UPDATED

Environmental Review of a Portion of Silver Star Mountain Resort

PREPARED FOR

SILVER STAR MOUNTAIN RESORT

PREPARED BY

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

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1.0 INTRODUCTION

The Environmental Review of a Portion of Silver Star Provincial Park was originally released in draft form in October 1996 by GeoAlpine Environmental Consulting Ltd., a parent company of Cascade Environmental Resource Group Ltd. The document was widely circulated for review by the public and inter-governmental agencies and subsequently released in final form in March 1997. Over the next six months additional environmental planning took place in support of an application to expand the resort into a portion of Provincial Park. Government and public critiques of the document were received and additional research was conducted in response to those comments. GeoAlpine and Silver Star Mountain Resort decided to release an updated Environmental Review that integrated the additional information into the original document, thereby providing a more comprehensive review. Virtually all of the original text for the draft and the update remains in this document with the exception of typographical errors that were corrected. This updated document addresses changes in legislation, policy and regulation that have occurred since 1997. The updated document was prepared based on analysis of orthophotos produced from 2004 aerial photography and on the understanding that no changes have occurred to the subject lands in the intervening period. The appendix containing information gathered by GeoAlpine in a review of the effluent monitoring program for the waste treatment plant remains in this document.

Silver Star Mountain Resort operates downhill and cross-country ski facilities within a Controlled Recreation Area (CRA) that is surrounded by Class A Provincial Park. Expansion plans for the resort to expand its four-season status to include the development of additional recreational facilities beyond the current southern boundary of the CRA. The proposed development required adjustments to the boundary of Silver Star Provincial Park. As part of the planning process for boundary adjustment and recreational development, Silver Star Mountain Resort retained GeoAlpine Environmental Consulting Ltd. to conduct an Environmental Review of the site. This report presents the results of inventory work and analysis performed in 1996.

In 1999 the Crown made an Offer of Lease to Silver Star Mountain. The former owners of Silver Star allowed the lease offer to lapse as they decided not to proceed with development at that time. In 2001, the Formal Application to transfer a portion of Silver Star Provincial Park to the Controlled Recreation Area (CRA) for the purpose of constructing a golf course was approved and the study area was incorporated into the Silver Star Mountain Resort CRA.

Recently Silver Star Mountain Resort entered into a Master Planning process for the purpose of renewing its All Season Resort Lease agreement with the Province. During the Master Planning process, Silver Star expressed interest in reactivating the previous application to lease the golf course lands and incorporate the concept into the plan. The application was reactivated with the Ministry of Tourism, Sport and the Arts (MTSA) in early 2006. At that time MTSA reviewed the original submission for its completeness and applicability to current policies and regulations. As part of MTSA's review, it was decided that Silver Star needed to update certain aspects of the original submission. During discussions with MTSA and the Ministry of Environment (MOE) Silver Star Mountain Resort agreed to update the Environmental Review as part of the Master Planning process.

1.1 Study Area Location

The Silver Star Mountain Resort is encircled by Silver Star Provincial Park on the east side of Okanagan Lake, approximately 20 km northeast of Vernon and 15 km northwest of Lumby. The study area is located to the southeast of the Resort, on a ridge that is drained on the north side by tributaries to Vance Creek and on the south by tributaries to Coldstream Creek. (see Location Map following).

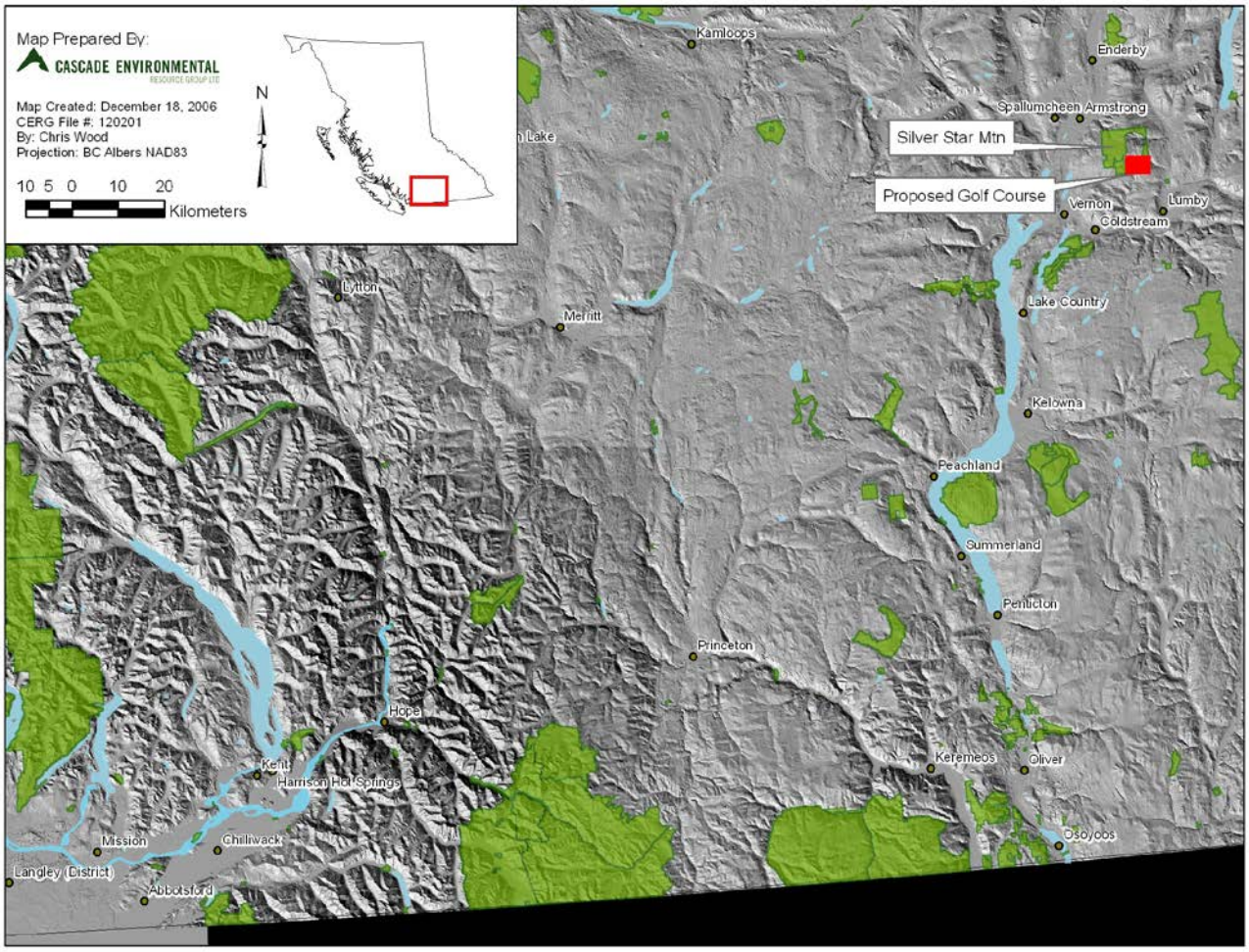
1.2 Statement of Limitations

This Document was originally prepared by **GeoAlpine Environmental Consulting Ltd.** for the account of **Silver Star Ski Resort** in March 1997. It has been updated and re-released by Cascade Environmental Resource Group Ltd. for the account of Silver Star Mountain Resort.

Neither all nor part of the contents of this report should be used by any party, other than the client, without the express written consent of Cascade Environmental Resource Group Ltd. If such consent is granted, a surcharge may be rendered. Should this report contain an error or omission then the liability, if any, of Cascade Environmental Resource Group Ltd. should be limited to the fee received by Cascade Environmental Resource Group Ltd. for the preparation of this Document. Recommendations contained in this report reflect Cascade Environmental Resource Group Ltd.'s judgment in light of information available at the time of study. The accuracy of information provided to Cascade Environmental Resource Group Ltd. is not guaranteed. Any use made of this report by a Third Party, or any reliance upon decisions made on the basis of this Document, are the responsibility of such Third Parties. Cascade Environmental Resource Group Ltd. accepts no responsibility for damages suffered by any Third Party as a result of decisions made or actions taken based on this Document.

This Document should not be construed to be a Phase 1 - Environmental Site Assessment, nor should it be construed to be a Preliminary Site Investigation (as per the Contaminated Sites Regulations of the Environmental Protection Act), nor should it be construed to be an Environmental Impact Assessment.

Map 1 Location of Study Area



1.2 Project Team

Field studies were conducted by a project team consisting of:

- ◊ Dave Williamson, B.E.S.
- ◊ Mike Nelson, R.P.Bio.
- ◊ Mike Cole, M.Sc., P.Eng.
- ◊ Ethan Askey, M.R.M.
- ◊ Martin Gebauer, M.Sc., R.P.Bio.

Additional research assistance was provided by Jas Michalski, B.Sc., and Karina Andrus, B.A.

The 2006 update was completed by:

- ◊ Dave Williamson, B.E.S.
- ◊ Mike Nelson, R.P.Bio.
- ◊ Chris Wood, M.Sc.
- ◊ Amber Lunn, B.Sc.

Additional documents were prepared during the application process and reviewed as part of the update. These documents include, but are not limited to:

- ◊ Formal Application to transfer a portion of Silver Star Provincial Park to the Controlled Recreation Area for the purpose of constructing a golf course, 1997
- ◊ Silver Star Mountain Resort Golf Course Environmental Construction and Monitoring Plan, 1999.
- ◊ Hydrological Assessment For Proposed Golf Course Development Silver Star Provincial Park, 1997.
- ◊ Silver Star Mountain Resort, Golf Course Project – Comparison of Pre-Development and Post Development Drainage, 1997.

1.3 Project Scope

Silver Star Mountain Resort Inc. updated their Resort Development Plan in 1995. As part of that process Brent Harley and Associates Inc. conducted a review of the Base Area (BHA, 1995). The review identified a portion of Silver Star Provincial Park to be potentially suitable for the development of a golf course. Coincidentally, this same site presented an ongoing pest management concern with the Ministry of Forests and BC Parks. GeoAlpine Environmental Consulting Ltd. was retained to conduct an environmental inventory and review of the subject site. The primary objectives of this undertaking (hereafter referred to as the Environmental Review) are to identify and delineate ecosystem units, environmentally sensitive areas, and ecologically significant habitats within the study area.

1.4 Methodology

The study area landscape was divided into map bio-terrain polygons based on ecological criteria such as climate, surficial geology and topography, soil, and vegetation. Recently established terrestrial ecosystem mapping principles (Resources Inventory Committee, 1998) were employed to identify and delineate distinct ecosystem units, and show their distribution within the study area. Terrestrial ecosystem mapping integrates both abiotic and biotic components to provide an ecological framework for land use and resource management. Furthermore, it also serves to:

1. Identify sensitive wetlands and riparian areas;
2. Identify productive forest types;
3. Produce wildlife capability and suitability mapping for the following species: Deer, Black Bear, Amphibians, Cavity Nesters, Bats.

At the outset of the study, a literature review was conducted to collect pertinent data and identify information gaps. Maps and aerial photographs of the study area were analyzed to develop preliminary distinctions between ecosystem units, based on terrain and vegetation. The method of assessment used for the study is the current provincial standard for environmental assessment using Terrestrial Ecosystem Mapping, as developed by the Resources Inventory Committee and coordinated by the MOELP and MOF. These tentatively delineated polygons were mapped for field use and ground-truthing during site investigations.

Reconnaissance level field investigations were conducted between July 21 and 25, 1996. Ecosystem Field Forms [FS 882(1) HRE 96/4] were used to collect and record information to describe the site, soils, vegetation, and mensuration/wildlife in each polygon of the study area. A Global Positioning System (GPS) was employed during field investigation to provide accurate geo-referencing of sample sites. Fish habitat information was collected using the DFO/MOE Stream Survey Forms and methodology, and a program of electrofishing and trapping was undertaken to determine fish presence in the vicinity of the study area.

The collected field data and other information constitutes a baseline environmental inventory which identifies the main ecological systems and processes that occur in the study area. In the final phase of the study, an analysis of the inventory information was performed to identify constraints to development in the study area.

Further detail on methodology is included under separate section headings.

2.0 EXISTING CONDITIONS

2.1 Cultural Environment

At the time of this study, no archeological, heritage, or recreational features were identified in the study area. The only evident anthropogenic activity in the area consists of cut blocks and skid roads associated with timber harvesting, undertaken in the past decade apparently as a management response to an infestation of mountain pine bark beetle. Most of the study area is densely forested and undulating in topography, with poor access. While there are no known disputes or claims concerning this area currently administered by the Ministry of Environment (MOE) and the Integrated Land Management Bureau (ILMB) of the Ministry of Agriculture and Lands (MAL), it should be noted that land claims issues are yet to be resolved with First Nations throughout the province.

During the inter-agency review process Chief Reynolds Bonneau, Okanagan Indian Band raised a number of issues. Issues raised by Chief Bonneau fall outside the scope of the studies conducted by the consultant. Subsequent to the initial release of the GeoAlpine Environmental Review anthropological and archeological assessments were conducted under the direction of the Archeology Branch of the Ministry of Small Business, Tourism and Culture. These studies were designed to address these issues.

2.2 Physical Environment

2.2.1 Climate

Climatic data for Silver Star Village (elevation 1572 m) is available for the period 1970 to 1990 from the Atmospheric Environment Service (AES) of Environment Canada. Mean annual precipitation for the period of record is 985 mm, of which 38% falls as rain (May to September) and 62% falls as snow (October to April). Further details are available in Appendix A.

2.2.2 Geology

Silver Star Mountain is composed mainly of rock from the Nicola Group of the Triassic / Jurassic eras. This Group is composed of lavas and pyroclastic rocks, with occurrences of sedimentary rock including argillites and some limestones. In addition, within the Putnam Creek Drainage feeder intrusions, greenstone and chloritic schist is noted (Minfile 082LSW, 1993). Silver Star Mountain was prospected under the Silver Queen claim, with recorded showings of silver, gold, copper, zinc, and silica. Bedrock outcrops were encountered within one polygon (Polygon 4a) which displayed fine grained sandstones. Test pits encountered metamorphic units (schists and slates) possibly related to the Silver Creek Formation (Proterozoic/Paleozoic) identified to the west (Minfile 082LSW, 1993).

2.2.3 Geomorphology & Surficial Materials

The physiology of the study area is predominated by Quaternary units at all elevations below 1700 m and the western slopes of Silver Star Mountain. Below the tree line of Silver Star Mountain, bedrock is covered with a thick layer of glacial till. Above 1700 m bedrock outcrops occur frequently and the depth of overburden is frequently less than 1m. The eastern, leeward slopes and drainages of the study area are generally characterized by deep morainal and colluvial deposits of glacial till (Belsham, 1978). As a result, the creeks have a dendritic pattern with deeply incised banks.

In general, the study area can be described as an undulating plateau, consisting of a series of bedrock controlled ridges and depressional troughs. Terrain mapping was developed for the study area based on aerial photo interpretation. In 2006, the terrain mapping was updated to reflect the increased accuracy of digital orthophoto technology and survey level (1 m contour interval) digital mapping. Bio-terrain polygons were generated using the updated geomorphology and recent Vegetation Resource Inventory (VRI) as the principal criteria in delineation. Bio-terrain mapping is presented in Map 2.

Of the 14 test pits excavated in the course of site investigation, most exhibited layers of fine-grained, relatively well-sorted morainal tills varying in thickness from 0.3 to 1.0 m. It is possible that there is more than one origin for the geomorphic units within the study area. Some units appear to be lacustrine or glaciofluvial in origin, based on their well-sorted nature. Conversely, a dense, poorly-sorted clay unit was encountered in two test pits, which is more characteristic of morainal tills.

The majority of the surficial units are free-draining depending on slope. The lithic contacts tend to contain weathered bedrock units (in the form of angular gravels) ranging from sandstones to slate schists in origin.

Map 2 Silver Star Golf Development – Terrain Features

2.2.4 Hydrology

Silver Star Provincial Park and the Controlled Recreation Area (CRA) contained therein is situated on the divide between two major river systems. These are the Fraser River system via the Shuswap River, and the Columbia River system via the Okanagan Lake/River. Drainage basins within the study area are presented in Map 3.

Watercourses that drain the study area into the Fraser/Shuswap River system include:

◊ Vance Creek via Bessette Creek.

Watercourses that drain the study area into the Columbia/Okanagan system include:

◊ Coldstream Creek.

The Water Survey of Canada (WSC) has established stream gauging stations on some of these drainages. A summary of available WSC information for these stations is presented in Table 1. Further details on the two main drainages, Vance and Coldstream Creeks, are provided below.

Vance Creek

The Vance Creek drainage area is approximately 73.3 km^2, which includes the southeastern portion of Silver Star Provincial Park (10.2 km^2 within the CRA). This creek flows east and southeast into Bessette Creek, which in turn flows into the Shuswap River approximately 15 km upstream of Mabel Lake. Within the CRA, Vance Creek appears to be more actively eroding its channel bed than Putnam Creek. In the upper reach, extending from 1040 m to 1640 m, the main channel has an average gradient of 12%, while the gradient of its tributaries at this elevation range from 12 to 20%. Vegetation on the stream banks consists mainly of young alders, indicating recent changes to the stream profile. Side banks above the channels often exceed 50% and numerous slope failures were noted on the January site visit. Between the park boundary and the 720 m elevation, where Vance Creek enters the Trinity Valley, the average gradient lessened to an average of approximately 5%. The Vance Creek drainage area upstream of the Trinity Valley was calculated at approximately 36.4 km^2 by the study team. Within the Trinity Valley, the gradient of Vance Creek was about 4%.

A WSC gauging station has been operated on Vance Creek below Deafies Creek since 1970. The creek has a total annual discharge ranging from 6,840 to 26,700 dam^3 (mean 15,100 dam^3) for the period of record. Three WSC stations have also been located on Bessette Creek.

Coldstream Creek

Coldstream Creek drains a small portion of the extreme south of Silver Star Provincial Park. It flows southwest into Kalamalka Lake, which drains north and then southwest to Okanagan Lake via Vernon Creek. Coldstream Creek's total drainage area is about 207 km^2, with approximately 1.4 km^2 within the Silver Star Mountain Resort CRA.

Coldstream Creek has been gauged at four locations by the WSC, and is the subject of a 2 1/2 year study by the Water Investigations Branch of the then BC Department of Lands, Forests and Water Resources, released in 1974. The Water Investigations Branch report (1974) divides the Coldstream into two (upper and lower) sub-basins. The Upper Coldstream sub-basin corresponds to the WSC Station No. 08NM142, and has a drainage area of 58.5 km^2. The annual runoff for the period of record ranges from 2,750 dam^3 to 14,700 dam^3 (mean of 7,850 dam^3), with maximum and minimum elevations of 1660 m and 600 m respectively. Within the Upper Coldstream drainage, the mean gradient of the creek channel is 5%. The gradient steepens to an average of 13% within study area.

