

# FIELD FORESTRY SERVICES, INC.

Dave Field , RPF, CFP  
1599 Lindsay Drive  
Kelowna, B.C. V1V 1T5

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Telephone (250) 860-3411  
Fax : (250) 717-0055

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## **Wildfire Interface Management Report for Crystal Mountain Ski Resort Expansion**

### 1.0 INTRODUCTION

This report prescribes actions to be undertaken in order to make the proposed expansion of the existing facilities at Crystal Mountain Ski Resort compliant with the FireSmart Manual objective of protecting the lives and property of future landowners.

There are two components to a Wildfire Hazard Assessment. A detailed Area Hazard Assessment of the proposed development site will be completed once the snow has melted. This area is defined as Priority Zone 3 and is located 30 meters away from buildings. The assessment will stratify the property into distinct polygons that will have similar topographical features (slope and aspect), vegetative cover (timbered vs. non-timbered) and density (crown closure), and presence of ladder fuels. Each polygon will be assigned a Fire Danger Rating that ranges from Low to Extreme.

Strict adherence to the vegetative management prescriptions can be expected to reduce the risk of a wildfire entering or leaving the Controlled Recreation Area (CRA) by reducing the fire hazard to a low or moderate rating. Managing the surrounding timber resource will also greatly reduce the demands of a water supply system.

The other component of a Wildfire Hazard Assessment is a Structure and Site Hazard Assessment that will evaluate the risk posed by construction techniques and building materials of individual structures. The Site hazard area is defined as Priority Zones 1 and 2, which extend in concentric circles up to 10 meters from a building and up to 30 meters away, respectively.

This report will concentrate on the latter component. It is the intention of the forestry consultant that the developer will be better informed to implement fire hazard mitigation in the design and planning stages of the proposed expansion once they are made aware of the hazards inherent in their conceptual plans.

The Fire Hazard Mitigation Prescription for the property, to be completed later this Spring, will incorporate the guidelines of the FireSmart Manual which can then be integrated into Section 219 Restrictive Covenants. Architectural designs can be modified on a site specific basis for areas with a Low or Moderate hazard rating, allowing for amendments to Development Permits.

## CRYSTAL MOUNTAIN SKI RESORT EXPANSION FIRESMART GUIDELINES

Appendix 1 provides a thorough description of the actions that should be implemented by individual homeowners to control the vegetation around their homes. Appendix 2 discusses the FireSmart building code that further reduces the demands on a water supply system.

Appendix 3 specifies the developer's intention to provide for access routes that meet the requirements of the FireSmart Manual. The designation of an emergency escape road in Appendix 4 also contributes to protecting the lives of residents and tourists lodging in the onsite facilities.

A water supply plan cannot be designed until the size of each proposed structure is known. Once the building permit has been submitted, a professional engineer specializing in groundwater hydrology should be consulted to fulfill this obligation. Appendix 5 offers guidelines that the developer can consider in consultation with Fire Officials and engineers.

### 1.1 Description of Property :

The CRA is bounded by Powers Creek Canyon to the east, the Trepanier Creek Trench to the west, Highway 97C Okanagan Connector to the south, and a tributary to Powers Creek to the north. Jack Creek, Law Creek and Fern Creek are main drainages within the CRA.

However, these drainages may not be practical sources of water for fire suppression activities. Pennask Lake, approximately 33 kms to the northwest, would likely be the nearest practical source of water at this elevation for air tankers. Lambly (Bear) Lake and Jackpine Lake would be suitable for helicopters to refill monsoon buckets and for tanker trucks to refill.

A preliminary assessment of Exhibit IV-1 and IV-3 maps provided in the Master Plan Proposal confirms that while the CRA is highly susceptible to a wildfire entering from several directions, the most obvious path for a fire to reach the CRA would be from the west or northwest. The BC Hydro right-of-way from Brenda Mines to Glenrosa is an effective firebreak for a wildfire from the south. The Crystal Mountain road and the Last Mountain FSR serve as buffers along the eastern boundary.

