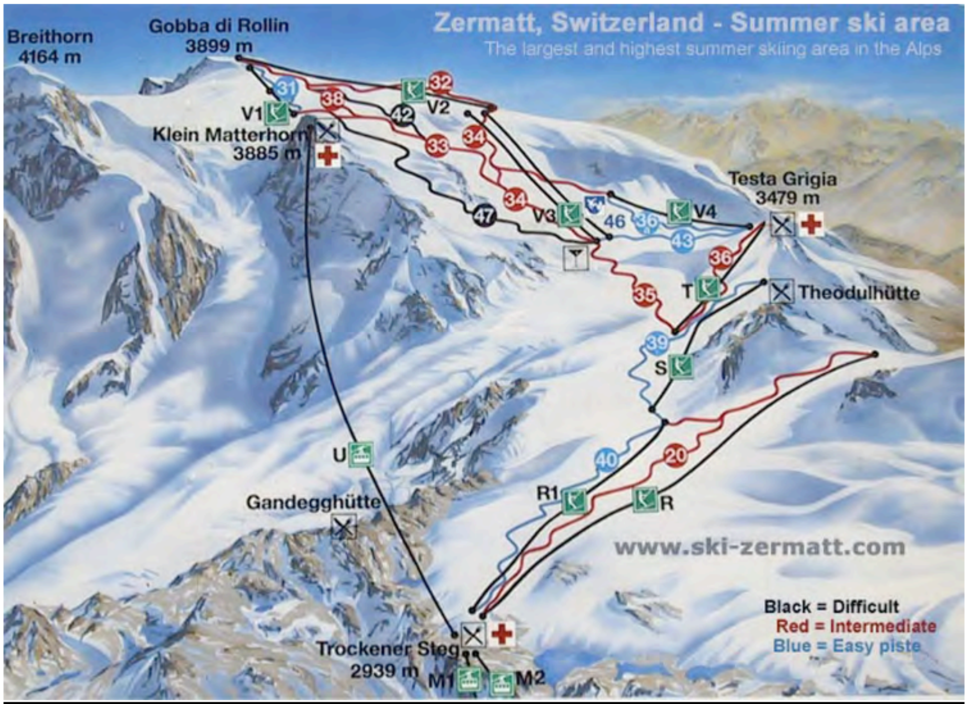


Exhibit 6.6: Les Diablerets Ski Area, Switzerland

Exhibit 6.7: Les Diablerets Summer Skiing, Switzerland

Exhibit 6.8: Summer Ski Area – Zermatt, Swtizerland



Zermatt has Europe's highest summer skiing (between 2,939 and 3,900 metres) with more skiing in summer, over a bigger vertical, than most resorts in North America have in winter; in British Columbia, only Whistler-Blackcomb, Kicking Horse Mountain Resort, and Panorama have a bigger vertical in winter, than Zermatt has in the summer

Exhibit 6.9: Summer Ski Area – Breuil-Cervinia, Italy

The Cervinia summer ski area spans an international border and connects to Zermatt, Switzerland. This is the largest summer ski area in the world. Its vertical drop in summer surpasses that of most North American resorts in winter.

Exhibit 6.10: Summer Ski Area – Hintertux, Austria

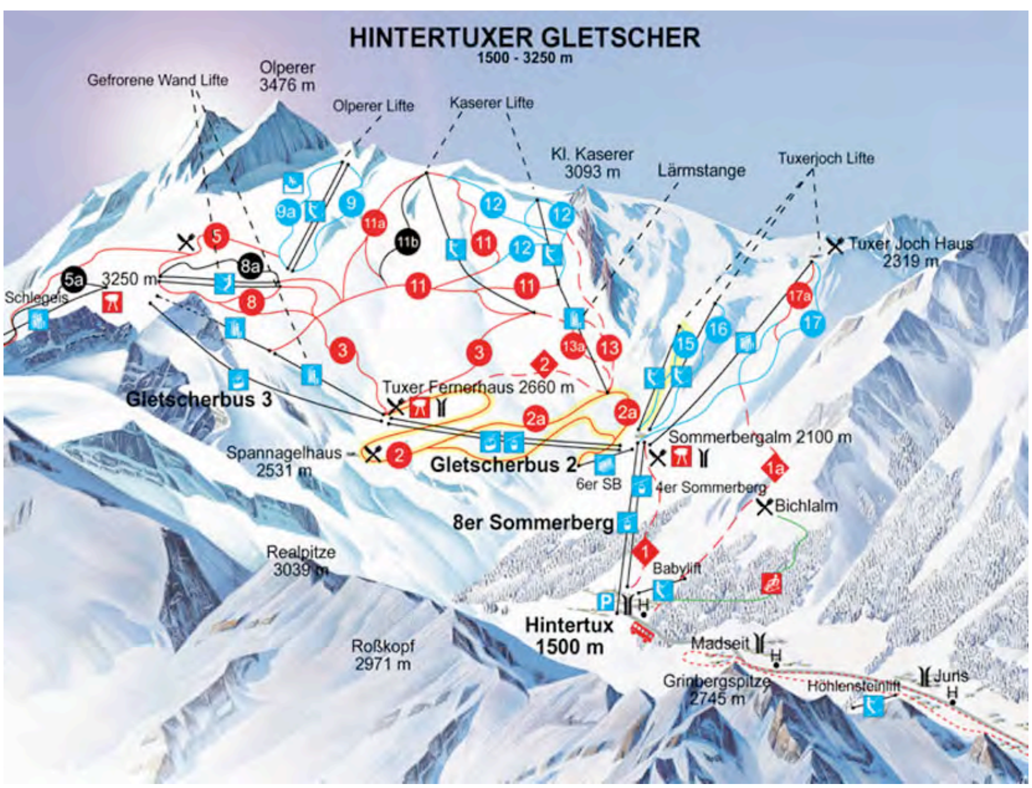


Exhibit 6.11: Summer Ski Area – Stubai, Austria

Exhibit 6.12: Summer Ski Area – Stryn Sommerski, Norway

6.5.10 Conclusion

World demand for scenic access and for prime ski areas, in particular for high quality skiing experiences, appears to be growing. Heli-skiing, European glacier skiing and trends in world tourism indicate that there is a substantial market for a resort with access to glacier skiing, which is not available in North America at this time. The proposed resort and its location seem to be ideally positioned to respond to a substantial and unique market niche.

The summary of research available to date regarding both the general visitor market for sightseeing and the ski market indicate that the numbers of visitors and of skiers in the market for the proposed resort are much larger than needed to fill the resort's 5,502 beds visitor beds at buildout. The resort's market niche will not dilute the existing market of nearby resorts, which are competing more on a regional basis than on a worldwide market share basis.

The data reviewed above indicate also that new facilities capable of captivating the imagination and the interest of the world tourist market are essential for our Province and for Canada in order not to recede in the international market share.

As a final consideration, the unsolicited and unprecedented interest shown by the international news media for the proposal appears to be one more confirmation of the extraordinary market interest for this type of resort.

7. FIRST NATIONS

7.1 INTRODUCTION

The Environmental Assessment Certificate granted in October 2004 required the proponent to try to conclude an impact management and benefit agreement with all First Nations during the Master Plan process. This work has been underway following the resumption of the CASP process in November 2005. Meetings were held starting in the winter of 2006, and on-going discussions have continued since. It is anticipated that the good will demonstrated by the proponent in these relationships will eventually result in the support of and involvement in the project by all interested First Nations and it is expected that an agreement will be finalized with all First Nations affected by the project before the conclusion of the Master Development Agreement in 2007. The Ktunaxa Nation and Shuswap Indian Band have provided the following statements to be included in the Master Plan:

7.2 THE KTUNAXA NATION

The Ktunaxa Traditional Territory covers approximately 70,000 kilometres of south-eastern British Columbia. The Ktunaxa, as the original inhabitants, have occupied the region since early post-glacial time. The Ktunaxa relationship to the land is supported by their language, oral history, legends, archaeological record and ecological knowledge. The Ktunaxa language is a linguistic isolate – a language that is not related to any other language. The archaeological record in the region extends back 10,000 to 20,000 years. The Ktunaxa Nation collectively holds a vast ecological knowledge of the region that is reflected in an extensive nomenclature of plant species, place names, oral history and legends throughout the Traditional Territory.

The Ktunaxa Nation has political, social, economic, cultural, spiritual and historical connections and attachments to their Traditional Territory. These attachments pre-date European contact and continue today. The Ktunaxa Nation asserts aboriginal rights and title, ownership and jurisdiction over the Traditional Territory, which includes the Jumbo Pass and Jumbo Valley. The Ktunaxa have occupied and used their Traditional Territory since time immemorial and continue to occupy and use the lands and resources within that territory.

The Ktunaxa Nation have always governed themselves and used the land according to their cultural practices, customs, traditions, values and teachings. The Ktunaxa have never relinquished or surrendered the lands and resources within their Traditional Territory and continue to assert existing title and rights.

Since July 2006, the Ktunaxa Nation has been engaged in a consultative relationship with the Province of British Columbia regarding Jumbo Glacier Resort. As well, since mid 2007, the Ktunaxa Nation has been discussing impact management and mitigation options, benefits and strategies with the proponent, Glacier Resorts Ltd. These options and strategies may be negotiated and then formalized into subsequent agreements pending further consideration by the Ktunaxa Nation leadership and people. All final agreements will be incorporated into the Master Development Agreement between Glacier Resorts ltd. and the Province.

7.3 SHUSWAP INDIAN BAND

The Shuswap Band as a member of the Shuswap First Nation has carried out traditional First Nation activities in the region near and surrounding the Jumbo Glacier project well before European contact. There is strong 3rd party archeological evidence in the regions that, in conjunction with adjacent First Nation traditional stories, supports the use and occupation of the Columbia Valley regions by the Shuswap First Nation people. The regions of south-eastern British Columbia show use and occupation of the area by a number of First Nations and such shared use is confirmed by treaties that include the Shuswap Indian Band members and that were substantiated by the Governments of Canada and the U.S. in the 1800's.

The Shuswap Indian Band has demonstrated its strategic interest in the project by working closely with the Resort developers and the Province of BC from the initial stages of the project and through the Government of BC's Environmental Review process. Through that process, the Shuswap Indian Band has demonstrated its traditional interest in the resort area by confirming that it has numerous trap line interests (as registered with the Province of British Columbia), surrounding the project area and that the pass adjacent to the Resort and as confirmed by the Province of BC's name registry, was originally known as Shuswap Pass (now known as Earl Grey Pass). The use and occupation of this pass by the Shuswap people was also confirmed by the Arrow Lakes First Nation people (now residing in Colville, Washington, USA). The pass was known as the Kinbasket Trail, named after the Kinbasket family of the Shuswap First Nation who now occupy the Shuswap Indian Band Reserve, I.R. #0. The reserve is located at the Athalmer Road exit off of Highway 93/95 and is the primary access to the Jumbo Glacier Resort Project.

The Shuswap Indian Band and its wholly owned Kinbasket Group of Companies have demonstrated the administrative and business capacity to carry out self-government and economic development activities. As a self-governing First Nation, Shuswap Indian Band has a responsibility to manage and protect its traditional titles and rights in the lands associated with its current and traditional use and occupation.

Since the early 1990's, the Shuswap Indian Band has been engaged in consultation and negotiations with Glacier Resorts Ltd. and the Province of BC on matters pertaining to the development and occupation of the Crown lands associated with the Jumbo Glacier Resort project. All the parties have maintained the highest level of professionalism throughout the many years of working together. Benefits accruing to the Shuswap Indian Band are to mitigate, compensate or to tangibly demonstrate economic participation in any development activities arising either directly within the lands provided to the project by the Crown, i.e. sold, leased or permitted; or indirectly by way of creating access to the project or creating an impact to near or adjacent lands. These benefits are to be finalized through negotiations with the Shuswap Indian Band and incorporated in the final Master Development Agreement between the Province and Glacier Resort Ltd.

8. PLANNING CONTEXT & RESORT APPROVAL HISTORY

8.1 MASTER PLAN AND MASTER DEVELOPMENT AGREEMENT

This Master Plan was originally prepared in response to the Interim Agreement in 1993. It was updated and modified in response to the information gathered during the CORE process in 1995 and through the environmental assessment process concluded in 2004. It was re-issued in 2005 and updated again in 2007. It has evolved into a comprehensive document that covers all aspects of the project from an overall development planning point of view.[1]

The Master Plan contains the necessary information for a comprehensive Official Community Plan (OCP) to be used by the local government and is the basis for zoning the development as a Comprehensive Development Zone in multiple phases.

Once a Master Plan is approved it becomes the legal document for the control that is at the basis of the use of the land, and it is an essential component of the Master Development Agreement (MDA), which is the contract between the Province, as a landowner and future landlord of the Controlled Recreation Area defined in the Master Plan, and the proponent, which will become the developer.

The Master Development Agreement gives standing to the proponent before it has the right to acquire land, which remains property of the Crown. The MDA is a large contractual document that defines the rights of the Province and of the developer, and allows the Province to maintain control over the development. The Master Development Agreement contains all the undertakings of the developer in a legal contract that covers the life of the project.

8.2 MOUNTAIN RESORT ASSOCIATIONS ACT & COMMUNITY SERVICES STATUTES AMENDMENT ACT

Mountain resorts are typically developed in locations that are not serviced by any local government and therefore need to develop their own services. In addition, local government policies and by-laws are generally oriented in the direction of an urban model that is unsuitable for the image and function of mountain resorts.

Consequently, in 1975 it was deemed necessary to create the special Mountain Resort Municipality of Whistler, and twenty years later the same principles were utilized to create a Mountain Resort Associations Act that would complement the CASP policy and could facilitate a similar governance model for all the resorts of the Province.