Map 3 Study Area and Drainage Basins

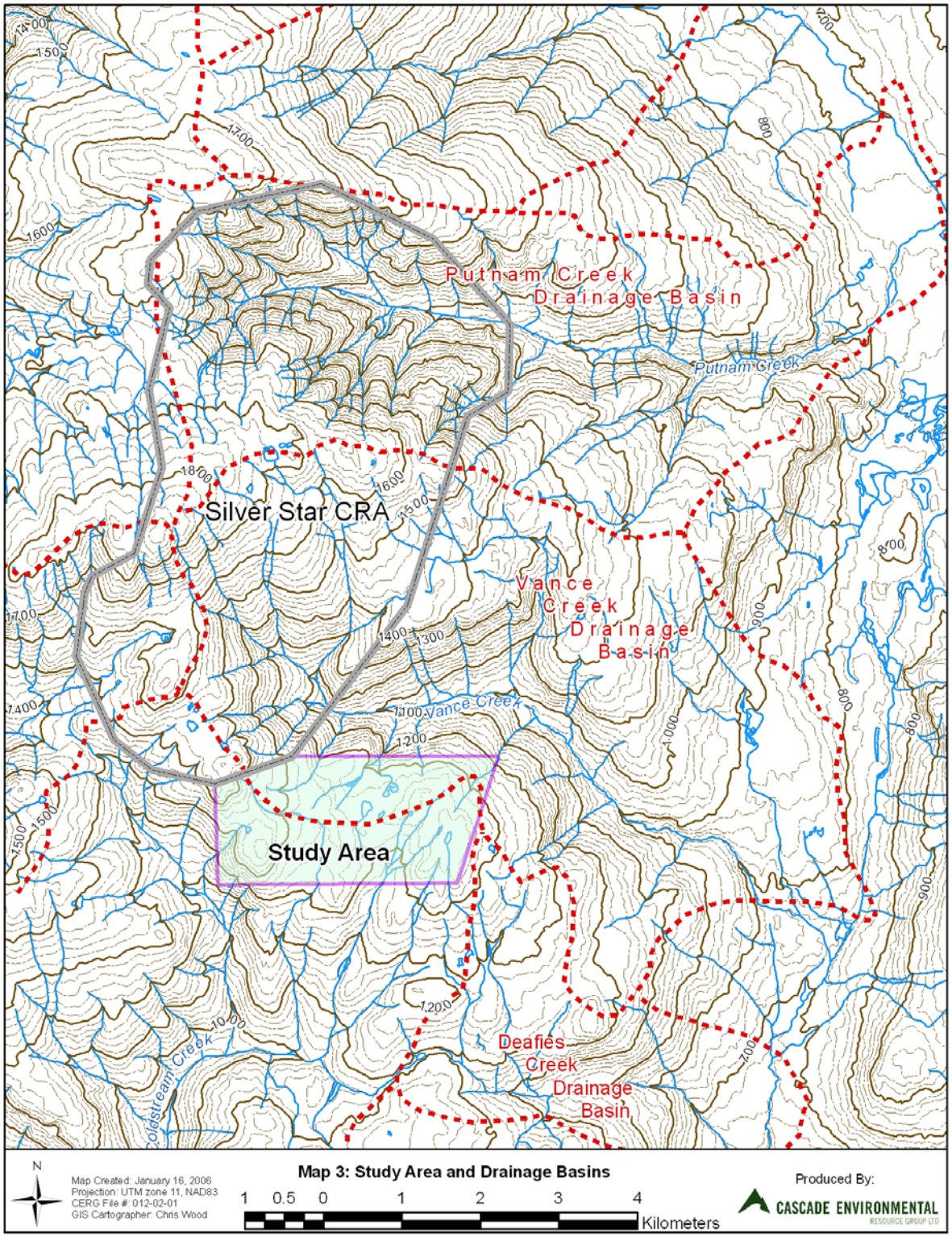


Table 1: Historical Streamflow Summary (to 1990), Water Survey of Canada

Stream Gauging Station Name	Station No.	Period of Record	Drainage Area (km^2)	Regulated/ Natural Flow	Mean Annual Discharge (m^3/s)	Maximum Daily Discharge (m^3/s)	Minimum Daily Discharge (m^3/s)
Okanagan/Columbia Drainage System							
BX Creek above Vernon Intake	08NM020	1921 – 90	55.7	Regulated	0.297	4.56	0.000
BX Creek below Swan Lake Control Dam	08NM123	1959 – 78	120	Regulated	0.258	2.94	0.00
Coldstream Creek above Kalavista Diversion	08NM179	1970 – 82	207	Regulated	0.626	8.30	0.096
Coldstream Creek above Municipal Intake	08NM142	1967 – 90	58.5	Natural Flow	0.249	4.04	0.017
Coldstream Creek at Mouth	08NM154	1969 – 70	205	Regulated	n/a	2.34	n/a
Coldstream Creek near Lavington	08NM124	1959 – 79	61.9	Regulated	0.211	3.91	0.000
Shuswap/Fraser Drainage System							
Bessette Creek above Beaverjack Creek	08LC039	1970 – 90	603	Regulated	3.42	50.4	0.194
Bessette Creek above Lumby Lagoon Outfall	08LC042	1973 – 90	469	Regulated	3.04	36.6	0.136
Bessette Creek near Lumby	08LC005	1919, 43 - 83*	253	Regulated	n/a	23.1	0.007
Fortune Creek at Stepney	08LC031	1950 – 60*	132	Regulated	n/a	9.06	0.008
Fortune Creek near Armstrong	08LC035	1911 - 12, 59 - 84	41.2	Natural Flow	0.623	4.85	0.000
Shuswap River at Outlet of Mabel Lake	08LC019	1927 - 36, 51 - 79	4040	Regulated since 1940	81.1	552	9.12

Table 1: Historical Streamflow Summary (to 1990), Water Survey of Canada (continued)

Stream Gauging Station Name	Station No.	Period of Record	Drainage Area (km^2)	Regulated/ Natural Flow	Mean Annual Discharge (m^3/s)	Maximum Daily Discharge (m^3/s)	Minimum Daily Discharge (m^3/s)
Shuswap River at Outlet of Sugar Lake Reservoir	08LC018	1926 - 40, 71 – 79, 84 - 86, 90	1130	Regulated since 1940	38.4	371	0.320
Shuswap River near Enderby	08LC002	1911 - 36, 60 - 90	4690	Regulated since 1940	87.7	626	10.6
Shuswap River Near Lumby	08LC003	1913, 17 - 36, 45 - 73, 84 - 86, 90	2000	Regulated since 1940	50.3	552	0.566
Trinity Creek above Diversion	08LC048	1981 – 84*	42.9	Natural Flow	n/a	4.85	n/a
Trinity Creek near the Mouth	08LC050	1985 – 90*	191	Regulated	n/a	35.1	n/a
Vance Creek below Deafies Creek	08LC040	1970 – 90	73.3	Natural Flow	0.479	5.60	0.018

n/a Not available *Flows recorded from April to September only

The Lower Coldstream drainage includes the remainder of the Coldstream watershed. While there are no water licenses in the upper sub-basin, the quantity of water in the lower sub-basin licensed in 1974 for consumption purposes exceeds the total mean annual runoff from both sub-basins (Water Investigations Branch, 1974; WSC). It is also of note that although the mean annual total discharge of Coldstream Creek at the mouth is 19,800 dam^3, 90% of this water flow occurs during freshet.

2.3 Terrestrial Environment

The terrestrial environment is described using an ecological approach. Information was gathered with the assistance of Describing Ecosystems in the Field (Luttmerding, et. al., 1990). Ecosystem Field Forms were used to collect general site information as well as more detailed information on soils, vegetation, mensuration and wildlife.

2.3.1 Pedologic Soils

Reconnaissance (Intensity Level 4) soils mapping undertaken by the provincial government in the 1970's indicates that Brunisolic Gray Luvisols, Orthic Gray Luvisols, Typic Humisols, and both Orthic and Eluviated Dystric Brunisols are expected to occur in the study area (Kowall, 1978). This mapping was undertaken by way of surface and aerial reconnaissance of the map area at an average working scale of 1:100,000 with traverses up to 8 km apart (Kowall, 1978; Van Vlies, 1996). Messiter (MT) soils associated with lesser amounts of Waby (WY) soils are shown to be most widely distributed in the study area. Clapperton (CPA) soils with lesser amounts of Minnie (MN) soils are shown to occur primarily in the far western portion of the study area, with some Vermelin (VN) soils occurring on the northern edge of the area. Other soils in higher elevation areas and ridges in the vicinity of Silver Star Mountain include Cinnemousen (CNA) and Snookwa (SAA) soils, which are classified as Orthic Humo-Ferric Podzols. Soils inventory information is presented on the Terrain Map 2.

The occurrence of Messiter, Waby, and Vermelin soils is generally consistent with other identified environmental factors such as the elevation, slope, acidic parent materials, ecological moisture regime, and biogeoclimatic vegetation units (ICH-T) that describe the area. Field investigations undertaken for the current study suggest that Clapperton and Vermelin soils may occur in the study area to a greater extent than indicated by Kowall (1978). These soils, which are characterized by Orthic Dystric Brunisols and Eluviated Dystric Brunisols, were indicated in several soil pits. Given the uncertainty associated with the taxonomic distinction (made in the field) between these Brunisolic soils and Orthic Humo-Ferric Podzols, there is also the possibility that Cinnemousen and Snookwa soils extend down into the study area. The use of chemical analysis to differentiate between these morphologically similar soils is beyond the scope and budget of this study.

Soil interpretations were developed based on field descriptions of soil morphology at non-random, representative sample sites. Apparent diagnostic processes and properties were noted and later interpreted using the Canadian Soil Classification System, with the results of this classification presented below in Table 2.

Table 2: Sample Plot Soils

SAMPLE PLOT #	SOIL CLASSIFICATION	ABBREVIATION
1	Orthic Dystric Brunisol	O.DYB
2	Orthic Dystric Brunisol	O.DYB
3	Eluviated Dystric Brunisol	E.DYB
4	Gleyed Eluviated Dystric Brunisol	GLE.DYB
5	Eluviated Dystric Brunisol	E.DYB
6	Eluviated Dystric Brunisol	E.DYB
7	Eluviated Dystric Brunisol	E.DYB
8	Eluviated Dystric Brunisol	E.DYB
9	Typic Humisol	TY.H
10	Eluviated Dystric Brunisol	E.DYB
11	Orthic Dystric Brunisol	O.DYB
12	Orthic Dystric Brunisol	O.DYB
13	Duric Dystric Brunisol	DU.DYB
14	Humic Fibrisol	HU.F

Soils of the Brunisolic order (Orthic and Eluviated Dystric Brunisols) appear to be most widely distributed in the study area, with Organic soils occurring in wetlands. Dystric Brunisols are typically less developed than most other soils, brownish to red-brown in color, acidic, and well to imperfectly drained (Canada Soil Survey Committee, 1978). Organic soils, which in this study area appear to include both Humisols and Fibrisols, are often referred to as peat, muck, or bog. They occur in poorly drained depressions or level areas, and are saturated with water throughout much or all of the year.

The chief distinction between the Luvisolic soil order (Messiter soils) indicated by Kowall (1978) and other orders (specifically the Brunisolic and Podzolic orders) is the presence of illuvial clay in the soil profile. The diagnostic process of illuviation (a Bt horizon at least 5 cm thick) was not evident in any of the soil pits dug during field investigation.

2.3.2 Vegetation

Methodology

Preliminary bio-terrain polygons identified using air photographs (September 4, 1990) and Forest Cover Mapping (1992) prior to site investigations were further subdivided into terrestrial ecosystem units following vegetation surveys. Vegetation condition including dominant and sub-dominant tree species was used to distinguish ecosystem unit boundaries. The vegetation of each unit is indicative of specific growing conditions, and therefore can be used to map subtle changes in the site ecology. These distinctions are referred to as site series. The terrestrial ecosystem and site series information is presented in the map appended to this report entitled Terrestrial Ecosystems of a Portion of Silver Star Provincial Park. A summary of the mapped ecosystem polygons and their respective areas is presented in Table 3.

Vegetation information was collected during field investigations from fourteen non-random sample plots of 20 m X 20 m (representing 1/25 ha) at various locations in the study area. An attempt was made to represent each bio-terrain unit identified. Some

polygons were not sampled due to difficulty of access and constraints associated with available mapping.

General vegetation health and species identification information was included in the sample plot survey. A count of tree species within the A1, A2 and A3 strata was used to estimate tree density within the plots. Core samples were taken from representative trees to determine age and soundness. Crown closure and ground cover were estimated. Shrub layer coverage was estimated for B1 and B2. Ground cover plant coverage was estimated and species were identified. A list of all plant species observed is presented in Table 4.

Vegetation of the study area is typical of the vegetation expected in the ESSFdc2, ICHmk1, and ICHmw2 biogeoclimatic subzones. Nevertheless, it is unusual is to experience a transition from three different subzones and two different zones in a study area of less than 500 ha.

The BC Forest Service and BC Parks have waged an on-again, off-again battle originally with mountain pine beetle, and then with Douglas-fir and spruce beetle, in the vicinity of the study area. References to logging contained in this report reflect the recent history of harvesting in the study area with the objective of pest control.

2.3.3 Vegetation Update

The base mapping for the study area was altered with updated layers and new data.

- Ecoregion/ecosection mapping has changed,
- Biogeoclimatic subzone mapping was updated with new line-work,
- 2005 contour mapping covering the entire area with 5 m contours was available,
- VRI mapping (rollover from FC1 updated in 2002) provided new baseline forest inventory,
- 2004 orthophotos were available, and
- Updated wetland classification system was available.

Preliminary changes in base line-work occurred as a result of updates to the Ecoregional mapping which had subsequent impacts on Biogeoclimatic mapping. Further changes to provincial Biogeoclimatic mapping were finalized in 2005. These updated lines were incorporated directly into the TEM mapping resulting in a westerly and northerly shift of several lines.

Updated terrain mapping based on a new elevation model and orthophoto was brought in to the existing TEM mapping and line-work was adapted to match terrain features.

Updated forest cover mapping (VRI) linework was utilized when appropriate and final TEM stand-class determination was based partly on VRI age attributes.

Wetland classifications were made based on the new provincial wetland codes (MacKenzie and Moran, 2004).

Terrestrial Ecosystem Mapping - Polygon Descriptions

Detailed information regarding vegetation communities is found in the Expanded Legend (Appendix B) that is intended for use with Map 4 entitled “Silver Star Golf Development –

Terrestrial Ecosystems". The ecosystem mapping was revised to reflect new information that is currently available and as a result the ecosystem polygons underwent significant changes. In an effort to maintain continuity with the original report polygon identification numbers were preserved wherever possible.

Table 3: Terrestrial Ecosystem Polygon Areas

POLYGON_	BEC	ECOREGION	TEM CODE	DECILE	MODIFIER	MODIFIER	STRUCURAL STAGE	DECILE AREA (m)	POLYGON TOTAL (Ha)
1	ESSFdc2	SOI - TOP - NOH	LF	10	w	v	6	3.23	3.23
1a	ESSFdc2	SOI - TOP - NOH	FR	6	s		5	6.13	10.21
			FV	2	y		5	2.04	
			LF	2	x		5	2.04	
2	ICHmw2	SIM - COH - SHH	RF	10			6	8.59	8.59
2a	ICHmw2	SIM - COH - SHH	HO	10			7	12.78	12.78
2b	ICHmw2	SIM - COH - SHH	RF	10	k		6	10.64	10.64
2c	ICHmw2	SIM - COH - SHH	HO	5			6	9.63	19.27
			RF	5			6	9.63	
2d	ICHmw2	SIM - COH - SHH	RF	5			6	12.86	25.72
			RF	5	s		6	12.86	
3	ICHmk1	SOI - TOP - NOH	DT	10	w	s	6	10.55	10.55
3a	ICHmk1	SOI - TOP - NOH	RF	10	w	v	6	1.05	1.05
3b	ICHmk1	SOI - TOP - NOH	RF	10	w	v	3a	4.06	4.06
3c	ICHmk1	SOI - TOP - NOH	RF	10	w	v	6	1.59	1.59
4	ICHmk1	SOI - TOP - NOH	RF	10			6	18.88	18.88
4a	ICHmk1	SOI - TOP - NOH	DT	10	w	v	6	13.44	13.44
4b	ICHmk1	SOI - TOP - NOH	RF	6			6	20.92	34.86
			SO	4	m	y	5	13.94	
4c	ICHmk1	SOI - TOP - NOH	DT	10	w		5	3.71	3.71
4d	ICHmk1	SOI - TOP - NOH	DT	10	w		7	4.65	4.65
5	ICHmk1	SOI - TOP - NOH	DT	10	j	v	5	11.71	11.71
6	ICHmk1	SOI - TOP - NOH	DT	10	w		2	8.74	8.74
6a	ICHmk1	SOI - TOP - NOH	RF	10			6	3.48	3.48
6b	ICHmk1	SOI - TOP - NOH	SG	2	s		3a	2.35	11.76
			SG	2			5	2.35	
			SG	6	s		6	7.06	
6c	ICHmk1	SOI - TOP - NOH	Wf02	10	p		3a	1.80	1.80
6d	ICHmk1	SOI - TOP - NOH	RF	10	j		6	9.86	9.86
7	ICHmw2	SIM - COH - SHH	RD	10			6	2.58	2.58
7a	ICHmw2	SIM - COH - SHH	Wf01	10			2	1.59	1.59
7b	ICHmw2	SIM - COH - SHH	Wf01	10			2	1.02	1.02
7c	ICHmw2	SIM - COH - SHH	RD	10			6	3.01	3.01
7d	ICHmw2	SIM - COH - SHH	RD	10				0.23	0.23
8	ICHmw2	SIM - COH - SHH	HO	10			7	11.78	11.78
8a	ICHmw2	SIM - COH - SHH	DF	4	r		3a	2.35	5.87
			DF	6	r		6	3.52	

Table 3: Terrestrial Ecosystem Polygon Areas (continued)

POLYGON_	BEC	ECOREGION	TEM CODE	DECILE	MODIFIER	MODIFIER	STRUCURAL STAGE	DECILE AREA (m)	POLYGON TOTAL (Ha)
8b	ICHmw2	SIM - COH - SHH	RF	8	r		6	8.32	10.40
			DF	2	r		6	2.08	
9	ICHmw2	SIM - COH - SHH	HF	10			6	13.06	13.06
9a	ICHmw2	SIM - COH - SHH	Ws10	10				0.73	0.73
9b	ICHmw2	SIM - COH - SHH	Ws10	10				0.53	0.53
9c	ICHmw2	SIM - COH - SHH	RS	10			4	2.13	2.13
9d	ICHmw2	SIM - COH - SHH	RF	10			6	18.43	18.43
9e	ICHmw2	SIM - COH - SHH	HO	10			6	7.19	7.19
9f	ICHmw2	SIM - COH - SHH	HF	10			7	0.93	0.93
10	ICHmw2	SIM - COH - SHH	HO	10			6	12.91	12.91
11	ICHmw2	SIM - COH - SHH	HF	10	j		6	38.01	38.01
12	ICHmw2	SIM - COH - SHH	HO	10	k	m	6a	3.90	19.51
12a	ICHmw2	SIM - COH - SHH	HO	10			7	6.36	6.36
12b	ICHmw2	SIM - COH - SHH	HF	8	k		6	18.93	23.66
			HO	2	k		6	4.73	
13	ICHmw2	SIM - COH - SHH	RH	10			6	1.03	1.03
13a	ICHmw2	SIM - COH - SHH	Ws10	10			5	0.44	0.44
14	ICHmw2	SIM - COH - SHH	RF	10	k	r	6	3.83	3.83
14a	ICHmw2	SIM - COH - SHH	DF	2	r	w	5	1.62	8.08
			DF	4	r	w		3.23	
			DF	4	r	w	3a	3.23	
15	ICHmw2	SIM - COH - SHH	DF	10	r	w	6	9.63	9.63
16	ICHmw2	SIM - COH - SHH	HO	8			6	23.33	29.16
			RS	2			6	5.83	
16a	ICHmw2	SIM - COH - SHH	HF	10				2.78	2.78
16b	ICHmw2	SIM - COH - SHH	HF	4	m		6	21.80	54.49
			RF	2	j		3a	10.90	
			RF	4	j		6	21.80	
16c	ICHmw2	SIM - COH - SHH	RF	10			6	10.20	10.20
								530.20	310.10

SIM - COH – SHH: Southern Interior Mountain Ecoprovince, Columbia Highlands Ecoregion, Shuswap Highlands Ecosection
SOI - TOP – NOH: Southern Interior Ecoprovince, Thompson Okanagan Plateau Ecoregion, North Okanagan Highland Ecosection

Map 4: Silver Star Golf Development - Terrestrial Ecosystems

Photo 1: Oblique Aerial View of the Plateau containing the Study Area

Photo 2: View up to the Plateau from the lower Vance Creek drainage basin.

Additional site specific species information can be found on the Ecosystem Field forms (Appendix F). The four letter codes are cross referenced with the Plant Species List (Table 4). The following sections contain general descriptions of the map polygons organized by biogeoclimatic (BGC) subzone.

Biogeoclimatic Subzone ESSFdc2

The Dry Cold Engelmann Spruce / Sub-alpine Fir subzone (Thompson variant) generally ranges from 1520 - 1900 m along ridge tops and upper slopes on the west side of the Okanagan Valley. Climax forest vegetation is typically Engelmann spruce and subalpine fir, although lodgepole pine also occurs in successional stands on wetter and drier sites (Lloyd, et al., 1990). The northwest corner of the study area contains a small component of the ESSFdc2 (approximately 13.44 ha).

Map Polygon 1, 1a

Within the ESSFdc2 subzone, polygon 1 consisted of a unit of *lodgepole pine / Engelmann spruce - falsebox - pinegrass* (BEC site series 3) on the knoll and upper slopes overlooking the main plateau of the study area. The structural stage of this unit is mature forest (6).

Map polygon 1a is located at the toe of the upper plateau slope, contained two additional site series. Approximately 60% of the unit is composed of zonal vegetation described as *subalpine fir - rhododendron - grouseberry*. In addition, a bedrock controlled ridge yields warmer, drier conditions with *lodgepole pine / Engelmann spruce - falsebox - pinegrass*. Wet depressions and seepage areas within the polygon yield *subalpine fir - gooseberry - oak fern* associations. The structural stage of polygon 1a is young forest (5).