The topography of the CRA has been identified in the Master Plan as rolling terrain, but neglects to point out that this plateau is relatively high above Okanagan Lake. This will also have a significant bearing on the use of water bombers for wildfire suppression.

The topographic attributes that make Mount Last desirable for development as a destination ski resort are also the primary reason for the area's high susceptibility to a wildfire from outside the CRA. Namely, it is the highest point of land between Westbank and the Connector

As experienced in the Okanagan Mountain Park fire of 2003, the winds shift around 4:30 PM every day and draw downhill. This phenomenon is attributed in part to the atmospheric changes occurring on the Okanagan Connector that funnel down the Trepanier Creek Trench. An accidental fire initiated along the Connector could therefore

## CRYSTAL MOUNTAIN SKI RESORT EXPANSION FIRESMART GUIDELINES

be expected to spread quickly up the steep slopes and into the watersheds within the CRA.

Ski hills are classified by terms such as “vertical drop.” The Master Plan expects the proposed ski hill will have a vertical drop of approximately 700 metres. In combination with a generally southern exposure, this area can be expected to suffer drought conditions during the hot, dry summer months characteristic of the Okanagan Valley. An accidental fire initiated within the resort area during the summer would generally spread uphill during morning and early afternoon hours. A late afternoon fire may escape downhill, threatening houses in the Glenrosa area. If the fire was funneled down Powers Creek it could even endanger houses in the Jim Smith Creek subdivision to the southeast of the resort.

Armed with this knowledge of fire behavior, an initial fire prescription would incorporate a firebreak around the susceptible areas of the CRA. Reviewing Exhibits I-9 and IV-1, it is apparent that there are existing roads along the western and eastern flanks that can be integrated into a fire mitigation prescription. The Jack Creek road and the Last Mountain Forest Service Road (FSR) would also serve as initial attack access for tanker trucks and fire suppression crews.

The field assessments scheduled for later this Spring will clarify the actual risk and present mitigation prescriptions where required. For now, RDCO officials and the Fire Chief should be aware that the prescription for firebreaks will be similar to the treatment of Priority Zones 1, 2 and 3.

## 2.0 BACKGROUND

Crystal Mountain has received conditional approval from the Provincial Government agencies responsible for administration of the Commercial Alpine Skiing Policy to apply for an expansion of the existing ski runs and infrastructure as per the Master Plan Proposal submitted by Pheidias Development Management Corporation, and approved by the Province in August 2003 with a Master Development Agreement for the operation and expansion of Crystal Mountain.

Crystal Mountain recognizes recognizes that the Fire Smart Manual guidelines have been introduced subsequent to the date that the Master Plan Proposal was submitted.

Clarification will be required in the following sections of the Master Plan Proposal in order to be consistent with the application of the Fire Smart Manual guidelines:

SECTION	TITLE	PAGE No.
2(b)(iii)(C)	Single Family Dwelling Requirements	IV-17
2(b)(iv)(A,B &G)	Resort Fire Prevention and Control	IV-20
2(c)(iii)	Single Family Chalets	IV-25, 26
2(h)(i)	Landscaping Concept	IV-36
2(h)(ii)	Parking, Road and Pedestrian System	IV-36
2(i)(iii)(l)	Non-Combustible Building Construction ...	IV-55
2(i)(iii)(l)	Landscape Efficiency	IV-55, 56
2(i)(xviii)	Fire Protection Services	IV-72
3(d)(i)(F)	Forest Fires	IV-80, 81, 82

### 2.1 Revisions to the Master Plan Proposal

#### 2.1.1 Single Family Dwelling Requirements (2(b)(iii)(C))

The intent expressed in this section is to nestle the homes into the forest with minimal landscaping. No regard is given to the hazard rating of the site. Crystal Mountain will be better informed once the proposed resort base area has been classified by the forestry consultant this Summer. The relative size of a “Large lot” can be quantified once the planning department incorporates the hazard assessment prescription into their subdivision design and layout.

