

Environmental Overview

Hemlock Resort Fraser Valley Regional District, BC



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Executive Summary

Berezan Management Ltd. (Berezan) is exploring expansion opportunities for Hemlock Resort located in Hemlock Valley, BC. The proposal includes expanding the ski area and associated accommodations. The details of the proposed expansion can be found in the Hemlock Resort Master Plan 2009 prepared by Brent Harley & Associates Inc. (BHA). Pottinger Gaherty Environmental Consultants Ltd. (PGL) was retained by Berezan to conduct a preliminary site reconnaissance and associated desktop research to scope potential environmental issues in the project area. The goal is to assess the preliminary feasibility of the proposed project from an environmental perspective, summarize preliminary environmental issues and outline environmental mitigation strategies.

PGL conducted a site visit in October 2008 and collected information related to environmental issues onsite. PGL also met with representatives from the Chehalis First Nation in March 2010 to collect additional environmental baseline information. The information gathered from the meeting and collected in the field was assessed in combination with a desktop overview to determine key environmental issues.

Several environmental issues were uncovered during this investigation, including:

- The potential species at risk (SAR) occurrence of provincially listed plant communities and provincially and federally listed plant SAR;
- The potential occurrence of 17 wildlife SAR;
- Identified fish habitat in Sakwi Creek and its tributaries;
- Identified sensitive terrestrial ecosystems (i.e., wetlands and riparian habitat) near Sakwi Creek and its tributaries; and
- The confirmed presence of previously recorded archaeological sites near Hemlock Valley.

There are ways to avoid or mitigate many of these impacts, which are summarized in the report. More detailed inventory and assessment will be completed in conjunction with the detailed design of each phase. An outline of these future studies is also provided.

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List of Acronyms

BEC	-	Biogeoclimatic Ecosystem Classification
BGC	-	Biogeoclimatic zone
BHA	-	Brent Harley & Associates
BMPs	-	best management practices
CDC	-	BC Conservation Data Centre
CEMP	-	Construction Environmental Management Plan
CMAunp	-	Coastal Mountain-heather Alpine, Undifferentiated and Parkland subzone
CMT	-	Culturally modified tree
COSEWIC	-	Committee on the Status of Endangered Wildlife in Canada
CWH	-	Coastal Western Hemlock
CWHdm	-	Dry Maritime Coastal Western Hemlock subzone
CWHvm2	-	Very Wet Maritime Montane variant of the Coastal Western Hemlock
DCK	-	Chilliwack Forest District
FISS	-	Ministry of Environment Fisheries Information Summary System
MHmm1	-	Moist Maritime Windward variant of the Mountain Hemlock
MOE	-	BC Ministry of Environment
MOFR	-	Ministry of Forests and Range
OGMA	-	old-growth management area
PFR	-	Preliminary Field Reconnaissance (Archaeology)
PGL	-	Pottinger Gaherty Environmental Consultants Ltd.
SAR	-	Species at Risk
SARA	-	Species at Risk Act
UTM	-	Universal Transverse Mercator coordinates

1.0 INTRODUCTION

Pottinger Gaherty Environmental Consultants Ltd. (PGL) is pleased to provide this report on our overview assessment of potential environmental issues associated with the proposed Hemlock Valley development project near Harrison Lake, BC.

We understand that Berezan Management Ltd. (Berezan) is proposing an expansion to the existing Hemlock Resort. The proposal includes expanding the ski area and associated accommodations. The details of the proposed expansion can be found in the Hemlock Resort Master Plan 2009 prepared by Brent Harley & Associates Inc. (BHA).

The following report discusses potential environmental issues associated with this site, and possible challenges related to the proposed development and potential environmental impacts, including:

- Comments regarding the quality of vegetation onsite;
- Comments regarding the quality of wildlife habitat onsite;
- Comments regarding fish habitat values associated with watercourses in the study area;
- The potential existence of species at risk (SAR) and other species/ecosystems of conservation concern onsite;
- A discussion of potential project impacts on the above environmental issues; and
- A summary of the mitigation measures available to deal with the potential impacts.

We have already used this information to work with the project designer (BHA) to iterate the project elements and avoid impacts at the macro scale.

2.0 PROJECT DESCRIPTION

The 2009 Hemlock Master Plan provides a detailed description of the proposed expansion. The proposal involves expanding the existing resort (village, ski runs, hiking trails, etc.) and adding additional commercial and residential developments. At buildout, the Hemlock Resort Controlled Recreation Area is proposed to be 5,737ha, as compared to the current 346ha. In addition, a proposed Joint Venture Lands (with Chehalis First Nation) will encompass approximately 10,144ha. This will result in 19,969 bed units, as compared to the current 1,072. There will be a phased approach to the proposed development that will be dictated by market conditions. The phased approach will take many years before Hemlock will reach buildout.

3.0 STUDY AREA

The study area is roughly 15,900ha and includes the existing Hemlock Valley Ski Area, the surrounding Mount Keenan and Mount Klautt hillsides, and undeveloped lands between Hemlock Valley and the western shore of Harrison Lake (Figure 1 and 2). A large number of tributaries can be found throughout the study area, the majority of which appear to drain into either Sakwi Creek, Weaver Creek, or down towards Harrison Lake. Sakwi Creek flows from the north into Weaver Creek, which flows into Morris Lake, down through Morris Creek, and eventually discharges into the Harrison River.

4.0 PROJECT SETTING

Hemlock Valley is located in and around Mount Keenan approximately 7km west of Harrison Lake, BC (Figure 1), and is found in the Chilliwack Forest District (DCK) of the Coast Forest Region. Access to Hemlock Valley is facilitated by Hemlock Valley Road, which can be accessed via Morris Valley Road extending north off the Lougheed Highway (Highway 7). Access to areas along the west side of Harrison Lake is provided by Harrison West Forest Service Road.

PGL staff conducted a reconnaissance of the existing Hemlock Valley Resort area on October 3, 2008. Observations were made to provide an overview description of this location including broad-level descriptions of vegetation conditions, potential wildlife considerations, potential SAR issues, documented fish presence, and fish habitat values.

Because of extensive development, habitat in the Fraser Valley Regional District is particularly valuable to plants, animals, and ecosystems of conservation concern. Past experience on projects in this region suggests that a number of specific SAR will require detailed studies to determine habitat suitability and/or capability, species presence/absence, and to develop mitigation strategies for potential impacts.

5.0 ENVIRONMENTAL OVERVIEW

The following sections contain a summary of broad-level environmental characteristics derived from the Hemlock Valley Resort area reconnaissance, and available resources (e.g., orthophotos, existing mapping, government databases, existing reports, etc.). The summary also provides lists of potential plant and animal SAR and ecosystems of conservation concern that will likely require further detailed bio-inventory surveys and mapping.

5.1 Vegetation

The proposed resort development project in and around Hemlock Valley will span four different Biogeoclimatic Ecosystem Classification (BEC) subzones or variants, including:

- The Dry Maritime Coastal Western Hemlock subzone (CWHdm);
- The Montane Very Wet Maritime Coastal Western Hemlock variant (CWHvm2);
- The Windward Moist Maritime Mountain Hemlock variant (MHmm1); and
- The Coastal Mountain-heather Alpine, Undifferentiated and Parkland subzone (CMAunp).

CWHdm

The CWHdm subzone occurs at low elevations between sea level and roughly 650m. This subzone dominates the lower portions of the Study Area including areas along the shores of Harrison Lake. The climate in the CWHdm subzone is characterized by warm and relatively dry summers followed by moist, mild winters with little snowfall. Plant communities on zonal sites (sites having intermediate soil moisture and nutrient regimes within a given area that best reflect the influence of regional climate) are characterized by forests dominated by Douglas-fir (*Pseudotsuga menziesii*), western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*). The understorey typically contains salal (*Gaultheria shallon*), red huckleberry (*Vaccinium parvifolium*), step moss (*Hylocomium splendens*), Oregon beaked moss (*Kindbergia oregana*), lanky moss (*Rhytidiadelphus loreus*), and wavy-leaved cotton moss (*Plagiothecium undulatum*) (Green and Klinka, 1994).