Biogeoclimatic Subzone ICHmk1

The southwestern portion of the study area lies within the Moist Cool Interior Cedar - Hemlock subzone (Kootenay variant), at the eastern and upper elevation limits of the subzone's distribution. This subzone occupies approximately 140.1 ha of the study area. Fourteen ecosystem polygons were defined within this subzone. Four site series and a wetland class were described. While the ICHmk1 generally occurs on north and west facing slopes on the east side of Okanagan Lake (Lloyd, et al., 1990), it appears to also occur on south and west slopes in the study area. With the exception of a dry bedrock hillock and two seepage areas, most of the subzone is zonal. Zonal ICHmk1 is described as western redcedar, hybrid white spruce dominated forest with subalpine fir also frequently dominant. The shrub understory primarily consists of falsebox and black huckleberry. Five sample plots (#1, #2, #3, #4, #14) were established within the ICHmk1. Additional, information about the ICHmk1 portion of the study area was gathered during GPS traverses conducted by the study team.

Map Polygon 3, 3a, 3b, 3c

Polygon 3 is 10.55 ha in size and consists of a hillside with southwest exposure that is approximately 80% de-forested. Vegetation consists of a *Douglas fir / lodgepole pine - pinegrass - twinflower* site series, with the non-forested portion of the polygon assessed as shrub structural stage (3).

Polygons 3a, 3b, and 3c, approximately 6.7 ha in size, were not sampled. However, information gathered from sample plot #2 and the traverse between plot #1 and plot #2

was applied to aerial photo interpretation to classify the polygons. Based on variations in aspect and canopy cover, the polygons were assessed to contain zonal vegetation associations of *western redcedar / hybrid white spruce - falsebox.* Variation within the unit arises from structural stages varying between mature forest (6) that is generally under 100 years of age, and a low shrub successional stage (3a) where selective clearing has taken place within the past 20 years.

Map Polygon 4, 4a, 4b, 4c, 4d

Polygon 4 is a zonal site consisting of mature forest (structural stage 6). Sample plot #2 represents the condition found through this unit of *western redcedar / hybrid white spruce - falsebox*. The site is mesic with a diverse range of vegetation species including Douglas-fir, subalpine fir, western redcedar, lodgepole pine, Engelman spruce and western larch. The shrub layer contains sitka alder, falsebox, black huckleberry, white-flowered rhododendron, Utah honeysuckle, birch-leaved spirea, thimbleberry, western mountain-ash, and black gooseberry. The herb layer is dominated by five-leaved bramble, one-leaved foamflower, Queen's cup, twinflower and rattlesnake plantain; with single delight, pathfinder, false Solomon's seal, bunchberry, pinegrass, clasping twisted stalk, sweet-scented bedstraw, blunt-fruited sweet-cicely, single delight, round-leaved violet, and Hooker's fairybells also commonly occurring. Moss cover is present, but sparse.

Plant species found within polygon 4a are well reflected in sample plot #1 and are described in the expanded legend found in Appendix B. Trembling aspen was also observed within the plot. However, its presence can be explained by the fact that this unit is located on the boundary of the ESSF and the ICH zones.

Polygon 4b consists of toe slopes, receiving areas and seepage zones, with north and west aspects. Accordingly, soil moisture conditions range from submesic to subhygric. Approximately 60% of the unit is wet trough with low gradients and an apparent ephemeral stream. Sample plot #4 was located close to the ESSF - ICH transition and the vegetation sample reflected the ESSF influence. Vegetation sampled at plot #4, within the depression, corresponds to *hybrid white spruce - oak fern* site series. However, white-flowered rhododendron was very common on the upslope portion of the plot. Generally, this species of shrub is more closely associated with ESSFdc2 rather than ICHmk1.

Polygons 4c and 4d are similar site series to polygon 5, described below, but are situated on a steep, southwest facing slope (w). Polygons 4c and 4d are differentiated by structural stage of young (5) and old forest (7) respectively.

Map Polygon 5

Although the bounds are adjusted to reflect more accurate mapping, the 11.7 ha polygon 5 preserves its identifier from the original report and represents the drier subzeric to submesic conditions produced by a small, thin-soiled hillock. Vegetation consists of a *Douglas fir / lodgepole pine - pinegrass - twinflower* site series. The site was selectively logged and, although the remaining stand is of the young forest structural stage (5), several mature trees from the original climax stand were sampled at sample plot #3.

Map Polygon 6, 6a, 6b, 6c, 6d

Polygon 6 is 8.7 ha in size and consists of a hillside with southeast exposure that is 80% de-forested. Vegetation consists of a *Douglas fir / lodgepole pine - pinegrass - twinflower* site series, with the non-forested portion of the polygon assessed as young forest structural stage (5) and herb (2).

Polygon 6a and 6d are zonal sites and is similar to polygon 4. Vegetation consists of a mature forest *western redcedar / hybrid white spruce - falsebox* vegetation association. Polygons 6a and 6d are separated due to a change in soil type (see Map 2 Terrain Mapping).

Polygon 6b is a moist seepage area that appears to contribute to the headwaters of Coldwater Creek. The *hybrid white spruce / Douglas fir - gooseberry - sarsaparilla* site series is differentiated by structural stages ranging from mature forest (6), to young forest (5), to low shrub (3a). Photo 3 was taken at Sample Site 14 and typifies this unit.

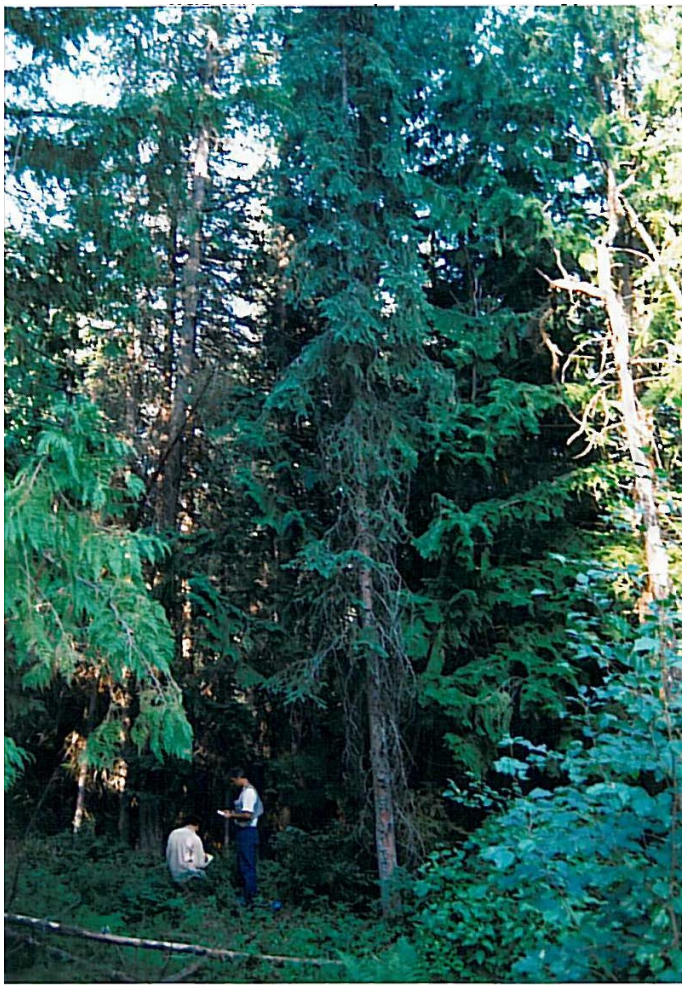


Photo 3: Sample Site 14 ICH mk1, Ecosystem Polygon 6b

Polygon 6c defines an essentially non-forested, sloping fen originally classified as a hydric *sedge - cinquefoil* site series (08). Application of the B.C. Wetland classification

system yielded a designation as Wf02, *scrub birch - water sedge* (MacKenzie and Moran, 2004). Several large cottonwoods are located around the margins of the wetland and there is evidence of past logging within the wetland. Observed shrub species include sitka alder, willow, and yew.

Biogeoclimatic Subzone ICHmw2

The Moist Warm Interior Cedar - Hemlock subzone (Shuswap variant) is the most extensive biogeoclimatic subzone in the study area, occupying approximately 299.6 ha of the study area. Twenty-nine ecosystem units were defined within this subzone and seven site series and two wetland classes were described. ICHmw2 occurs at low to mid elevations south of Shuswap Lake (Lloyd, et al., 1990). The ICHmw2 subzone in the study area is best described as a rolling plateau characterized by a number of linear ridges and troughs. It occupies north, south and east aspect slopes. While zonal site series dominate the subzone within the study area, the undulating nature of the plateau creates several microclimates. Variations in microclimate and soil depth, and coincidence of seepage areas and depressions together result in a diverse range of site series. This small area effectively contains examples of all eight site series found in the ICHmw2. Zonal ICHmw2 is described as forest dominated by western hemlock and western redcedar, with Douglas-fir, western larch, paper birch, white pine and hybrid white spruce occurring as seral species. The shrub understory consists of falsebox and Prince's pine, with herb cover including twinflower. Mosses tend to dominate the ground cover. Nine sample plots (#5, #6, #7, #8, #9, #10, #11, #12, #13) were established within the ICHmw2. As with the ICHmk1 subzone, GPS traverses were conducted through not sampled with ecosystem plots.

Map Polygons 2, 2a, 2b, 2c

Polygons 2, 2a, 2b and 2c were not sampled due to time and access constraints. This relatively large (77 ha) ecological unit is part of the Vance Creek drainage. Classification of these units is based on information gathered in adjacent units, Vegetation Resource Inventory mapping and on aerial photo interpretation. Polygon delineation responds to changes in site series and structural stage. Site series differentiation is controlled by variations in slope, aspect, and soil types. Polygon 2 (including 2a, 2b, 2c and 2d) is expected to be submesic and cool due to its north aspect. Given its similarities with the sampled polygon 4b, polygons 2, 2b, 2c and 2d are attributed with a mature forest (6) structural stage. Polygon 2a is old forest (structural stage 7) based on VRI information. The site series is assessed as 03, *western redcedar / Douglas-fir - falsebox* based on information gathered at polygon 4b. Receiving areas within these polygons are assigned site series 04, *western redcedar / western hemlock – oak fern – foamflower.*

Map Polygons 7, 7a, 7b, 7c, 7d

Polygon 7 forms a wetland complex of approximately 8.44 ha, that occurs within the same trough described for polygons 4b and 16. Two hydrologically separated *water sedge – beaked sedge* fens are identified within the complex as Wf01 (polygons 7a and 7b). Polygons 7a, 7b and 7d were visited to confirm soil types and plant species. Polygons 7, 7c and 7d form a forested margin around the fen and is classified as site series 05, *western redcedar / western hemlock - Devil's club - sarsparilla*. Polygons 7a and 7b were probed to 70 cm with an Oakfield soil probe, yielding organic soils. The presence of sphagnum moss was confirmed at 7a. Both sites with initially classed as *bluejoint - glow moss* site series 08, but are subsequently reclassified as Wf01.

Map Polygons 8, 8a, 8b
With a total area of 28.1 ha, this unit is composed of a low plateau punctuated by bedrock knolls and separating two depressional troughs.

Within polygon 8, a number of small seepage areas were observed on aerial photos. Their presence is noted here but not in the mapping due to their limited extent. The presence of moisture receiving areas corroborates the site series 04 classification as *western redcedar / western hemlock – oak fern foamflower.*

Except for unit 8a, much of the polygon remains undisturbed by logging activity. Polygon 8a (sample plot #7) is a harvested site that is classed as *Douglas-fir / western redcedar - falsebox - Prince's pine* site series 02 with 60% structural stage 6, mature forest and 40% structural stage 3a, low shrub.

Approximately 80% of polygon 8b appears to consist of site series 03, *western redcedar / Douglas-fir - falsebox*. The remaining portion of the polygon is xeric to submesic *Douglas-fir / western redcedar - falsebox - Prince's pine* site series 02.

Map Polygons 9, 9a, 9b, 9c, 9d, 9e, 9f
The polygon 9 complex comprises another depressional trough with a total area of approximately 43 ha. Polygon 9 occupies the southern portion of the trough and contains plot #13. The information gathered at this plot let to a zonal site series assessment of *western hemlock / western redcedar – falsebox – feathermoss.* The structural stage of the mature forest is 6.

Polygon 9f is immediately adjacent to polygon 9 and is zonal old growth forest.

Photo 4: Sample Site 13 ICH mw2, Polygon 9

Although water flow was minimal at the time of investigation, pooling was observed particularly around the seepage areas identified as polygons 9a, 9b, and 9c. Based on information gathered at sample plot #5 and plot #6, polygon 9d is assessed as *western redcedar / Douglas-fir – falsebox* site series 03, while 9e is assessed as *western redcedar / western hemlock - oak fern - foamflower* site series 04. The structural stage is mature forest (6), with the exception of sapling pole forest (4) at polygon 9c and the small old growth forest unit of 9f. Polygons 9a, 9b, are reclassified as swamp wetlands Ws10, *western redcedar - spruce - skunk cabbage* and 9c is assessed as *western redcedar / hybrid white spruce - skunk cabbage* site series 07.

Map Polygon 10

Polygon 10 is approximately 12.9 ha and represents the terminus of the depressional trough associated with polygons 4b, 16 and 7. The trough becomes less defined closer to the steepening terrain of the Vance Creek drainage. This polygon was not visited, but was assessed by aerial photo interpretation as a *western redcedar, western hemlock - oak fern - foamflower* site series 04, with mature forest (6) structural stage.

Map Polygon 11

Polygon 11 was traversed and assessed via sample plot #11 as a zonal *western hemlock / western redcedar - falsebox - feathermoss* site series. The structural stage of the 38 ha mature forest unit is 6. This polygon occupies low gradient slopes that are transitional between ridges and troughs.

Map Polygon 12, 12a, 12 b
Polygon complex 12, at 49.5 ha, is similar to 11 except that it occupies the north aspect slope of the plateau above the Vance Creek drainage. Polygon 12 is described as site series 04, *western redcedar / western hemlock - oak fern - foamflower.* The structural stage is mature forest (6). Polygon 12a, is similar but characterized by old growth forest, structural stage 7.

Sample plot #8, located within polygon 12b indicated a primarily zonal *western hemlock / western redcedar - falsebox - feathermoss* site series, with a sub-component (approximately 20%) of receiving area classified as *western redcedar / western hemlock - oak fern - foamflower.* The structural stage is mature forest (6).

Map Polygons 13, 13a
Polygon 13 is a small (1.47 ha) depressional trough and seepage area containing a wetland polygon 13a reclassified as Ws10 and associated marginal forest (polygon 13). Both polygons were sampled (sample plot #9). Polygon 13 is assessed as *western redcedar / western hemlock - horsetail* site series 06. Polygon 13a is assessed as *western redcedar - spruce - skunk cabbage.*

Map Polygons 14, 14a
Polygons 14 and 14a occupy 11.9 ha, representing cool and warm aspects of the same small ridge. Although sample plot #10 was located within 14a, the transition between site series was evident. Polygon 14, situated on a steep north and west aspect slope, is assessed as *western redcedar / Douglas fir - falsebox* site series 03, with consistent mature forest structural stage (6). Polygon 14a has a warmer, southerly aspect and bears evidence of past selective logging. As a result the site series (02) is *Douglas fir / western redcedar - falsebox - Prince's pine*. Structural stages observed within polygon 14a include mature forest (6), young forest (5), and low shrub (3a).

Map Polygon 15
Polygon 15 is a 9.6 ha bedrock ridge assessed as *Douglas-fir / western redcedar - falsebox - Prince's pine* site series (02) based on information gathered at sample plot #12. The structural stage is mature forest (6).

Map Polygon 16
The 96.6 ha polygon 16 complex occupies a low gradient trough or depressional feature (polygon 16) as well as the southern slopes of the central portion of the study area (polygons 16 a, 16b and 16c).

In polygon 16, water was observed at the bottom of the trough, although flow was minimal. As a function of its morphology the trough appears to collect rather than convey moisture, and the result is a hygric to subhygric site graduating to more submesic conditions further from the bottom of the trough. The polygon therefore includes *western redcedar / hybrid white spruce - skunk cabbage* site series 07 and *western redcedar / western hemlock - oak fern - foamflower* site series 04, with a mature forest (6) structural stage.

Polygons 16a and 16b represent an ecosystem unit continuation into the ICHmw2 from the ICHmk1 biogeoclimatic subzone. Polygon 16b represents a continuation of the

zonal forest of polygon 6a and 6f, although it has more varied structure. The structural stages range from mature forest (6) to a small shrub (3a) component on the more recent logging sites. This polygon contains a *western redcedar / Douglas fir - falsebox* site series (03). This component is sub-divided into mature forest (6) and low shrub (3a) structural stages, which reflects the selective logging activity which has occurred in much of the area. The remaining 40% of the polygon is a zonal *western hemlock / western redcedar - falsebox - feathermoss* site series. Photo 4 was taken at Sample Site 13 and typifies the site conditions within this large polygon.

Polygon 16c is a relatively intact unit of *western redcedar / Douglas fir - falsebox* site series (03). This component is mature forest structural stage(6).

Table 4: Plant Species List for Portion of Silver Star Provincial Park

CODE	LATIN NAME	COMMON NAME
	TREES	
Bl	*Abies lasiocarpa*	Subalpine Fir
Lw	*Larix occidentalis*	Western Larch
Se	*Picea engelmannii*	Engelmann Spruce
Sxw	*Picea engelmannii x glauca*	Hybrid White Spruce
Pl	*Pinus contorta*	Lodgepole Pine
Pw	*Pinus monticola*	Western White Pine
Act	*Populus balsamifera*	Black Cottonwood
At	*Populus tremuloides*	Trembling Aspen
Cw	*Thuja plicata*	Western Redcedar
Hw	*Tsuga heterophylla*	Western Hemlock
Fd	*Pseudotsuga menziesii*	Douglas-fir
	SHRUBS	
AcGl	*Acer glabrum*	Douglas Maple
AlIn	*Alnus incana*	Mountain Alder
AlSi	*Alnus sitchensis*	Sitka Alder
AmAl	*Amelanchier alnifolia*	Saskatoon
ChUm	*Chimaphila umbellata*	Prince's Pine
CoSt	*Cornus stolonifera*	Red-osier Dogwood
LeGl	*Ledum glandulosum*	Trapper's Tea
LiBo	*Linnaea borealis*	Twinflower
LoIn	*Lonicera involucrata*	Black Twinberry
LoUt	*Lonicera utahensis*	Utah Honeysuckle
MaAq	*Mahonia aquifolium*	Tall Oregon-Grape
OpHo	*Oplopanax horridus*	Devil's Club
PaMy	*Pachistima myrsinites*	Falsebox
RhAl	*Rhododendron albiflorum*	White-flowered Rhododendron
RiLa	*Ribes lacustre*	Black Gooseberry
RiTr	*Ribes triste*	Red Swamp Currant
RiVi	*Ribes viscosissimum*	Sticky Currant
RoGy	*Rosa gymnocarpa*	Baldhip Rose
RuId	*Rubus idaeus*	Red Raspberry
RuPa	*Rubus parviflorus*	Thimbleberry
RuPe	*Rubus pedatus*	Five-leaved Bramble
SaBe	*Salix bebbiana*	Bebb's Willow
SaSc	*Salix scouleriana*	Scouler's Willow
SaRa	*Sambucus racemosa*	Red Elderberry
ShCa	*Sheperdia canadensis*	Soopolallie
SoSc	*Sorbus scopulina*	Western Mountain-Ash
SpBe	*Spiraea betulifolia*	Birch-leaved Spiraea
TaBr	*Taxus brevifolia*	Western Yew
VaMe	*Vaccinium membranaceum*	Black Huckleberry
VaOv	*Vaccinium ovalifolium*	Oval-leaved Blueberry
VaSc	*Vaccinium scoparium*	Grouseberry
ViEd	*Viburnum edule*	High-Bush Cranberry
		(Continued next page)
CODE	**LATIN NAME**	**COMMON NAME**