## CRYSTAL MOUNTAIN SKI RESORT EXPANSION FIRESMART GUIDELINES

### 2.1.2 Resort Fire Prevention and Control (2(b)(iv)A,B,G) and Single Family Chalets (2(c)(iii))

Section 2(b)(iv)(A) recommends creating a buffer around each building. This is referred to as Priority Zone 1 and extends for 10 meters on flat ground. Section 2(c)(iii) envisages that the single family chalets will be distributed “among the trees.” It should be pointed out that chalets located closer than 20 meters between each other will be cleared of all trees if they are located in High or Extreme hazard rating areas. Forest stands that are 10 to 30 meters away from a chalet are in Priority Zone 2 and must be thinned so that there is a minimum of 3 meters between the crowns of adjacent trees. This means that the stems of trees may be 10 meters apart on flat ground. This may significantly impact the density of chalets per hectare or require the chalets to be restricted to lower hazard rated areas. Crystal Mountain can make these decisions at the planning stage.

Section 2(b)(iv)(B), Building locations, does not recognize that structures located on a slope and built of entirely non-combustible exteriors to FireSmart design standards can be exempted on a site specific basis. This would be appropriate on slopes above irrigated fairways or paved roads where there is a low or moderate fire danger rating.

Section 2(b)(iv)(G) may be excessive for a low-risk structure in a low-hazard area. It may be appropriate where other risk reduction strategies are impractical but it seems that water sources are at a premium on the hillside and may be inadequate to reliably supply enough volume if an interface fire rages through a neighborhood.

### 2.1.3 Landscaping Concept

Section 2(h)(i) needs to clarify that Priority Zone 1 will only be retained in a natural vegetative state if the structure meets strict exemption requirements. The most significant criteria for exemption is that the structure has been built to Fire Smart standards and the area is in a low or moderate hazard rating. Vegetative Management strategies are provided in Appendix 1.1 and 1.2 of this report for the Landscape designers.

### 2.1.4 Parking, Road and Pedestrian System

Section 2(h)(ii) does not recognize the guidelines proposed in the Fire Smart manual. They are provided in Appendix 3 of this report for the benefit of the infrastructure planners. The Fire Chief may authorize amendments to these guidelines.

### 2.1.5 Non-combustible Building Construction Where Possible

Section 2(i)(iii)(l) recommends that the single family and bed and breakfast buildings have sprinklers, mainly because they are expected to be constructed of combustible materials. If the Fire Smart construction guidelines are enforced, the use of sprinklers may become an optional feature at the discretion of the Fire Chief.

### 2.1.6 Landscape Efficiency

## CRYSTAL MOUNTAIN SKI RESORT EXPANSION FIRESMART GUIDELINES

Section 2(i)(iii)(l) dwells more on the concept of single family chalets and houses being “landscaped to blend in with the natural forest setting and avoid a city-type grass lawn landscaping”. While the Crystal Mountain should be given credit for their serious consideration for water conservation, commitments cannot be made until a fire hazard assessment of the proposed structure and site have been completed. The structural fire hazard assessment can only be completed once architectural plans have been submitted for Development Permit. If the design conforms to Fire Smart construction guidelines it will only be a formality to approve them. Landscaping standards are presented in Appendix 1 of this report.

The initial detailed assessment planned to be completed this Summer will be for the entire CRA. This macro overview will enable Crystal Mountain to define suitable subdivision sites that are either in naturally low or moderate fire hazard areas or will become such after fuel modification strategies have been employed or due to infrastructure development.

### 2.1.7 Fire Protection Services

Section 2(i)(xviii) discusses volunteer firefighters. The Fire Smart manual deals extensively with incorporating the design of roads with the needs of emergency fire fighting vehicles. The manual also provides options for individual homeowners that the developer may include in Section 219 Restrictive Covenants.