CWHvm2

The climate of the CWHvm2 variant is characterized by wet and humid conditions with cool, short summers and cool winters experiencing substantial snowfall. In the study area, this variant occurs above the CWHdm subzone and below the MHmm1 variant. Typical zonal forest canopies in the CWHvm2 variant are dominated by western hemlock and amabilis fir (*Abies amabilis*). Lesser components of western redcedar, yellow-cedar (*Chamaecyparis nootkatensis*), and mountain hemlock (*Tsuga mertensiana*) may also occur here. Common understorey include Alaskan blueberry (*Vaccinium alaskaense*) and five-leaved bramble (*Rubus pedatus*), with a well-established moss layer containing step moss, lanky moss and pipecleaner moss (*Rhytidopsis robusta*) (Green and Klinka, 1994).

MHmm1

The MHmm1 variant occurs above the CHWvm2 variant and below the CMAaup subzone. The climate is described as having long, wet and cold winters with short, cool summers. High snowfall in the MHmm1 can result in snowpack persisting through to July. Tree species composition on zonal sites in the MHmm1 variant is dominated by mountain hemlock and amabilis fir with lesser components of yellow-cedar. The herb and shrub layers of this variant typically contain both Alaskan and oval-leaved blueberry (*Vaccinium ovalifolium*), with pipecleaner moss being the most prominent species in the moss layer (Green and Klinka, 1994).

CMAaup

The CMAaup subzone occurs in the alpine above the MHmm1 variant and is subject to the harshest climate of all the BEC zones in BC. Temperatures are cold for most of the year with a mean annual temperature range between -4° and 0°C, and the subzone is typically subject to significant precipitation usually in the form of snow. The tree line in this environment can be lowered significantly relative to other alpine zones due to heavy and prolonged snowpack. Vegetation is typically lush in and around the tree line; however, plant communities become sparse with elevation. Tree species along the tree line of the CMAaup subzone are dominated by mountain hemlock, yellow-cedar and subalpine fir (*Abies lasiocarpa*). Understorey vegetation and ground cover above the tree line is typically characterized by low-growing evergreen dwarf shrubs such as white and pink mountain-heather (*Cassiope mertensiana* and *Phyllodoce empetrifomis*, respectively) (MacKenzie and Meidinger, 2006).

5.1.1 Vegetation Observations

The following sections summarize observations for both the existing Hemlock Valley Resort, as recorded during the October 2008 reconnaissance, and those made during our background research and desktop review.

5.1.1.1 Hemlock Valley Resort Reconnaissance

The majority of onsite, undisturbed vegetation observed during the existing Hemlock Valley Resort area reconnaissance represented a typical second-growth forest (Photograph 1). These conditions likely resulted from forest harvesting activities and historic resort development. Very few mature, veteran trees were observed in the limited areas visited during the field reconnaissance. The understorey vegetation in areas observed was typical of shrub, herb, and moss compositions expected in the CWHvm2 and MHmm1 variants.

Based on the reconnaissance visit and a review of aerial imagery of the existing Hemlock Valley Resort, a variety of coarse-level habitat types were observed, including:

- Young seral deciduous forest stands;
- Second-growth coniferous forest;
- Riverine, streams, and wetlands;
- Open grassy fields (e.g., ski runs on mountain slopes); and
- Montane rocky cliffs.

Although the majority of the area around the existing Hemlock Valley resort has been historically disturbed through forestry activities and/or land development, vegetation has re-established, and terrestrial habitat values in less-disturbed areas are considerable. A detailed field investigation will be required once specific phase study areas are defined, to confirm:

- Plant communities (e.g., site series/ecosystems) present;
- The presence/absence and locations of valued ecosystems or ecosystem components (e.g., veteran trees, old-growth forests, wetlands and riparian habitats); and
- The occurrence of ecosystems and plant species of conservation concern (e.g., provincially Red- or Blue-listed plant species or ecosystems, and federally protected plant species under the Canadian *Species At Risk Act*).

5.1.1.2 Background Research Summary

A review of existing resources was completed for the entire study area. The goal of this task was to provide preliminary description of vegetation characteristics, and identify key ecological values known to occur in the study area. Aerial photographic imagery (e.g., orthophotos, Google Earth, etc.) were reviewed to identify broad ecosystem types, and additional government and non-government resources (e.g., iMapBC, BC Ministry of Environment (MOE), the Integrated Land Management Bureau, etc.).

Outside of the immediate areas surrounding the existing Hemlock Valley Resort, land disturbances from human activity (i.e., land development, forestry, etc.) appear to be less frequent and/or non-existent. Based on aerial imagery, much of the land in the Study Area outside of that observed during the October 2008 reconnaissance appears to be characterized by forest representing young, mature and old-growth structural stages. Some disturbance areas were evident in the eastern portion of the study area approaching Harrison Lake. A network of cutblocks and logging roads occurs in this location, as well as an existing linear transmission corridor paralleling the western shore of Harrison Lake. Several additional cutblocks are located to the east of Weaver Lake.

In addition to the habitat types listed in Section 5.1.1.1, key broad-level ecosystems observed in various locations throughout the entire study area include:

- Riparian forest ecosystems adjacent to watercourses and lakes;
- Wetland ecosystems;
- Mature to old-growth forests; and
- Alpine ecosystems.

In addition, the Chilliwack District Sustainable Resource Management Plan (West Harrison Landscape Unit) identifies several old-growth management areas (OGMA) that occur within the study area (George et al., 2005). The OGMA are designated based on criteria outlined in the provincial *Landscape Unit Planning Guide* (MOFR and MOE, 1999). Based on the guidelines, OGMA targets for the West Harrison Landscape Unit were delineated including 1,233ha in the CWHdm, 802ha in the CWHvm2 and 331ha in the MHmm1. Due to insufficient old forest in some of the BEC subzones/variants of the West Harrison Landscape Unit, some younger-aged immature and mature forest stands were selected as recruitment areas to meet required targets.

Several OGMA polygons occur within the Study Area, a number of which overlap both proposed development and ski pods (Figure 3). Overlapping areas are evident in all three general areas of the project, including the Hemlock Valley Resort area and along the western shore of Harrison Lake. Any proposed development in OGMA will necessitate mitigation either through amendments or relocation. Proposed amendments or relocations of OGMA will require agreement and approval by the provincial government and all other interested parties involved (i.e., those parties holding forest tenures in the West Harrison Land Unit).

5.1.2 Ecosystems (Site Series) at Risk

Different ecosystems found in a particular BEC subzone/variant can be classified into site series or ecosystems. Site series describe landscape units that are capable of producing the same late seral or climax plant community within a BEC subzone/variant. The various different terrestrial plant communities occurring in each subzone/variant describe different climax ecosystems expected to occur under natural circumstances. The resulting climax ecosystems are influenced by landscape profile, soil types and aspect, as well as soil moisture and nutrient regimes. Additional ecosystems have also been classified in BC to represent different aquatic/semi-aquatic ecosystems, such as various distinctions of wetlands (e.g., fens, bogs) within each BEC subzone/variant.

Given the recent (e.g., <100 years) disturbances associated with the existing Hemlock Valley Resort, it is unlikely that any the late seral/climax plant communities actually exist there. However, there is a good possibility that plant communities in mature to old-growth structural stages do occur in less-disturbed portions of the study area (e.g., OGMA). A detailed field investigation and ecosystem mapping survey will be required in future baseline bio-inventory studies to describe existing vegetation conditions, classify site series and identify those ecosystems of conservation concern.

The BC Conservation Data Centre (CDC) recognizes site series classifications and identifies those that are considered rare and endangered ecosystems. A variety of plant communities in the DCK of the Coastal Forest Region are ranked by the CDC as Red- or Blue-listed (see Appendix 1 for provincial and federal SAR status definitions). Although there are no legal requirements currently in place to protect listed plant communities, regulatory agencies generally require that best management practices (BMPs) be employed by development projects to avoid, minimize, and mitigate impacts to Red- or Blue-listed plant communities.

Based on our preliminary desktop review of the BC Species and Ecosystems Explorer (MOE, 2010), a total of 21 different Red- or Blue-listed ecosystems potentially occur in the study area (Table 1). Fifteen of these occur in the CWHdm subzone, five occur on the CWHvm2 variant, and one is found in the MHmm1 variant. No listed ecosystems occur in the CMAunp subzone. Four of the 21 listed ecosystems potentially occurring in the Study Area are wetland ecosystems. A large wetland ecosystem was observed north of the maintenance yard associated with the existing Hemlock Valley Resort (Photographs 2 and 3). Classification of this wetland plant community will be required to assess the provincial status of this ecosystem, as well as all other wetland and terrestrial ecosystems occurring in the Study Area.