	HERBS	
AcRu	*Actaea rubra*	Baneberry
AdBi	*Adenocaulon bicolor*	Pathfinder
AnMa	*Anaphalis margaritacea*	Pearly Everlasting
AnRa	*Antennaria racemosa*	Racemose Pussytoes
ArNu	*Aralia nudicaulis*	Wild Sarsaparilla
ArCo	*Arnica cordifolia*	Heart-leaved Arnica
AsCo	*Aster conspicuus*	Showy Aster
CaRu	*Calamagrostis rubescens*	Pinegrass
CaCr	*Carex crawfordii*	Crawford's Sedge
CaMe	*Carex media*	Scandinavian Sedge
CaRo	*Carex rostrata*	Beaked Sedge
CaMi	*Castilleja miniata*	Common Red Paintbrush
	Cirsium spp.	Thistle spp.
ClUn	*Clintonia uniflora*	Queen's Cup
CoMa	*Corallorhiza maculata*	Spotted Coralroot
CoCa	*Cornus canadensis*	Bunchberry
CyMo	*Cypripedium montanum*	Mountain Ladyslipper
DiHo	*Disporum hookeri*	Hooker's Fairybells
EpAn	*Epilobium angustifolium*	Fireweed
EpCi	*Epilobium ciliatum*	Purple-leaved Willowherb
ErSu	*Erigeron subtrinervis*	Triple-nerved Daisy
ErAn	*Eriophorum angustifolium*	Narrow-leaved Cotton-Grass
EqAv	*Equisetum arvense*	Common Horsetail
FrVi	*Fragaria virginiana*	Wild Strawberry
GaTr	*Galium trifidum*	Small Bedstraw
GaTr	*Galium triflorum*	Sweet-scented Bedstraw
GePr	*Gentianella propinqua*	Four-parted Gentian
GeMa	*Geum macrophyllum*	Large-leaved Avens
GeRi	*Geum rivale*	Water Avens
GoOb	*Goodyera oblongifolia*	Rattlesnake Plantain
HiAl	*Hieracium albiflorum*	White Hawkweed
LiCo	*Lilium columbianum*	Tiger Lily
LiCa	*Listera caurina*	Northwestern Twayblade
LiCo	*Listera convallariodes*	Broad-leaved Twayblade
LiCo	*Listera cordata*	Heart-leaved Twayblade
LuAr	*Lupinus arcticus*	Arctic Lupine
MeTr	*Menyanthes trifoliata*	Buckbean
MiGu	*Mimulus guttatus*	Yellow Monkey-Flower
MiBr	*Mitella breweri*	Brewer's Mitrewort
MiNu	*Mitella nuda*	Common Mitrewort
MoUn	*Moneses uniflora*	Single Delight
OrSe	*Orthilia secunda*	One-sided Wintergreen
OsDe	*Osmorhiza depauperata*	Blunt-fruited Sweet-Cicely
PaFi	*Parnassia fimbriata*	Fringed Grass-of-Parnassus
PeBr	*Pedicularis bracteosa*	Bracted Lousewort

(Continued next page)

CODE	**LATIN NAME**	**COMMON NAME**
	HERBS	

PePa	*Petasites palmatus*	Palmate Coltsfoot
PeSa	*Petasites sagittatus*	Arrow-leaved Coltsfoot
PlDi	*Platanthera dilatata*	White Bog-Orchid
PlHy	*Platanthera hyperborea*	Green-flowered Bog-Orchid
PoPr	*Poa pratensis*	Kentucky Bluegrass
PoPa	*Potentilla palustris*	Marsh Cinquefoil
PyAs	*Pyrola asarifolia*	Pink Wintergreen
PyCh	*Pyrola chlorantha*	Green Wintergreen
SeTr	*Senecio triangularis*	Arrow-leaved Groundsel
SiSu	*Sium suave*	Water-Parsley
SmRa	*Smilacina racemosa*	False Solomon's Seal
SmSt	*Smilacina stellata*	Star-flowered False Solomon's Seal
StAm	*Streptopus amplexifolius*	Clasping Twisted Stalk
ThVe	*Thalictrum venulosum*	Veiny Meadowrue
TiUn	*Tirella unifoliata*	One-leaved Foamflower
TrCe	*Trichophorum cespitosum*	Tufted Clubrush
VaSi	*Valeriana sitchensis*	Sitka Valerian
ViGl	*Viola glabella*	Stream Violet
ViOr	*Viola orbiculata*	Round-leaved Violet
	FERNS	
AtFi	*Athyrium filix-femina*	Lady Fern
DrEx	*Dryopteris expansa*	Spiny Wood Fern
GyDr	*Gymnocarpium dryopteris*	Oak Fern
	MOSSES, LICHENS, LIVERWORTS	
LyAn	*Lycopodium annotinum*	Stiff Clubmoss
LyCo	*Lycopodium complanatum*	Ground-Cedar
	Sphagnum spp.	Sphagnum spp.

Rare and Threatened Plant Communities

The B.C. Conservation Data Center lists two rare forested and/or grassland plant communities for the area. *Juniper - bunchgrass* communities are blue listed in the ESSFdc2/02 subzone, and *hybrid white spruce - gooseberry - sarsaparilla* communities are blue listed in the ICHmk1/01. The xeric site series requirements (02) for *juniper - bunchgrass* were not observed during the field investigation, nor was the plant association noted. While *spruce - gooseberry* communities were observed in plots #2 and #4 in the ICHmk1 subzone, sarsaparilla was not observed.

No known rare plant species were observed in the study area. However, due to the complexity of plant taxonomy and identification (particularly within the wetlands of the site), rare plant occurrence cannot be ruled out.

During the public review process issues were raised regarding MOF Forest Cover Mapping that identifies potential occurrence of alpine larch within the study area. Alpine

larch can be differentiated in the field from western larch by the number of needles in each cluster (alpine larch has 30-40 needles, western larch has 15-30 needles).

The Conservation Data Centre (CDC) has no occurrence records for rare elements within the proposed golf course area. They stipulate, however, that this does not mean that there are none there, only that the area has not been surveyed. In fact their botanist suspects that there could be rare plants.

John Surgenor, Fish & Wildlife Branch, B.C. Environment forwarded some information regarding rare forest types within the Vernon Landscape Unit. Species rarity is a function of species type, (projected) age class and stand productivity. Species are considered rare under Forest Practices Code if they comprise less than 2% of a Landscape Unit and are not common in adjacent Landscape Units. Within the site in question, there are some larch (alpine larch - LA + western larch - LW), age class 6, with medium productivity as well as western larch, age class 7 with good productivity that are classified as rare according to the Forest Practices Code.

Table 5: Rare Species Types - Vernon Landscape Unit

Species	Stand Unit Numbers	Age Class	Site Index (Productivity)	Hectares	Percent
LW	445	6, 7, 8	G	811.72	1.52%
L	310, 530, 537	6, 7, 8	M	774.62	1.45%
Vernon	Landscape	Unit Total:		53, 271.31	

The species type ‘Larch’ is not described in further detail; in particular with respect to the elevation of the site (which may indicate the possibility of alpine larch presence). Field studies have only identified western larch. The rare species L in the above table would actually be LW and therefore not be rare by FPC definitions (since LW, age class 6, 7, 8 with medium productivity covers 6.38% of the Landscape Unit in question).

The stand unit numbers in question are marked on the attached forest cover map. The unit of most concern is stand unit 445, located in the northwest corner of the site.

2.3.3 Wildlife and Wildlife Habitat

Methodology

A reconnaissance level wildlife and wildlife habitat inventory was conducted which focused on wildlife species of regional concern, namely mule and white-tailed deer, black bear, amphibians, cavity nesters, and bats. The methodology involved collecting information on wildlife use during site traverses and terrestrial ecosystem mapping plots. Direct contacts with wildlife and evidence of wildlife occurrence (i.e., 'sign' such as scats, tracks, trails, burrows, nests, bones, feathers, and various kinds of feeding sign) were recorded. Wildlife was observed with the aid of 8X36 binoculars. The primary objective of the surveys was to identify valued ecosystem components (VECs) such as important nest sites, wildlife trees and feeding areas, and environmentally sensitive areas including habitats of high value to wildlife.

The Conservation Data Center was contacted to investigate known rare wildlife occurrences within Silver Star Provincial Park. However, no rare wildlife occurrences are currently mapped within the Park (to 14 August 1996). Wildlife observed on the subject property, and wildlife that is expected to occur, are described in more detail below.

The field survey (July 21-25) was conducted outside the optimum time window for observing wildlife such as birds. However, utilization by wildlife could be inferred from the detailed assessment of habitats on the site (i.e. Terrestrial Ecosystem Mapping) and knowledge of the habitat requirements and distribution of wildlife species. Wildlife experts (e.g. Orville Dyer) were also contacted regarding local information on wildlife utilization that may have been overlooked during the field survey. An effort was made to focus survey and assessment effort on those wildlife species considered to be at risk (ie. red or blue-listed species) or of management concern (e.g. bear and deer). Due to the scope of the project, detailed surveys (e.g. breeding bird surveys, trapping etc.) of wildlife utilizing the site was not possible.

Specific impacts of the proposed golf course on wildlife utilizing interior forest conditions were not addressed in the GeoAlpine report. There is no question that wildlife currently utilizing forested habitats will be directly and indirectly affected by land clearing and other activities associated with golf course development. It is thought that most of these wildlife species are common in adjacent forested habitats. No red or blue-listed amphibian or reptile species are expected to occur within the subject property. The yellow badger *Taxidea taxus,* a red listed species, and the following blue-listed species potentially inhabit or frequent the study area: Short-eared Owl (*Asio flammeus)*, Fisher (*Martes pennanti)*, Wolverine, luscus subspecies (*Gulo gulo luscus),* and Grizzly bear (*Ursus arctos)*. Because most wildlife utilizing interior forests are common, the assessment focused on particularly sensitive habitats such as wetlands, creeks and mature forests which are important to a wide range of wildlife species. Habitats of wildlife species of management concern (e.g. bear and deer) will likely be improved by golf course development.

Birds

Because of the late summer timing of the field survey, many of the breeding birds expected to occur on the site were not observed. Table 6 provides a complete list of bird

species known or expected to occur on the site. Species observed during the survey included American robin (see Table 6 for scientific names), black-capped chickadee, brown creeper, common raven, dark-eyed junco, golden-crowned kinglet, gray jay, hairy woodpecker, Hammond's flycatcher, hermit thrush, mountain chickadee, pine grosbeak (collecting food materials), pileated woodpecker (numerous feeding sign on cedars), pine siskin, red crossbill, red-breasted nuthatch, ruffed grouse, rufous hummingbird, solitary vireo, spruce grouse (one female with two young, and one male displaying), Swainson's thrush, western tanager, winter wren and yellow-rumped warbler.

Woodpeckers were heard drumming on several occasions, and feeding sign was evident throughout the site. Downy and hairy woodpeckers as well as northern flicker are expected to be residents of the area. Snags which provide nesting and foraging opportunities for woodpeckers were particularly evident along ephemeral streams, in mature forests, and adjacent to one of several wetlands present on the site.

What was assumed to be a plucking station of a northern goshawk was found within Plot #5. Cooper's hawk may occur but is typically found at lower elevations than goshawks. Another large forest hawk, also thought to be a goshawk, was observed at Plot #12.

The Short-eared Owl (*Asio flammeus)* is the sole blue-listed bird species to potentially occur in the study area.

Table 6: Bird species known or expected to occur in the Study Area
Site Symbol definitions for status are Common (Com), Uncommon (Unc), Rare (Rar), Summer (Su), Visitor (Vis), Migrant (Mig), and Resident (Res).

Common Name	Scientific Name	Status
GEESE AND DUCKS		
Canada Goose	*Branta canadensis*	RarVis
Mallard	*Anas platyrhynchos*	RarVis
HAWKS		
Sharp-shinned Hawk	*Accipiter striatus*	UncMig
Cooper's Hawk	*Accipiter cooperii*	RarRes
Northern Goshawk	*Accipiter gentilis*	UncRes
Red-tailed Hawk	*Buteo jamaicensis*	RarRes
GROUSE		
Ruffed Grouse	*Bonasa umbellus*	RarRes
Spruce Grouse	*Dendragapus canadensis*	UncRes
OWLS		
Great Horned Owl	*Bubo virginianus*	UncRes
Northern Pygmy-Owl	*Glaucidium gnoma*	RarRes
Barred Owl	*Strix varia*	RarRes
Northern Saw-whet Owl	*Aegolius acadicus*	UncRes
Short-eared Owl	*Asio flammeus*	UncRes
GOATSUCKERS		
Common Nighthawk	*Chordeiles minor*	RarRes?
HUMMINGBIRDS		
Rufous Hummingbird	*Selasphorus rufus*	UncRes
Calliope Hummingbird	*Stellula calliope*	RarRes
WOODPECKERS		
Red-naped Sapsucker	*Sphyrapicus nuchalis*	RarRes
Downy Woodpecker	*Picoides pubescens*	UncRes
Hairy Woodpecker	*Picoides villosus*	UncRes
Three-toed Woodpecker	*Picoides tridactylus*	RarRes
Black-backed Woodpecker	*Picoides arcticus*	RarRes
Northern Flicker	*Colaptes auratus*	RarRes
Pileated Woodpecker	*Dryocopus pileatus*	UncRes
FLYCATCHERS		
Olive-sided Flycatcher	*Contopus borealis*	UncSuRes
Western Wood-Pewee	*Contopus sordidulus*	UncSuRes
Hammond's Flycatcher	*Empidonax hammondii*	UncSuRes
SWALLOWS		
Tree Swallow	*Tachycineta bicolor*	RarSuRes
CORVIDS		
Steller's Jay	*Cyanocitta stelleri*	RarRes
Gray Jay	*Perisoreus canadensis*	UncRes
American Crow	*Corvus brachyrhynchos*	RarVis
Clark's Nutcracker	*Nucifraga columbiana*	RarVis

(Continued on next page)

Common Name	Scientific Name	Status
Common Raven	*Corvus corax*	UncRes
CHICKADEES		
Black-capped Chickadee	*Parus atricapillus*	UncRes
Mountain Chickadee	*Parus gambeli*	ComRes
NUTHATCHES/CREEPERS		
Red-breasted Nuthatch	*Sitta canadensis*	UncRes
Brown Creeper	*Certhia americana*	UncRes
WRENS		
Winter Wren	*Troglodytes troglodytes*	ComRes
KINGLETS/THRUSHES		
Golden-crowned Kinglet	*Regulus satrapa*	ComRes
Ruby-crowned Kinglet	*Regulus calendula*	UncMig
Townsend's Solitaire	*Myadestes townsendii*	RarRes?
Swainson's Thrush	*Catharus ustulatus*	UncSuRes
Hermit Thrush	*Catharus guttatus*	UncSuRes
American Robin	*Turdus migratorius*	ComSuRes
Varied Thrush	*Ixoreus naevius*	RarRes
WAXWINGS		
Cedar Waxwing	*Bombycilla cedrorum*	RarSuVis
STARLINGS		
European Starling	*Sturnus vulgaris*	RarSuVis
VIREOS		
Solitary Vireo	*Vireo solitarius*	RarSuRes
Warbling Vireo	*Vireo gilvus*	RarSuRes
WARBLERS		
Orange-crowned Warbler	*Vermivora celata*	UncSuRes
Yellow-rumped Warbler	*Dendroica coronata*	UncSuRes
Townsend's Warbler	*Dendroica townsendii*	RarSuRes
Northern Waterthrush	*Seiurus noveboracensis*	RarSuRes
MacGillivray's Warbler	*Oporornis tolmiei*	UncSuRes
Wilson's Warbler	*Wilsonia pusilla*	RarSuRes
SPARROWS		
Western Tanager	*Piranga ludoviciana*	UncSuRes
Chipping Sparrow	*Spizella passerina*	RarSuRes
Song Sparrow	*Melospiza melodia*	UncSuRes
Lincoln's Sparrow	*Melospiza lincolnii*	RarSuRes
White-crowned Sparrow	*Zonotrichia atricapilla*	UncSuRes
Dark-eyed Junco	*Junco hyemalis*	ComRes
BLACKBIRDS		
Brown-headed Cowbird	*Molothrus ater*	UncSuRes
FINCHES		
Pine Grosbeak	*Pinicola enucleator*	UncRes
Red Crossbill	*Loxia curvirostra*	ComRes
White-winged Crossbill	*Loxia leucoptera*	RarVis
Pine Siskin	*Carduelis pinus*	ComRes
Evening Grosbeak	*Coccothraustes vespertinus*	RarVis

Mammals

Rare or endangered wildlife that may occur on the site include badger (red-listed) and Fisher (*Martes pennanti)*, Wolverine, luscus subspecies (*Gulo gulo luscus*) and Grizzly bear (*Ursus arctos*) (blue-listed). Habitat preferences and distribution of these and other mammal species known or expected to occur on the site are described in more detail below. General references include Cowan and Guiget (1965), Nagorsen (1990) and Nagorsen and Brigham (1993).

Observed black bear (*Ursus americanus*) sign included diggings, tree scrapes, scats and feeding. In one location, lower bark stripping on several subalpine firs was indicative of bears feeding on the soft cambium layer. One den site of a bear was located in a hollow western redcedar adjacent to a small ephemeral stream. It was not clear whether the site was a winter den site or a summer rest location. One other day bedding site was located in a densely forested area. Large diameter scats nearby suggested that a large bear was occupying the site. One bear was observed in a clearcut area just east of the study area. Bears are expected to be common residents of the study area, especially in the spring when forbs and herbs are attractive food sources. Grasses and sedges in several of the wetlands also provide foraging opportunities for bears. Black huckleberry, oval-leaved blueberry, thimbleberry and soopallalie provide foraging opportunities in the fall.

Grizzly bear (*Ursus arctos*), a blue-listed species, may move through the area as a vagrant in some years.

Mule deer (*Odocoileus hemionus hemionus*) are common residents of the study area. Utilization of the site in the winter is likely limited by high snow depths. Anecdotal information indicates that the study area and surrounding habitats may be prime areas during the fall rut (approximately early October to mid-December). However, forested habitats within the study area have been significantly reduced in the last few years because of salvage operations for beetle-killed wood possibly reducing the suitability of the area for rutting.

Old and fresh deer sign was encountered frequently on the site. Deer were seen on at least five occasions, especially in open clearcut or selectively logged areas where forb and herb productivity is high.

White-tailed Deer (*Odocoileus virginianus*) are not as abundant as mule deer on the site. They were, however, observed on two occasions. White-tailed deer typically inhabit dense areas adjacent to creeks or in valley bottoms whereas mule deer are more typically found in open, higher elevation areas in summer.

Moose (*Alces alces*) pellet groups and tracks were noted throughout one of the small wetlands and on several ridgetops. Moose are expected to occur as visitors throughout the year. Dense shrub vegetation adjacent to wetlands, and in clearcuts or selectively cut areas provides good winter foraging opportunities. Moose populations in the areas are apparently on the increase (Orville Dyer, BCE, Penticton, pers. comm., 1996).

Although there are recent reports of a small elk (*Cervus canadensis*) herd in the Lumby

and Cherryville area, there have been no reports from Silver Star Mountain. However, elk numbers may increase in the future and expand their range into other suitable habitats (Orville Dyer, BCE, Penticton, pers. comm., 1996).

The nearest known mountain caribou (*Rangifer tarandus*) populations are on the east side of the valley north of Sugar Lake (Orville Dyer, BCE, Penticton, pers. comm., 1996).

Red squirrel (*Tamiasciurus hudsonicus*) sign and individuals were observed on numerous occasions. Sign included cone scales, large and extensive middens and calls. The predominance of cone-bearing trees on the site provides an abundance of foraging opportunities.

Yellow-pine chipmunk (*Tamias amoenus*) occurs throughout the study area, especially in areas with high course woody debris, or windthrow areas with large, dense brushpiles. Columbian groundsquirrel (*Spermophilus columbianus*) may occur in open, disturbed areas on the site (they are common at Silver Star Village nearby) and northern flying squirrel (*Glaucomys sabrinus*), a nocturnal squirrel, likely inhabits forested regions.

Evidence of earth mounding and tunneling indicates that northern pocket gopher (*Thomomys talpoides*) are present in moderate abundance on the site.

A single water shrew (*Sorex palustris*) was captured in a minnow trap in a small creek draining the study area. Water shrews are expected to occur in creek and wetland habitats throughout the site. However, some of the creeks dry up in the summer and would not be suitable for this species. Other shrew species expected to occur on the site include common (*Sorex cinereus*), dusky (*S. monticolus*) and vagrant shrew (*S. vagrans*).

The availability of snags and wetlands on the site provides excellent roosting and foraging opportunities for bats. Silver Star falls within the known distribution of several bat species. These species include California myotis (*Myotis californicus*), western long-eared myotis (*M. evotis*), little brown myotis (*M. lucifugus*), long-legged myotis (*M. volans*), Yuma myotis (*M. yumanensis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), big brown bat (*Eptesicus fuscus*), and Townsend's big-eared bat (*Corynorhinus townsendii*).

Although snowshoe hares (*Lepus americanus*) were not observed during the field survey, they are expected to be relatively common on the site, especially in denser, mature forests. The absence of sign during the recent field survey may be due to the currently low populations. Snowshoe hare populations' exhibit marked cycles.

Porcupine (*Erethizon dorsatum*) was not observed during the field survey but is expected to occur in moderate numbers on the site.

Southern red-backed vole (*Clethrionomys gapperi*) is expected to inhabit forested regions whereas deer mouse (*Peromyscus maniculatus*) likely occurs in most habitats. Other small rodent species that may occur include long-tailed vole (*Microtis longicaudis*), heather vole (*Phenacomys intermedius*), meadow *vole (Microtis pennsylvanicus*) and meadow jumping mouse (*Zapus hudsonius*).