### 2.1.8 Forest Fires

Section 3(d)(i)(F) deals with prevention measures to reduce the fire hazard on the CRA. Four options are presented in the Master Plan Proposal. The first option, vegetation management, recommends treating the forested areas between the existing and proposed ski runs. Without the benefit of a risk assessment, removing all dead and down debris, then spacing and pruning the retained living trees may be unnecessary. A firebreak around the perimeter of the CRA that incorporates the edges of ski runs and existing and proposed roads would be more practical. The hazard assessment report to be submitted in the Spring will offer specific prescription options based on actual hazard ratings.

Construction materials should follow the Fire Smart guidelines. The architects and planners for Crystal Mountain have extensive experience in mountain architecture and are aware that Hardy planks simulate the look of cedar siding but are an approved Fire Smart exterior siding. Exposed large timber beams are also acceptable if properly treated chemically. It is significant to note that contrary to the Master Plan Proposal, “sprinklering buildings” is not “an acceptable alternative to many of the above noted measures.” Sprinkler systems do not provide reliable structure protection where there is wildfire exposure and can become unserviceable for a number of reasons (Reference page 3-36, Fire Smart manual). However, sprinklering is the most effective way to protect buildings and occupants from internal fires according to insurance and fire protection experts and is a recommended practice for many building code building classifications, especially when there is no full fire department on site.

### 3.0 CONCLUSION

The Master Plan Proposal was developed prior to the publication of the FireSmart manual. This manual has been readily accepted by the Kelowna, Vernon and Sicamous Fire Departments, as well as the North Okanagan Regional District Fire Commissioner.

The Okanagan Mountain Park fire provided the first opportunity to complete a post-fire evaluation of a fire reduction prescription. The Cantina Court and Arrowleaf Lane greenspaces in the Dilworth Homes subdivision on the South Slopes were barely singed while the Rank 6 firestorm devastated adjoining areas that had not been treated yet, even though a prescription had been authorized. Pictures of the minimal scarring of tree trunks and ground fire damage within the greenspaces have been used by the Alberta department of Sustainable Resource Development and the Natural Resource department of the Canadian Forestry Service for training sessions across Western Canada.

In order for second-generation and subsequent homeowners in this resort development to be made aware of their obligations to maintain the Fire Smart guidelines, I recommend that the Fire Hazard Reduction Prescription to be submitted this Summer be included by Crystal Mountain in the proposed Section 219 Restrictive Covenants for the entire area.

Submitted by

Dave Field, RPF, CFP

## APPENDIX 1 Vegetation Management Strategies

The first step in mitigating a fire in the interface area is to control the vegetation. NFPA 1144, the Standard for Protection of Life and Property from Wildfire, offers guidelines recommended by numerous fire protection agencies.

The goal of a vegetation management strategy is to prevent a low-intensity ground fire from escalating into an uncontrollable crown fire. This is usually accomplished by either removing or reducing strategies (1.1.1) or converting the fuels (1.1.2) on a particular property. The intensity of a strategy's application has been correlated with the distance around a building. Two concentric Priority Zones are recommended for this development, each with their own unique vegetation management strategy.

### 1.1 Recommended guidelines for Priority Zone 1:

This zone covers the first 10 meters in all directions from a structure built on flat ground. The zone increases proportionately as the slope increases. The strategy here is to remove the fuels to create a firebreak immediately adjacent to a structure.

#### 1.1.1 Fire Hazard Reduction Prescription :

- Remove all conifers within 10 meters of any building on flat ground, increasing this distance as slopes increase.
- Dispose of accumulations of small branches and needles on the ground annually to prevent the spreading of fire on the ground or up the trees.
- Remove standing dead and dying trees, and large, sound logs on the ground.
- Keep leaves, needles, and moss accumulations from roofs and gutters at all times.
- Store firewood and other flammable materials at least 10 meters away from the house, not under decks or soffits.
- Retention of conifers within Zone 1 should be evaluated by a Registered Professional Forester on a site-specific basis.