5.1.3 Plant Species at Risk

In addition to rare and endangered plant communities, a search was conducted using the CDC database to list potential plant SAR in all BEC subzones/variants occurring in the study area. A total of 41 Red- and Blue-listed plant species were identified as potentially occurring in the study area (Table 2).

The CDC was also consulted for known occurrences of plant species in the study area that are either protected under the Canadian *Species at Risk Act* (SARA) – Schedule 1, or provincially listed as Red or Blue status. No unmasked (i.e., species occurrence information publicly available) plant species occurrences were found in the study area; however, several masked occurrence (i.e., species occurrence information unavailable without consent from MOE) polygons overlap the study area. MOE was contacted to obtain additional information regarding the presence of masked occurrence polygons in the study area. MOE advised that the exact known occurrence locations were roughly 5km or more from the study area. Future baseline inventory work will require additional consultation with MOE, including commitment to a confidentiality agreement in order to obtain details regarding these occurrences (e.g., species, populations, migration, exact known locations, etc.). This information will be required to assist in the preparation of detailed bio-inventory study designs, complete a thorough impact assessment of the proposed development phases and prepare mitigation strategies, as required.

Table 1: CDC listed plant communities in the CWHvm2 and MHmm1 BEC variants

Scientific Name	English Name	BC List	Site Series	Ecosystem Group
<i>Tsuga heterophylla</i> / <i>Plagiothecium undulatum</i>	western hemlock / flat-moss	Blue	CWHdm/01	Forest
<i>Pseudotsuga menziesii</i> - <i>Pinus contorta</i> / <i>Holodiscus discolor</i> / <i>Cladina</i> spp.	Douglas-fir - lodgepole pine / oceanspray / reindeer lichens	Red	CWHdm/02	Woodland, Forest
<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i> Dry Maritime	Douglas-fir - western hemlock / salal Dry Maritime	Blue	CWHdm/03	Forest
<i>Pseudotsuga menziesii</i> / <i>Polystichum munitum</i>	Douglas-fir / sword fern	Red	CWHdm/04	Forest
<i>Thuja plicata</i> / <i>Polystichum munitum</i> Dry Maritime	western redcedar / sword fern Dry Maritime	Blue	CWHdm/05	Forest
<i>Tsuga heterophylla</i> - <i>Thuja plicata</i> / <i>Blechnum spicant</i>	western hemlock - western redcedar / deer fern	Red	CWHdm/06	Forest
<i>Thuja plicata</i> / <i>Tiarella trifoliata</i> Dry Maritime	western redcedar / three-leaved foamflower Dry Maritime	Blue	CWHdm/07	Forest
<i>Picea sitchensis</i> / <i>Rubus spectabilis</i> Dry	Sitka spruce / salmonberry Dry	Red	CWHdm/08	Riparian, Forest
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Alnus rubra</i> / <i>Rubus spectabilis</i>	black cottonwood - red alder / salmonberry	Blue	CWHdm/09	Riparian, Forest
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Salix sitchensis</i>	black cottonwood / Sitka willow	Blue	CWHdm/10	Riparian, Forest
<i>Thuja plicata</i> - <i>Picea sitchensis</i> / <i>Lysichiton americanus</i>	western redcedar - Sitka spruce / skunk cabbage	Blue	CWHdm/12	Wetland, Forest
<i>Thuja plicata</i> / <i>Rubus spectabilis</i>	western redcedar / salmonberry	Red	CWHdm/13	Forest, Riparian
<i>Thuja plicata</i> / <i>Lonicera involucrata</i>	western redcedar / black twinberry	Red	CWHdm/14	Forest
<i>Thuja plicata</i> / <i>Carex obnupta</i>	western redcedar / slough sedge	Blue	CWHdm/15	Wetland, Forest
<i>Typha latifolia</i> Marsh	common cattail Marsh	Blue	CWHdm/Wm05	Wetland, Herbaceous

Scientific Name	English Name	BC List	Site Series	Ecosystem Group
<i>Tsuga heterophylla</i> - <i>Thuja plicata</i> / <i>Gaultheria shallon</i> Very Wet Maritime	western hemlock - western redcedar / salal Very Wet Maritime	Blue	CWHvm2/03	Forest
<i>Thuja plicata</i> - <i>Tsuga heterophylla</i> / <i>Polystichum munitum</i>	western redcedar - western hemlock / sword fern	Blue	CWHvm2/04	Forest
<i>Abies amabilis</i> - <i>Picea sitchensis</i> / <i>Oplopanax horridus</i>	amabilis fir - Sitka spruce / devil's club	Blue	CWHvm2/08	Riparian, Forest
<i>Carex sitchensis</i> / <i>Sphagnum</i> spp.	Sitka sedge / peat-mosses	Red	CWHvm2/Wf51	Wetland, Herbaceous
<i>Salix sitchensis</i> / <i>Carex sitchensis</i>	Sitka willow / Sitka sedge	Blue	CWHvm2/Ws06	Wetland, Shrub, Riparian
<i>Carex sitchensis</i> / <i>Sphagnum</i> spp.	Sitka sedge / peat-mosses	Red	MHm1/Wf51	Wetland, Herbaceous

Source: B.C. Conservation Data Centre. 2010. BC Species and Ecosystems Explorer. BC Ministry of Environment, Victoria, B.C. Available: <http://a100.gov.bc.ca/pub/eswp/> (accessed Apr 15, 2010).

Search Criteria: Red and Blue Provincial Conservation Status; Chilliwack Forest District (DCK); Lower Mainland MOE Region; FVRD; Southern Pacific Ranges Ecoregion; BGC Subzones/Variants CWHdm, CWHvm2, MHm1, and CMAup.

Table 2: CDC listed plant SAR potentially occurring in the CWHvm21 and MHmm1 BEC variants

Scientific Name	English Name	COSEWIC	BC List	SARA	BGC	Habitat and Range Information
<i>Actaea elata</i>	tall bugbane	Endangered	Red	1	CWHdm; CWHvm; MHmm	Moist forests in the lower montane zone; rare in extreme SW BC, known only from the Cultus Lake-Chilliwack River area
<i>Alopecurus carolinianus</i>	Carolina meadow-foxtail	-	Red	-	CWHdm	Wet to moist vernal pools, roadsides and meadows in the lowland zone; rare on S Vancouver Island, the Gulf Islands and SC BC
<i>Anemone drummondii</i> var. <i>drummondii</i>	alpine anemone	-	Blue	-	CMA; MHmm	Mesic to dry meadows, rock outcrops and scree slopes in the subalpine and alpine zones; rare in SW BC, common in SE BC, infrequent elsewhere E of the Coast-Cascade Mountains
<i>Apocynum x floribundum</i>	western dogbane	-	Blue	-	CWHdm	Mesic to dry roadsides, fields, shrublands and open forests in the lowland, steppe and montane zones rare in S BC east of the Coast-Cascades Mountains
<i>Asplenium adulterinum</i>	corrupt spleenwort	-	Blue	-	CWHvm; MHmm	Dry to mesic walls of limestone fissures in the montane and subalpine zones; rare on Vancouver Island and in lower Fraser Valley
<i>Berula erecta</i>	cut-leaved water-parsnip	-	Blue	-	CWHdm	Wet to moist streambanks, ditches and opens areas in the lowland, steppe and montane zones; rare in S BC
<i>Bidens amplissima</i>	Vancouver Island beggarticks	Special Concern	Blue	1	CWHdm	Moist to wet ditches, streambanks and pond edges in the lowland zone; infrequent in SW BC, known from Vancouver Island and the adjacent mainland; endemic to BC
<i>Callitriche heterophylla</i> ssp. <i>heterophylla</i>	two-edged water-starwort	-	Blue	-	CWHvm	Shallow ponds, slow-moving streams and shorelines in the lowland and montane zones; ssp. <i>bolanderi</i> - frequent on S Vancouver Island, rare in SE BC, ssp. <i>heterophylla</i> - rare in coastal BC
<i>Carex comosa</i>	bearded sedge	-	Red	-	CWHdm	Shorelines and wet meadows in the lowland, steppe and montane zones; rare in SW and SC BC
<i>Carex interrupta</i>	green-fruited sedge	-	Red	-	CWHdm	Streamsides and wet places in the lowland zone; rare in SW BC
<i>Carex scoparia</i>	pointed broom sedge	-	Blue	-	CWHdm	Moist to wet ditches, lakeshores, marshes and meadows in the lowland and montane zones; rare in S and EC BC
<i>Carex vulpinoidea</i>	fox sedge	-	Blue	-	CWHdm	Wet meadows, swamps, marshes, and streambanks in the lowland, steppe and montane zones; rare in S BC