The Mountain Resort Associations Act allowed the creation of a Mountain Resort Area that becomes regulated by the Province under the approved Master Plan and Master Development Agreement, and that becomes capable of creating its own utilities and services.

At the time, the Minister could create a Mountain Resort Area at the request of a local/regional

[1] Some of the information has been left as contained in the previous master plan submissions in 2003 and in 2005, if it was not considered necessary to complete repeated updates.

government.

In 1995, Sun Peaks Resort was transitioned into the Mountain Resort Associations Act with the creation of a Mountain Resort Improvement District. A Mountain Resort Area designation was created for Kicking Horse Mountain Resort in 2000. The RDEK requested such designation for the Jumbo Valley area in September 1996, but the Minister at that time chose to wait until the proponent would obtain an Environmental Assessment Certificate before moving forward on the RDEK's request.

The proponent received an Environmental Assessment Certificate for Jumbo Glacier Resort in October 2004. In February 2005, however, the RDEK rescinded its resolution of September 1996, and voted not to participate in the provincial Master Plan and Master Development Agreement process. In March 2006 the RDEK refused a motion by one of its Directors to request the Province to create a Mountain Resort Area and municipality for the project.

In March 2007 a new Act, the Community Services Statutes Amendment Act (Bill 11 – 2007), was passed by the B.C. Legislature, streamlining and updating the process originally envisioned in the 1995 legislation.

The provisions of the new Act (Bill 11) are comprehensive and complex and affect many aspects of resort development. Bill 11 also attends to some fine technical and housekeeping matters in addition to amendments that would affect aspects of mountain resort development such as this project. Of most relevance, however, are amendments to the Local Government Act, the Community Charter, the Mountain Resort Associations Act and the Hotel Room Tax Act, among others. The amendments provide for the designation of new "resort areas" and "resort regions", power to collect development cost charges (DCCs) to finance employee housing in resorts, and provisions for additional Hotel Room Tax Act revenues by way of a new tax in a prescribed "resort area".

Mountain resort municipalities remain a form of municipality that can be created by letters patent, if there are ski lift operations and other facilities or if there is an agreement with the government for ski lift operations (such as a CASP Master Development Agreement). A mountain resort municipality may have special powers and exemptions from statutory provisions.

By way of detail, Section 16 of Bill 11 amends Section 11 of the Local Government Act, which deals with the incorporation of a "mountain resort municipality". The changes are inserted within the existing text. Section 11 of the Local Government Act indicates that a "mountain resort municipality" is indeed a type of "municipality".

The letters patent for a mountain resort municipality can also provide for appointments to the Council until the general voting day for the first election of Council members and can also provide for council members to be appointed to Council by the Province (apparently this was the model used in the early days of Whistler).

Under the amendments to Section 13, the Minister can also provide for any size of Council. The letters patent may also require establishment of a resort advisory committee.

A mountain resort municipality may exercise broad development permit powers under section 920(8) of the Local Government Act (Development Permits) that include power to establish form and character requirements. Therefore, as amended by the addition of a new section 919.1(1) (g), a development permit area in a mountain resort municipality can reinforce design guidelines under amended section 920:

> 920(8) If land has been designated under section 919.1 (1)(d), (e) (f), or (g) a development permit may include requirements respecting the character of the development, including landscaping, and the siting, form, exterior design and

finish of buildings and other structures.

Section 17 of Bill 11 deals with land use matters within the amendments to Section 13 of the *Local Government Act*. First, the letters patent may require the adoption of an official community plan (OCP) by the mountain resort municipality within a specified period. The OCP requires the approval of the Minister. This would allow the Miinister to ensure consistency with a CASP Master Plan and MDA, documents that are the result of the most extensive consultation and participation process available in the Province. Currently there is no mechanism to require a local government OCP to comply with a CASP Master Plan.

The letters patent for a mountain resort municipality may provide that the new Section 919.1 of the *Local Government Act* applies so as to allow for special “form and character” requirements (more than guidelines) within a development permit area, an important consideration for this mountain resort project.

Another planning tool in Bill 11 is the concept of phased development agreements (Section 23 of Bill 11). New sections 905.1 to 905.5 of the *Local Government Act* can have application to the development in a mountain resort municipality or other local government. This appears to expand on the provisions for amenity zoning and housing agreements in the *Local Government Act* by allowing for a phased approach to development and provision of amenities, including specific reference to the filing of section 219 covenants for that purpose. These new provisions import some certainty for a developer and limit unilateral change by local government by crystallizing certain development rights under referenced sections of a zoning bylaw, in a manner similar to the former concept of a land use contract. The new phased development agreement tools are consistent with the phased development concept for Resort Master Plans and Master Development Agreements under CASP.

While letters patent can deal with special exemptions for a mountain resort municipality, there will likely continue to be many areas where cooperation with regional district and nearby municipalities is desirable and worthy of implementation for mutual benefits, such as with respect to any service provided by the regional district or nearby municipality by contract, preparation of regional growth strategy plans, debenture bylaws for financing for services infrastructure, and the general powers of requisition related to taxes to be applied through municipal property taxes for general administration and services. The resort municipality, however, may delegate its representation in the regional district to one of the nearby municipalities and not require a seat on the RDEK Board of Directors.

Bill 11 addresses also important issues under the Resort Areas designation: A “resort area” designation has an entirely new meaning as a new term under the *Hotel Room Tax Act* that triggers the new levy on the sale of accommodation in a resort area. A “resort area” must be one of a “resort region”, a “mountain resort municipality”, or Whistler. The designation of a “resort area” is up to the minister. The new levy will be payable to and administered by a “resort body” which may be prescribed under the *Hotel Room Tax Act*.

In summary, Bill 11 provides more tools to facilitate provincial resort development programs for resorts of all kinds, including Jumbo Glacier Resort.

The Province should be commended on such a thorough package of amendments that will coordinate and accommodate balanced new development or expansion of various types of resorts in the Province, and facilitate the conclusion of the long process for this project, where the completion of the *Environmental Assessment Act* process had been expected to provide a green light.

The proponent has reviewed available options and has become convinced that the creation of a mountain resort municipality by the Province is the only way to allow the phased implementation of the approved Master Plan within reasonable time. By means of a letter to the Minister, the proponent has asked the Province to create a mountain resort municipality for the project (see Appendix 8-R).

8.3 LAND OWNERSHIP AND ACQUISITION MODEL

The land in the entire study area is provincial Crown land. CASP provides the model policy for future land tenures for the resort. **The Controlled Recreation Area remains Crown land** with a tenure granted to the proponent for the purposes established in the Master Development Agreement.

The land in the right of way of the ski lifts and necessary for the daylodges, parking and generally all recreation operations is covered by a land lease to the proponent. The land lease contains the conditions established in the Master Development Agreement and may be terminated in case of default by the proponent/developer.

The land necessary for the development of the bed base is sold as fee simple land by the Province according to the CASP model to the proponent/developer in proportion to the number of Bed Units required after the construction of each lift. This number and the location of each parcel of land with respective development rights is established according to the approved Master Plan and to the phasing outlined in the Master Development Agreement. Each subdivision plan is approved by the Approving Officer of the MoT, after the servicing plans are approved by the provincial and, if required, local authorities having jurisdiction. The installation and approval of the infrastructure and of the ski lifts is one of the conditions for the purchase of the land parcels by the developer according to the land grants that are made available for the resort base area according to the Master Plan.

8.4 PROVINCIAL POLICY & THE BC RESORT STRATEGY

8.4.1 Overview

Since its inception and initial application, the project has been designed to respond to public policy, including policy documents such as the *Commercial Alpine Ski Policy* (CASP), and government objectives expressed by successive provincial Premiers and Ministers. The promotion of tourism locations in the interior of the Province, capable of expanding the market internationally at elevations that have the certainty of snow and of views that will stand the test of time in an age of global warming, and the creation and improvement of prime, sustainable resort infrastructure, has been a consistent provincial objective.

In February 1993, Premier Mike Harcourt wrote to the project's lead consultant:[2]

> It was nice meeting with you in Davos and having the opportunity to learn more about the impressive Jumbo Glacier Project. I was pleased to note that you have focussed on a beautiful part of our province, and that your plans call for a year round high-class resort. I hope that you will be able to proceed on this project and that, one day, we may see this international venture realized.
>
> May I wish you good luck with the further formal assessment and review of your project.

In July 1996, Premier Glen Clark wrote to the project's lead consultant:[3]

[2] A copy of the letter is included in Appendix 8-A.

[3] ibid.

> I want to take this opportunity to tell you that my government welcomes investment in B.C.'s tourism industry. Tourism plays a significant role in our efforts to enhance B.C.'s competitive strength, and by working together to promote and develop our natural advantage, we hope to maximize job creation to meet our target of 23,000 new tourism industry jobs by the year 2001.
>
> At the same time, my government is cognizant of the need to ensure that B.C.'s resources and environment are sustained and renewed so they can serve this and future generations. Our comprehensive environmental assessment process is designed to achieve that goal in a way that balances the needs and interests of business, the environment and all British Columbians.

In March 2000, Joan Sawicki, the Minister of Environment, Lands and Parks wrote on behalf of Premier Ujjal Dosanjh to reassure the project's lead consultant that there had been no change to the government's position with respect to the Jumbo Glacier Resort project and that the Premier "supports economic development initiatives in the Province of British Columbia that can be shown to be sustainable."[4]

Most recently the provincial government has undertaken a number of steps to further define public policy with regards to tourism and has spearheaded a number of initiatives to benefit and promote tourism including the resort sector. These initiatives have included[5]:

- the 2010 Olympic and Paralympic Winter Games;
- the Spirit of 2010 Tourism Strategy
- the International Trade and Investment to 2010 Strategy;
- the British Columbia Tourism and Hospitality Education and Training Consortium;
- launching of the "British Columbia. Be Here." national and international ad campaign;
- the doubling of Tourism BC's annual marketing budget from $25 million to $50 million, and
- major infrastructure upgrades including planned airport expansions and highway improvements.

The *Spirit of 2010 Tourism Strategy* was announced in the 2003 Speech from the Throne.[6] It included the BC Resort Task Force. Premier Gordon Campbell described the new task force and new resort activity, including this project, in the State of the Province address of February 12, 2003:

> Our B.C. resorts task force is aiming at assuring that we build a network of all-season resorts in all regions of this province, working with resort communities and First Nations alike. Just think of this: the fastest growing economy in our province in the last few years has been the Whistler/ Blackcomb/ Pemberton area. We can do that for other parts of the province as well. Big White, Silver Star, Red Mountain in Rossland, Sun Peaks near Kamloops, Mount Washington near Courtenay, Canoe near Valemount, Jumbo near Invermere, Panorama near Invermere, Kimberley Alpine Resort, Fernie Alpine Resort, Kicking Horse Resort in Golden, Garibaldi, Powder King near Dawson Creek, Hudson Bay in Smithers.

---

[4] ibid.

[5] *BC Resort Strategy and Action Plan* (2004): pages 2 - 4, available online at: http://lwbc.bc.ca/02land/resorts/index.html

[6] http://www.legis.gov.bc.ca/37th5th/4-8-37-5.htm

> All of this activity will take place within an environmental framework that sets an example not just for our country but for the world. We are going to continue to work with Canada on the creation of a new national park in the southern Okanagan and the creation of new marine parks to protect valuable marine assets along our coast. Environmental sustainability and public policy is a critical part of our social and economic future in British Columbia. It will be a keystone of our bid for the 2010 Olympic Games. Working with First Nations, communities and people from all over B.C. and across our country, we are now in a position where we have an opportunity to win the 2010 Olympic and Paralympic Games for British Columbia, for Canada. It's an exceptional opportunity.

The BC Resort Task Force was composed of a Chair (Minister Sandy Santori), a Deputy Minister, a 15-member External Advisory Group and an Inter-Agency Working Group. Its goals were to:

- Enhance resort development and partnerships in B.C.; and
- Identify and eliminate barriers to resort development, creation and expansion.

Although the main focus of attention and investment has been on Whistler, and in a minor way on other existing resorts, public policy clearly encourages the development of a project such as the one described in this Master Plan.

In addition, the City of Cranbrook is counting on projects such as this one to support the utilization of its expanded airport. The EAO, at the conclusion of nine and a half years of review, described the project as being "in the **broad public interest** in that it provides significant economic benefits to government and the region."[7]

8.4.2 BC Resort Strategy

The BC Resort Task Force "undertook an aggressive and extensive consultation process that included fact finding tours by the Chair, meetings with stakeholders, analysis of written submissions, independent studies, and committee meetings."[8] The process generated a report[9] outlining fourteen recommendations and a set of priorities: accelerated policy reform, increased resort development; resort community development, and increased First Nations involvement. Based on these recommendations and in keeping with the goals and vision of the government, the *BC Resort Strategy* was formulated[10]. The *BC Resort Strategy* contains a vision statement, "To develop British Columbia as a world-class all season resort destination" and the following five strategic objectives:

1. Maintain and Enhance British Columbia's Competitive Edge in Resort Development;
2. Increase Resort Development;
3. Support Resort Communities;

---

[7] See item 10 of the *Recommendations of the Executive Director and Reasons for Recommendations* (for an Environmental Assessment Certificate) included as Appendix 1-B.