Habitats of the subject property are suitable for all three canid species. Coyote (*Canis latrans*) is likely the most abundant species followed by red fox (*Vulpes vulpes*) and gray wolf (*Canis lupus*). Gray wolves are expected to be of rare or occasional occurrence within the study area.

Cougars (*Felis concolor*) are likely attracted to the high numbers of deer within and adjacent to the subject property. Lynx (*Lynx canadensis*) and bobcat (*Lynx rufus*) likely occur occasionally and at low numbers (Orville Dyer, BCE, Penticton, pers. comm., 1996).

Marten (*Martes americana*) and ermine (*Mustela erminea*) are expected to be relatively common residents of the subject property (Orville Dyer, BCE, Penticton, pers. comm., 1996). Red squirrels and small rodents provide an abundance of prey. Occurrence of long-tailed weasel (*Mustela frenata*), striped skunk (*Mephitis mephitis*) and wolverine (*Gulo gulo luscus*) is not known. Wolverine is blue-listed by the B.C. Ministry of Environment.

Although there has been no recorded sightings of Fishers on the subject property and most populations inhabit lower elevations (majority below 1000 m), they can be found up to 2500 m. Fishers, a blue-listed species, are generalist predators with a specialty of porcupines (*Erethizon dorsatum*) and snowshoe hares (*Lepus americanus*). Summer foraging is strongly associated with coarse woody debris (MOE 2004b).

Wolverine, a blue-listed species, is widely distributed albeit at low densities from valley bottom to alpine meadows. Wolverines use a wide variety of ecosystems and are known to pass through the area. Wolverine intensity and frequency is dependent on the ability of the habitat to support specific food source (ungulates, hoary marmots). Habitat is in predominantly mature and old forest structural stage. (MOE, 2004c).

Although Silver Star occurs within the known range of badger (*Taxidea taxus*), a species red-listed by BC Environment, the status of this species on the subject property is not clearly understood. In BC most Badger activity is at low elevations and in dry regions within native or non-native grasslands, open forests of Douglas fir or Ponderosa pine, and disturbed sites such as agricultural fields. Habitat is prey dependent (MOE, 2004a). One of the key prey items of badgers is the Columbian groundsquirrel which are present in large colonies nearby. Rahme *et al.* (1995) note that badgers have been reported from the Interior Cedar-Hemlock biogeoclimatic zone. A badger was sighted 12 km west of the study area in 2005 at an elevation of approximately 750m (Jared Hobbs, pers comm., 2006). The authors also list two records (1967 and 1970) of badger sightings from Silver Star Lookout.

Amphibians

Several spotted frogs (*Rana pretiosa*) were observed in wetlands on the subject property. One of the wetlands had numerous tadpoles thought to be of either spotted frog or western toad (*Bufo boreas*). Although only one Pacific tree frog (*Hyla regilla*) was observed during the site reconnaissance, they are expected to be relatively common on the site. The only salamander species that is expected to occur on the site is long-toed salamander (*Ambystoma macrodactylum*)(Green and Campbell 1984).

Reptiles

No reptiles were observed during the field surveys at the site. Species which may occur include northern alligator lizard (*Gerrhonotus coeruleus*), common garter snake (*Thamnophis sirtalis*), and western terrestrial garter snake (*T. elegans*). Although Silver Star is within the known distribution of the blue-listed rubber boa (*Charina bottae*), it is not known whether this species occurs at this elevation (Gregory and Campbell 1984).

2.3.4 Wildlife Capability and Suitability Ratings

Wildlife capability and suitability ratings for all ecosystem units and structural stages located on the subject property are summarized in Appendix C. Comments on habitat capability for each of the species or species groups of concern are provided below. Completed Wildlife Data Forms for the site are provided in Appendix G.

Mule and White-tailed Deer

Mule and white-tailed deer are widespread on the subject property. Early seral stage habitats (i.e. polygons 1a, 3 and 3b) in all biogeoclimatic zones generally have well developed herb and shrub layers and are of moderate to high value to deer, especially in spring and summer. Both dry and moist sites were suitable for deer because of an extensive herb layer in moister sites, and the dominance of pinegrass on drier sites. Young forest stands (i.e., age class 4 and 5) were generally of low suitability for deer because of reduced understorey shrub and herb vegetation. Older seral stage forests were rated moderately high depending on the extent of herbaceous plant species available in the understorey. Demarchi *et al.* (1983) provide detailed information on the wildlife capability classification system for ungulates in British Columbia.

Black Bear

Because of the presence of herbs, grasses and berry-producing shrubs in early seral stages (i.e. polygons 4a, 3, 3b), these habitats were rated moderately high. Wetter sites with species such as devil's club, skunk cabbage and lady fern were also rated moderately high. Drier sites received lower ratings, with the exception of sites with a good cover of berry producing shrubs such as soopolallie and black huckleberry. Wetlands were also rated highly because of the presence of sedges and other herbaceous plants which are preferred forage items for bears.

Bats

Bats are known to forage extensively over open areas such as wetlands and cleared areas (i.e. early seral stages - polygons 4a, 3, and 3b). Open, dry forest sites may also be utilized by bats for foraging. Since habitats with a high abundance of snags and large trees provide roosting opportunities for bats, later seral stage forests were also considered to be important. Open wetlands with adjacent mature forests are the most suitable for bats because they provide both highly productive foraging sites and adjacent forested habitats for roosting.

Cavity Nesters

Cavity nesters such as woodpeckers, chickadees, nuthatches and brown creeper require snags or mature trees for nesting. Snags include decadent black cottonwood, stunted cedar in wetland areas, and large, mature Douglas fir, balsam, spruce, hemlock and pine. Older growth forests also provide excellent foraging opportunities for woodpeckers. Small owls such as northern saw-whet owl and northern pygmy-owl have similar nesting habitat requirements to woodpeckers. Thus, older seral stage forests received the highest suitability ratings.

Amphibians

Wetland habitats are extremely important for many breeding amphibians. Mature, moist forests with a good volume of course woody debris are also utilized by pond-breeding amphibians at other times of the year. These habitats in all biogeoclimatic zones received the highest suitability ratings.

2.3.5 Valued Ecosystem Components

Deer Rutting Areas

Anecdotal information from local hunters suggests that the subject property is or was utilized by mule deer during the rutting season. There is no evidence, however, that indicates the area to be of particularly high regional sensitivity. Much of the area has been significantly altered by salvage logging following extensive beetle kill in the area. The resulting open forest with dense shrub and herb layers appear to be utilized as spring and summer foraging areas by both mule and white-tailed deer. It is not clear whether deer still make use of the area during the rutting season. Availability of forage and cover are generally the most important habitat features required during the rutting season.

Wildlife Trees

Wildlife trees include significant standing snags, veteran trees, and trees with broken tops. These trees are important as perching areas for raptors such as red-tailed hawk, and foraging and nesting sites for woodpeckers, small owls and other cavity nesters. Although the majority of the subject property is dominated by second growth forest, important wildlife snags are scattered throughout. These snags are especially prevalent adjacent to wetlands and along ephemeral streams.

Pileated woodpecker and other woodpeckers were frequently observed throughout the study area. Cedar snags, both dead and alive, appear to be the preferred foraging substrate for pileated woodpeckers. Large snags may also be used as roosting areas for bats, especially adjacent to important foraging areas over wetlands, ridge crests and other open habitats.

Ephemeral Streams and Riparian Areas

The subject property is intersected by several small ephemeral streams and tributaries, many of which are dry during the summer months. Riparian and ravine habitats are dominated by vegetation such as western redcedar, Sitka alder, black cottonwood and Douglas maple. These habitats provide high structural heterogeneity and plant species diversity compared to the more adjacent uniform coniferous forests, and are attractive to numerous bird, mammal and amphibian species. Because of fluctuating water flows,

snags are often in greater abundance adjacent to creeks. During migration, these habitats also attract neotropical migrants such as warblers, vireos, flycatchers and thrushes. A black bear den site was located in a hollow cedar snag adjacent to a small ephemeral stream on the subject property during the recent field survey.

Ephemeral stream and pool habitats are utilized as drinking and preening areas for wildlife, and possibly breeding areas for frogs, toads and salamanders.

Ephemeral streams are also natural wildlife movement corridors. These movement corridors are of greater importance once adjacent upland areas are developed.

In 2006, the Riparian Area Regulation of the British Columbia Fish Protection Act came into effect and all developments requiring development permits and/or building permits must comply with the regulation. For the Purpose of this study the Streamside Protection and Enhancement Area (SPEA) was assessed as 30 m from top of bank, based on the Simple Assessment Method. This riparian buffer was applied to all mapped watercourses within the study area. The original assessment for this area identified a recommended setback of 15 m for the watercourses of the site. As the project moves into the detailed design stages, the proponent may wish to conduct Detailed Assessment for portions of the watercourses where needed. There is potential for reduction in the width of the SPEA to 10 m for the subject watercourses with this type of assessment. Proposed crossings or intrusions into the SPEA may require site specific permitting under the B.C. Water Act or the Federal Fisheries Act.

Wetlands

Wetlands not only provide breeding habitats for amphibians such as spotted frog and western toad, but also provide foraging opportunities for deer and bear. Bear and deer sign was evident in wetlands surveyed during the site reconnaissance. Wetlands are utilized as foraging areas for bats which are attracted to the open nature of the site and the high insect populations. Snags adjacent to these wetlands are utilized as roost sites by bats. The Riparian Area Regulation applies to all wetlands that have a surface water connection (high water mark) to a watercourse based on a 5 year return period. For the purposes of this assessment all wetlands were determined to be connected and a 30 m SPEA (riparian buffer) was applied. As the project moves into the detailed design stages, the proponent may wish to conduct Detailed Assessment for portions of the wetlands where needed.

Wildlife Movement Corridors

As discussed above, ephemeral streams and associated riparian habitats are potentially important wildlife movement corridors. These corridors become increasingly important upland forests are disturbed by logging or development activity. The several small ephemeral streams on the site provide connections to adjacent forested habitats south, north and west of the site.

2.4 Aquatic Environment

2.4.1 Aquatic Biophysical

Methodology

An aquatic biophysical inventory and fisheries survey was conducted for creeks draining the eastern and southern portions of Silver Star Mountain. The inventory and survey, conforms to the criteria set out in Fish -Stream Identification Guidebook, Forest Practices Code of British Columbia (MOF, 1995a), the Stream Survey Field Guide (DFO/MOELP, 1989), and the Lower Mainland Region Stream Inventory/Assessment Methods, Fifth Draft (Bech, 1994).

The objective of the fisheries component of the studies was to inventory and assess the present fisheries values within the study area. Field investigations revealed no suitable fish habitat within the proposed golf course development area. Therefore, cursory stream studies further afield were conducted to try to determine the extent of fish usage of Putnam, Vance and Coldstream Creeks near the proposed development areas.

Prior to conducting the field work, GEC reviewed available information concerning the fish presence and distribution in the drainages both within the project area and in the surrounding area. The fisheries records for these creeks, however, are sporadic, with the records presently being updated. Existing information is mainly confined to larger systems in the valley bottoms. Information reviewed included that found in the joint DFO MOELP Stream Information Summary database (DFO, 1990), the Kalamalka - Wood Lake Basin Water Resource Management Study (Water Investigations Branch, 1974), and in the Freshwater Fishing Directory and Atlas (BC Outdoors, 1995).

Two hundred (200) m long sections of these stream reaches (as opposed to 500 m long sections recommended in the Forest Practices Code) were electrofished. To augment the electrofishing program, the study team also used Gee type minnow traps to elucidate fish usage in the areas studied.

Putnam Creek

Putnam Creek drains the bulk of the northeastern portion of Silver Star Provincial Park. The creek flows approximately 12.9 km in an eastward direction into Trinity Creek, which in turn flows into the Shuswap River. For its first 10.5 km, the gradient of the creek is 6%, rising from 700 m to 1,300 m. During the remainder of its length, Putnam Creek's gradient increases to an average of 17%, with the creek rising rapidly to its headwaters at approximately 1,700 m elevation.

The fisheries capabilities of Putnam Creek were not listed in the databases searched. However, Trinity Creek (into which Putnam Creek flows) is known to support coho and chinook salmon (*Onchorhynhchus kisutch* and *O. tshawytscha*, respectively), Dolly Varden char (*Salvelinus malma*), Kokannee (*O. nerka*), mountain whitefish (*Prosopium williamsoni*), and rainbow trout (*O. mykiss*). The SIS database indicates that there is a culvert at the Trinity Valley Road and a water falls 500 m upstream of the road which pose an obstruction to migration of coho and chinook salmon.

Putnam Creek was surveyed for aquatic biophysical parameters near the 1250 m contour, approximately 500 m upstream of the Putnam Lift base station (Map 5). A 200 m section of the creek was surveyed in detail (DFO/MOE Stream Survey Forms are attached in Appendix H). The gradient of Putnam Creek at the sampling site was 5 %, with a channel width averaging 3.3 m, and a wetted width averaging 2.2 m. No barriers to fish movements were evident, although there were three debris and log jams with heights ranging from 0.4 to 0.7 m. The fish stream cover was approximately 35%, provided mainly by overstream vegetation, LOD (large organic debris) and deep pool, with lesser amounts of cover provided by boulder and cutbank. Riparian vegetation consisted of western hemlock, mountain alder, devil's club, red-osier dogwood, clasping twisted stalk, one-leaved foamflower, oak fern, lady fern, red columbine, and common horsetail. The tree canopy consisted of western hemlock, western redcedar, with lesser amounts of Douglas fir and Engelmann spruce. The stream substrate consisted mainly of gravels, with almost equal, but lesser amounts of fines and larges. The water was clear with moderate flow conditions (discharge estimated at 0.03 m^3/s). The flow character was 20 % pool, 40 % riffle and 40 % run. The water temperature was 10 °C, while the conductivity was 160 μs/cm. Three passes with a Dirigo electrofisher were conducted within this section of creek to elucidate fish presence. The first electrofishing effort was over 100 m of stream length, for 1,665 seconds, with the electrofisher set at 400 V and 80 Hz. The second effort was over the same 100 m section for 1,050 seconds with the same electrofisher settings. The third electrofishing effort was over a 200 m section of stream for 792 seconds, with the same electrofisher settings. In addition, six baited minnow traps were set overnight (16:35 hr on July 23 to 07:55 hr on July 24). No fish were caught by electrofishing or in the minnow traps.

Vance Creek

The southeastern portion of Silver Star Provincial Park is drained by Vance Creek. The creek flows approximately 10.5 km east and southeast into Bessette Creek, which in turn flows into the Shuswap River. In its upper reach, extending from 1040 m to 1640 m, the main channel has an average gradient of 12%, while the gradient of its tributaries at this elevation range from 12 to 20%. Side slopes above the channels often exceed 50% and numerous slope failures. Between the park boundary and its confluence with Bessette Creek, the average gradient of Vance Creek lessened to an average of approximately 5%.

Fisheries records for Vance Creek are also lacking, although Bessette Creek, into which Vance Creek flows, is listed in the SIS database. Fish known to occur in Bessette Creek include sockeye salmon (*O. nerka*), coho and chinook salmon, sculpin (*Cottus sp.*),dace (*Rhinichthys sp*.), mountain whitefish, rainbow trout, redside shiner (*Richardsonius balteatus*) and sucker (*Catostomus sp*.). Due to the low gradients in the lower reaches of Vance Creek is likely that at least some of these species also utilize that creek.

Two sampling stations were established on Vance Creek, one at the 1,190 m contour near the proposed ski lift base, and the other downstream at 6.8 km on the Vance Creek Forestry Road at about the 900 m contour (Map 5). At the upstream site, a 200 m section of the creek was surveyed in detail (DFO/MOE Stream Survey Forms appended). The creek's gradient averaged 14 %, with a channel width averaging 4.9 m, and a wetted width averaging 2.3 m. Fish stream cover was estimated as 20%, provided mainly by boulder and deep pool, with lesser amounts provided by overstream

vegetation and a trace of LOD and cutbank. Riparian vegetation consisted of mountain alder, willow, northern black cottonwood, red-osier dogwood, Douglas maple, thimbleberry, black gooseberry, one-leaved foamflower, oak fern, lady fern, and common horsetail. The crown closure was less than 5 %. The stream substrate consisted mainly of larges, with lesser amounts of gravels and fines. The water was clear with moderate flow conditions (discharge estimated at 0.02 m^3/s). The flow character was 40 % pool, 55 % riffle and 5 % run. The water temperature was 11 °C, while the conductivity was 200 μs/cm. Three passes with the electrofisher were conducted within this section of creek to elucidate fish presence. The first electrofishing effort was over 100 m of stream length, for 1,296 seconds, with the electrofisher set at 400 V and 80 Hz. The second effort was over an additional 100 m section of stream for 1,080 seconds with the same electrofisher settings. The third electrofishing effort was over a 200 m section of stream for 840 seconds, with the same electrofisher settings. In addition, six baited minnow traps were set overnight (12:20 hr on July 23 to 07:05 hr on July 24). No fish were caught by either sampling method.

At the lower Vance Creek Sampling site, approximately 100 m of the stream was sampled in detail (DFO/MOE Stream Survey Forms appended). The creek's gradient averaged 7 %, with a channel width averaging 3.4 m, and a wetted width averaging 1.6 m. Although no barriers to fish movements were observed, there were three small log and sediment controlled falls within the section surveyed (heights ranging from 0.6 to 1.0 m). Fish stream cover was estimated as 30%, provided predominantly by overstream vegetation, deep pool and LOD, with some cutbank. Riparian vegetation consisted of western hemlock, western red cedar, northern black cottonwood, mountain alder, thimbleberry, black gooseberry, one-leaved foamflower, oak fern, and devil's club. The crown closure was estimated as 10 %. The stream substrate consisted predominately of gravels with some cobble and fines. The water was clear with moderate flow conditions (discharge estimated at 0.02 m^3/s). The flow character was 20 % pool, 50 % riffle and 30 % run. The water temperature was 8 °C, while the conductivity was 160 μs/cm. Two passes were conducted with the electrofisher, both over 100 m sections of stream, with the electrofisher set at 400 V and 80 Hz. The first effort was for 1,350 seconds, while the second effort was for 972 seconds. As with the other sites, six baited minnow traps were set overnight (13:30 hr on July 24 to 10:00 hr on July 25). Again, no fish were caught by either sampling method.

Coldstream Creek

Coldstream Creek drains a small portion of the extreme south of Silver Star Provincial Park. The creek flows southwest, from its headwaters in the park, for 25 km to Kalamalka Lake. Within the upper Coldstream drainage, the mean gradient of the creek channel is 5%. However, immediately downstream but within Silver Star Park the creek steepens and has an average gradient of 13 %.

Coldstream Creek is known to provide spawning habitat for both Kokanee and rainbow trout in its lower 6 km (Water Investigations Branch, 1974). At approximately 6.7 km upstream of its mouth, the gradient of Coldstream Creek increases, and there is a log jam that prevents further fish migrations past that point. The report also noted that the creek could support these species along 15 km of its 25 km length if it was in pristine condition. Minimum discharge requirements to support a viable fisheries in Coldstream Creek are also detailed in the Water Investigations Branch (1974) report. The minimum

recommended flow for the spring rainbow trout spawning period (April to May) and the kokanee spawning period (September to November) is 0.226 m^3/s. The mean monthly discharge was lower than this quantity for five months between 1970 and 1992. The recommended absolute minimum flow to maintain a resident population of rainbow trout was 0.045 m^3/s. The minimum flow has not dipped below this critical level at the WSC gauging stations near the mouth or above the Kalavista diversion. The extreme minimum daily discharge for the period of record at the later station (the station for which there is a lengthier record) was 0.096 m^3/s, observed on February 10, 1971.

Coldstream Creek was surveyed for aquatic biophysical parameters on July 24 and 25, 1996, at about the 1000 m contour, approximately 1 km downstream of the Park boundary. Within the park, the stream was ephemeral, with no surface flow at the park boundary. A 200 m section of the creek was surveyed in detail (DFO/MOE Stream Survey Forms are attached in Appendix H). The gradient of Coldstream Creek at the sampling site was 2%, with a channel width averaging 1.8 m, and a wetted width averaging 1.0.2 m. No barriers to fish movements were evident, except for the culvert at Deafies Creek Forestry Road (at about the 1000 m contour) which would pose a barrier to upstream fish movements during low flows. Fish stream cover was very high, estimated at about 80%, provided mainly by overstream vegetation with lesser amounts of cover provided by LOD, cutbank and a trace of pool. The dense riparian vegetation consisted of Englemann spruce, western red cedar, Douglas fir, mountain alder, devil's club, red-osier dogwood, clasping twisted stalk, twinberry, thimbleberry, black gooseberry, lady fern, highbush-cranberry, fireweed, Indian hellebore, and common horsetail. The tree canopy was thin, estimated at abut 10%. The stream substrate consisted was dominated by fines and small gravels. The water was clear with low flow conditions (discharge measured at 0.006 m^3/s). The flow character was 10 % pool, 50% riffle and 40% run. The water temperature was 9 °C, while the conductivity was 160 μs/cm. Only a single pass electrofishing effort was conducted over a 100 m section of the stream. The electrofisher set at 400 V and 80 Hz, for the 1,125 seconds of sampling. Six baited minnow traps were set overnight (17:30 hr on July 24 to 11:00 hr on July 25), three upstream and three downstream of the forestry road. No fish were caught by electrofishing or in the minnow traps.