Scientific Name	English Name	COSEWIC	BC List	SARA	BGC	Habitat and Range Information
<i>Cephalanthera austiniiae</i>	phantom orchid	Threatened	Red	1	CWHdm	Moist to mesic forests in the lowland zone; rare in the lower Fraser Valley, SE Vancouver Island and the Gulf Islands
<i>Coleanthus subtilis</i>	moss grass	-	Red	-	CWHdm	Damp, muddy lake margins in the lowland and lower montane zones; rare in SW and SC BC, known only from Shuswap and Hatzic Lakes
<i>Elatine rubella</i>	three-flowered waterwort	-	Blue	-	CWHdm	Wet ditches, mudflats and shallow ponds and shorelines in the lowland, steppe and montane zones; rare in extreme SW and SC BC
<i>Eleocharis rostellata</i>	beaked spike-rush	-	Blue	-	CWHdm	Salt marshes, hot springs and alkaline or saline ponds in the lowland and steppe zones; rare in S BC
<i>Elodea nuttallii</i>	Nuttall's waterweed	-	Blue	-	CWHdm	Lakes, ponds and streams in the lowland, steppe and montane zones; rare in S BC
<i>Epilobium glaberrimum</i> ssp. <i>fastigiatum</i>	smooth willowherb	-	Blue	-	CMA	Moist streambanks, rocky slopes, and open forests in the montane to alpine zones; rare in S BC
<i>Epilobium leptocarpum</i>	small-fruited willowherb	-	Blue	-	CMA; CWHdm; CWHvm	Moist meadows and streambanks in the montane to alpine zones; rare throughout BC
<i>Fabronia pusilla</i>	silver hair moss	Endangered	Red	1	CWHdm	Habitat described on the two Schofield specimens from Sumas Mountain was a cranny on a dry semi-shaded vertical sandstone cliff and a damp, shaded sandstone cliff; occurring in crevices of steep rocks of undetermined type. In Oregon and California it occurs in similar habitats as well as tree bark, especially on oaks
<i>Helenium autumnale</i> var. <i>grandiflorum</i>	mountain sneezeweed	-	Blue	-	CWHdm	Moist to mesic streambanks, meadows and forest openings in the lowland, steppe and montane zones; rare (var. <i>grandiflorum</i>) to frequent (var. <i>montanum</i>) in S BC
<i>Hydrophyllum tenuipes</i>	Pacific waterleaf	-	Red	-	CWHdm	Moist woodlands and streambanks in the lowland zone; rare on S Vancouver Island and the lower Fraser Valley
<i>Hypericum scouleri</i> ssp. <i>nortoniae</i>	western St. John's-wort	-	Blue	-	CWHvm	Moist to wet streamsides, estuaries, marshes and open slopes in all zones except the alpine and steppe zones; infrequent in S BC
<i>Juncus oxymeris</i>	pointed rush	-	Blue	-	CWHdm	Wet meadows and riverbanks in the lowland zone; rare in SW BC

Scientific Name	English Name	COSEWIC	BC List	SARA	BGC	Habitat and Range Information
<i>Lewisia columbiana</i> <i>var. columbiana</i>	Columbia lewisia	-	Blue	-	MHmm	Mesic to dry gravelly or rocky slopes and rock outcrops from the montane to alpine zones; infrequent on S Vancouver Island and the Cascade Mountains
<i>Mitella caulescens</i>	leafy mitrewort	-	Blue	-	MHmm	Wet to moist meadows and woodlands in the lowland and montane zones; rare on S Vancouver Island and the lower Fraser Valley
<i>Myriophyllum hippuroides</i>	western water-milfoil	-	Blue	-	CWHdm	Lakes and sloughs in the lowland zone; infrequent in SW BC, known only from the lower Fraser River Valley
<i>Myriophyllum ussuriense</i>	Ussurian water-milfoil	-	Blue	-	CWHdm	Lake margins and muddy river banks in the lowland zone; rare on Vancouver Island, lower Fraser River valley and SE BC; amphiberian, in North America known only from BC
<i>Nephroma occultum</i>	Cryptic Paw	Special Concern	Blue	1	CWH	Grows on bark and wood of conifers. Almost all known locations are from old-growth forests on the western slope of the Cascades, dominated by <i>Pseudotsuga - Tsuga heterophylla</i> , stands tending to have abundant populations of <i>Lobaria oregana</i> ; on fallen branches or recently windthrown trees; near the forest floor only where the forest is somewhat more open. The lichen occurs most frequently in the mid to upper canopy
<i>Persicaria hydropiperoides</i>	water-pepper	-	Blue	-	CWHdm	Wet swampy sites, shorelines and shallow water in the lowland zone; rare in SW BC
<i>Polemonium elegans</i>	elegant Jacob's-ladder	-	Blue	-	CMA	Dry cliffs and scree slopes in the subalpine and alpine zones; rare in S BC south of 56°N, mostly in the Coast-Cascade Mountains
<i>Potamogeton nodosus</i>	long-leaved pondweed	-	Red	-	CWHdm	Lakes and sloughs of the lowland zone; rare in the lower Fraser River Valley and in the Okanagan Valley, doubtful elsewhere
<i>Potamogeton oakesianus</i>	Oakes' pondweed	-	Blue	-	CWHvm	Lakes and ponds in the lowland and montane zones; rare in SW and SC BC, known only from Steelhead (near Vancouver) and Mara Lake
<i>Potamogeton perfoliatus</i>	perfoliate pondweed	-	Blue	-	CWHdm	Lakes in the montane zone; rare north of 53 degrees N, known only from Swan Lake in the Cassiar Range

Scientific Name	English Name	COSEWIC	BC List	SARA	BGC	Habitat and Range Information
<i>Pseudocypbellaria rainierensis</i>	Oldgrowth Specklebelly	Special Concern	Red	3	CWHvm	The plant is restricted in Canada to sheltered old-growth forest ecosystems in British Columbia. It is found at low to moderate elevations in the Coastal Western Hemlock zone. It occupies at least five of the ten sub-zones, which suggests that the plant is widely but sparsely distributed. It colonizes a wide assortment of trees and shrubs, but occurs most frequently on conifers. It is very slow at becoming established, but can become locally abundant with time. The climatic conditions of the habitat in B.C. are highly oceanic and markedly humid. Associated species include Sword Fern, False Azalea , Alaska Blueberry, Oval-leaf Blueberry and Dwarf Dogwood
<i>Rubus lasiococcus</i>	dwarf bramble	-	Blue	-	MHmm	Mesic to moist thickets and open forests in the montane and lower subalpine zones; rare in SW BC
<i>Rupertia physodes</i>	California-tea	-	Blue	-	MHmm	Mesic open forests in the lowland zone; rare on S Vancouver Island and the lower Fraser Valley
<i>Sparganium fluctuans</i>	water bur-reed	-	Blue	-	CWHvm	Ponds, lakeshores and slow-moving streams in the lowland and montane zones; rare in BC south of 55oN
<i>Toxicodendron diversilobum</i>	poison oak	-	Blue	-	CWHdm	Dry to mesic rocky slopes (often climbing trees) in the lowland zone; rare in SW BC, known from SE Vancouver Island, the Gulf Islands and Howe Sound
<i>Verbena hastata</i> var. <i>scabra</i>	blue vervain	-	Red	-	CWHdm	Moist to wet ditches, meadows and marshes in the lowland and steppe zones; rare in SW and SC BC
<i>Wolffia borealis</i>	northern water-meal	-	Red	-	CWHdm	Ponds, lakes and slow-moving streams in the lowland and montane zones; rare in the lower Fraser Valley and SE BC (Creston)

Source: B.C. Conservation Data Centre. 2010. BC Species and Ecosystems Explorer. BC Ministry of Environment, Victoria, B.C. Available: <http://a100.gov.bc.ca/pub/eswp/> (accessed March 3, 2010).