[8] *BC Resort Strategy and Action Plan* (2004): page 1, available online at: http://lwbc.bc.ca/02land/resorts/index.html

[9] *Recommendations of the BC Resort Task Force* (2004); available online at: http://srmwww.gov.bc.ca/resortdev/rtf_report.html

[10] see *BC Resort Strategy and Action Plan* (2004); available online at: http://lwbc.bc.ca/02land/resorts/index.html

4. Improve Transportation Infrastructure; and
5. Build First Nations Partnerships.

Jumbo Glacier Resort can be seen as the best current response to the *BC Resort Strategy* in British Columbia. In accordance with the above noted vision, this resort will offer a truly "world-class all season resort destination" that will:

1. Maintain and enhance BC's competitive edge by offering the only true year-round skiing opportunity and high elevation glacier sightseeing in North America;
2. Increase resort development in a sustainable manner and in an carefully chosen location that has been comprehensively reviewed under the BC *Environmental Assessment Act*;
3. Support existing regional resort communities, particularly Panorama Mountain Village, by attracting more long-haul travellers to the region;
4. Provide an additional economic impetus for the planned transportation infrastructure improvements in the region; and
5. Ensure First Nations economic and cultural participation in the project.

In summary, CASP and the *BC Resort Strategy* confirm that the Jumbo Glacier Resort project is a unique and ideal response to long term policies of the Province that define the public interest in the development of tourism resorts.

8.5 APPROVAL PROCESS

8.5.1 History of the Approval Process

8.5.1.1 Early Studies & Submission of a Formal Proposal (1989-1991)

Pheidias Project Management Corp. (Pheidias) completed a series of studies in 1989 to identify the ideal mountain resort location in North America. Following an extensive study, the upper Jumbo Valley, providing access to Glacier Dome, Jumbo Glacier, Commander Glacier and Farnham Glacier in the Purcell Mountains of British Columbia was identified as the most suitable location. [11]

During the summer of 1990, on behalf of its client, Glacier Resorts Ltd., Pheidias discussed an Expression of Interest with the B.C. Ministry of Lands and Parks for the development of a ski resort in the upper Jumbo Valley providing access to nearby glaciers for year round skiing. The proponent group was encouraged to proceed with a formal application and in March 1991 it submitted a volume containing a Formal Proposal with conceptual development plans according to the *Commercial Alpine Skiing Policy* (CASP).

[11] The location identified and selected by Pheidias in 1989 was the same location (unknown to Pheidias at the time) identified as most suitable for an "International Class Alpine Destination Resort" by in *The British Columbia Rocky Mountain Tourism Region*, a study prepared under the auspices of the *Tourist Industry Development Subsidiary Agreement* (TIDSA) for the Governments of British Columbia and of Canada and in 1982. See Section 2.7.3.1 of this Master Plan for an overview.

8.5.1.2 Acceptance as an Expression of Interest (1991)

In June 1991 the proposal was formally accepted as an Expression of Interest. It was followed by a public input period focused on the land use issue, organized by B.C. Lands during the summer of 1991.

The proponent was not permitted to participate and was not given formal proponent status by the Province, which postponed the Formal Proposal and proponent selection process.

According to CASP, the Province should have proceeded to a Proposal Call and the selected proponent was to present a Master Plan for public review. Instead, the Province initiated a public process on the question of land use.[12] **The Regional District of East Kootenay had noted that it would be difficult to evaluate the proposal in terms of land use in the absence of a regional plan by the Province**.

8.5.1.3 Public Input Period and a Resolution to Move Forward (1991-1993)

A three-month long public input period was declared by B.C. Lands in the Summer of 1991, lasting till September 30, 1991. It was advertised with an announcement by B.C. Lands in the *Kootenay Advertiser*, the *Cranbrook Townsman*, the *Kimberley Bulletin*, the *Valley Echo*, the *Golden Star* and the *Nelson Daily News* for two weeks, beginning from July 18, 1991. B.C. Lands held open houses in Invermere on September 26th and 27th, 1991. There was an overwhelming response of opinions. Among the participants there were also representatives of the First Nations and of local environmental advocacy groups.

B.C. Lands then decided that on the basis of the initial public input period response and the type of proposal, the project should move forward to the Master Plan stage. A resolution to support moving the proposal to the Master Plan stage was also passed by the District Council of Invermere.

However, B.C. Lands delayed the Proposal Call and proponent selection according to CASP for more than a year, until the beginning of 1993.

In the meantime, through 1992, the Province encouraged the proponent to move forward and confirmed that government policy encouraged the type of project being presented. The proponent continued studies towards the preparation of a Master Plan.[13]

At a meeting held during the World Economic Forum conference in Davos, Switzerland in January 1993, **Premier Harcourt personally confirmed that**

---

[12] This was a deviation from policy at the time.

[13] Government staff made available for reference a May 1983 study by Ecosign Mountain Resort Planners Ltd. of Whistler, BC for Jumbo Glacier Skiing Ltd. of Invermere (John Ritchie and Grant Costello) proposing lift serviced skiing on Farnham Glacier. This study seems to have been done independently and without knowledge of the 1982 TIDSA study mentioned previously. The incidence of at least three studies independently identifying the skiing potential of the area within the same decade is a testament to the unique suitability of the project's location.

provincial policy encouraged the type of project being presented[14].

8.5.1.4 Acceptance of Formal Proposal and Signing of Interim Agreement (1993)

In January 1993, B.C. Lands again advertised the project to request any other expressions of interest regarding the Jumbo Creek valley, with a deadline on February 15, 1993. In the absence of competing proposals, **the Province signed an Interim Agreement with the proponent in March 1993**, selecting Glacier Resorts Ltd. as the sole proponent and confirming the application according to the CASP review process and policy.

However, in 1992 a provincial land-use exercise, the Commission on Resources and the Environment (CORE) , was set in motion. It was decided that final consideration of the Jumbo Glacier Resort under the *Commercial Alpine Ski Policy* (CASP) would be postponed pending the completion of a land-use plan for the Kootenay region by CORE.[15] The project team participated in the CORE public process while continuing to prepare a Master Plan under CASP and requesting formal sole proponent status according to CASP.

8.5.1.5 The CORE Land Use Review Process (1993-1994)

CORE was the most comprehensive land use review exercise ever undertaken in the Kootenays by the Province, involving all stakeholders and levels of government. **The Commissioner, Stephen Owen, was the former provincial Ombudsman**. **Jumbo Glacier Resort was the only site-specific land use issue reviewed by and decided under CORE**.

The project team participated as a member of the Commercial Tourism caucus at the East Kootenay CORE Table and as a member of the Land Use Designation Committee.

CORE was a structured public process, during which the Jumbo Glacier Resort project was specifically discussed several times; at one point Local Government Table members put forward a motion, unanimously carried, in support of the future processing of the application, when it appeared that a potential definition of settlement could block the application.

The CORE process was not void of controversy. Strong-minded individuals, including government staff, confronted the proponent's representatives, but the Province confirmed that the CORE approval was the all-important approval for the project.

On December 31, 1993, in a letter to Pheidias Project Management Corporation (see Appendix 8-N), referring to the behaviour of certain government staff opposed to the project, Dr. Thomas Gunton, Deputy Minister of Environment Lands and Parks, stated

[14] See letter in Appendix 8-A.

[15] The de-facto moratorium was also contrary to policy. The proponent was advised that the project could continue through the CASP approval process only if a favourable CORE decision would occur. The project team was encouraged to participate as an observer at CORE and to continue to undertake planning and environmental studies for the Master Plan process at Glacier Resorts Ltd.'s risk.

that "**As you are aware, the recommendations of the C.O.R.E. table will be the most significant factor in the approval or rejection of this project**." [emphasis added]

In November 1994, following 18 months of public meetings and the completion of the land use designation exercise (which resulted in an eighteen to four vote in favour of the project), a formal favourable response to the land use question was given by CORE (see Appendix 8-K).[16]

18 sectors voted in favour of the land use designation favouring the creation of the proposed ski resort in upper Jumbo Valley and 4 opposed it. The majority of the 18 favourable sectors requested an integrated use designation specifically allowing the proposed resort while the four opposed wanted a special management designation prohibiting ski resorts. The Commissioner compromised by choosing the minority special management designation but giving a clear go-ahead to the resort use subject to the environmental review. In the Special Management designation for the Jumbo Valley, **CORE gave tourism resorts the highest value, which was ahead of Grizzly Bears, which were given a high value.**

The Commissioner acknowledged that the proponents' supporters (a large majority) wanted the project to go ahead following CORE and that the environmental review would cause another delay. In fact, the majority of the stakeholders involved in the CORE process felt that environmental interests were given a disproportionately high representation at the CORE Table. They produced an independent land use recommendations report in March 1995. This report, entitled *Land Use Plan by the Coalition for an East Kootenay Solution*, reduced the land designations for conservation and special management (the CORE East Kootenay plan contained 16.5% of the land in protected areas, a much higher designation level than the provincial policy target of 12%) and assigned an Integrated Use designation to the Jumbo Valley.

Provincial staff suggested, however, that the project be reviewed under what was then proposed new legislation – the *Environmental Assessment Act*. The proponent objected.[17]

Following the proponent's objection to the introduction of the new *Environmental Assessment Act* (EA Act) review process, Commissioner Owen promptly wrote a letter (on December 13, 1994 – see Appendix 8-L) to the Minister of Environment, Lands and Parks and to the Minister of Employment and Investment, clarifying that a public process such as CASP would be considered equivalent to the EA Act process and that the Commissioner did not intend to require a new process:

> This recommendation assumes that the environmental assessment

---

[16] Recommendation 75 of the CORE East Kootenay Land Use Plan read as follows: "The Commission recommends that: The approval process for a resort development in Jumbo Creek include an environmental assessment under the Environmental Assessment Act."

[17] In September 1993 the proponent had requested and obtained assurance in writing from the Province that should the CORE process result in a favourable land use decision, the proponent would be allowed to resume and complete the CASP process without delay, and the project would not be subject to any new and untried review processes.

process under the *Environmental Assessment Act* will be:

- Imminently available to begin reviewing proposals
- Efficient in providing a one-window review within strict time limits, and
- Effective in providing public participation and the consideration of the full range of values that may be affected by the proposed development.

We have since been advised that the design and detailed operational procedures of the environmental review process have not yet been finalized and that the recommended EAA assessment for the Jumbo Creek development proposal would not likely commence for some time. **In the circumstances we would have no objection with the assessment of this proposal proceeding under existing project review processes, so long as they met the conditions of efficiency and effectiveness mention above.**

[emphasis added]

Nevertheless, review of the Project under CASP was again put on hold pending completion of the EA review under the *Environmental Assessment Act*, R.S.B.C. 1996.

8.5.1.6 Kootenay/Boundary Land Use Plan (1995)

In March 1995, the Province announced the *Kootenay/Boundary Land Use Plan* (KBLUP), which identified ski resort development as an acceptable land use of the upper Jumbo Creek valley (see Appendices 8-J and 8-K).

8.5.1.7 Confirmation of Land Use Decision and Initiation of the EA Act Review Process (1995)

On April 10, 1995 the Province announced the approval of the land use decision for Jumbo Glacier Resort via a press release, and that the project was to be transitioned into the *Environmental Assessment Act* (EA Act) review process. The Government's press release quoted two Ministers, Glen Clark and Moe Sihota (see Appendix 8-M):

> "The East Kootenay Land Use-Use Plan includes the Jumbo valley within the special resource management zone category – a designation which allows this type of development to be considered" said Clark.
>
> "The proponent of this project has shown a great deal of understanding and co-operation while awaiting the completion of the land -use plan," said Sihota. "I'm pleased they will now be in a position to have the project considered through a fair and comprehensive environmental review process."

The new EA Act, proclaimed on June 30, 1995, was intended to establish a quasi-judicial technical review, independent from political interference.

The proponent was required to submit its draft Master Plan, being prepared under CASP, to the Environmental Assessment Office (EAO) by June 30, 1995 so the document could be utilized as an Application for Stage 2 under the new Act. A five-volume Master Plan document[18] incorporating the environmental, planning and design studies of the previous five years was hastily completed as requested and submitted to the EA Office. A Transition Order was signed, obligating the proponent to have the project reviewed under the new EA Act.

The EA review of the project formally commenced in July 1995 with the submission of the Jumbo Glacier Resort Application for a Project Approval Certificate (the Application) to the Environmental Assessment Office (EAO).

On July 12, 1995 the Interim Agreement outlining the same study area was renewed by the then-Ministry of Environment, Lands and Parks (MELP) and the proponent, confirming the proponent's status as "sole proponent" and authorizing access to Crown land to carry out investigations and assessments necessary for the EA review of the project. The Interim Agreement also confirmed the basis of the relationship between the parties and clarified roles and responsibilities and the linkage between CASP and the EA review process. **A timeline outline of approximately two years was attached to the agreement**.

In 1995 the Province created both the EA Act and the *Mountain Resorts Associations Act* (MRAA). **The two Acts and CASP were supposed to be coordinated and to provide a fair and timely process to project proposals such as the ski resort proposal for the Jumbo Valley.** The proponent anticipated that following the EA Act and CASP processes the resort area would be designated as a Mountain Resort Area and would be able to proceed with its own municipal status following the land use decision and all the environmental and relevant Ministries' approvals.

The EA Act process was supposed to provide the "one window" efficient approval process mentioned in Commissioner Owen's letter of December 13, 1994 (Appendix 8-L).

In July 1995 a new public input process was initiated. Government agencies (federal, provincial, and local), First Nations, stakeholders and the public were involved. Input received by the EAO during the public comment period helped to identify additional information needed to complete the EA review. The public input process was initially supposed to last for thirty days, but was extended until the end of September (75 days).

Information meetings and public hearings were held at the discretion of the Project Director and special interest groups, without a structured format. The local MLA intervened at the conclusion of a public meeting requested by project opponents on September 14, 1995, and declared his opposition to the project before the Project Committee had initiated its review. The Province, through its Ministers, encouraged the proponent to continue through the required technical review.