Other Streams

The northwestern portion of Silver Star Provincial Park and the northwestern fringe of the Controlled Recreation Area is drained by Fortune Creek, which flows into the Shuswap River near Enderby. Within the park, Fortune Creek drains an area whose elevation ranges from 1,880 m to 1,100 m. The average gradient of the creek within the park is approximately 11%. Downstream of the park boundary the creek steepens to about 17%, until it reaches the broad valley bottom near Armstrong at the 400 m elevation. The Stream Information Summary (SIS) database indicates the presence of coho and chinook salmon, and rainbow trout. The salmon are noted to occur from the confluence of Fortune Creek with the Shuswap River to approximately 15 km upstream, near Armstrong. This is approximately 4 km from the Silver Star Provincial Park boundary and 10 km from the Silver Star Mountain Resort Controlled Recreation Area boundary. An aquatic biophysical assessment of this system was not conducted by the study team.

The extreme northern eastern portion of Silver Star Provincial Park is drained by the easterly flowing Miriam Creek. Waters from this creek flow into Trinity Creek, which tends north into the Shuswap River. Fisheries records for Miriam Creek were unavailable at the time of writing, however, with stream gradients of over 25 % within the park, those reaches are unlikely to be fish bearing. No additional field work was conducted on this creek.

BX Creek, draining the southwestern portion of Silver Star Provincial Park, flows southwest into Swan Lake, which drains into Okanagan Lake via lower BX Creek and Vernon Creek. The streams gradient ranges from an average of 11% above 1,100 m, to less than 5% below that elevation. At the park boundary, BX Creek has a stream gradient of approximately 20 %. No SIS records are presently available for BX Creek. An aquatic biophysical assessment was not conducted on this creek.

2.4.2 Water Quality

A water quality sampling program was initiated to elucidate baseline water quality in the study area. As there was no flowing water within the study area, the samples were collected from the various water courses that drained the area in question, or ,receive waters draining from the study area. The sites selected were the same as the fisheries sampling site (identified on Map 5). These are Vance Creek at the new lift base (1180 m contour upstream of the study area) sampled on July 23, 1996; Vance Creek 6.8 km up Vance Creek forestry Road (920 m contour downstream of the study area) sampled on July 24, 1996; and Coldstream Creek at Deafies Forestry Road (1100 m contour downstream of the study area) sampled on July 25, 1996. In addition, Putnam Creek which drains the north-eastern flank of the current Silver Star operation was also sampled (1060 m contour) on July 23, 1996.

It is understood that a water quality monitoring program will be developed so that any potential changes to the surface and ground water regimes in the area can be detected and appropriate action can be taken. The program will include sampling of the streams in the area (upstream and downstream samples) as well as sampling of representative golf course ponds and all wetlands and ponds constructed for water quality control. The effectiveness of the present water sampling program will be reviewed and incorporated into an expanded program. Parameters to be sampled for include primarily nitrogen and phosphorus compounds, but will also include and pesticides used on the golf course. By properly designing the water quality monitoring program, the effectiveness of the fertilizer and pesticide management program, water management program, and constructed wetland water treatment can be realized. Potential problems can be identified, and appropriate mitigating measures and corrective action can be taken.

Four new water quality sampling sites were established during the course of the Environmental Review of a Portion of Silver Star Provincial Park. These sites are in addition to the sampling locations previously established by Silver Star Staff. The purpose of establishing these sampling sites is to take a “snapshot” of the water quality in select waterbodies (Coldstream, Vance and Putnam Creeks). During the development of the construction and post-construction monitoring programs, a thorough review of all existing data will be conducted, as will a review of the sampling locations to ensure that the goals of the monitoring program are being met. An improved map of the stream sampling site will be provided at that time. UTM Grid references for the new sampling sites are listed below.

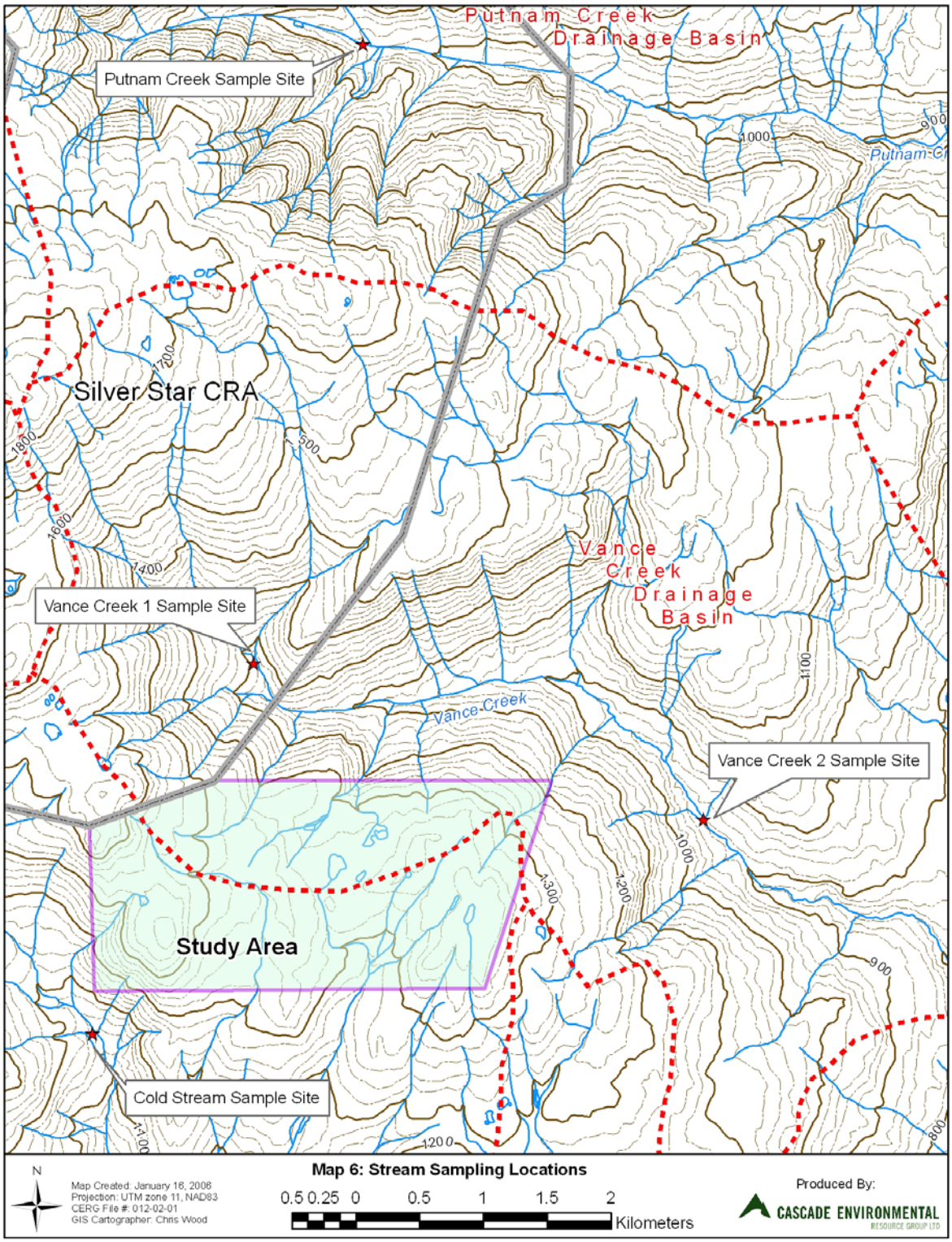
Table 7: Stream Sampling Locations

Water Sampling Site	UTM Grid Reference
Vance Creek – upstream (at New Lift Base)	356400E 5578250N
Vance Creek – downstream (at Forestry Road)	359730E 5578400N
Coldstream at Deathie Forestry Road	354175E 5576275N
Putnam Creek near Lift Base	355995E 5584450N

Parameters sampled for include pH, electrical conductivity, total dissolved solids, total suspended solids, turbidity, orthophosphate, total nitrogen, potassium, calcium, magnesium, sodium, iron, copper, zinc, manganese, sulphate, chloride, fluoride, boron, carbonate, bicarbonate, hardness, ammonia, nitrate, nitrate-nitrite, phosphate, total phosphorus, total Kjeldahl nitrogen and fecal and total coliforms. Results of the analyses are listed in Appendix E.

All of the water samples meet the guidelines for drinking water for the parameters sampled (Health Canada, 1996). The waters can be considered hard, with moderate alkalinity. Total suspended solid levels are low as would be expected for clear mountain streams. Nutrient concentrations (nitrogen and phosphorus) are generally fairly low, and are lower than the suggested guidelines of the protection of aquatic life (Pommen, 1991). Ammonium-N levels in the Coldstream Creek sample, however, can be considered as moderate, being approximately 50% of the 0.461 mg/l guideline for the protection of aquatic life at the pH and temperature of that site (Pommen, 1991, CCREM, 1992). The moderate ammonium levels are likley due to microbial production in Coldstream Creek's wetland source within the study area. As ammonium is a fairly volatile compound, it is probable that additional sampling of Coldstream Creek further downstream would have seen much reduced ammonium concentrations.

Map 5 Stream Sampling Locations



2.5 Wetland Environment

2.5.1 Delineation

Eight small pocket wetlands were identified within the study area (polygons 6c, 7a, 7b, 9a, 9b, 9c, 13a, 16). Although two were not visited, the other sites exhibited some basic consistent characteristics. All wetlands were organic soil wetlands of the fen or swamp type, and sphagnum moss was prevalent (NWWG, 1987, Mackenzie and Moran, 2004). Formation of the wetlands appears to be a function of low gradients coincident with seepage or collection areas.

2.5.2 Functionality

The wetlands were assessed for functionality using a 14 point system of evaluation that includes the following functions:

- Education / Research
- Erosion Control
- Fish Habitat
- Flood Storage
- Flood Conveyance
- Food Production
- Red / Blue Listed Species Habitat
- Historic / Archeological
- Aesthetics
- Recreation
- Sediment Control
- Timber Production Water Supply
- Water Quality
- Wildlife Habitat

A matrix was generated to identify functional values associated with each of the wetlands of the site. Each function was assessed a value of High, Medium or Low. Functional values were based on a regional level. High values were then highlighted in the matrix to illustrate significance.

Table 8 Wetland Function Matrix

Function	**Wetland**						
	6c	**7a**	**7b**	**9a**	**9b**	**9c**	**13a**
Education / Research	**H**	**H**	**H**	L	M	M	M
Erosion Control	L	M	M	**H**	M	L	M
Fish Habitat	L	L	L	L	L	L	L
Flood Storage	L	M	M	M	M	M	L
Flood Conveyance	L	M	M	M	M	M	L
Food Production	M	M	M	L	M	M	M
Red / Blue Listed Species Potential Habitat	M	M	M	L	L	L	M
Historic / Archeological	L	L	L	L	L	L	L
Aesthetics	**H**	**H**	**H**	L	L	L	M
Recreation	**H**	**H**	**H**	L	M	M	L
Sediment Control	L	M	M	M	M	M	M
Timber Production Water Supply	L	L	L	M	L	L	L
Water Quality	L	M	M	L	M	M	M
Wildlife Habitat	**H**	**H**	**H**	M	H	H	M

The primary functions provided by the wetlands appear to include aesthetics, recreation (nature viewing), wildlife habitat, biodiversity, and education. Of secondary significance although of potentially equal importance is the potential for the occurrence of red or blue listed plants. No Red or Blue Listed species were identified, however, past conversations with local naturalist Roseanne VanEe, yielded information regarding the potential occurrence within these wetlands.

Low value functions and functions not provided by these wetlands include flood protection, water quality protection and food production.

3.0 ENVIRONMENTAL CONSTRAINTS

3.1 Cultural Environment

Constraints due to heritage interests in the area are currently unidentified. There appear to be no development constraints associated with archeological or heritage interests in the study area.

During the public review process, the issue of alternative land use in the study area was raised. If proposed golf course is approved then doesn't go ahead the lands would not be used for other forms of development instead. This would be addressed in the land use contract or Crown Lease Agreement.

Road access into the site would be constrained as "a driveway to serve the proposed golf course only". Chris Chekerda, District Development Technician, MOTH (April 15/97) indicated that the proponent must enter into discussions with MOTH (re: engineering requirements, possible road upgrading) prior to highway road construction.

3.2 Physical Environment

3.2.1 Climate

Climatic conditions are well documented from the ski activities occurring at Silver Star Resort. No climatic constraints are noted.

3.2.2 Geology

Exposed bedrock across the study area occurs infrequently and does not pose any geologic hazard such as rockfall or toppling. No geologic constraints are noted.

3.2.3 Geomorphology & Surficial Materials

The majority of the surficial units are free-draining across gentle to moderate slopes. No constraints are noted in relation to the stability of these materials.

3.2.4 Hydrology

The study area lies within the upper reaches of the tributaries to Vance and Coldstream Creeks. There are no major streams within this area as most tributaries are ephemeral. Consequently, few hydrologic constraints exist. Stream channel structure must be maintained to permit seasonal runoff.

The prime objective of the hydrology design is to minimize any increase in peak flows associated with development. Peak flow increases could potentially affect fish populations by altering channel morphology, changing patterns of debris recruitment and placement, increasing bed load, and adversely affecting water quality.

Map 6 presents identified environmental constraints associated with the site.

Map 6 Silver Star Golf Development - Environmental Constraints

3.3 Terrestrial Environment

3.3.1 Pedologic Soils

The widely distributed Brunisols in the study area are generally well drained soils which are associated with no known constraints to recreational development. The Organic soils which occur in poorly drained areas, however, are associated with wetlands. Development constraints associated with wetlands are discussed in Section 3.4.

3.3.2 Vegetation

The forest of the study area is less than 140 years old and no old forest communities were observed. However, occasional veterans were observed during the field studies. Older trees are less tolerant of the potential impacts that may arise from development. Accordingly, any forested polygon of structural stage 6 should be considered constraining to development. However, the age range covered by the mature forest stage is 80 to 140 years, and as a result site specific conditions will affect the degree of impact. The stand class of 7 identified in MOF Forest Cover Mapping was not supported by field studies and therefore could not be considered of old growth forest (age class 7). Core samples taken from the largest trees in each sample plots indicated the majority of the potentially affected forest to be mature forest (age class 6). This information is conveyed in the map contained in this report. This age class discrepancy may be explained by the fact that much of the site has been selectively logged (due to pest infestation) such that many of the veteran trees may have been removed.

Removal of these lands may be constraining to the Annual Allowable Cut for this area. If lands are identified for trade that are part of the existing Timber Harvesting Land Base there is a potential for reduction of the Annual Allowable Cut. Likewise, potential golf course lands used in the forest cover calculations within the drainage basin will add to the ECA values and may restrict harvesting in the Small Business Forest Enterprise Program. However, the total area in question is relatively small. A land replacement plan should be comprehensive in land management objectives, considering potential impacts to other land base users, as well as best use of the land, and it should compensate accordingly. This issue of land allocation is a matter of higher level planning than the level of planning undertaken by the consultant.

Windthrow is an existing problem on the site and will continue to be an constraint if clearing proceeds. However, the potential for timber blowdown can be minimized or even mitigated to a large degree by sound clearing practices and fairway design. All golf course edges should be scalloped to avoid straight cut lines and will be feathered to reduce abrupt changes in the vertical profile of the vegetated landscape. Dripline protection should be included in tree preservation and an environmental monitor should be present during clearing.

No specific constraints are associated with the various tree or plant species noted within the study area. No rare or endangered terrestrial plants or plant communities were observed within the study area. Potential presence of alpine larch may be considered constraining if encountered. While no rare or endangered plants were identified within the wetlands, the reconnaissance level of survey precluded identification of all plants to the level of species. Consequently, wetland vegetation should be considered constraining due to the potential presence of rare or endangered plant species.

3.3.3 Wildlife and Valued Ecosystem Components

Deer Rutting

Because utilization of the subject property by deer during the rutting season is poorly understood, it is difficult to recommend options for mitigating potential impacts. Restrictions on development or golf course activity between 15 October and 15 December would reduce disturbance to deer utilizing the area during the rut. The golf course would likely not be operational at this time of year.

At Sun Peaks Golf Course, greenways and fairways appear to be providing additional foraging opportunities for deer in the area (Rick Howie, BCE, Kamloops, pers. comm., 1996). Deer would also be expected to forage on greenways and fairways if such features were developed at Silver Star.

Wildlife Trees

Areas with high snag densities need to be retained to maintain nesting and foraging opportunities for woodpeckers, small owls, bats and cavity nesting passerines. Large snags in upland areas with known nesting activity should not be removed unless absolutely necessary from a development design perspective. Care must be taken in golf course design and construction to provide adequate forested buffers along fairways, so that important nest and forage trees/snags are less vulnerable to windthrow.

Approximately 60-70% of resident bird species in British Columbia are cavity nesters and use cavities to roost in winter (Millikan 1994).

Ephemeral streams and Riparian Areas

Ephemeral streams and adjacent riparian areas should not be disturbed. These habitats are important as feeding, drinking, and breeding sites for numerous wildlife species. These habitats also act as natural movement corridors for wildlife across the site, especially following intensive land use activities such as clear-cutting, golf course and potential residential development. Carefully designed crossings will be required.

Open Wetlands

Because wetlands are relatively uncommon in upland ecosystems of Silver Star Provincial Park, the integrity of all existing wetlands should be retained. Wetlands are important foraging areas for bats and breeding areas for amphibians. With careful design, any ponds created as part of the golf course layout may also eventually be utilized by amphibians as breeding areas. At Sun Peaks Golf Course, western toads have begun breeding in drainage ponds (Rick Howie, BCE, Kamloops, pers. comm., 1996). However, breeding success and long-term impacts on toad populations is not known.

Wildlife Movement Corridors

Wildlife movement corridors maintain the connectivity of adjacent habitats and need to be provided for wildlife moving across or through the site. Ephemeral streams and riparian areas are natural corridors and should be maintained as such.

Wildlife as Pests

If a golf course is developed, it will become necessary to manage certain species of wildlife to prevent their becoming pests. Some of the wildlife species that can be considered potential pests include:

- ◊ biting insects such as mosquitoes, horseflies and blackflies,
- ◊ Canada goose (presence and droppings on greens),
- ◊ woodpeckers (excavate holes in man-made wood structures),
- ◊ crows and ravens (garbage),
- ◊ coyote (safety),
- ◊ bears (safety and garbage),
- ◊ deer (eating flowers, shrubs at clubhouse, other facilities etc.),
- ◊ moose (browsing shrubs, particularly in winter),
- ◊ northern pocket gopher (burrowing and mounding on greens),
- ◊ snowshoe hare (clipping of ornamental shrubs),
- ◊ cougar (safety), and
- ◊ skunks (denning under man-made structures).

3.4 Aquatic Environment

3.4.1 Aquatic Biophysical

Putnam Creek

The aquatic biophysical assessment and fish sampling program conducted for this study indicates that Putnam Creek within Silver Star Provincial Park is likely non fish bearing. This creek does, however, flow into Trinity Creek, which is a known to support a fish population. It is important, therefore, to retain the riparian vegetation to protect the stream banks from erosion which could lead to downstream siltation. In addition, the riparian vegetation help maintain lower water temperatures in summer, and provides a potential food source for downstream fish (i.e. terrestrial insects falling into the stream).

Vance Creek

As with Putnam Creek, the present studies indicate that Vance creek is unlikely to support fish within Silver Star Provincial park. Again, it is important to retain the existing riparian vegetation for the previously mentioned reasons. In addition, The banks and side slopes in Vance Creek's headwaters are noted to be slumping in several locations. Maintenance of appropriate buffer leave strips adjacent to the creek, and proper water management will help address this ongoing concern.

Coldstream Creek

Coldstream Creek is known to support a fisheries resource in the valley downstream of the study area. Within and immediately downstream of Silver Star Provincial Park, the creek has been shown to be barren. Similar to constraints for the above two creeks, it is important to maintain an appropriate buffer to protect the riparian vegetation adjacent to the headwaters of this creek.

Other Streams

The other watercourses and associated ravines and gullies pose the same constraints as those previously mentioned.