Search Criteria: Chilliwack Forest District (DCK); Lower Mainland MOE Region; FVRD; Lacustrine, Palustrine, Riverine and Terrestrial Habitat Types; BGC Subzones CWHdm, CWHvm, MHmm, and CMA

5.2 Wildlife

PGL's wildlife biologist completed a preliminary identification of key wildlife species and habitat in the areas being contemplated for development, based on:

1. Field observations from an October 2008 reconnaissance visit to the Hemlock Valley area; and
2. Desktop review of wildlife databases and reports for the area.

The identification of key wildlife habitat gave particular consideration to the habitat requirements of wildlife SAR and other key species known to inhabit the region. This information will permit the preliminary scoping of wildlife habitat issues, and help to focus and define further wildlife work.

5.2.1 Potential Key Wildlife Species

For the purpose of this task, key wildlife species are considered to be:

- Federally or provincially designated SAR;
- Species protected under other legislation, such as the *Wildlife Act*;
- Species that have recreational or cultural value; and/or
- Species of common public concern.

Preserving suitable or capable habitat is important to the protection of SAR, is a mandate of some legislation, and is a general best management practice. It also should be noted that active nests of all native birds are protected under the *Wildlife Act* and due diligence requires nest surveys according to government protocol during the breeding season (April 1 to July 31) prior to disturbance.

A query of the CDC Mapping Service web application (accessed March 2010) for the Hemlock Valley did not contain any results on previously observed provincially Blue- or Red-listed wildlife species. Likewise, a query of Environment Canada's Species at Risk Web Mapping Application showed that the study area is not in the known ranges of any species protected under Schedule 1 of SARA. While these resources provide information on the known ranges and recorded observations of SAR, it does not confirm absence of SAR, so further scoping and detailed investigation of the potential presence of SAR are required.

A query of the wildlife SAR (Red or Blue list) in the BC Species and Ecosystems Explorer web application (accessed March 2010) for the Fraser Valley district resulted in 54 species being identified. Of these, 21 species are considered to potentially occur in the proposed study area based on cursory knowledge of the habitat present. In some cases (e.g., some invertebrate species), habitat requirements are poorly known and more desktop research is required to further evaluate their potential occurrence at this location. Table 3 presents these 21 species and indicates the provincial and federal designations.

Table 3: Wildlife SAR potentially occurring in the Hemlock Valley that require additional investigation

Scientific Name	Common Name	BC Status	Federal Status	
			COSEWIC	SARA (Schedule)
<i>Ascaphus truei</i>	Coastal tailed frog	Blue	SC	1
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Blue	T	1
<i>Botaurus lentiginosus</i>	American Bittern	Blue	—	—
<i>Butorides virescens</i>	Green Heron	Blue	—	—
<i>Dendragapus fuliginosus</i>	Sooty Grouse			
<i>Epitheca canis</i>	Beaverpond Baskettail	Blue	—	—
<i>Erythemis collocata</i>	Western Pondhawk	Blue	—	—
<i>Falco peregrinus anatum</i>	Peregrine Falcon, <i>anatum</i> subspecies	Red	SC	1
<i>Gulo gulo luscus</i>	Wolverine, <i>luscus</i> subspecies	Blue	SC	—
<i>Hirundo rustica</i>	Barn Swallow	Blue	—	—
<i>Megascops kennicottii kennicottii</i>	Western Screech-Owl, <i>kennicottii</i> subspecies	Blue	SC	1
<i>Octogomphus specularis</i>	Grappletail	Red	—	—
<i>Patagioenas fasciata</i>	Band-tailed Pigeon	Blue	SC	—
<i>Prophyaon vanatta</i>	Scarletback Tailedropper	Blue	—	—
<i>Rana aurora</i>	Red-legged frog	Blue	SC	1
<i>Sorex trowbridgii</i>	Trowbridge's Shrew	Blue	—	—
<i>Strix occidentalis</i>	Spotted Owl	Red	E	1
<i>Sympetrum vicinum</i>	Autumn Meadowhawk	Blue	—	—
<i>Tanypteryx hageni</i>	Black Petaltail	Blue	—	—
<i>Ursus arctos</i>	Grizzly bear	Blue	SC	—
<i>Zonitoides nitidus</i>	Black Gloss	Blue	—	—

COSEWIC status: E = endangered; T = Threatened; SC = special concern.

This exercise is the first step in scoping potential key wildlife species occurrence, and will be refined as research and fieldwork further clarify the possible presence of these species. Further scoping of the wildlife species list in Table 3 will enable the identification of groups of focal species. Focal species should be confirmed with regulatory agencies (e.g., MOE), and will guide the detailed wildlife studies for the environmental assessment of specific development phases. As noted in Section 5.1.3 above, several known masked occurrence polygons overlap the study area. These occurrences may be animal species and could influence the determination of focal

species for future studies. Consultation with MOE will be required to obtain further details regarding these occurrences.

Regarding grizzly bears, the site is adjacent to the southern boundary of the Garibaldi-Pitt population unit. Further investigation will determine the potential impact on this population based on recorded presence and habitat suitability.

5.2.2 Key Wildlife Habitat

Based on a reconnaissance visit to the Hemlock Valley and review of orthophotography, the project area covers a variety of coarse-level habitat types, with the main ones being:

- Second-growth coniferous forests;
- Mature and old-growth forests;
- Riverine, streams, and wetland;
- Lacustrine habitat at Weaver Lake; and
- Montane/alpine rocky cliffs and open areas.

In general, the most sensitive of these habitats are the watercourses and wetlands because they generally include the highest biodiversity. Several of the wildlife SAR noted in Table 3 are associated with watercourses, wetland and riparian habitats. Most of the rest of the potential SAR are reliant on areas of mature forest and, in the case of the Peregrine Falcon, cliffs that are suitable breeding sites. The study area contains portions of these higher-value wildlife habitats, and these will be sites on which to focus future wildlife surveys.

Two legally defined Ungulate Winter Range polygons are located immediately west of the site, on the west slope of Mount Keenan (Figure 4) (Ministerial Order U-2-006). The western edge of the proposed ski area is located on the edge of this Ungulate Winter Range, which provides suitable winter conditions for deer populations in the area. A detailed survey of this area would identify if there may be any significant impacts from the development and use of ski runs.

Wildlife habitat values in the study area are varied with respect to habitat type, and will require further investigation to determine:

- The potential effects on key wildlife species from the proposed project;
- Suitability/capability and use of impacted habitat by key wildlife species; and
- Seasonal use of, and associations with, impacted habitat by key wildlife species.

5.3 Fish Habitat

The main waterbodies within the site are:

- Sakwi Creek in the Hemlock Valley;
- Brett Creek and Cartmell Creek on the east side of the site draining into Harrison Lake; and
- Maisal Creek and Vaughn Creek on the west side draining into Chehalis River.

A large number of watercourses can be found throughout Hemlock Valley (Photograph 4), all of which appear to drain into Sakwi Creek (Photograph 5). Sakwi Creek flows from the north into Weaver Creek, which flows into Morris Lake, down through Morris Creek, and eventually discharges into the Harrison River. Chum salmon, coho salmon, cutthroat trout, rainbow trout, sculpin (general), sockeye salmon, and sucker (general) are known to occur in Sakwi Creek and may access areas adjacent to the site. According to MOE Fisheries Information Summary System (FISS), there is a cascade barrier preventing anadromous fish from accessing the proposed project area. Preliminary watercourse and wetland buffers for a portion of the study area are shown in Figure 5.

On the east side of the site, the proposed development phases contain the headwaters of Cartmell Creek which flows east and through the proposed development area before entering Harrison Lake. Both creeks have rainbow trout with unknown presence at the high elevations of the proposed ski areas.