8.5.1.8 Freedom of Information Request (1995)

In November 1995 a map was circulated by staff members of BC Environment showing an isolated and unexplainable concentration of Grizzly Bears in the Jumbo

---

[18] This document is commonly referred to as the "1995 Master Plan."

Creek Valley; no data was available to validate the map. The project consultants launched a *Freedom of Information and Protection of Privacy Act* request to obtain government staff's information on the project area. In March 1996 boxes of government staff correspondence were delivered (3 months late) in response to the Freedom of Information (FOI) request. **Letters and internal memos dating back to 1990 indicated a strategy by some government staff and special interest groups to prevent the project from gaining approval**. **Some memos specifically outlined a plan to bog down the project in endless and costly studies** (see Appendix 8-O).

It was confirmed that there were no studies apart from those undertaken by project consultants for the Jumbo Creek valley and the above noted BC Environment map was not based on any known data regarding Grizzly Bears in the Jumbo Creek area. Government staff quickly acknowledged that their map was not indicative of Grizzly Bear population distribution. Deputy Ministers intervened to reassure the proponent that fair process would prevail. One BC Environment staff member (who had previously personally threatened the project's lead consultant) was quietly let go; others were not permitted to continue to work on the project. However, substantially the same group of people continued to condition the progress of the review.

8.5.1.9 Regional District: Request for Designation of a Mountain Municipality (1996)

In September 1996 the Regional District, acting on a request by the proponents' consultants, passed a resolution requesting that the Province create a Mountain Resort Area and future municipality for the project area, according to the Mountain Resort Associations Act of 1995, providing a clear governance model for the resort. The Minister responded that the province would not act before the completion of the EA Act review process.

8.5.1.10 EA Act Review Process: Formulation of Project Specifications (1995 - 1998)

The Project Director convened a Public Advisory Committee (PAC) in order to assist with drafting the Project Specifications that would propose additional study and information requirements for the project. For greater caution, the Project Director appointed a majority of radical opponents to the PAC despite a vote by the Project Committee requesting that an equal number of project supporters and opponents be represented in the PAC. The project consultants questioned the fairness of the review process and the agenda of those involved in the PAC as declared project opponents.

Draft Project Report Specifications were issued in December 1996. A 60-day comment period was established to collect feedback from the public. Comments were also received from the proponent and from the PAC. The Project Committee, in part due to the radical composition of the PAC, continued to struggle over the Project Specifications for nearly two years. According to the EA Act's timelines, the process was supposed to take approximately five weeks, beginning in October 1995.

In May 1998, following the conclusion of the PAC's deliberations, the Project Director issued the Project Specifications as final without further review of the proponent's responses, claiming that the process had been taking too long. The project consultants continued to object to the final draft of the Project Specifications as being unreasonable.

Seeing that the Project Specifications appeared to be biased against the project and difficult to respond to, **the proponent made an application to the Provincial Ombudsman for a process review**. The Environmental Assessment Office (EAO) gave assurances and indicated that it wished to provide a fair and timely process and that it should be given the opportunity to complete the process before the complaint would be acted upon. The Ombudsman did not initiate the requested review.

8.5.1.11 EA Act Review Process: Clarification, Continued Studies & Transition to New EA Act (1998-2002)

Between May 1998 and 2000 meetings were held with government staff to determine and clarify the meaning and the requirements of the Project Specifications.[19] New studies were undertaken at the same time in order to respond to the Project Specifications.

In January 2000 some of the investors attended a meeting at the Environmental Assessment Office (EAO) with senior provincial staff and the senior members of the design team. The Deputy Minister of the EAO chaired the meeting and the Assistant Deputy Minister of the Ministry Environment offered to visit the site in the following weeks and to conclude the environmental review in six months. The site visit (his first one) occurred in April 2000, but the exchange of information, the review and the studies continued long after the middle of 2000. The terms of reference and the model for a new grizzly bear study based on the notion of cumulative impacts became a study in itself, which was very difficult even for the senior project consultants to administer. The project team accepted the government staff model and all government staff requirements and all remaining studies and reports were brought to a conclusion.

A revised *Environmental Assessment Act*, S.B.C. 2002, c.43, came into effect in December 2002 and the proponent was provided until December 31, 2003 to submit the information required to complete the EA review.

8.5.1.12 EA Act Review Process: Completion and Submission of Project Report (2003)

The proponent continued studies, responses and meetings with provincial staff and other experts leading to the completion of a *Project Report* that contains the result of the work undertaken from 1990 to 2003 including all the responses to the Project Specifications issued in 1998. On December 30, 2003, the proponent submitted the Project Report including a Master Plan Concept to the EAO. The Project Report (see Appendices 8-E to 8-I) was divided into thirteen volumes of 3,772 pages including Appendices.

---

[19] On January 20, 2000 a meeting was held at the EAO with the proponent's representatives, consultants and government staff; BC Environment Assistant Deputy Minister undertakes to have his staff provide all available information and necessary responses to conclude the required studies in a few months. It would take three and a half years.

8.5.1.13 EA Act Review Process: Public Input & Formal Review of Project Report (2004)

On January 27, 2004, the EAO determined that the proponent's submission contained the information required and took appropriate steps, including extending time limits for providing information during the EA review, to enable the thorough and timely review of the project. A 180-day period for reviewing the *Project Report* began on February 5, 2004. The EAO established a 60-day public comment period on the Project Report (February 13 to April 13, 2004).

Open Houses were held in Invermere and Nelson and meetings with stakeholders were held throughout the Kootenays. Project information was mailed to every household in the East and West Kootenays and the Project Report and revised Master Plan were made available in electronic format on the Internet. Public comments were received from around the world.

It should be noted that the entire EA Act process is a public process and the information is compiled for public use in the public Project Registry, with a library in Victoria and a librarian responding to public enquiries and making copies of all documents and correspondence. Copies of the documents were also made available at selected libraries in the Kootenays.

The Project Report and the public **process comments and responses are made widely available through the websites of the EAO and of the proponent.**

As a result of the public process and comments that are part of the review under the EA Act, the proponent improved and modified the Master Plan of the project with a number of important changes that are listed in Section 8.6.2 of this Master Plan.

8.5.1.14 EA Act Review Process: Issuance of an Environmental Assessment Certificate (2004)

On August 4, 2004, the EAO submitted its quasi-judicial review report, the *Jumbo Glacier Resort Project Assessment Report* (JGRPAR) (see Appendix 8-C), and recommendation for an Environmental Certificate to the Provincial Ministers (see Appendix 8-D); the Ministers' decision was required by September 17, 2004. The EAO's report **stated in its conclusions that the project is "in the broad public interest."**

On September 15, 2004, an extension to October 18, 2004 for the three Ministers' decision was announced.

Minister George Abbott announced that an Environmental Assessment Certificate had been issued for the project on October 14, 2004. The Minister indicated that following the environmental certificate the next step for the project would be the official community plan and rezoning process by the regional district.

8.5.1.15 Regional District: Repeal of Governance Model and Pullback from Project Review (2005-2006)

Provincial staff contacted the Board of Directors of the Regional District of the East Kootenay (RDEK) in order to harmonize the approval process of the Master Plan with the adoption of the Official Community Plan and rezoning of the first phase of the project by the regional district, but in February 2005 the Board voted to rescind the resolution of September 1996 that requested the creation of a mountain resort municipality designation for the project. The Board of Directors also decided to refuse to participate in the Master Plan approval process.

In March 2006, a motion by a Director of the RDEK to again ask the Province to create a mountain resort municipality for the project was defeated, following what one of the Directors described as an intense intimidation campaign by some local pressure groups.

8.5.1.16 Attempts by Project Opponents to Repeal the Environmental Certificate (2004-2007)

Project opponents referred the major issues reviewed during this entire process to **Office of the Auditor General of Canada** and to the Commissioner of the Environment and Sustainable Development of Canada, which provided responses from the federal ministries in 2005 confirming the assessments made by the EAO (copies enclosed – see Appendix 8-P).

RK Heli-Ski Panorama (RK) requested a judicial review of the EAO process and of the decision of the Ministers to grant an Environmental Certificate. The case was heard for five days in court in Cranbrook, in the end of October 2005. Two lawyers from Vancouver represented RK, a lawyer came from Victoria represented the Province and a Cranbrook lawyer represented the proponent. In November 2005, the judge rendered his decision upholding the Environmental Certificate and granting court costs to defendants. RK appealed the decision to the B.C. Court of Appeals and a panel of three judges unanimously upheld the earlier decision (see Reasons for Judgement in Appendix 8-Q).

RK attempted to make the case that natural justice had been denied to the opponents, **but it is clear that if there is any party that has been denied natural justice in this unprecedented 16-year process, it is the applicant, not the opponents.**

8.5.1.17 Master Plan Approval Process (2005-2007)

The proponent submitted the Master Plan for approval and the resumption of the CASP review process that was originally interrupted in 1991, in 1993 and again in 1995.

The Province formally resumed the CASP process in November 2005 following a ten year interruption.

An Open House was held in January 2006 and a public input process was concluded in the Spring of 2006. The proponent's information is that approximately 700 letters registering opposition and approximately 600 letters registering support were received.

8.5.1.18 A Solution for Governance (2007)

In March 2007 the Province passed legislation under Bill 11—2007 that will facilitate the creation of mountain resort municipalities for projects such as Jumbo Glacier Resort. The implications of Bill 11 are discussed in Section 8.2 of this Master Plan.

The proponent has reviewed available options and has become convinced that the creation of a mountain resort municipality by the Province is the only way to allow the phased implementation of the approved Master Plan within reasonable time. By means of a letter to the Minister, the proponent has asked the Province to create a mountain resort municipality for the project (see Appendix 8-R).

8.5.2 Controversies and Key Issues

Through its lengthy review process (and in part because of it) the project came to be defined as "controversial". Controversy is not unique to this project and is a healthy part of any democratic debate. **What is unique to this project is the length of the debate, the repetitive aspects and the changing goal posts of the various processes**.

It was the proponent's and the government officials' hope that the extensive and repeated processes would eventually resolve the issues to everybody's satisfaction, but it is now clear that there are parties that **will likely never be satisfied, irrespective of process or fact**. The discussion was complex and covered issues that took three volumes to be described by the EA Office and the large (60 person) Project Committee when it issued the Project Specifications. The response had to be summarized in thirteen volumes.

To summarize, a few **key concerns** that emerged at CORE and at the during the EA Act review process were:

- Protection of Jumbo Pass and threat of a highway project through Jumbo Pass;
- Protection of the Grizzly Bear population;
- Avoiding the creation of new burdens for taxpayers;
- Continuing to maintain a profitable heli-ski operation;
- Global Warming; and
- "Everybody is against the project".

These, and the other issues have raised reasonable concerns, which are still in the public domain. The provincial process gave the proponent an opportunity to address these issues and **many people, including those who were appointed to judge the outcome, are now satisfied that they have been properly addressed**. Some people may not have the time to follow the process or do not have a disposition to hear the arguments, and are still not persuaded. However, these are summarized responses:

1. **Jumbo Pass** and the valley corridor leading to it have been protected. The resort is located approximately 2.5 – 3 km away and has designed so that it will not be visible from Jumbo Pass. The lifts also will not be visible except with binoculars because of the distances, the locations of the lifts and the scale of the mountains. The Ministry of

Transportation has confirmed that both funding and planning for a Jumbo Pass highway project[20] have been completely eliminated, and the project's road alignments and design speed would not be suitable for the previously planned Jumbo Pass highway.

2. **The protection of the Grizzly Bear population** has been a main objective of all the studies from 1990 to 2003 and the main focus of the EAO review. No other tourism resort project has ever conducted more thorough and complete habitat mapping and field research. The ultimate reports indicated that as planned the resort would have insignificant impacts, which may be mitigated to achieve a zero or near zero net loss. The EAO noted that:[21]

    > "The proposed Project is located in the 4,619 km² Central Purcell GBPU, one of 49 GBPUs in the Province designated as 'viable' under the Grizzly Bear Conservation Strategy. This designation means that the population is stable and sufficiently productive to permit some hunting. The current population estimate of the Central Purcell GBPU is 150 bears. WLAP estimates that this population is currently at 93% of habitat capability (163 bears) and that would have to decline by 41% (i.e., to less than 81 bears) to be designated as 'threatened'."
    >
    > "The key finding of the CEA was that, in the absence of any measures to mitigate impacts on Grizzly bears, the Project would increase the risk of Grizzly bear mortality by 2.6% to 3.8% and reduce habitat effectiveness by 1.7% to 3.1% within the 3,977 km 2 study area (89% of the Central Purcell GPBU)."
    >
    > "However, the risk of mortality and loss of habitat effectiveness within the CRA would be substantially reduced by application of measures described in the proponent's Grizzly Bear Management Plan."

3. Generally speaking mountain resorts provide a vastly positive, not negative tax cash flow to governments. In the case of this project, and according to current government policy, taxpayer funded subsidies have **neither been offered nor requested.** It should be expected that the same policy would apply to all projects. **Provincial staff has insisted that in this project road improvements must be paid for by Jumbo Glacier Resort, even for the public access road.** This remains a controversial item because it will be difficult to justify to any investor a policy made to penalize one project versus all the others (unless this policy starts to be enforced on all mountain resorts).

4. The proponent has committed to cooperate to enhance the heli-ski operations' profitability. As proof of good faith it has offered to buy the heli-ski company at market value before construction starts and to continue to operate it. The Province would in any event determine mandatory compensation, if it were true that the project were to cause a loss to the heli-ski company.