#### 1.1.2 Comply with Fire-Safe Landscaping :

- Use pea-gravel or non-flammable types of ground cover rather than bark mulch.
- Build a rock-type garden.
- Plant low-growing (<0.5m. tall) shrubs only around the house. Deciduous trees are favored for landscape plantings. Replace highly flammable trees such as Western Red Cedar, hemlocks, spruces and firs with deciduous trees, or larches.
- Maintain an irrigated lawn within Zone 1.

### 1.2 Recommended guidelines for Priority Zone 2:

This zone surrounds Zone 1 and extends outward in concentric circles for another 20 meters. If the lots are less than 200 meters wide, apply the Zone 2 prescription to the property line. The goal of vegetation management in Zone 2 is to further extend the fuel modified area by thinning the forest cover and pruning lower conifer branches.



## CRYSTAL MOUNTAIN SKI RESORT EXPANSION FIRESMART GUIDELINES

### 1.2.1 Fire Hazard Reduction Prescription for Priority Zone 2:

- ◆ Space trees so that there is a minimum of 3 meters between the crowns of trees. Select the larger trees for retention. Priority is given to Aspen, poplar, maples and birches over conifers.
- ◆ Prune all branches that are within 3 meters of the ground and remove this debris.
- ◆ Remove all sound-woody debris on the ground and maintain annually
- ◆ Remove standing dead and dying trees.
- Maintain the prescribed spacing between trees as they continue to grow.

## APPENDIX 2.0 FireSmart Building Code

The demands of a fire fighting water supply can be partially reduced by using FireSmart design standards for all interface residence construction. The goal here is to reduce the ignition hazard of a structure while a fire is passing through the property.

- Use fire resistive materials for roofs and exterior walls.
- Use fire resistive materials for exterior window shutters, vent openings, and awnings.
- Build balconies and decks of non-combustible or fire-resistant materials.
- Ensure the house address is visible so fire fighters can find you quickly.
- Have a pre-planned escape route out of the area in case of emergency forest fire evacuations.
- Have a garden hose available that can reach at least 30m from the house and be prepared to place a sprinkler on the roof if needed.
- Houses without pressurized water systems should have a minimum 45-gallon water barrel close to each house with a two gallon pail attached.
- Paint the handles of fire fighting shovels and mattocks with red paint so that they are not used for regular gardening chores. Perform annual maintenance checks on these tools during the winter months.
- Keep a ladder available that will provide access to the roof.

## APPENDIX 3 Access Routes

Developments in the interface area must be designed to provide both public and emergency vehicle access. Any road systems proposed in the Master Plan will incorporate the design parameters endorsed in the FireSmart Manual. RDCO may grant a Development Permit exemption to these standards if written approval is received by the developer from the Westbank Fire Chief

Section 2(h)(ii) of The Master Plan can be augmented with the following FireSmart guidelines concerning roads and driveways (Sections 3.1 – 3.3) and be incorporated directly into engineering designs;

## CRYSTAL MOUNTAIN SKI RESORT EXPANSION FIRESMART GUIDELINES

### 3.1 FireSmart Guidelines for the layout, design, construction, and maintenance of proposed subdivision roadways :

- ◆ Roads should provide safe simultaneous access for emergency vehicles and public evacuation with a traveled way of not less than 6.1 meters horizontally and 4.1 meters vertical (overhead) clearance.
- ◆ Road curvature radius should be at least 30 meters, measured from the centerline.
- ◆ Dead-end roads more than 90 meters in length should be provided with a turnaround at the terminus having no less than 36 meters outside diameter of traveled way. Fire officials may authorize a “hammerhead T” turn-around to provide three point turnaround ability. Dead-end roads should have their non-through traffic status posted on fire-resistant signs.
- ◆ Road gradient should not exceed 10 %, unless negotiated with fire officials.
- ◆ All gates should be located at least 9 meters from the public right of way and should not open outward. Gate openings should provide a clear opening of not less than 0.6 meters wider than the traveled way.
- ◆ Fire service personnel shall be provided with keys for locks on any gates restricting fire service access.
- ◆ Roads should have a hard all-weather surface capable of supporting any fire apparatus likely to be operated on the road.