No fish were captured in any of the fish sampling locations using either of the methods and it is GeoAlpine's opinion that further sampling in these areas would not have captured any fish. However, it has been the authors' experience that a single sampling program (using a double pass electrofishing and Gee trap program as utilized in this case) is rarely sufficient to conclusively prove that a stream is barren. Therefore, for the purposes of this development, the waters into which development lands drain are being considered as fish bearing.

To that end, a 30 m Streamside Protection and Enhancement Area (SPEA) is identified. It is GeoAlpine's interpretation of the RAR (Malaspina, 2006) that the recommendation for 30 m minimum riparian setback is applied as a default unless a detailed assessment is conducted. It is understood that reduced setbacks represent exceptions and that whenever possible the largest setback feasible will be delineated. A 30 m minimum setback cannot be applied consistently given the topography of the site. CERG suggests a 15 m SPEA may be attainable with detailed assessment given the bio-physical character of the watercourses. Since past experience with golf courses indicates that there will be

"pinch points" including doglegs around existing waterbodies or wetlands, and fairway stream crossings. These may be addressed through detailed assessment or site specific permitting. However, every attempt should be made to minimize the encroachments into that 30 m buffer.

3.4.2 Water Quality

Water quality of the streams draining the study area is of particular concern to downstream water users, especially in the Coldstream watershed, where the total water licenced for consumption for that water body exceeds its total mean annual runoff. As water is valued resource in the arid Okanagan, maintaining (and / or improving) the water quality of the streams leaving the project site is essential. In addition, any changes to the water quality in Putnam, Vance and Coldstream Creeks will not only affect downstream human water usage (whether it be for agriculture, domestic, or other usage), but could impact on downstream fisheries resources.

In addition, a pesticide sampling program will be set up in conjunction with the Integrated Pest Management Plan. The water quality monitoring program will be subject to agency review before it is implemented.

The operational requirements for managing effluent will be developed in the detailed design stage of the development. This will include sizing and locations of all facilities, ponds and wetland features, as well as environmental considerations for siting those locations.

Water quality issues will be addressed by development of the effluent treatment system as outlined above. This system and potential receiving areas will be monitored to ensure that the system it is functioning effectively. Plans of both the effluent treatment system and monitoring program will be developed during the detailed design stage of the project.

Changes to the groundwater regime also could potentially affect fisheries resources if water quality is deteriorated or if groundwater recharge is decreased. Increases in nutrients (nitrogen and phosphorus) could lead to excessive algal growth, which could deplete oxygen levels in waters where algal blooms occur.

A fertilizer and wastewater management program should be developed so that ground water won't be contaminated by the proposed development. The storage and handling of all pesticides will conform to the guidelines in the latest edition of BC Environment's Handbook For Pesticide Applicators And Dispensers. Features incorporated into pesticide storage areas include, among others:

1. distinct/separate from other work areas
2. constructed of fire resistant materials,
3. potentially absorbent materials sealed,
4. spill containment measures,
5. no floor drain,
6. protected from temperature extremes,
7. materials stored in original containers,
8. warning signs,
9. locked and well lit,
10. inventoried.

Petroleum storage, including propane storage, fuel storage, lubricant storage, storage of other petroleum products and fuel should be designed to meet or exceed the existing safety regulations of the British Columbia Fire Code, as well as the "Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products" (Canadian Council of Ministers of the Environment, 1994) and the "Summary of Environmental Standards & Guidelines for Fuel Handling, Transportation and Storage" (Ministry of Environment, Lands and Parks and Ministry of Forests, 2002).

A decrease in groundwater recharge to the creeks within the study area could lead to decreased flows in those drainages. This could lead to higher summer temperatures in affected drainages, and hence reduced oxygen carrying capacity of those waters. Groundwater resources must be managed so that summer low flows in the adjacent drainages are not adversely affected.

3.5 Wetland Environment

3.5.1 Delineation

Delineated wetlands should be considered constraining to development. The most significant wetlands are delineated as polygons 6c, 7a, 7b, 9a, 9b, 9c 13a and 16. Smaller wetlands do occur, but were not mapped at the 1:5000 scale. The best example of this type of wetland within the study area is found within polygon 4b.

3.5.2 Functionality

Wetlands 6c, 7a, and 7b have the highest function values and are considered the most significant wetlands on the site. They are classic fens and presently exist in an undisturbed state. Although occurring in close proximity it is now known that 7a and 7b are hydrologically isolated from each other. These wetlands were noted when the Ministry of Forests produced in forest cover mapping at 1:20,000 scale. Wetlands 9b and 9c actually represent a single wetland complex that is bisected by a logging haul road. As a result its functional value is somewhat reduced. The small swamp wetland identified by polygon 13a is assessed lower functional values due to its smaller size.

Present plans call for the construction of a series of wetland ponds designed to operate in isolation from the existing wetlands for the purpose of isolating irrigation waters from the golf course. The objective of these constructed wetlands would be to prevent irrigation waters from entering the natural wetland system while providing complimentary habitat enhancement opportunities. In 1993, there were more than 150 constructed wetlands in the United States used to treat municipal and industrial wastewaters. The majority of these were in the southeastern and south-central states where a long growing period occurs (Horner, R. 1993. Constructed Wetlands for Storm Runoff Water Quality Control, Univeristy of Washington). A long growing season is required in these cases, as there is waste input throughout the year.

In the case of a golf course, potential nutrient (phosphorus and nitrogen) losses would likely be associated with fertilization of turf grasses. The most efficient method of reducing the potential losses of these compounds is, therefore, to properly manage the use of fertilizer on the golf course and the provision of adequate buffer zones between areas fertilized and waterbodies. Where such management has been previously undertaken (e.g. Nelson Environmental Services, 1990 to 1996 monitoring programs for the Chateau

Whistler Golf Course and for the Nicklaus North Golf Course), the study team has found no noticeable nutrient level increases in waterbodies adjacent to golf courses.

However, where fertilizers are used, there is always potential for nutrient loading to become a problem. The study team has therefore proposed to construct wetlands to facilitate removal of excess quantities of phosphorus and nitrogen compounds. Constructed wetlands in the United States have been found to remove between 40 and 90% of total suspended solids, 20 to 50% of the ammonia, and 50 to 75% of the total phosphorus in wastewaters (Strecker et al. 1992. The Use of Wetlands for Controlling Stormwater Pollution. US EPA). While the use of wetlands has been proven for wastewater treatment, one disadvantage in northern climates is the lack of nutrient uptake in the winter months. This disadvantage has limited the use of wetlands for treatment of municipal wastewater, and underlines the need for supplemental tertiary treatment. However, in the case of golf courses, the potential nutrient loading would only be realized in the growing season when fertilizers are applied.

As part of the proposed monitoring program, drainages in and around the golf course will be analyzed for nutrient levels. If phosphorous uptake slows down and nutrient concentrations in the sampled waters become elevated, a wetland vegetation harvesting program will be initiated. Once the vegetation in the wetland is established a program of rotational vegetation (*Typha / Scirpus /Juncus*) harvest will be implemented. It is important to recognize that, within a closed loop system, concentrations of phosphorous in the water will be redistributed onto the golf course. The effectiveness of phosphorous uptake will depend on biological productivity of the aquatic plants. During past field work the consultants observed healthy, productive plant life within the wetlands on the site. It is reasonable to presume the constructed wetlands will be similarly healthy and productive.

4.0 RECOMMENDATIONS AND CONCLUSIONS

4.1 General

1. The integrity of the water quality, habitat values and downstream fisheries values of all waterbodies should be protected by the establishment of riparian buffer zones (SPEA's). In general, buffers should be as specified in the Riparian Areas Regulation of the B.C. *Fish Protection Act*.

2. The proponent should review guidelines outlined by Barnard (1992), RCGA (1993) and Chilibeck (1992) and, where applicable, incorporate into development planning and design.

3. The proponent should endeavor to employ Integrated Pest Management (IPM) techniques to minimize pest problems.

4. The proponent should attempt to preserve all delineated wetlands with suitable buffers. Wetlands potentially impacted by future developments should be subjected to detailed assessment to identify all plant species prior to development approval.

5. Fairways should be situated parallel to ephemeral streams to reduce the need for crossings and to maintain the undisturbed nature of set-back areas.

6. Any alpine larch found in the area in the study area should be preserved.

7. Retain an on-site environmental monitor to be present during all development activity.

The environmental monitor will be an appropriately accredited professional retained by Silver Star and approved by BC Environment, whose responsibilities include:

a. Preparation of a site specific monitoring program, in accordance with the BC Environment's requirements.
b. Monitor all project development related activities and their effects on biophysical resources within and adjacent to the site in accordance with the approved monitoring program.
c. Review and submit monitoring reports to Silver Star, BC Environment and other applicable government agencies on the monitoring results in accordance with a predetermined schedule and format.
d. Impose temporary work stoppages for non-compliance with the monitoring program.
e. Amend the monitoring program, undertake additional resource assessments, and implement mitigative measures if requested by BC Environment or Silver Star.
f. Make recommendations to Silver Star for changing construction and operating procedures and methods deemed necessary to ensure protection of the environment.
g. The Environmental Monitor may be dismissed by either Silver Star or BC Environment for not adequately enforcing the Guidelines.

8. The golf course design should incorporate "no adverse effects" on downstream water flows. The prime objective of the hydrology design is to minimize any increase in peak flows associated with development.

4.2 Wildlife and Wildlife Habitat

4.2.1 Construction Windows

1. The subject property may be used by deer during the fall rut. Development activity and future use of the site should be restricted between 15 October and 15 December.

2. To avoid contravention of the Wildlife Act, land clearing activity should not be undertaken between May 1 and July 31, the sensitive nesting period for breeding birds and other wildlife. Under Section 34 of the Wildlife Act, it is an offense to destroy nests occupied by a bird, its eggs or its young.

4.2.2 Habitat Protection

1. Areas with high densities of snags should be retained. A 30 metre vegetated buffer on either sides of creeks (i.e., from top of bank) and wetlands should be retained. In areas where windthrow is a risk, wider buffer zones should be set aside. Existing vegetation should not be disturbed. These set-back zones should be established whether an area has been previously disturbed (e.g., clearcut) or not. Natural regeneration is expected to occur rapidly in most areas where clearing has already encroached into this zone. Protection of these areas will retain wildlife trees, breeding and foraging areas for wildlife and provide corridors for wildlife moving or migrating through the site.

2. Large snags in upland areas should be retained within the development plan wherever possible. Widespread clearing of the subject property should not be permitted. Rather, clearing should be restricted to future fairways, cart paths and buildings. Rough areas between fairways should be composed of existing native vegetation including trees. Additional plantings may be necessary in disturbed areas. Roughs between fairways should be continuous and connected to property boundaries to provide secure travel corridors for transient wildlife through the golf course.

3. Wetlands should be retained intact and undisturbed. Disturbances such as infilling or redirection of runoff into wetlands should be avoided. Golf course design and construction should attempt to avoid and mitigate impacts to wetlands. Compensation should be made for any losses of wetland habitat as a result of golf course development. Water utilization for watering and other uses should ensure that current hydrology of wetlands is not altered. A 30 m vegetated setback should be established adjacent to wetlands to protect the unique plant and wildlife values of the wetland and adjacent riparian areas. Often wildlife trees important to bats and other wildlife species are located within the 30 m setback area.

4. Wildlife movement corridors will be provided if retention zones along ephemeral streams are designated as recommended above. Road and trail crossings of these ephemeral streams should be designed so that wildlife movement is not impeded or discouraged. The number of stream crossings should be minimized. Bridges rather

than culverts or fords are preferred. Planting of additional native, riparian shrubs and trees may be necessary.

5. Nests of raptors such as northern goshawk and great horned owl found during land clearing activity must be adequately protected by forested buffer while the nest is occupied.

6. All areas protected for wildlife habitat, preferably by restrictive covenant, should be flagged and enclosed by temporary fence (e.g., snowfence) along the covenant boundary prior to initiation of work on the site to ensure no encroachment occurs into those areas. The proponent should take whatever steps necessary to ensure that golfers and grounds-keeping staff do not enter protected areas.

7. Register and participate in the Audubon International's Cooperative Sanctuary Program for Golf Courses (http://www.audubonintenational.org/programs/acss/golf.htm). A Cooperative Sanctuary is a private or public course of which the owner, manager or superintendent has an interest in learning more about the wildlife and habitat potential of the course and a desire to work toward enhanced wildlife populations on the property.

4.2.3 Habitat Enhancement

1. Establish and maintain a nest box program. Strategically placed nest boxes of swallows, chickadees, small owls and woodpeckers will enhance breeding opportunities on the site. Bat houses in more remote areas of the course may also be a consideration. A single bat can consume 500 to 1000 mosquitoes and insects in an hour, depending on the bat species and size (Millikan 1994).

2. Planting of native shrubs and trees such as Douglas maple, spruce, alder and cedar may be necessary in previously or proposed disturbance areas. Native ground cover and shrubs adjacent to watercourses, ponds and fairways, along with trees, provide excellent habitats for birds and many other small animals. Plant species using local seed and plant strains suitable for high elevation areas. Transplanting from cleared areas is also an option although plant survival may be an issue.

3. Ponds should be designed with extensive emergent and riparian vegetation along the majority of the shoreline to provide habitat diversity for wildlife. Vegetation such as cattails can sequester certain contaminants as well as provide a source of litter for the invertebrate community.

4. Additional detailed surveys or assessments of wildlife may be useful. However, given the costs associated with conducting surveys (i.e. repeated surveys throughout the survey period), further assessment may not be possible. Because wetland areas and buffers are considered to be sensitive habitats of high value to many species, disturbance would not be permitted in these areas. Wildlife utilizing these areas should be adequately protected by the proposed set-back and buffer areas.

4.3 Additional Studies

1. More detailed assessment of specific wetlands may be required pending detailed development design.

2. A wildlife habitat management plan should be developed and implemented. The management plan will detail why, where, when and how lands with a designated wildlife function on or adjacent to the golf course will be managed over a given time period (usually 5 years).

3. As part of the development of a golf course a plan for fungicide, herbicide, and pesticide use management was produced. This document should be updated to conform to current regulations.

4. An Environmental Construction and Monitoring Plan was produced for MOELP review and approval prior to commencement of any construction (Midgely, 1999). A sediment and erosion control plan would be incorporated into these plans prior to any construction.

5. A long term water quality monitoring program for Vance and Coldstream Creeks should be developed and initiated prior to development.

6. Further study designed to identify replacement or compensation lands should be considered. This issue was repeatedly identified in the public review process even though it falls outside the terms of reference for the environmental consultants and outside the responsibilities of the proponent.

7. A number of hydro-engineering issues were raised in the inter-agency review. Studies are ongoing with other consultants and are not specifically identified here.

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7.0 Appendices

A: Climate Data - Silver Star Lodge

Canadian Climate Data - (c)1994 Environment Canada Page No. 1
VERNON SILVER STAR LODGE, BC (50°22'N 119°4'W, 1572m, 1970 to 1993)
ID : 1128584, User Calculated Means For (1970-1990.)

Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Temperature													
Mean Daily													
Maximum (°C)													
mean	-4.5	-2.8	1.4	3.3	11.2	14.5	18.8	18.8	12.4	6.2	-2.8	-5.6	5.9
No.Yrs	7	10	9	3	1	3	7	8	8	5	7	9	
Mean Daily													
Minimum (°C)													
mean	-9.4	-9.3	-5.9	-4.0	M	3.9	8.7	8.9	4.8	0.3	-7.8	-10.7	-1.9
No.Yrs	8	10	10	4	0	2	8	8	5	4	6	9	
Mean Daily													
Temperature (°C)													
mean	-6.9	-6.0	-2.1	-0.5	M	8.4	13.8	13.9	8.1	3.1	-6.7	-8.0	1.6
No.Yrs	7	10	9	3	0	2	7	7	4	3	4	9	
Extreme Daily													
Maximum (°C)													
mean	2.1	4.9	8.0	14.4	21.4	23.7	26.8	26.1	20.2	15.1	5.9	0.1	0.0
No.Yrs	8	10	10	8	2	6	10	10	10	10	9	9	
Extreme Daily													
Minimum (°C)													
mean	-20.5	-19.9	-12.9	-8.6	-7.5	-2.0	1.9	2.9	-2.1	-9.0	-17.7	-21.7	0.0
No.Yrs	8	10	10	8	2	4	9	10	10	10	9	10	
Precipitation													
Total													
Rainfall (mm)													
mean	0.4	0.1	0.1	18.2	43.2	106.0	63.7	66.0	64.5	19.3	3.3	0.0T	384.9
No.Yrs	8	9	8	2	1	5	8	7	7	4	7	10	
Total													
Snowfall (cm)													
mean	98.3	84.9	81.1	63.5	5.5	11.6	0.1	0.0	7.2	31.5	116.2	117.2	617.0
No.Yrs	8	9	8	2	2	5	9	10	9	6	7	10	
Total													
Precipitation (mm)													
mean	98.7	85.0	81.2	81.8	43.2	117.6	63.8	66.0	73.8	37.1	119.4	117.2	984.8
No.Yrs	8	9	8	2	1	5	8	7	7	4	7	10	
Extreme Daily													
Rainfall (mm)													
mean	0.4	0.1	0.1	6.6	8.6	26.7	17.4	21.6	20.9	5.8	1.8	0.0T	0.0
No.Yrs	8	9	8	2	2	5	8	7	7	4	7	10	
Extreme Daily													
Snowfall (cm)													
mean	16.4	17.5	16.3	11.7	2.2	4.9	0.1	0.0	2.8	9.8	17.5	20.6	0.0
No.Yrs	8	9	8	7	2	5	9	10	9	6	9	10	

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C: Wildlife Capability Ratings

for ecosystem units and structural stages on a proposed golf course at Silver Star (Rating system based on Demarchi 1995 - see Appendix D below). Structural stages currently occurring are shaded.