5. **Global warming is one more reason why this project is very necessary**. The high elevations of the upper Jumbo Valley and its mountain tops ensure that Jumbo Glacier Resort will have an abundance of good natural snow for skiers for years to come. This is why experts worldwide are advocating that **new ski areas should be located in the right climate at higher elevations**. A fact sheet discussing climate change can be found in

[20] A proposal for a road through Jumbo Pass was initated as early as the 1950s and has nothing to do with the Junmbo Glacier Resort project.

[21] EAO *Jumbo Glacier Resort Assessment Report* (pages 55-59) – see Appendix 8-C.

Appendix 2-C.

6. Those who could not be convinced of the value of the project have portrayed an image of general opposition to it, making the argument that “90% of the people oppose it”, but as can be expected, this is far from the truth and is highly misrepresentative. A comparative analysis performed by the EAO indicates that this project has received higher than normal support among the projects reviewed by the EAO. It is normal for people who oppose projects to be vocal, and in this project less than 2% of the regional population has expressed opposition. What is more significant is that in this project, a considerable number of people among the “silent majority” have come out and expressed support, including most of the local businesses and tourism organizations, and this is despite an exceptionally well organized opposition that has repeatedly distributed information that misrepresented the project for a number of years. **The Calgary Herald commented in its editorial that followed the announcement of the Environmental Certificate that the disinformation had not succeeded with those who studied the project.**

8.5.3 Remaining Approval Process

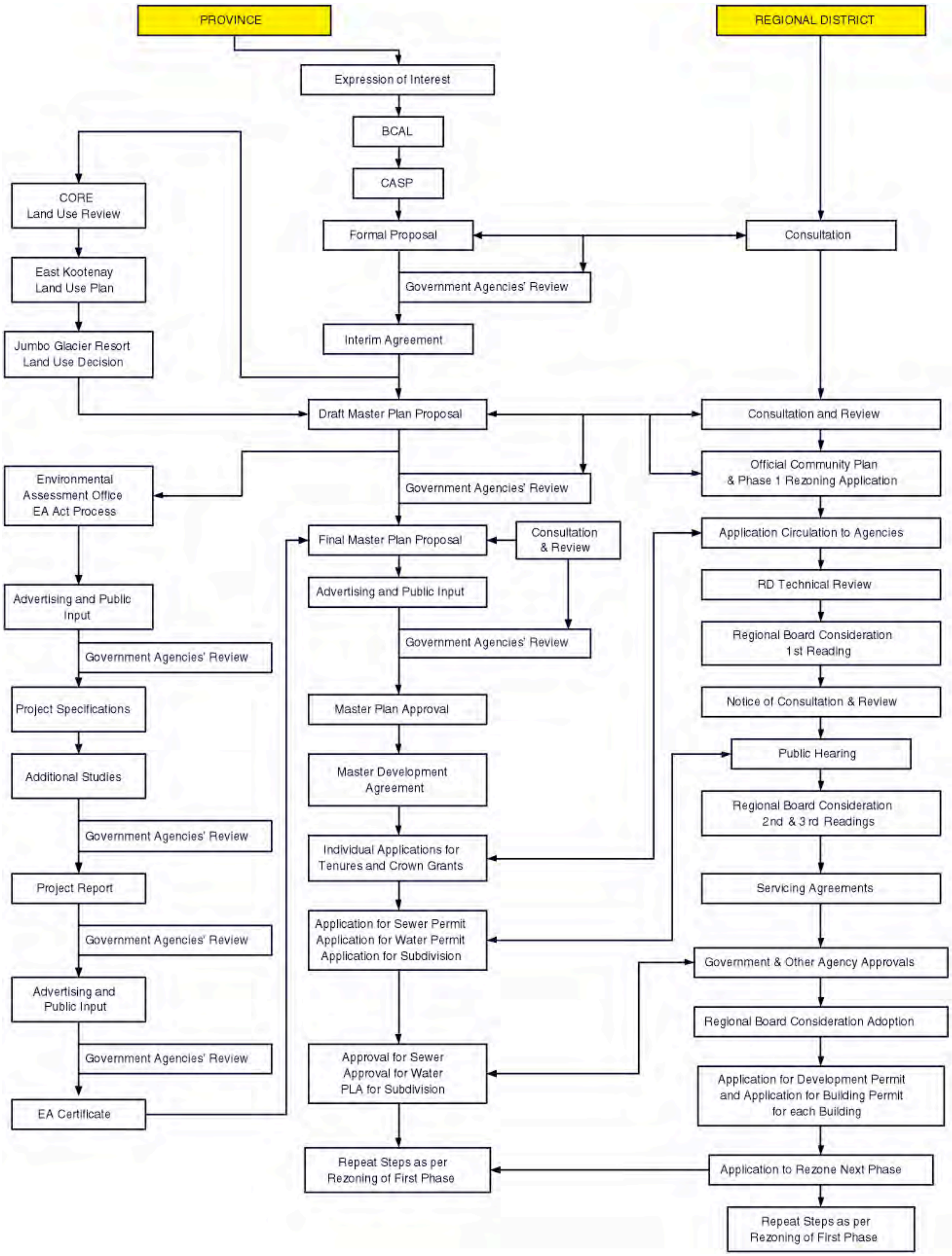
The approval process set in motion under CASP, CORE and the EA Act is not yet complete and the flowchart included at Exhibit 8.1 would indicate the absurdity of the process. The proponent has continued to follow government requirements in the expectation that, although the process to date has been very onerous and perhaps discriminatory, a conclusive process of incremental steps that is conducted in good faith must be ultimately expected from governments.

The next step is the completion of the Master Plan approval process, followed by a Master Development Agreement between the Province and the developer. Following the Master Development Agreement, the Province and the local government will have to agree on the issues of local jurisdiction of a remote location and on the Official Community Plan and rezoning process or designation of a Mountain Resort Area for the project.

After fourteen years of process the proponent is looking forward to the conclusion of a progressive rather than circuitous final process by all levels of government. The EA Act was supposed to provide a timely and fair approval process, however, the system in place clearly does not reflect this intent. Reproduced in Exhibit 8.1 below is the approval process flowchart that outlines the steps that the provincial and local government at some point seemingly proposed. There are no credible timelines that would indicate when the project might start after fulfilling all the conditions of the authorities having jurisdiction, but the Environmental Assessment Act imposed a timeline of five years. Almost three years were spent in the Master Plan approval process following the Environmental Certificate. The flow chart reproduced below was exhibited in the B.C. Legislature in November 2003[22] as an example of how significant projects of public interest are forever delayed by process. One may add that the good faith of governments becomes a reasonable question when looking at examples of approval processes such as the one utilized by the authorities having jurisdiction for this project, The process itself has become the biggest planning issue of this project. It is therefore evident why the legislature passed Bill 11 – 2007, previously mentioned, and why the proponent has applied for its use.

[22] Comments on Bill 75 – 2003 Legislative Session: 4th Session, 37th Parliament, *Debates of the Legislative Assembly* (Hansard); Thursday, November 6, 2003, Afternoon Sitting, Volume 18, Number 5.

Exhibit 8.1: Existing Approval Process Flowchart



8.6 PUBLIC CONSULTATIONS[23]

8.6.1 Overview

The Jumbo Glacier Resort Master Plan has been shaped in part by a long history of public consultations. No tourism project in British Columbia has had a longer and more complex history of public consultations than the Jumbo Glacier Resort project. Public consultations began in the summer 1991 and have been going on in a variety of forms and processes since then.

In addition to ongoing public exposure, the project has also undergone five major public consultation processes. These include:

- July, 1991 – September 1991: three-month public comment period on land-use and the JGR Formal Proposal, including Open House in Invermere;
- May, 1993 – November, 1994: eighteen-month CORE land use public review process - public meetings at least every month throughout the Columbia Valley and the East Kootenays;
- July, 1995 – September, 1995: 75-day public comment period on the EA Application, - Open Houses in Invermere and Public Meetings held by the EAO at the request of opponent groups in Invermere and in Nelson;
- December, 1996 – February, 1997: 60-day public comment period on draft Project Specifications, - all meetings of the Project Committee held in public, a Public Advisory Committee formed, a Public Registry information office created and maintained until 2004;
- February, 2004 – April, 2004: 60-day public comment period on the *Project Report*;
- January, 2006 – Open house in Invermere for the CASP review process; and
- January, 2006 – March, 2006 public comment period under the CASP process.

The project's consultants have also maintained an on-going dialogue with major stakeholders since 1990.They have attended community meetings, presented to local groups and clubs and set up and manned information booths at annual trade shows such as the Kinsmen Trade Show in Invermere, the Calgary Ski Show and the Canada West Ski Areas Association Trade Show. A project website (www.jumboglacierresort.com) was created as early as 1995 and has been continuously maintained and updated since then. The entire *Project Report* and *Master Plan Concept* were made available for public download via the project website. Efforts have been made to answer every project-related e-mail query. The project has been reported on by provincial and national media including the *CBC, CTV, Global TV, RDI, the Globe and Mail*, *the National Post, Calgary Herald, Vancouver Sun, Vancouver Province, Ski Canada Magazine*, *Skiing Magazine*, and the *New York Times*. Regional newspapers such as the *Calgary Herald* have published major features on the project and local newspapers and media have covered the project extensively.

The project's consultants are unaware of any other mountain resort project in British Columbia that has provided the public with more information and more avenues and opportunities for comment than the Jumbo Glacier Resort project.

As outlined above, the project was amply debated in public for over four years before the EA Act was proclaimed in 1995. After the EA Act was proclaimed a new formal public process

[23] For First Nations consultations, please refer to Section 7 of this Master Plan.

was initiated. This public process is documented by the library of the Public Registry organized by the Environmental Assessment Office. The EA Office created another Public Input period with various meetings by the proponent and by the EA Office during the summer 1995. The EA Office then established a Project Committee that met in public during the two and half years of preparation of the Project Specifications. A Public Advisory Committee, primarily fielded by project opponents, was also established by the EA Office for the duration of the project Specifications preparation period.

The proponent's representatives met with all interested individuals and with all recognized organizations that have expressed an interest and a willingness to meet, including environmental advocacy groups and First Nations. The proponent has continued the consultation process based on the following criteria and plan of action, according to the three main objectives of public participation processes:

1. To hear from anyone about anything that may matter with the proposal. To this end the Environmental Assessment Office organized a public registry in accordance with its mandate and the proponent provided a website with clear contact information and a dedicated e-mail address for project related comments and questions.

2. To hear from organized groups and to gain the assistance of local organizations to disseminate project information. To this end the proponent's consultants held information meetings with local organizations from the time the project proponent was selected by the Province in March 1993.

3. To hold meetings and open houses in compliance with the requirements of the EA Act, to afford a public forum to supporters and dissenters and to allow the EA Office and provincial and regional staff to monitor the process.

A more detailed history of public consultations is reported in the response to Specification A.8 of the *Project Report* prepared for the Environmental Assessment process. The *Project Report* is included as Appendices 8-E to 8-I to this Master Plan.

The Environmental Assessment Office's (EAO) *Jumbo Glacier Resort Project Assessment Report* (JGRPAR) also discusses the history of public consultations from the perspective of the EAO. A stand-alone report, entitled *Jumbo Glacier Resort Project Report on Public Views and Interests* is provided as Appendix C to the JGRPAR. The JGRPAR is included as Appendix 8-C to this Master Plan.

An additional Fact Sheet highlighting some of the key findings of the EAO's Report on Public Views and Interests is included in Appendix 1-D.

8.6.2 Project Changes Due to Public Consultations

A number of concerns that were expressed during the public consultation process were addressed via a simplified and clarified Master Plan and more specifically with the following changes introduced between the 1995 Master Plan and the current Master Plan:[24]

- Removal of the lift into the Horsethief Creek drainage (lift 1.8 of 1995 Master Plan) and confirmed the lack of any visual contact or physical access into that drainage.

[24] A Fact Sheet outlining project changes is included in Appendix 1-D.

- Removal of two lifts (lift 2.4 and 2.5 of the 1995 Master Plan) and ski runs at the south end of the project, in order to remove the notion of a visual or physical potential conflict with recreational use of the Jumbo Pass area, both in summer and in winter.
- Provided visual analysis demonstrating that the feared visual intrusion of the resort was misunderstood. It has also been confirmed that the resort area is not visible from Jumbo Pass and from most of the trail because of a shoulder of the mountain and of the height of the trees along the trail.
- Removal of the major day skier parking area previously connected with lift 4.1 of the 1995 Master Plan. This lift, if installed, would be limited to providing access from lower Jumbo Creek to the top of Farnham Glacier for the CODA sponsored and other Canadian ski training. The lift may be transformed into a people mover for improved access to Farnham Glacier in winter in conjunction with a shuttle bus if conditions warrant it.
- Reduction of the Controlled Recreation Area by approximately 60% and removing the entire lower Jumbo Creek area from it.
- Removal of any potential ski runs into lower Jumbo Creek, except for a safety evacuation trail.
- Simplification and reduction of lift system and of carrying capacity. **Comfortable Carrying Capacity reduced to less than half.**
- Removal of the parking area and bus access facilities at the Mineral King Mine site.
- Making the resort area even tighter and smaller than before, with all future parking and access to the lifts starting at the entry of the resort base in Upper Jumbo Creek. **The total resort development area has been reduced to approximately 104 hectares at build out.**
- Providing **all employee housing at the resort**, and phasing it with the resort growth.
- Deleting the Glacier Dome Lodge initial phase at the base of Glacier Dome, and starting the first phase in the resort base area at the abandoned sawmill site, so that the entire development is contained in the one area.
- Removal from the Controlled Recreation Area of the lower Jumbo Creek area that has been perceived as having greater visitation potential from Grizzly Bears.
- Designing the resort so that on completion it can hypothetically be enclosed so as to act as a self contained entity in the wilderness relative to wildlife's territory encroachment.
- Design of road improvements for a 50km/h & 60km/h access road in order to minimize environmental impacts, reduce traffic speed and the risk of wildlife kills and to avoid loss of connectivity of wildlife territory that could be caused by a fenced higher speed road. Management is to encourage the use of shuttle buses from Panorama and Invermere/ Fairmont/ Radium, which is currently proposed to be provided free of charge to the resort clients from the first day of operation of the Jumbo Glacier tram, but which may be provided to everyone from the beginning.
- Selection of road alignments almost entirely along existing forestry and mining roads to minimize environmental impacts and to avoid the use, reconstruction or relocation of bridges.