The west and northwest side of the site (proposed ski areas) include the headwaters of Vaughn Creek and Maisal Creek in the Chehalis River watershed. According to FISS, Maisal Creek contains coho salmon and steelhead in the lower reaches with resident rainbow trout present from the confluence with the Chehalis River to about 6.8km upstream (outside proposed development area). Fish presence in Vaughn Creek is unknown, with a single FISS record of an electrofishing survey in 1996 that did not catch any fish.

The site is adjacent to Harrison Lake, which contains numerous fish species, including all species of west coast salmon.

Further studies would map fish presence in areas that may be affected by the project, as well as classification of the habitat potential. Proving absence of anadromous fish in the project area and assessing populations of resident fish species requires three sampling events in different seasons using at least two sampling methods.

5.3.1 Fish Species at Risk

A search was performed using the CDC database to identify potential fish SAR in the waterbodies on the site (Table 4). According to existing data, only cutthroat trout are known to exist in the project area.

Table 4: CDC listed fish SAR potentially occurring in the study area

Scientific Name	Common Name	COSEWIC*	BC Status	SARA
<i>Catostomus platyrhynchus</i>	Mountain sucker	Not at Risk	Blue	—
<i>Oncorhynchus clarkii clarkii</i>	Cutthroat trout, <i>clarkii</i> subspecies	—	Blue	—
<i>Salvelinus confluentus</i>	Bull trout	—	Blue	—
<i>Salvelinus malma</i>	Dolly varden	—	Blue	—

* COSEWIC = Committee on the Status of Endangered Wildlife in Canada.

5.4 Heritage

A search of the Provincial Heritage Registry Database at the Ministry of Tourism, Sport, and the Arts in Victoria was conducted to identify previously recorded archaeological sites located within and adjacent to the study area. Several previously recorded sites were found near the Hemlock Valley.

The lack of additional recorded sites in the Hemlock Valley should not be interpreted as suggesting that there are no archaeological sites present and/or that there is no archaeological potential and/or aboriginal usage of the area under investigation. It is recommended that a future environmental baseline inventory for specific development phases include a Preliminary Field Reconnaissance (PFR) to further investigate the potential for archaeological sites. An application should be made for a Stó:lō Heritage Investigation Permit prior to the initiation of the PFR, and the PFR should be conducted under the terms of a Stó:lō Heritage Investigation Permit. It should be noted that once the First Nations with asserted traditional territories encompassing the proposed study area have been identified, a Chehalis Indian Band Archaeological Investigation permit as well as other First Nations Archaeological Investigation permits may also be required.

Traditional use studies should be completed for specific development phases during future baseline studies.

5.5 Socioeconomic

Currently the Hemlock Valley has several economic activities, including a wide variety of recreational opportunities. Some of the main sectors of the Hemlock Valley economy include forestry and resort/tourism. Logging activities in the Hemlock Valley have a history that dates back to the 1960s. Currently there is little active logging underway in the Hemlock Valley. The existing Hemlock Valley Resort was created in 1969. There are also a number of mineral claims within the study area. Recreational activities in the area include hiking, riding ATVs and motorbikes, and sport fishing. There are two BC Forest Service camping sites on the south side of Weaver Lake. There are also skiing activities at the existing Hemlock Valley Resort.

The proposed development could have potential impacts to socioeconomic activities including impacts to the local economy, traffic, community recreational values, and visual aesthetics.

6.0 FIRST NATIONS CONSULTATION

Another factor to consider is that the Stó:lō Nation and local First Nations are integral to, and very active in, land-use decisions. The Stó:lō Nation and local First Nations are very active in the preservation and conservation of archaeological sites throughout their asserted traditional territory and in general land-use planning.

Berezan representatives have developed a working relationship with the Chehalis First Nation. Chief William Charlie of the Chehalis First Nation has written a letter of support (August 7, 2009) for the Hemlock Resort Master Plan 2009. PGL staff met with Gordon Mohs (Heritage Resources Advisor) and James Leon (Research Technician) at the Chehalis First Nation Band Office on March 4, 2010 to discuss environmental baseline information.

As the development phases proceed, further consultation would be conducted on the detailed design and impact assessments.

PGL also recommends that all Stó:lō and local First Nation Heritage policies be followed.

7.0 KEY ISSUES AND POTENTIAL MITIGATION MEASURES

PGL’s preliminary examination of potential issues associated with the proposed expansion of Hemlock Resort in the Hemlock Valley identified five important issues:

- Sensitive terrestrial ecosystems (i.e., wetland and riparian habitat);
- Potential SAR occurrences (ecosystems, plants, and animals);
- Fish habitat;
- Archaeology; and
- Socioeconomic.

Specific issues and mitigation measures will be identified in conjunction with the detailed design of each phase of the project. Potential issues and potential mitigation measures are summarized in the Table 5.

Table 5: Potential issues and potential mitigation measures

Potential Issues	Potential Mitigation and Compensation Strategies
Sensitive terrestrial ecosystems (i.e., wetland and riparian habitat)	<p>During the detailed design phase of the project, sensitive terrestrial ecosystems will be identified and full effort will be made to avoid these areas. If work is to occur in or adjacent to sensitive terrestrial ecosystems, compensation and mitigation strategies will be implemented, including:</p> <p>Mitigation:</p> <ul style="list-style-type: none"> • Construction Environmental Management Plans (CEMPs) will be developed and include specific mitigation measure to protect sensitive terrestrial ecosystems; • Environmental monitoring will be implemented during construction; • Invasive Species Management Plans will be designed and implemented; and • Plants will be salvaged wherever possible. <p>Compensation:</p> <ul style="list-style-type: none"> • Sensitive terrestrial ecosystem replacement and restoration plans will be developed and include long-term monitoring to ensure survival.

Potential Issues	Potential Mitigation and Compensation Strategies
Potential SAR occurrences (ecosystems, plants, and animals)	<p>During the detailed design phase of the project, potential SAR will be identified and full effort will be made to avoid these areas. If work is to occur in or adjacent to potential SAR locations, compensation and mitigation strategies will be implemented, including:</p> <p>Mitigation:</p> <ul style="list-style-type: none">• CEMPs will be developed and include specific mitigation measure to protect SAR;• Environmental monitoring will be implemented during construction;• Species specific surveys (nesting surveys, etc.) will be conducted; and• SAR will be salvaged wherever possible; and <p>Compensation:</p> <ul style="list-style-type: none">• Habitat enhancement plans for SAR will be developed and include long-term monitoring to ensure survival.

Potential Issues	Potential Mitigation and Compensation Strategies
Fish Habitat	<p>During the detailed design phase of the project, fish habitat will be identified and full effort will be made to avoid these areas. If work is to occur in or adjacent to fish habitat, compensation and mitigation strategies will be implemented, including:</p> <p>Mitigation:</p> <ul style="list-style-type: none"> • CEMPs will be developed and include specific mitigation measure to protect fish habitat; • Environmental monitoring will be implemented during construction; • Erosion and Sediment Control Plans will be developed and implemented; • Stormwater BMPs will be incorporated into the development; • Recommendations outlined in the Land Development Guidelines will be met or exceeded; • DFO operational statements will be used wherever possible; • Construction activities will be scheduled to avoid or limit time spent working in or around water bodies during the rainy season (period of highest risk of sediment mobilization to surface water); and • A Spill Contingency Plan will be prepared to deal with the accidental release of substances (e.g., hydrocarbons) that are harmful to the aquatic environment. <p>Compensation:</p> <ul style="list-style-type: none"> • Fish habitat replacement and restoration plans will be developed and include long-term monitoring to ensure survival.
Archaeology	<p>At the detailed design phase of the project a PFR will be conducted to identify any potential archaeological impacts. If there is potential for archaeological impacts all effort will be made to avoid these areas. CEMPs that include specific mitigation measures to protect archaeological sites will also be developed.</p>
Socioeconomic (i.e., local economy, traffic, community recreational values and visual aesthetics)	<p>Socioeconomic impacts will be further assessed at the detailed design phase of the project. Potential impacts to socioeconomic activities include impacts to the local economy, traffic, community recreational values and visual aesthetics.</p>

Cumulative effects will be identified during each phase of the project. For example, the first phase of the proposed project will consider the cumulative effect of Phase 1 and the existing Hemlock Valley Resort.