### 3.2 FireSmart Guidelines for the layout, design, construction, and maintenance of fire service access driveways in addition to the last four guidelines listed above for roads :

The FireSmart manual also provides recommended guidelines for driveway standards. Fire trucks must be capable of turning around at the end of a driveway that is more than 45 meters from a main road. Shorter roads without a turnaround should be marked at the entrance as such.

- ◆ Driveways more than 45 meters in length should be a minimum of 3.7 meters wide and provide 4.1 meters of overhead clearance. Fire officials may specify additional widths and clearances.
- ◆ Turnouts shall be spaced so that drivers can see from one turnout to the next. Turnout requirement is waived where the fire service access width is at least 6.1 meters. Driveways more than 90 meters long should be provided with turnouts at locations approved by fire officials.
- ◆ Driveway turns should not restrict the access of the largest emergency vehicle likely to be operated on the driveway. Fire officials will specify local emergency response agency requirements.
- ◆ Dead-end driveways more than 91 meters in length shall be provided with a turnaround at the terminus having no less than 15 meters outside diameter of traveled way. Fire officials may authorize a “hammerhead T” turnaround to provide three point turnaround ability. Dead-end roads should have signs warning of their no-through-traffic status.

### 3.3 FireSmart Guidelines for road, driveway and address signs:

- ◆ Signs should be clearly visible and legible from the road and use a consistent system that provides for sequenced or patterned numbering and non-duplicated naming.
- ◆ Signs should be built of non-combustible materials and mounted 2 meters above the road surface.
- ◆ Roads will be identified as “Dead-end” by fire officials. Directions to and the type of water source will also be signed.
- ◆ Letters, numbers, and symbols used on all signs should be at least 10 centimeters high with a 12 mm stroke, contrast with the background color of the sign, and be reflective.

## APPENDIX 4            Emergency Escape Road

The logical Emergency Evacuation Route would be down the Crystal Mountain Road to Glenrosa and Highway 97. Alternatively, the Last Mountain FSR would be used to evacuate vehicles to Kelowna via the Bear Main FSR if a wildfire was coming up Powers Creek towards the resort.

While the paved access road to Crystal Resort is presently under the authority of BC Highways Dept., the Last Mountain FSR is a gazetted road. Industrial users pay the Crown a maintenance fee when using it for log hauling. The Developer should communicate annually with the Ministry of Forests office in Vernon to enquire about the scheduling of road maintenance activities to ensure the road is suitable for an alternate emergency evacuation route and not undergoing road repairs during summer months.

## APPENDIX 5            FireSmart Water Supply Guidelines:

Wildfire suppression needs substantial volumes of water from a dependable source. Since this proposed development will not have a public water system supplying fire hydrants it will be the responsibility of both the developer and the homeowner to ensure their properties are adequately protected. The minimum standards recommended in the FireSmart Manual include:

- ◆ Dig a separate well to supply fire fighting water or ensure there is an alternative power source on the household well in the event an electrical power supply is interrupted during a wildfire.
- ◆ Any fire fighting water storage systems should be equipped for forestry-type hose connections.
- ◆ Consider the addition of firefighting foam concentrates, gels and wetting agents to the water supply.

## CRYSTAL MOUNTAIN SKI RESORT EXPANSION FIRESMART GUIDELINES

### 5.1 Developer's Responsibilities.

The developer will be required to install a water reservoir. The location and capacity of the reservoir should be calculated in consultation with the local fire officials. A portable water tanker may be considered a viable alternative to a reservoir. As well as being mobile, an enclosed tank will not be depleted by evaporation

### 5.2 Homeowner's Responsibilities:

The homeowner will be required to design and install a firefighting water delivery system that will meet the requirements of the NFPA 1231 code, Standard on Water Supplies for Suburban and Rural Fire Fighting. The water supply requirements can often be relaxed in proportion to other precautions the homeowner has implemented. Strict adherence to a fire-safe building code, landscaping code and maintenance code will all contribute to a more efficient fire suppression plan.