8.6.3 On-going Public Dialogue

The project consultants will continue to meet with the public and to disseminate project information as needed for the completion of the approval process. They expect to meet all special interest groups, especially those that have opposed the project, to provide presentations, information and discussions. In the past special interest groups that have opposed the project have refused to allow the project consultants to present their design and information, but the project consultants continue to work in the hope that there will be an opportunity to disseminate correct information about the project.

In general terms, the on-going public consultation program has included:

Project Display: The project consultants plan to continue to maintain an up-to-date project website and to secure space in an appropriate location in Invermere for the display of project information.

Presentations to First Nations: The project consultants have been working with the local First Nations representatives from the beginning of the project and will continue in the project implementation process. They have been initially aided by the Shuswap Kinbasket First Nation, who are actively supporting the project and are looking at all opportunities for cooperation, including that of becoming the utility service providers to the project. In year 2006 and 2007 great progress has been made also with the Ktunaxa First Nation. This path of progress was concluded with the drafting of an Impact Management and Benefit Agreement to be ratified soon by the Nation as the start of a new climate of respectful cooperation.

Additional Meetings with Individuals and Groups: The project consultants plan have met all special interest groups who are willing to meet, and have tried to meet especially those that have opposed the project, to provide presentations, information and discussions. In the past special interest groups that have opposed the project have refused to allow the project consultants to present their design and information, but the project consultants hope that there will be new opportunities to disseminate correct information about the project as it progresses towards implementation. A steering committee of supporting businesses and individuals, comprising approximately 40 people, has been officially formed and has met several times under the direction of Grant Costello and Dave Milne, two very knowledgeable local residents who have had long involvement with the project.

Open House: The Master Plan was presented locally at an Open House to further solicit public comment and to interact with the nearest community.

Focus Group: A focus group, which defined itself as a steering committee as mentioned above, of local leaders and businesspersons has been established in order to ensure local participation in the project and its direct, indirect and induced spin-offs. The proponent plans to continue to meet with the project focus group and to take advantage of their offer to continue to help.

Meetings with Local Governments Representatives: Presentations to the East Kootenay Regional District, the District of Invermere and the Village of Radium have been made and will continue, especially in view of the anticipated discussions regarding contracts for services of mutual benefit to the project and to the local communities.

9. GOVERNANCE

9.1 RESORT ADMINISTRATION, GOVERNANCE AND PROVISION OF PUBLIC SERVICES

9.1.1 Introduction

This section reviews the options for resort governance and the legal structure that is necessary to oversee the provision of services and orderly development of the resort. These include the delivery of services related to utilities, infrastructure, development control, emergency services, and regulatory controls. The infrastructure and related services are described in Section 5 of this Master Plan.

9.1.2 Background

When the EA Act review process started it was expected that the Regional District and the Province would collaborate to create a Mountain Resort Area and a Mountain Resort Municipality. The initial Board of Commissioners or initial Council would be appointed by the Province. The developer would be responsible to ensure that the necessary services would be built and in place for the start of each phase of the project.

Jumbo Glacier Resort, like other new mountain resorts such as Kicking Horse Mountain Resort, presents an unusual challenge with respect to governance because of the lack of existing services in place or in its proximity. However, this provides the project with the opportunity to provide a coordinated and simplified approach to resort administration, at least as an interim measure, and to generate the services that a future Mountain Resort Municipality would oversee.

In the case of utilities, this means that Jumbo Glacier Resort will create or contract to a public utility company the task to provide and administer those services until a later transition to the appropriate local jurisdiction, as described above. An agreement in principle has been entered with Kinbasket Development Corporation of the Shuswap Band for the provision of public utility services for the resort. The Kinbasket Development Corporation is already an experienced utility provider in Invermere and may provide these services in conjunction or joint venture with other experienced utility providers, such as Corix.

In the case of development controls, the proponent, Glacier Resorts Ltd. will have an interest in the orderly development of the resort in accordance with the Master Plan and will strive to implement controls through statutory covenants and statutory building schemes that reflect the principles in this Master Plan.

Emergency services will be initially provided by utilizing the developer’s resources and liaising with existing resources, with measures that will be formalized and expanded as necessary over time. Similarly, the regulatory controls and standards provided through existing legislation and common law will provide the initial regulatory foundation for the resort.

When the EA Act review process began, the plan was that the resort would be designated as a Mountain Resort Area under the *Mountain Resort Associations Act* and that the above relevant functions and services would be provided to serve the development in accordance with the approved Master Plan in conjunction with the developer by a Mountain Resort Municipality.

The following is an overview of governance options as initially discussed with RDEK as reported by Bob Whetham, the former Manager of Planning and Development Services of the RDEK[1]:

RDEK Bylaws

Zoning

The proposed development area is located within the boundaries of Upper Columbia Valley Zoning Bylaw No. 900. Since the current designation is Rural Resource Zone: A – 1, an amendment to the zoning bylaw would be necessary for the resort to proceed. This process, which includes a public hearing, would have to be conducted by the RDEK or a municipality if the area is incorporated.

[We must note that the zoning is inconsistent with the provincial land use plan developed in the 1990's and that the rezoning process and related public hearing concept was legislated with the interest of the neighbours in mind. In the case of Jumbo Glacier Resort, the nearest neighbour is Panorama Mountain Village, which is 36 kilometres away.]

Building Inspection

The RDEK Building Regulation Bylaw applies throughout the unincorporated areas of the Regional District. Staff is only able to approve building permits where they are in compliance with applicable building codes and zoning regulations. There is no provision to delegate approving authority, however, inspections could be carried out by non-RDEK staff under contract.

[A system similar to the City of Vancouver's Certified Professional program can also be adopted.]

Subdivision Servicing Bylaw

This bylaw applies throughout the region. While the Crown is not bound by these restrictions, they would apply once title is raised and ownership is transferred to a private entity. As in other unincorporated areas, the authority for subdivision approval would be the Ministry of Transportation Approving Officer subject to applicable Regional District or Mountain Resort Municipality bylaws.

Resort Designation and Governance

The *Mountain Resort Association Act* provides a number of options for providing services but land use authority requires a transfer of municipal powers. This suggests two potential approaches.

---

[1] Letter is included in Appendix 9-B.

Mountain Resort Municipality

Designate the area as a municipality from the outset. The published guide to the previous Act did not support this option for new development, but the new legislation (Bill 11 – 2007) resolves this difficulty. This does offer the simplest structure for governance and would enable the resort to develop under the umbrella of a single management authority.

Implications:

The municipality would have full authority for zoning, land use, building inspection and subdivision within its boundaries.

Since there is no electorate to form a Council, the Province would have to agree to an alternative such as a board of commissioners or similar appointed body as an initial Council. An example could be there to five members, perhaps with one from the Province, one from RDEK, one from the First Nations, one from the developer and one from the public through a local association, or three and an advisory committee. At some point, when the resort may have a number of employees that would qualify for resident status, two or three members of the Board could be elected rather than appointed.

Utilities could be managed by the municipality or a private utility company.

The RDEK or one of the nearby municipalities could consider providing specific services such as building permits and inspections under contract if requested to do so.

Mountain Resort Association

Establish a Mountain Resort Association to “promote, facilitate and encourage the development, maintenance and operation” of the mountain resort area. Land use and building inspection would remain as RDEK responsibilities but other services could be provided through a Mountain Resort Improvement District.

Implications:

Authority for zoning, land use and building inspection remain with the RDEK.

Provisions of the Master Development agreement would have to be incorporated into an OCP.

Utilities could be managed by a Mountain Resort Improvement District, a private utility, or as an RDEK local service.

[Note that the proponent has proposed and agreed to have the Kinbasket Development Corporation provide utility services to the resort (see Section 9.1.3 below).]

Subdivision approval authority would remain with the Ministry of Transportation.

The proponent will ultimately expect a coherent implementation of land use decisions on Crown land on the completion of an approval process. The approval process has been completed in good faith according to the laws of the land over fifteen years. Delivery of the necessary legal tools must be one of the administrative duties of governments. In this respect, the choice of legal structure for the governance system and the creation of the necessary zoning to allow the project to go ahead following the approval process, which fairness requires to be an incremental and not a circular one, is fundamentally up to the government. If zoning had to be the system of choice for the Master Plan implementation, it would have been up to the Province and to the proponent together to work with the regional district to create the necessary zoning, regardless of whether the application be done by the proponent or by the Province, which is the land owner. The potential impasse created by the regional district's refusal to participate in the master plan approval process is resolved by the creation of new legislation under Bill 11 – 2007 and by the request of the proponent to complete the process with the creation of a mountain resort municipality as originally envisioned in 1996.

9.1.3 Relation to Panorama, Invermere, Radium, the RDEK and the Province

Jumbo Glacier Resort will be located on Crown land approximately 36 kilometres from Panorama and over 55 kilometres away from Invermere. Radium is approximately 70 kilometres from the resort. Its unorganized territory is nominally under the jurisdiction of the RDEK, but effectively it is an area of Crown land that is primarily under provincial jurisdiction. As the local authority is not present with services, the resort will have to create its own service infrastructure and a governance model as explained above to suit the circumstances.

9.1.4 Structuring and Administering Services

In the absence of existing services, whether related to utilities, infrastructure, development control, localized emergency services or regulatory controls, it is necessary to draw from the available options and implement immediate effective measures to fill the gap. These services are not expected to be provided by the Regional District or nearby local governments, except where arranged by contract.

9.1.4.1 Public Utility Companies

While utilities are often administered by "local government" or improvement districts, the operation of a public utility company is the necessary option that will be pursued by Jumbo Glacier Resort . Water, telephone, cable, propane gas, electricity and other services may be provided by the utility company if the need were to arise because of the absence of another utility provider and if the economic well-being and the enjoyment of the Resort were to require it. It is planned that the public utility will supply the resort area also with geothermal energy, making use of advanced technology, in accordance with the high quality environmental and sustainability objectives of the project.

There is ample precedent for public utility companies, which will be a welcome opportunity for local involvement in generating local jobs. Public utility companies in general are not prime areas of investment for profit but neither are they money losers. The Comptroller of Water Rights approved "the rate of return on operating equity and the operating margin" for the Sun Peaks Utility Co. Ltd. for 1998 at 11.25%. Kicking Horse Mountain Resort has set up a utility under a Certificate of Convenience and Public Necessity. It is therefore feasible and possible to operate a public utility company.

The proponent has concluded an agreement in principle with the Kinbasket

Development Corporation to achieve a First Nations operated utility company and they have also spoken to Corix as a potential joint venture partner in the development of the infrastructure.

9.1.4.2 Administration of Water and Sewer Infrastructure

As for jurisdiction, it is likely the water supply service will be operated initially as a private utility. For that reason, the proponent has already investigated obtaining a Certificate of Public Necessity and Convenience from the Comptroller under the *Water Act*, which is necessary when a water supply serves more than five people.

Water supply will continue to be provided by the independent utility, but the contracts will likely be transferred to a public jurisdiction as a Mountain Resort Municipality. The utility will be provided to all parts of the resort base area where habitable buildings are to be constructed. It is most likely that the public utility company, which is planned to be established and operated in partnership with the First Nations, will operate with a contract with the Mountain Resort Municipality.

The sanitary sewer systems for the collection, treatment and disposal of liquid waste will be another service that will be provided by the utility but that will have its contractual arrangements transferred from the developer to the eventual administration of a public jurisdiction. In the interim, the sewer system and the treatment plant will be operated by a public utility company which will involve contracts with any private users and statutory rights of way along roads. The sewage disposal and treatment system will comply with the requisite Provincial standards and will require Provincial permits. Even after tertiary treatment any effluent dispersal systems will require approval by the authority administering the Sewage Disposal Regulations under the *Health Act* at the time of installation.

9.1.4.3 Managing Development Control

For the purposes of this section, development control includes the application of a broad range of zoning principles, servicing requirements, review and approval of applicable design guidelines and administration of a scheme of building code compliance.

Development control at the local level will include a subdivision servicing Bylaw prepared by the civil engineers along the model of other mountain resorts such as Whistler and Sun Peaks, and development permit and building permit requirements will be provided under contract until when a local function would be established. The preferred initial option for the application of zoning principles includes the filing of land use covenants on each title in the resort area, under section 219 of the *Land Title Act*. Another tool to ensure compliance with building restrictions is the registration on title of a statutory building scheme under section 220 of the *Land Title Act*, which will facilitate the implementation of the Design Guidelines. Implementation of the Master Plan, zoning bylaws and the creation of a development permit area administered by a Mountain Resort Municipality is the most likely long term solution to development control. The option of seeking powers by private statute is not proposed here but it may be a choice presented as more expedient by the developers' lawyers. In the past, private building restriction statutes have been enacted to reinforce zoning principles where other controls were not effective. (Refer to the *Shaughnessy Heights Building Restriction Act*, 1922.)