8.0 FUTURE STUDIES

As the project proceeds to the detailed design stage for each phase, the environmental studies for approvals should include:

- Vegetation inventory and terrestrial ecosystem mapping;
- Wildlife habitat assessment;
- Detailed plant, plant community, and wildlife SAR surveys;
- Fish habitat assessments;
- Fish population surveys;
- Archaeological surveys (PFR);
- Socioeconomic studies; and
- Environmental assessment including impact mitigation measures.

Once the proposed project footprint has been established, we will define the studies required. PGL will involve First Nations in the design and implementation of environmental studies, and get their feedback on the assessment of impacts.

These studies would provide the basis for an assessment of impact and regulatory approvals, as well as constraint maps and tools for the design team. The relevant Environmental Assessment regulatory process will be clarified as the project design progresses.

Based on this Environmental Overview report, there does not appear to be any impacts that cannot be mitigated.

We trust that this report meets your needs. If you have any questions or require clarification, please contact Damien Crowell or Susan Wilkins at 604-895-7658 and 604-895-7621, respectively.

Respectfully submitted,

POTTINGER GAHERTY ENVIRONMENTAL CONSULTANTS LTD.

Per:



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LEED™ 2.0 Accredited Professional
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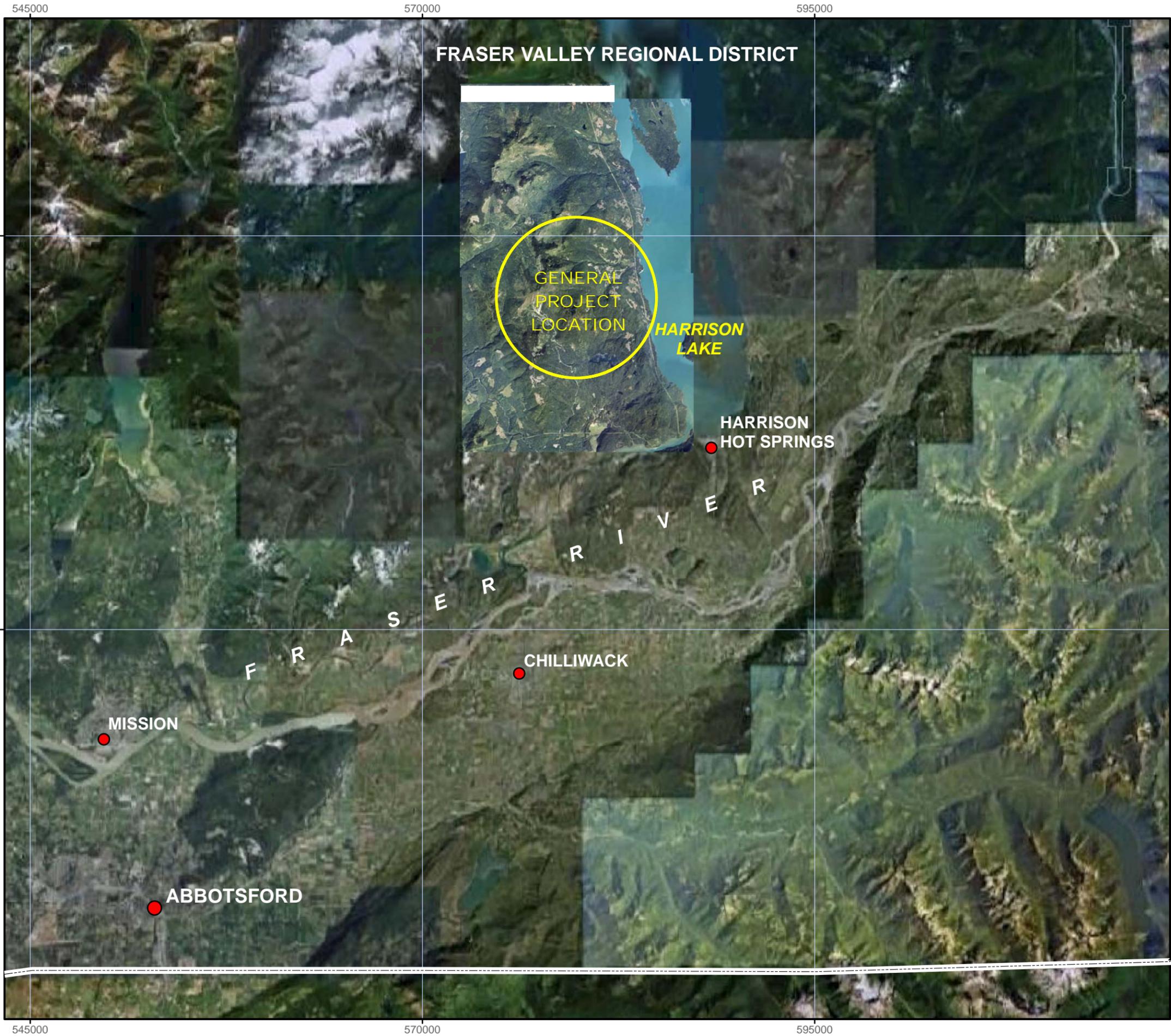

Susan P. Wilkins, M.Sc., P.Geo.
LEED™ 2.0 Accredited Professional
Vice President, Operations

DBC/SPW/stm
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Figures



HEMLOCK RESORT

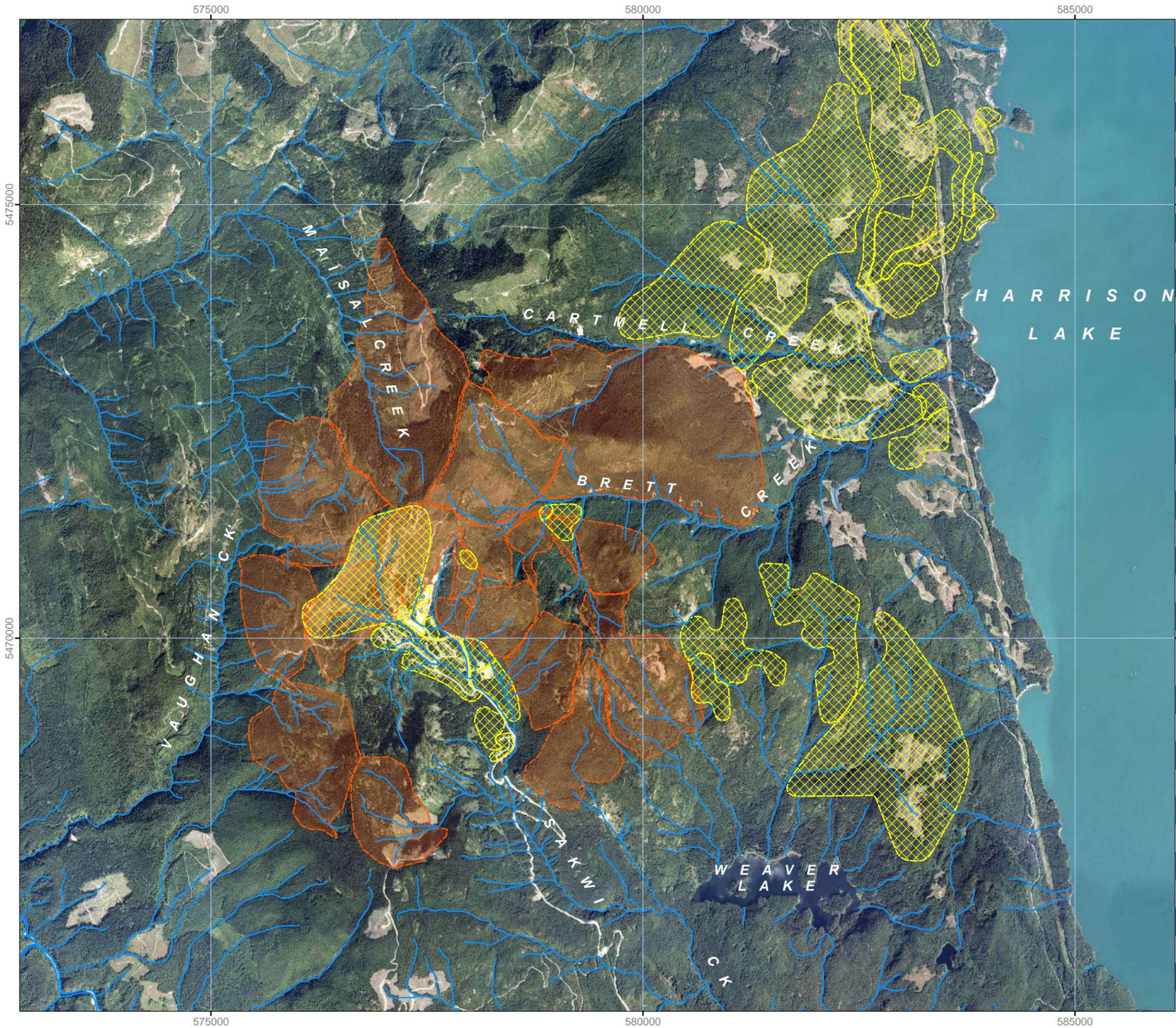


SITE LOCATION

MARCH 2010

FIGURE 1

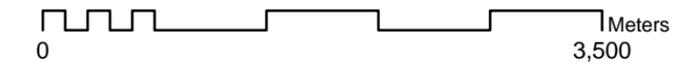
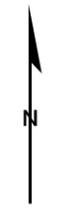
2894-13-02-01



HEMLOCK RESORT

LEGEND

-  Drainage
-  Development Pod Expansion
-  Proposed Ski Pods



PROJECT LAYOUT

AUGUST 2010

FIGURE 2

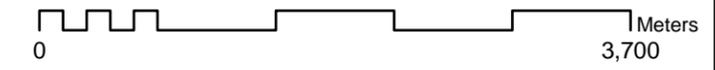
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HEMLOCK RESORT

LEGEND

-  Development Pods
-  Proposed Ski Pods
-  Old Growth Management Areas



OLD GROWTH MANAGEMENT AREAS

AUGUST 2010

FIGURE 3

2894-13-02-03.2



HEMLOCK RESORT

LEGEND

-  Development Pods
-  Proposed Ski Pods
-  Ungulate Winter Range
-  Drainage

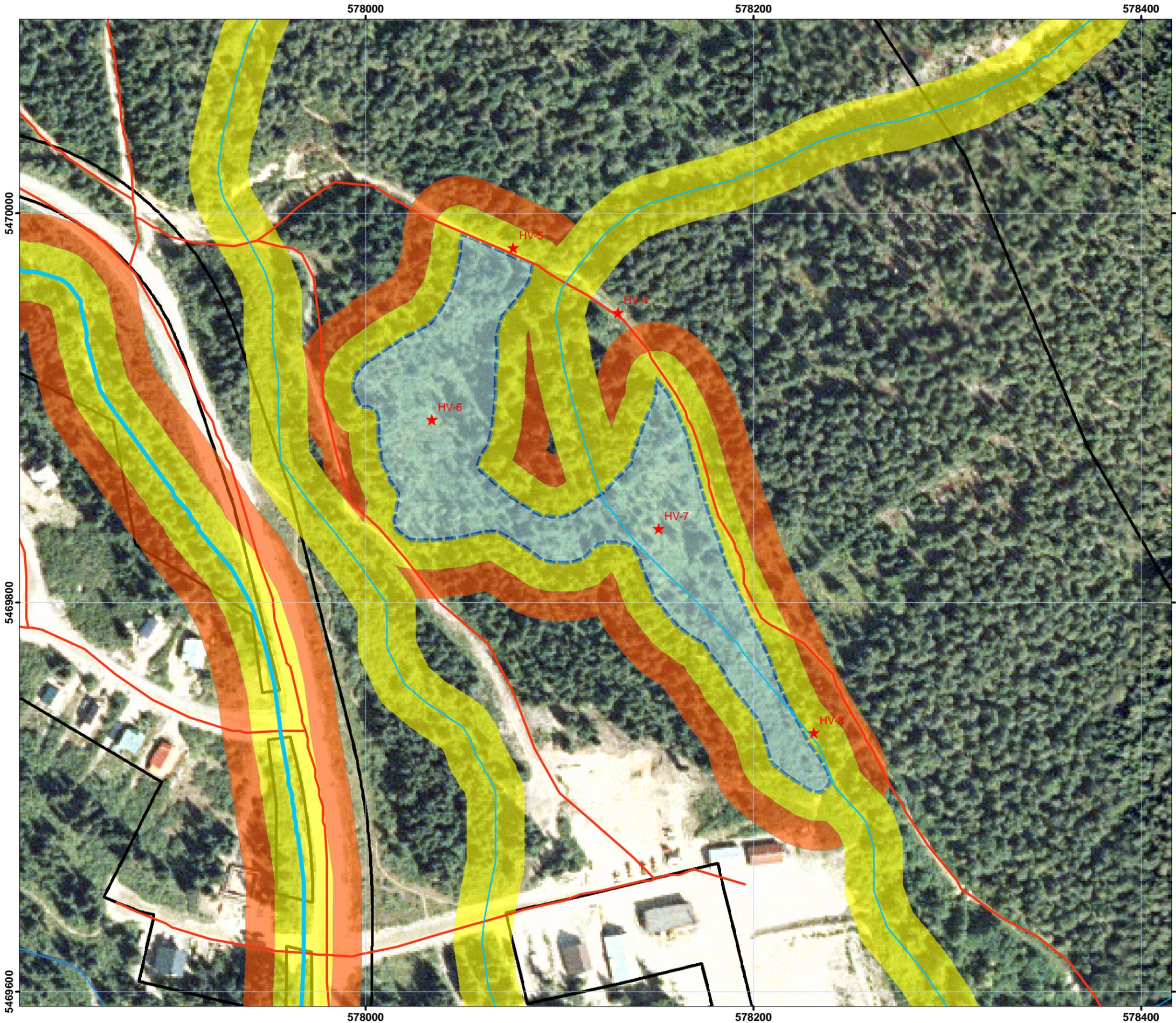


UNGULATE WINTER RANGE

AUGUST 2010

FIGURE 4

2894-13-02-04.2



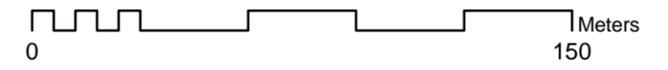
HEMLOCK RESORT

LEGEND

- ★ Observation Point
- Tributary
- Main Stream
- Road and Trail
- ▭ Wetland
- Watercourse and Wetland 15m Buffer
- Watercourse and Wetland 30m Buffer

Notes:

1. The setbacks are based on preliminary data. A detailed inventory study (RAR assessment) and regulatory approval will be required to develop an accurate setback.
2. We have indicated a likely 15m setback for the central tributary and a 30m worst case scenario on the wetland and main stream.
3. It is possible propose channel relocations and appropriate compensation (ie. for middle tributary).



WATERCOURSE AND WETLAND 15 - 30m BUFFER ZONE

MARCH 2010

FIGURE 5
2894-13-02-05

Photographs



Photograph 1:

Typical second-growth forest observed in the study area, north of the existing maintenance facility, looking southwest.



Photograph 2:

Wetland clearing north of the existing maintenance facility looking south-southwest.



Photograph 3:

Standing water in large wetland north of the existing maintenance facility.



Photograph 4:

Tributary to Sakwi Creek located west of the existing ski area parking.



Photograph 5:

Sakwi Creek main stem adjacent to Hemlock Valley Road, looking south.

Appendix 1

SAR Federal and Provincial Status Definitions

Appendix 1 – SAR Federal and Provincial Status Definitions

Status Definitions as per provincial Conservation Data Centre (CDC)

RED: Species that are candidates for Extirpated, Endangered, or Threatened status in BC. Placing taxa on these lists flags them as being at risk and requiring investigation.

BLUE: Species considered of Special Concern in BC. Taxa of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events.

Status Definitions as per federal COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

Endangered (E): A wildlife species that is facing imminent extirpation or extinction.

Threatened (T): A wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.

Special Concern (SC): A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Status Definitions as per federal Species at Risk Act (SARA)

ENDANGERED: A wildlife species that is facing imminent extirpation or extinction.

THREATENED: A wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.

SPECIAL CONCERN: A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

SCHEDULE 1: Official list of federally protected species.

SCHEDULE 2 and 3: Species under assessment for inclusion to Schedule 1.