Building Code compliance is usually enforced by local government, but in this case the Mountain Resort Municipality is not expected to have the staff for this function. Building Code compliance will need to be enforced by contract to a local government that will be able to provide this function or through a certified professional system. While the 2005 B.C. Building Code is applicable throughout the Province, enforcement mechanisms are not equally in place in all regions. Although code compliance is mandatory, it should not be necessary for the Mountain Resort Municipality to provide building inspection services with its own forces. Instead, the services may be provided by a nearby municipality or by others under contract or it is possible that the covenants placed on title in the resort area would require building drawings to be submitted to the Jumbo Glacier Mountain Resort Municipality and to the developer together with letters of assurance by design professionals. The design professionals would provide proof of professional liability insurance and would certify that the proposed buildings and other structures comply with all applicable B.C. Building Code requirements.

The Mountain Resort Municipality , together with the Resort Developer will establish a Design Review and Approval Authority (DRAA) to receive plans and to weigh the plans against the Master Plan, zoning principles, the Design Guidelines and other criteria set out in the covenants based on the approved Master Plan and Design Guidelines. It is intended that the DRAA will be comprised of a B.C. Registered Architect named by the Resort Developer, who initially will be the project designer, a B.C. Professional Engineer, or other technical person who will be part of the construction and development management group named by the Resort Developer, and a representative from the local Council of the Mountain Resort Municipality. It is not intended that the DRAA would do any reviews regarding compliance with the Building Code, which would be done by the design professionals and by the architects overseeing the issuance of Building Permits on behalf of the Mountain Resort Municipality. The alternative model to a DRAA is to name the design firm of architects for the resort to review design proposals for compliance. This would include a mechanism for an alternative design review, if necessary, over time. In order for the Mountain Resort Municipality and the Resort Developer to effectively regulate development standards, they must enter the statutory covenants as a grantee, and to do this, the Minister would have to grant the Resort Developer the required powers under section 219 (3)(c) of the *Land Title Act*. (Similarly to be granted statutory rights-of-way for utilities, the Resort Developer would have to acquire the authority under section 218 (1)(d) of the *Land Title Act.*)

The Mountain Resort Municipality would be able to adopt an Official Community Plan for the mountain resort and a Comprehensive Development Zone, requiring Development Permits for all projects, reflecting the approved Master Plan. These would be the guiding documents on the basis of which to assess applications and to provide Development Permits. Regarding Building Permits, over the long term it is possible that a small local building department capable of issuing building permits may be established by a jurisdiction such as a Mountain Resort Municipality at Jumbo Glacier Resort, but it is more likely that the size of the project would not justify even a small Building Department, and the services will continue to be performed under contract by others. However, the proponent’s consultants have noted that there are other building review models in the province, including the system administered by the former U.B.C. Real Estate Corporation (later known as U.B.C. Properties Inc.). That company is a wholly owned subsidiary of the University of British Columbia that undertook development on university lands as authorized by an Order in Council under the *University Act*. The corporation created its own zoning, and through contractual means it required the development to comply with specific design guidelines and in accordance with building authorizations administered by a design review and approval authority (DRAA) composed of a panel of design professionals. Because Jumbo Glacier Resort is not within an existing municipality, and because of the distance from the Regional District's offices, which may have difficulty administering a building permit system or zoning regulations in the resort area, the existence of contractual options is indeed relevant, whether achieved by contract or by a grant of special powers to acknowledge the special situation. The proposed development control system for the interim may be by way of charge on title until when the Council of the Mountain Resort Municipality would be able to take charge through contractual agreements for services, if there is any delay in the implementation of the governance structure.

9.1.4.4 The Master Plan

The Official Community Plan of the Mountain Resort Municipality will create a Comprehensive Development Zone, requiring Development Permits, which will embody the approved Master Plan. The approved Master Plan, with its pre-designed building envelopes, and the Design Guidelines of the mountain resort are expected to be the main development control document, effectively providing the basis for Development Permits for individual building components.

9.1.4.5 The Buffer Zone

The proponent will require some control on uses within the Controlled Recreation Area and will seek a general prohibition on additional development, commercial overnight accommodation, food and beverage facilities and ski lift construction in a buffer zone area of the Crown land around the Controlled Recreation Area as outlined in the Study Area of the Interim Agreement. The idea of a buffer zone is to recognize the huge capital to be invested in the ski facilities and related resort accommodation and to recognize the importance of open and undeveloped spaces complementing the mountain resort and the open recreation area. These "no development" open spaces will also help ensure the long term environmental sustainability of the surrounding area and of the skiing and sight seeing recreational concept being presented. These terms are to be contained in the Master Development Agreement and further confirmed and enforced by the RDEK. It is proposed that the boundary of the Mountain Resort Municipality be the boundary of the Study Area of the Interim Agreement.

9.1.4.6 Emergency Services Generally

In the region, fire, police and ambulance services are handled separately. Fire protection services are provided by a fire protection district serving the valley base area, which is too far to meet the intent of the B.C. Building Code and fire insurance purposes, while police and ambulance services are part of a broader service area. There is no "911" service to call emergency services.

Other emergency services such as search-and-rescue and emergency response programs are co-ordinated by the municipal emergency co-ordinator or through the RCMP who in turn call upon trained volunteers. There is a new Columbia Valley Emergency Management Program, based on volunteer emergency personnel that will be located at the old municipal office in Invermere as an Emergency Operations

Centre.

The resort developer should ensure to coordinate emergency provisions with the Columbia Valley Emergency Management Program. Any related agreements should be in place before building construction begins. During construction, as well as after opening of the resort regarding on site and ski area operations, WCB required safety procedures will be followed and the resort operator should participate in on-going emergency preparedness planning.

In relation to emergency services, the resort developer will arrange for its ski area operations to employ a certified professional ski patrol unit with basic paramedic training to provide for stabilisation and transfer of injured skiers to facilities in nearest urban area with appropriate facilities. The ski patrol will provide search-and-rescue operations within the Controlled Recreation Area and will call in regional search-and-rescue volunteers on an as-needed basis and in accordance with industry standards.

9.1.4.7 Fire Protection Services

There are several options for the provision of full fire protection services at Jumbo Glacier Resort. One option is contracting for services with the nearest Fire Department. A second option would be the creation of a single fire services district to include Jumbo Glacier Resort, Panorama and Invermere area. A third option would be creation of an independent fire service improvement district for Jumbo Glacier Resort (for example, under the umbrella of a Mountain Resort Municipality). In the first option, the Fire District may require additional equipment and create a station at Jumbo Glacier Resort. In the second and third options, a new fire hall, acting alone or as a satellite hall, would be required at the resort, with equipment to industry standards. Mutual aid agreements between different fire protection services could combine to reinforce fire protection in all areas. Generally, a fire protection service will be in accordance with the provision of the guidelines in “Establishing and Operating a Fire Department” issued by the former Ministry of Municipal Affairs and with the office of the Fire Commissioner, both under the wing of the Minister of Community, Aboriginal and Women's Services.

The intended fire protection at Jumbo Glacier Resort itself will likely be a volunteer fire department. An independent fire service will likely be created to carry on independently at the resort area, utilizing on-site equipment and trained volunteers, drawn from ski patrol and other ski resort employees.

In considering the best way to provide fire protection services, consideration must be given to insurance implications for property owners, the provision of sprinklers in buildings, and the opportunities for utilizing trained fire fighters to reinforce search-and-rescue and paramedic skills at the base of the resort. Building design will take into consideration the requirements of the Insurance Advisory Organization. The proponent’s project team has been in touch with the operators of other ski area fire protection services and will continue to consult with their facilities, to draw from their experiences.

A community fire protection strategy for Jumbo Glacier Resort is included in Appendix 9-A.

9.1.4.8 Police Services

The RCMP provincial police services have a detachment based in Invermere, which serves a broad area that includes Panorama. Services to Jumbo Glacier Resort will be operated from Invermere and will include the usual traffic. patrol and investigation services as well as operating a crime prevention and ski watch program. There is not expected to be an immediate need for an increase in detachment size as a result of the development of Jumbo Glacier Resort, because ski areas do not generate a great deal of crime and the initial visitor and staff numbers will be low. Search-and-rescue operations are dispatched by the RCMP utilizing the volunteers under the Provincial Emergency Preparedness Program. The RCMP works along with search-and-rescue teams on an as-needed basis. A security office has been proposed for the base area at Jumbo Glacier Resort; it will serve as a dispatch centre for necessary security services, including RCMP.

9.1.4.9 Medical and Ambulance Services

The Invermere and District Hospital provides acute care, extended care and continuing care facilities. The hospital now serves the Panorama area and is capable of providing services to Jumbo Glacier Resort. As population grows in the future, so too will the Province have to expand the hospital facilities in the region.

The Invermere and District Hospital is equipped with 21 acute care beds, 4 extended care beds and 4 bassinets.

Other Public Hospitals in the Regional District of East Kootenay are as follows:

- Cranbrook Regional Hospital: 73 acute care beds, 50 extended care beds, 10 bassinets
- Kimberley and District Hospital: 35 acute care beds, 18 extended care beds, 4 bassinets
- Fernie District Hospital: 42 acute care beds, 8 extended care beds, 7 bassinets
- Sparwood General Hospital: 20 acute care beds, 4 bassinets
- Elkford and District Diagnostic and Treatment Centre: 3 holding beds

Paramedical services generally will be provided at the ski area in conjunction with the certified professional ski patrol services. Injuries will be dealt with at the resort to stabilise victims. The ambulance facility in the resort area will be located near the base area of the Resort. Patients will be transferred to hospitals as necessary. Seriously injured skiers from the East Kootenay ski hills have also been flown to Calgary hospitals.

Ambulance service is currently available to Panorama through the District Ambulance Service, which provides coverage to a broad area. This service is based in Invermere. On-site ambulance service will be provided according to industry standards when skier volumes reach a certain level and could be provided as a local government service.

9.1.5 Development Control Covenants and Related Matters

There is more than one way to achieve the administrative objectives and to create a regulatory framework to apply to the resort area.

It is not necessarily in vogue to enact private statutes or to incorporate private company towns or enact umbrella development legislation that prevails over “local government” controls, although these approaches have been used in the past. While those models are still within the legislative capacity of the Province of B.C., the proponent’s preferred first step in local government is to establish rules by the simpler technique of charge on title, requiring only the ministerial grant of authority under the *Land Title Act*.

To achieve the desirable development controls during the first stage, rules and regulations may be registered on title to each parcel of land created during the subdivision or lease process. The Province will be the Transferee of the key conditions of land use with respect to Bed Unit count and overall site use, and the Resort Developer, once granted the requisite power by the Minister, will be the Transferee of the more detailed interim and permanent covenants as well as the author of the statutory building scheme. Together, these documents would provide the details equivalent to land use and local regulations.

The covenants should be divided up into issues for ease of enforcement. Those likely to be replaced in time by local government regulation should be separated from those that would remain on title in the long term. What follows is a list of some of the basic documents needed to administer the development aspects within the resort, before there is a “local government” or other statutory body exercising effective jurisdiction over those matters.

9.1.5.1 Site Layout and Design Guidelines

General site layout and more specific design guidelines will be contained in a covenant in favour of the Resort Developer. This will be permanent. The guidelines will be essentially as in the Master Plan. There may be additional regulations and some refinement to clarify concepts of design for easier application and interpretation by the Design Review and Approval Authority (DRAA). This covenant would require review and approval by the DRAA of a proposal as to its compliance with the guidelines. Presentation requirements may be set out, with a simpler format being required for single-family dwellings than for other buildings.

9.1.5.2 Bed Unit and Parcel Use

By way of covenant, in favour of the Province, Bed Unit and parcel use will be controlled and will limit land use on each parcel to a particular building use or uses (including permissive uses such as a health spa, tennis courts, and convention facilities in addition to any mandatory or primary uses). Bed Units would be limited to the maximum number for each parcel as generated by the corresponding ski lifts and related development. This covenant would be changed if there were a future change or minor modification in the Master Plan with respect to a particular parcel.

9.1.5.3 Detailed Siting, Construction and Use

This will be a covenant in favour of the Resort Developer containing siting and density conditions for each lot, together with servicing requirements beyond those that may be found in the RDEK subdivision servicing bylaw. (This will include, for example, set backs, maximum tree clearance and maximum floor areas for each building type). Compliance with the Ski Area Master Plan objectives, such as garbage control, sewer hook up and water hook up and energy efficiency in building design, will also be the subject of this covenant. The submission requirements for a review by the DRAA will include drawings showing management of sunlight, emergency vehicle access, grading requirements, a description of functional building operations and project volumetric compliance. The garbage requirement will be to deposit garbage at least every four days at the waste transfer station and to forbear at all times from keeping any garbage stored outside, but rather within the main building or a fully enclosed predator proof outbuilding. The compliance with the water conservation and energy efficient design standards could also be included, such as adherence to the B.C. Hydro Power Smart Guidelines and the referenced CBIP Commercial Power Conservation Guidelines (for 25% less power consumption than the Model National Energy Code for Buildings). This whole covenant will simply remain on title in whole or in part until the resort developer is satisfied that it can release the covenant after the creation of suitable replacement regulations by the local government.

Further provisions will be to the effect that, once initially subdivided, no parcel could be re-subdivided to yield any increase in the number of lots (except for the creation of strata lots, [excluding bare land strata lots] according to the Master Plan).

Each building type will have the following zoning restrictions by way of land use covenant: a maximum footprint or floor area (not an F.S.R.) front, side and rear setbacks, height limits, minimum on-site parking requirements, (either covered or non covered as the case may be). This covenant, where in favour of the resort developer, will refer to the DRAA for development approval.

The anticipated minimum setbacks and maximum heights for certain building type are as follows:

	FRONT	**SIDE**	**REAR**	**HEIGHT**
Single family chalets:	10 m.	5 m.	10 m.	12 m.
Townhouses:	6 m.	0 m.	5 m.	12 m.
Employee Housing:	0 m.	0 m.	0 m.	15 m.
Condotels: (alone or with commercial)	0 m.	0 m.	0 m.	20 m.
Hotels:	0 m.	0 m.	0 m.	35 m.
Commercial/Service: (alone)	0 m.	0 m.	0 m.	12 m.

Other conditions regarding siting may apply to certain lots or to corner lots or end units of townhouses. Maximum floor areas may be limited by the building envelope of height and setbacks, rather than by a floor area. The development will be limited also by numbers of beds and bedrooms under the Province's covenant. Site clearance maximum for single family chalets will be 50%.

Parking requirements will be set out on a per parcel basis to comply with the overall parking plan for the skiing and the resort base as outlined in the Ski Area Master Plan. Parking standards will include 2 on-site spaces for each chalet, 1 space for each townhouse and .75 of one parking space per condotel and hotel unit. Guest parking will be provided in accordance with the Master Plan on the basis of an additional 10%

of the per unit requirements. The parking space standards will be in accordance with the I.C.B.C. parking recommendations (which could be relaxed by the DRAA for freehold parcels in the case of either hardship or reasonable engineering considerations).

Initially, there may be a period of time when no building permit system is in place as it may be difficult to administer inspections for a remote area. However, this covenant will require Letters of Assurance from the Architect and the Engineers giving evidence under their professional seals to compliance with the B.C. Building Code and related code requirements, first upon submitting an application for development approval and again, by way of confirmation upon building completion prior to occupancy.

For leased areas, an appropriate version of the above covenant would be in favour of the Province, assuming there will be a title for these areas registered under the *Land Title Ac*t. This covenant would provide for details of the requisite ski hill base area where not specifically provided in the Lease document itself. For example there could be a requirement for the components of an operational ski facility including a ticket booth, rest rooms, a ski rental area, ski school, skiers' lockers, a personnel canteen and brown bag lunch room, a cafeteria, kitchen, store rooms, gift shop, a radio and dispatch office for the ski patrol, security, search and rescue and the RCMP, and a location for first aid services, etc.

9.1.5.4 Environmental Issues

An environmental covenant will be prepared in favour of the Province for prohibition of tree clearance and minimum building setbacks adjacent to a water course. Leave strips protecting the riparian areas will also become part of the environmental covenant. If necessary, other relevant environmental issues that are canvassed in the Master Plan appendices could be included in this environmental covenant, where the land is registered under the *Land Title Act*. Compliance with the Environmental Certificate and provincial policies and legislation will cover every aspect of the project.

9.1.5.5 Rental Pool

Experience has shown that the most effective way to achieve a successful rental pool is that of a voluntary option following the initial sales of overnight accommodations. A rental pool covenant, providing that a residential unit will be managed and marketed as tourist accommodation, may be put on title for a targeted minimum 50% of the townhouses and condotel units by completion of the development. The covenant will include clauses that provide for redecoration at the discretion of the Resort Developer or its assigned rental pool management company from time to time and financed through the rental pool scheme from revenues. This will be to ensure the product is current and the units have similar standards of furniture and finishes, especially with the passage of time.

9.1.5.6 Statutory Building Scheme

A Statutory Building Scheme will be registered by the proponent/developer against all single family chalets with detailed design guidelines and related restrictions. The instruments will provide for an enforcement mechanism by all property owners and therefore extend enforcement beyond the proponent/developer. Local government seldom has the power to enforce such guidelines on single family development unless achieved through voluntary covenant, as statutory development permit areas are generally limited to multiple unit developments or heritage areas, but in this project the Mountain Resort Municipality may be able to enforce development permits throughout the project, including single family chalets areas.

9.1.5.7 Timing of the Documentation

The proposed covenants must be consistent with the approved uses of the land parcels as foreseen when the land is actually subdivided. Some minor modifications will likely be required to provide for the specific details of a particular grant or subdivision. Covenants will likely be filed concurrently with the deposit of final subdivision plans in the Land Title Office. Other similar documents to be filed with the subdivision plan include statutory rights of way and easements.

9.1.6 Other Regulatory Controls

Governance by covenant on title should be limited to land use and related issues in order to be in strict compliance with the terms of Section 219 of the *Land Title Act*. The elements of governance missing in the early stages of the resort development seem to include the equivalent of regulatory bylaws, such as noise, dog control, business licensing, traffic regulation, etc. These are, of course, within the capability of the Mountain Resort Municipality if it chose to legislate in these areas. However, noise, foul odours and other issues, such as troublesome dogs may be actionable as nuisances by individual landowners at common law if they should become a problem. In addition, the resort developer may exercise its powers granted by the Province for the administration of the Controlled Recreation Area to control any nuisance problems that originate from areas other than fee simple land, which will be almost the entire resort area. The Resort Developer should establish regulations including a requirement to follow strict rules regarding pets, which generally should not be permitted except for very short periods of time (for example one week) and kept indoor, unless on leash and on prescribed walks inside the resort. The *Livestock Protection Act* provides a scheme to deal with uncontrolled dogs where there is no adequate local regulation. Traffic issues on dedicated roads will be subject to the *Highway Act* and *Motor Vehicle Act* until there is supplementary local legislation. Traffic and other regulatory rules on private property will be subject to owner control such as through bylaws of a strata corporation.

9.1.6.1 Official Community Plan and Zoning,

The Master Plan and the Master Development Agreement, together with the development controls described above, will represent for the mountain resort what the OCP and zoning represent for urbanized areas. A mountain resort, however, requires more detailed controls than those that are normally administered by means of an OCP and zoning regulations, as the points noted above indicate.

10. CONCLUSION

The Master Plan describes a project like no other in North America. It can only be compared with projects such as the Jungfraubahn of the Swiss Alps in year 1890. It is an opportunity to introduce to the urbanized public of North America mountain peaks and high alpine glaciers that still today can only be experienced in the Alps. The technology and the expertise exist to develop such a project in a sustainable manner, and much thought has been given during many years on the best approach and solutions to the challenges that a development of this nature presents. They are not challenges that have not been faced before elsewhere and that cannot be successfully resolved. The proponents' consultants are confident that no project has been more exhaustively studied in the preliminary planning stages than this one, and if the Master Plan and recommendations are followed, the project will be very successful in the implementation of the stated objectives. This project is also an opportunity to give new solutions to social and economic problems that need to be brought to a better solution in the East Kootenay region. It can provide an important example and a catalyst for change and a new vision where change has been perhaps too slow in coming, to the disappointment of new generations.

10.1 CHALLENGES AND OPPORTUNITIES FOR JUMBO GLACIER RESORT AND BRITISH COLUMBIA

10.1.1 The Challenges

10.1.1.1 A Public-Private Partnership

The project will be a model of private investment and government cooperation according to the CASP policy. It is a true example of Public Private Partnership, where Crown Land is used to generate sustainable development according to a well thought out policy developed through many years of study, implementation and refinement. It is a model where Crown Land is put to work, without loss of control of the Province, which remains the landlord, generating employment and revenues for an on going economic enterprise focused on a sustainable industry and renewable resources, i.e. tourism, snow, and mountain peaks. Like all Public Private Partnerships this is a project that involves complex processes and many different players, and will depend on the positive work of all those who are involved.

10.1.1.2 A First Nations Partnership

A joint venture agreement in principle with the Kinbasket Development Corporation of Invermere for the provision of infrastructure services at Jumbo Glacier Resort is the first tangible result of years of cooperative efforts by the proponent and the local First Nations. This is expected to be the first step of a relationship whereby the First Nations will become a partner in the development, management and operations of significant components of the project. In turn the partnerships will generate on going opportunities for training and employment in new areas of tourism, from hospitality and hotel facilities to infrastructure operations, ski instructing, guiding, ski patrolling and ski area operations. The proposed interpretive center will also create opportunities in environmental monitoring and interpretive activities.

10.1.1.3 Economic Diversification

For the East Kootenays a destination capable of providing an alternative to world images such as Lake Louise will represent a crucial step in bringing local tourism to the North American continent's and to the world's attention, giving true life to the much talked about process of economic diversification that has been slowly emerging in the last twenty years. There is no comparison between trying to attract tourists with advertising and attracting them with a real world-class and accessible image and product. There is also another benefit, in that advertising is very costly and is an on going effort, while **creating a world class destination is an investment in a product that will by itself create a reputation and a great amount of free advertising**. This is what has happened for Kicking Horse Mountain Resort, with the pictures of the views from the Eagle's Eye restaurant at the gondola's arrival point, which have travelled on newspaper and magazine articles across North America and Europe, creating new interest in the region at no advertisement cost. In order to diversify the economy it is necessary to actually provide the high quality diversified product and new international appeal.

10.1.1.4 Tourism Products

The North American continent has a tourist population approximately as large as that of the European continent. However, for historical reasons, the tourism product is generally different. European resorts started to develop at the end of the nineteenth century, and they became primarily accessible by railway. They were vacation places where people would go for health, rest and recreation, staying there for a period of time. They were destination resorts before the term was invented, and they developed accordingly even after the automobile and the airplane became the preferred modes of transportation. In Europe, destination resorts as described, numbered in the thousands and transformed villages of shepherds or farmers into bustling tourism centres. For Switzerland, the birth of tourism and the resorts meant the diversification and the transformation of its economy from primarily agrarian to a diversified economy that generated the capital to create an industry that covers almost every conceivable product, from the famous watches to engineering and pharmaceutical products.

In North America similar resorts developed later, but remain exceedingly rare. Examples that we may find in Western Canada are Banff and Lake Louise. The automobile syndrome generated a pattern of holidaying whereby people drive from place to place to visit the country, overnighting in tents, mobile homes and motels, generally following the highways and seldom being able to adventure into the unroaded side valleys, let alone the mountain tops. Hotel companies have specialized in building hotels that are primarily oriented to the convenience of business travellers. These types of hotels are successful in providing comfortable accommodation for people that travel from town to town. Tourism for these urban types of hotels primarily means conventions or dates with a partner. So the North American resort hotel is often designed as a destination for conventions, rather than for individuals or families looking for an extended stay for health, rest and recreation. It is also often located at major urban centres or near major traffic access points. With a few notable exceptions, remote destinations have been avoided.

From motels to "resort" hotels, the North American tourism product has been mostly created to respond to the expected demand of people who move almost every day, from place to place. For a destination holiday most North Americans still today travel to Europe, the Caribbean, Mexico, Hawaii, and even resort destinations in southeast Asia. In Canada, this has generated a major tourism deficit. In terms of mountain resorts only places such as Whistler Blackcomb, Vail/Beaver Creek, Jackson Hole and Aspen seem to have created the kind of place where people may go for an extended holiday, but at great cost. Other places are trying to convert from day ski areas into extended stay areas, but are having great difficulty because of climate, location and lack of initial planning. This compares poorly with the mountains of Europe, where literally thousands of mountain resorts in excellent locations cater to a continent-wide clientele with a complete spectrum of facilities and affordability. Kicking Horse Mountain Resort is a recent example of a successful attempt at filling the North American vacuum for vacation homes at the foot of a lift accessible mountain. However, the difference is still great and is still enticing many North Americans to fly to Europe for a rewarding mountain holiday of more than a few days.

10.1.1.5 The Window of Opportunity

The lack of destination resorts is being discovered continent wide, and while locations are difficult to find and approvals are even more difficult to obtain, it is apparent that all governments, from Quebec to British Columbia and from Vermont to California are discovering that tourism is an important means for diversification of the economy and that health, rest and recreation are important needs to respond to in the public interest.

For the East Kootenay it is an historical moment to seize the opportunity to become known world-wide as an area of destination mountain holidays, comparable to the best in the world, especially in preparation for the 2010 Olympics, which will put even greater focus on Vancouver and Whistler, but which will provide an occasion to show to the world what the interior of B.C. has to offer.

10.1.2 The Opportunities

Canadian Mountain Holidays, based in Banff but operating in B.C., has already realized the dream of showing the interior of B.C. to the world and has created an unsurpassable product with heli-ski skiing destinations, but this is a very small segment of tourism and is too exclusive to generate the mountain destination resorts where urbanized people go for general health, rest and skiing recreation.

Jumbo Glacier Resort represents the opportunity to offer a tourism product that will draw world wide attention to the beauty of the Purcell Mountains and to its undiscovered skiing potential for the general public. It will also be the only place in North America capable of operating a successful ski school year round for the general public. Through its summer camps on Farnham Glacier, CODA has already made possible to train Canadisn skiers before the 2010 Olympics.

10.2 JUMBO GLACIER RESORT, A TRULY UNIQUE DESTINATION AND THE ULTIMATE MOUNTAIN EXPERIENCE

Most new initiatives and newly discovered locations are called unique, and indeed they are from the point of view that no two endeavours or places are the same. However, often most places and experiences are not very different from many others. Jumbo Glacier Resort is unique in a more real and dramatic sense because in North America Jumbo Glacier Resort will be the only place capable of delivering tourists to the top of glaciers with views that only mountain climbers occasionally achieve and skiing that only helicopter skiers can dream of achieving. **Its latitude, access, location, climate and geography make the resort stand out on a continent-wide, and perhaps worldwide, comparison.** Lift-accessed skiing from elevations that are one third higher than the top of Whistler Blackcomb, in the dry powder of the Purcell Mountains, will have no comparison in North America or Europe. The resort base will be at an elevation (1,750 metres) where there will be abundant snow without the need of supplying snow making equipment, an unfortunate and increasingly important necessity for many existing lower elevation ski resorts.

The view from the top of Glacier Dome of Jumbo Glacier calving and falling into the Lake of the Hanging Glacier below is stunning and truly unique. Only cruises to Alaska can offer similar views, but the view from the mountaintop is a significantly more immersive and impressive experience.

INDEX

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

R

S

Y

Z