ESSF dc2 - Ecosystem Units and Structural Stages

	FR (01) - Bl – Rhododendron - Grouseberry (FRs)							
	Structural Stages							
Wildlife Species	**1**	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
Deer	6	3	3	4	4	4	3	3
Black Bear	6	3	3	4	5	5	4	4
Bats	X	U	U	U	X	X	X	U
Cavity Nesters	N	N	N	N	L	L	L	M
Amphibians	N	N	N	N	N	N	N	N

	LF (03) - PlSe - Falsebox - Pinegrass (LFwv)							
	Structural Stages							
	1	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
	6	3	3	4	4	4	3	3
	6	4	4	4	5	5	4	4
	X	U	U	U	X	X	X	U
	N	N	N	N	L	L	L	M
	N	N	N	N	N	N	N	N

ESSF dc2 – Ecosystem Units and Structural Stages

	FV (06) - Bl – Gooseberry – Oak Fern (FVy)							
	Structural Stages							
Wildlife Species	**1**	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
Deer	6	2	2	3	4	4	4	4
Black Bear	6	2	2	2	3	4	4	4
Bats	X	U	U	U	X	X	U	U
Cavity Nesters	N	N	N	N	L	L	M	M
Amphibians	N	N	N	N	N	N	L	L

ICH mw2 - Ecosystem Units and Structural Stages

	HF (01) - HwCw – Falsebox – Feathermoss (HF, HFj, HFk, HFm)							
	Structural Stages							
Wildlife Species	**1**	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
Deer	6	3	3	4	5	5	5	5
Black Bear	6	4	4	4	5	5	5	5
Bats	X	U	U	U	X	X	X	U
Cavity Nesters	N	N	N	N	L	L	L	L
Amphibians	N	N	N	N	N	N	N	N

	DF (02) - FdCw - Falsebox - Prince's Pine (DFr, DFrw,)							
	Structural Stages							
1	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
6	3	3	4	4	4	4	4
6	4	4	4	5	5	5	5
X	U	U	U	X	X	U	U
N	N	N	N	L	L	L	L
N	N	N	N	N	N	N	N

ICH mw2 - Ecosystem Units and Structural Stages

	RF (03) - CwFd – Falsebox (RF, RFj, RFk, RFkr, RFr, RFs)							
	Structural Stages							
Wildlife Species	**1**	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
Deer	6	3	3	4	4	4	4	4
Black Bear	6	3	3	3	4	4	4	4
Bats	X	U	U	U	X	X	X	U
Cavity Nesters	N	N	N	N	L	L	L	M
Amphibians	N	N	N	N	N	N	N	N

	HO (04) - CwHw - Oak Fern - Foamflower (HO, HOk, HOkm)							
	Structural Stages							
1	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
6	2	2	3	4	4	3	3
6	2	2	2	3	3	3	3
X	U	U	U	X	X	U	U
N	N	N	N	L	L	M	M
N	N	N	N	N	L	L	L

ICH mw2 - Ecosystem Units and Structural Stages

	RD (05) - CwHw - Devil's C;ub - Sarsaparilla (RD)							
	Structural Stages							
Wildlife Species	**1**	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
Deer	6	2	2	3	3	4	3	3
Black Bear	6	2	2	2	3	3	3	3
Bats	X	U	U	U	X	X	U	U
Cavity Nesters	N	N	N	N	L	L	M	M
Amphibians	N	N	N	N	N	L	L	L

	RH (06) - CwHw - Horsetail (RH)							
	Structural Stages							
	1	**2**	**3a**	**3 b**	**4**	**5**	**6**	**7**
	6	3	3	3	4	4	3	3
	6	2	2	2	2	2	2	2
	X	U	U	U	X	U	U	U
	N	N	N	N	L	L	M	M
	N	L	L	L	L	L	L	L

ICH mw2 - Ecosystem Units and Structural Stages

	RS (07) - CwSxw - Skunk Cabbage (RS)							
	Structural Stages							
Wildlife Species	**1**	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
Deer	6	3	3	3	3	3	3	3
Black Bear	6	2	2	2	2	2	2	2
Bats	U	U	U	U	U	U	U	U
Cavity Nesters	N	N	N	N	N	L	M	H
Amphibians	L	M	M	M	M	M	M	H

	Wf01 – Water Sedge – Beaked Sedge Ws10 – Western Redcedar – Spruce – Skunk Cabbage
	Edaphic Site - No Structural Stages
	3
	2
	U
	N
	H

ICH mk1 - Ecosystem Units and Structural Stages

	RF (01) - CwSxw – Falsebox (RF, RFj, RFw, RFws, RFwv)							
	Structural Stages							
Wildlife Species	**1**	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
Deer	6	3	3	4	5	5	5	5
Black Bear	6	3	3	3	4	4	4	4
Bats	X	U	U	U	X	X	X	U
Cavity Nesters	N	N	N	N	L	L	L	M
Amphibians	N	N	N	N	N	N	N	N

	DT (03) - FdPl - Pinegrass - Twinflower (DTjv, DTw, DTws, DTwv)							
	Structural Stages							
1	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
6	2	2	3	4	4	3	3
6	3	3	3	4	4	4	4
X	U	U	U	X	X	U	U
N	N	N	N	L	L	L	L
N	N	N	N	N	N	N	N

ICH mk1 - Ecosystem Units and Structural Stages

	SG (05) - SxwFd - Gooseberry - Sarsaparilla (SGs)							
	Structural Stages							
Wildlife Species	**1**	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
Deer	6	2	2	3	4	4	3	3
Black Bear	6	3	3	3	4	4	4	4
Bats	X	U	U	U	X	X	U	U
Cavity Nesters	N	N	N	N	L	L	M	M
Amphibians	N	N	N	N	N	N	L	L

	SO (06) - Sxw – Oak Fern (SOmy)							
	Structural Stages							
1	**2**	**3a**	**3b**	**4**	**5**	**6**	**7**
6	2	2	3	3	4	3	3
6	2	2	2	3	3	3	3
X	U	U	U	X	X	U	U
N	N	N	N	L	L	M	M
N	N	N	N	N	L	L	L

ICH mk1 – Ecosystem Units and Structural Stages

	Wf02 – Scrub Birch - Water Sedge											
	Structural Stages								Structural Stages			
Wildlife Species	**Edaphic Site, No Strucutral Stages7**											
Deer	3											
Black Bear	2											
Bats	U											
Cavity Nesters	N											
Amphibians	H											

D: Habitat Capability Rating Scheme

for three levels of knowledge about a species use of habitat. Ratings are based on the habitat's potential (i.e., the carrying capacity under optimal conditions) to support a particular species and reflect the animal's use of the best habitat (i.e., ecosection, biogeoclimatic unit or ecosystem unit) in the province. Species use is determined by the number of each species using one square kilometre of habitat for a month (# animals/km2/month).

Carrying Capacity (under optimal conditions)	**Detailed Knowledge** Mule Deer White-tailed Deer Black Bear		**Intermediate Knowledge** Amphibians Cavity Nesters		**Limited Knowledge** Bats	
	Rating	**Code**	**Rating**	**Code**	**Rating**	**Code**
100-75%	High	1	High	H	Present	U
75-50%	Moderately High	2	Moderate	M		
50-25%	Moderate	3				
25-5%	Low	4	Low	L		
5-0%	Very Low	5	Nil	N	Absent	X
0%	Nil	6				

E: Water Sampling Analysis

NORWEST LABS

Langley	PH.(604) 530-4344	FAX (604) 534-9996
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Calgary	PH.(403) 291-2022	FAX (403) 291-2021
Lethbridge	PH.(403) 329-9266	FAX (403) 327-8527
Winnipeg	PH.(204) 982-8630	FAX (204) 275-6019

WO (Lang.) : 19742
PO # : Silverstar
Date Rec'd. : 07/30/96
Date Comp. : 08/06/96

Client		Received From	
Name	: GEO ALPINE ENVIRONMENTAL	Name	:
Address	: 3132 Alta Vista Road Whistler, BC V0N 1B3	Address	:
Phone	: 938-1949	Phone	:
Fax	: 938-1949	Fax	:
Attn.	: Dave Williamson	Attn.	:
Project	: Silverstar Water		

RESULTS OF ANALYSIS

Lab #:	19742-2
Sample ID:	Vance W/S at New Lift Base

Parameter: mg/L

Ammonium-N	<0.005
Nitrate-N	0.095
Nitrate&Nitrite	0.100
Phosphate-P	0.060
Phosphorus (Total)	0.066
Total Kjeldahl Nitrogen	0.30

Approved: _____
Randy Neumann, B.Sc.
Laboratory Manager

Accredited By: CANADIAN ASSOCIATION OF ENVIRONMENTAL ANALYTICAL LABORATORIES (CAEAL)
For specific tests registered with the Association

Phone:
(604) 530-4344
1-800-889-1433
Fax:
(604) 534-9996

NORWEST LABS
203-20771 Langley Bypass
Langley, B.C. V3A 5E8

W.O. (Lang.) : 19742
W.O. (Other) :
P.O. # : SILVERSTAR
Date Received : 07/30/96
Date Completed : 08/07/96

Client	Received From
Name : GEO ALPINE ENVIRONMENTAL CONS.	Name :
Address : 3132 ALTA VISTA RD.,	Address :
: WHISTLER, BC	:
: V0N 1B3	:
Phone : 938-1949	Phone :
Fax : 938-1949	Fax :
Attention: DAVE WILLIAMSON	Attention:

WATER ANALYSIS REPORT

Lab #: 19742- 2
Sample ID: VANCE W/S AT NEW LIFT BASE WATER

ANALYTICAL RESULTS			GUIDELINES FOR DRINKING WATER
pH	8.40		pH values between 6.5 & 8.5 considered acceptable
Electrical Conductivity	302	uS/cm	Values above 1000 uS/cm indicate excessive salt content
Total Dissolved Solids	163	mg/L	Objective level 500 mg/L; higher values indicate high salts
Total Suspended Solids	1	mg/L	Values above 250 mg/L indicate excessive levels of sediment
Potassium	1.4	mg/L	No acceptable level set; values normally 0.5 to 10 mg/L
Calcium	71.80	mg/L	Objective below 75 mg/L; causes hardness
Magnesium	4.60	mg/L	Objective below 50 mg/L; causes hardness
Sodium	1.80	mg/L	Aesthetic limit 200 mg/L; below 20 mg/L for low sodium diets
Iron	<0.01	mg/L	>0.3 mg/L may cause staining; objective level <0.05 mg/L
Copper	<0.01	mg/L	Aesthetic limit 1.0 mg/L; objective below 0.01 mg/L
Zinc	<0.01	mg/L	Aesthetic limit 5.0 mg/L; objective below 1.0 mg/L
Manganese	<0.01	mg/L	Aesthetic limit 0.05 mg/L; objective below 0.01 mg/L
Sulphate	34.7	mg/L	Aesthetic limit 500 mg/L
Chloride	4.8	mg/L	Aesthetic limit 250 mg/L
Fluoride	0.06	mg/L	Values up to 1.2 mg/L desirable; under 1.5 mg/L acceptable
Boron	0.07	mg/L	Below 5.0 mg/L acceptable
Carbonate	1.7	mg/L	Presence indicates alkaline water
Bicarbonate	146.0	mg/L	High level indicates moderately alkaline water
Hardness (CaCO3 equiv)	198.5	mg/L	Soft waters are less than 75mg/L; hard waters are above 150 mg/l

APPROVED BY:
Randy Neumann B.Sc.
Laboratory Manager

Results quoted as zero indicate concentrations below the following detection limits:
Less than 0.01 mg/l Fe, Cu, Zn, Mn, B
Less than 0.05 mg/l Na, Ca, Mg, K, PO4-P, NH4-N, NO3-N
Less than 0.10 mg/l Cl, Fl, SO4-S
Less than 1 mg/l TDS, TSS, carbonate & bicarbonate

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1-800-889-1433
Fax:
(604) 534-9996

NORWEST LABS
203-20771 Langley Bypass
Langley, B.C. V3A 5E8

W.O. (Lang.) : 19742
W.O. (Other) :
P.O. # : SILVERSTAR
Date Received : 07/30/96
Date Completed : 08/07/96

Client		Received From	
Name	: GEO ALPINE ENVIRONMENTAL CONS.	Name	:
Address	: 3132 ALTA VISTA RD.,	Address	:
	: WHISTLER, BC		:
	: V0N 1B3		:
Phone	: 938-1949	Phone	:
Fax	: 938-1949	Fax	:
Attention:	DAVE WILLIAMSON	Attention:	

WATER ANALYSIS REPORT

Lab #: 19742- 3
Sample ID: VANCE D/S AT FORESTRY RD WATER

ANALYTICAL RESULTS			GUIDELINES FOR DRINKING WATER
pH	8.33		pH values between 6.5 & 8.5 considered acceptable
Electrical Conductivity	229	uS/cm	Values above 1000 uS/cm indicate excessive salt content
Total Dissolved Solids	117	mg/L	Objective level 500 mg/L; higher values indicate high salts
Total Suspended Solids	1	mg/L	Values above 250 mg/L indicate excessive levels of sediment
Potassium	0.8	mg/L	No acceptable level set; values normally 0.5 to 10 mg/L
Calcium	61.20	mg/L	Objective below 75 mg/L; causes hardness
Magnesium	3.30	mg/L	Objective below 50 mg/L; causes hardness
Sodium	1.40	mg/L	Aesthetic limit 200 mg/L; below 20 mg/L for low sodium diets
Iron	< 0.01	mg/L	>0.3 mg/L may cause staining; objective level <0.05 mg/L
Copper	< 0.01	mg/L	Aesthetic limit 1.0 mg/L; objective below 0.01 mg/L
Zinc	< 0.01	mg/L	Aesthetic limit 5.0 mg/L; objective below 1.0 mg/L
Manganese	< 0.01	mg/L	Aesthetic limit 0.05 mg/L; objective below 0.01 mg/L
Sulphate	23.0	mg/L	Aesthetic limit 500 mg/L
Chloride	3.8	mg/L	Aesthetic limit 250 mg/L
Fluoride	0.06	mg/L	Values up to 1.2 mg/L desirable; under 1.5 mg/L acceptable
Boron	0.05	mg/L	Below 5.0 mg/L acceptable
Carbonate	1.0	mg/L	Presence indicates alkaline water
Bicarbonate	128.0	mg/L	High level indicates moderately alkaline water
Hardness (CaCO3 equiv)	166.6	mg/L	Soft waters are less than 75mg/L; hard waters are above 150 mg/l

APPROVED BY:
Randy Neumann B.Sc.
Laboratory Manager

Results quoted as zero indicate concentrations below the following detection limits:
Less than 0.01 mg/l Fe, Cu, Zn, Mn, B
Less than 0.05 mg/l Na, Ca, Mg, K, PO4-P, NH4-N, NO3-N
Less than 0.10 mg/l Cl, Fl, SO4-S
Less than 1 mg/l TDS, TSS, carbonate & bicarbonate

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for specific tests registered with the Association

NORWEST LABS

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Lethbridge	PH.(403) 329-9266	FAX (403) 327-8527
Winnipeg	PH.(204) 982-8630	FAX (204) 275-6019

WO (Lang.) : **19742**
PO # : **Silverstar**
Date Rec'd. : **07/30/96**
Date Comp. : **08/06/96**

Client		Received From	
Name	: GEO ALPINE ENVIRONMENTAL	Name	:
Address	: 3132 Alta Vista Road Whistler, BC V0N 1B3	Address	:
Phone	: 938-1949	Phone	:
Fax	: 938-1949	Fax	:
Attn.	: Dave Williamson	Attn.	:
Project	: Silverstar Water		

RESULTS OF ANALYSIS

Lab #:	19742-3
Sample ID:	Vance D/S at at Forestry Road

Parameter: mg/L

Ammonium-N	0.005
Nitrate-N	0.013
Nitrate&Nitrite	0.018
Phosphate-P	0.065
Phosphorus (Total)	0.066
Total Kjeldahl Nitrogen	0.25

Approved: _____
Randy Neumann, B.Sc.
Laboratory Manager

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Winnipeg	PH.(204) 982-8630	FAX (204) 275-6019

WO (Lang.) : 19742
PO # : Silverstar
Date Rec'd. : 07/30/96
Date Comp. : 08/06/96

Client		Received From	
Name	: GEO ALPINE ENVIRONMENTAL	Name	:
Address	: 3132 Alta Vista Road Whistler, BC V0N 1B3	Address	:
Phone	: 938-1949	Phone	:
Fax	: 938-1949	Fax	:
Attn.	: Dave Williamson	Attn.	:
Project	: Silverstar Water		

RESULTS OF ANALYSIS

Lab #:	19742-1
Sample ID:	Coldstream @ Deathie Road

Parameter: mg/L

Ammonium-N	0.219
Nitrate-N	0.012
Nitrate&Nitrite	0.017
Phosphate-P	0.072
Phosphorus (Total)	0.075
Total Kjeldahl Nitrogen	0.29

Approved: R. Neumann
Randy Neumann, B.Sc.
Laboratory Manager

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Fax:
) 534-9996

NORWEST LABS
203-20771 Langley Bypass
Langley, B.C. V3A 5E8

W.O. (Lang.) : 19742
W.O. (Other) :
P.O. # : SILVERSTAR
Date Received : 07/30/96
Date Completed : 08/07/96

Client		Received From	
Name	: GEO ALPINE ENVIRONMENTAL CONS.	Name	:
Address	: 3132 ALTA VISTA RD.,	Address	:
	: WHISTLER, BC		:
	: V0N 1B3		:
Phone	: 938-1949	Phone	:
Fax	: 938-1949	Fax	:
Attention	: DAVE WILLIAMSON	Attention	:

WATER ANALYSIS REPORT

Lab #: 19742- 1
Sample ID: COLDSTREAM AT DEATHIE RD WATER

ANALYTICAL RESULTS			GUIDELINES FOR DRINKING WATER
pH	8.34		pH values between 6.5 & 8.5 considered acceptable
Electrical Conductivity	259	uS/cm	Values above 1000 uS/cm indicate excessive salt content
Total Dissolved Solids	160	mg/L	Objective level 500 mg/L; higher values indicate high salts
Total Suspended Solids	1	mg/L	Values above 250 mg/L indicate excessive levels of sediment
Potassium	2.4	mg/L	No acceptable level set; values normally 0.5 to 10 mg/L
Calcium	65.70	mg/L	Objective below 75 mg/L; causes hardness
Magnesium	2.90	mg/L	Objective below 50 mg/L; causes hardness
Sodium	1.60	mg/L	Aesthetic limit 200 mg/L; below 20 mg/L for low sodium diets
Iron	0.10	mg/L	>0.3 mg/L may cause staining; objective level <0.05 mg/L
Copper	< 0.01	mg/L	Aesthetic limit 1.0 mg/L; objective below 0.01 mg/L
Zinc	< 0.01	mg/L	Aesthetic limit 5.0 mg/L; objective below 1.0 mg/L
Manganese	< 0.01	mg/L	Aesthetic limit 0.05 mg/L; objective below 0.01 mg/L
Sulphate	21.7	mg/L	Aesthetic limit 500 mg/L
Chloride	3.6	mg/L	Aesthetic limit 250 mg/L
Fluoride	0.06	mg/L	Values up to 1.2 mg/L desirable; under 1.5 mg/L acceptable
Boron	0.07	mg/L	Below 5.0 mg/L acceptable
Carbonate	1.4	mg/L	Presence indicates alkaline water
Bicarbonate	159.0	mg/L	High level indicates moderately alkaline water
Hardness (CaCO3 equiv)	176.2	mg/L	Soft waters are less than 75mg/L; hard waters are above 150 mg/l

APPROVED BY:
Randy Neumann B.Sc.
Laboratory Manager

Results quoted as zero indicate concentrations below the following detection limits:
Less than 0.01 mg/l Fe, Cu, Zn, Mn, B
Less than 0.05 mg/l Na, Ca, Mg, K, PO4-P, NH4-N, NO3-N
Less than 0.10 mg/l Cl, Fl, SO4-S
Less than 1 mg/l TDS, TSS, carbonate & bicarbonate

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Lethbridge PH.(403) 329-9266 FAX (403) 327-8527
Winnipeg PH.(204) 982-8630 FAX (204) 275-6019

WO (Lang.) : 19742
PO # : Silverstar
Date Rec'd. : 07/30/96
Date Comp. : 08/06/96

Client		Received From	
Name	: GEO ALPINE ENVIRONMENTAL	Name	:
Address	: 3132 Alta Vista Road Whistler, BC V0N 1B3	Address	:
Phone	: 938-1949	Phone	:
Fax	: 938-1949	Fax	:
Attn.	: Dave Williamson	Attn.	:
Project	: Silverstar Water		

RESULTS OF ANALYSIS

Lab #: 19742-4
Sample ID: Putnam near Lift Base

Parameter: mg/L

Ammonium-N	0.008
Nitrate-N	0.010
Nitrate&Nitrite	0.01
Phosphate-P	0.05
Phosphorus (Total)	0.06
Total Kjeldahl Nitrogen	0.2

Approved: _____
Randy Neumann, B.Sc.
Laboratory Manager

Accredited By: CANADIAN ASSOCIATION OF ENVIRONMENTAL ANALYTICAL LABORATORIES (CAEAL)
For specific tests registered with the Association

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Fax:
(604) 534-9996

NORWEST LABS

203-20771 Langley Bypass
Langley, B.C. V3A 5E8

W.O. (Lang.) : 19742
W.O. (Other) :
P.O. # : SILVERSTAR
Date Received : 07/30/96
Date Completed : 08/07/96

Client		Received From	
Name	: GEO ALPINE ENVIRONMENTAL CONS.	Name	:
Address	: 3132 ALTA VISTA RD.,	Address	:
	: WHISTLER, BC		:
	: V0N 1B3		:
Phone	: 938-1949	Phone	:
Fax	: 938-1949	Fax	:
Attention:	DAVE WILLIAMSON	Attention:	

WATER ANALYSIS REPORT

Lab #: 19742- 4
Sample ID: PUTNAM NEAR LIFT BASE WATER

ANALYTICAL RESULTS			GUIDELINES FOR DRINKING WATER
pH	8.30		pH values between 6.5 & 8.5 considered acceptable
Electrical Conductivity	241	uS/cm	Values above 1000 uS/cm indicate excessive salt content
Total Dissolved Solids	127	mg/L	Objective level 500 mg/L; higher values indicate high salts
Total Suspended Solids	10	mg/L	Values above 250 mg/L indicate excessive levels of sediment
Potassium	1.5	mg/L	No acceptable level set; values normally 0.5 to 10 mg/L
Calcium	61.60	mg/L	Objective below 75 mg/L; causes hardness
Magnesium	4.70	mg/L	Objective below 50 mg/L; causes hardness
Sodium	1.40	mg/L	Aesthetic limit 200 mg/L; below 20 mg/L for low sodium diets
Iron	< 0.05	mg/L	>0.3 mg/L may cause staining; objective level <0.05 mg/L
Copper	< 0.01	mg/L	Aesthetic limit 1.0 mg/L; objective below 0.01 mg/L
Zinc	< 0.01	mg/L	Aesthetic limit 5.0 mg/L; objective below 1.0 mg/L
Manganese	< 0.01	mg/L	Aesthetic limit 0.05 mg/L; objective below 0.01 mg/L
Sulphate	20.7	mg/L	Aesthetic limit 500 mg/L
Chloride	3.6	mg/L	Aesthetic limit 250 mg/L
Fluoride	0.05	mg/L	Values up to 1.2 mg/L desirable; under 1.5 mg/L acceptable
Boron	0.03	mg/L	Below 5.0 mg/L acceptable
Carbonate	1.0	mg/L	Presence indicates alkaline water
Bicarbonate	129.0	mg/L	High level indicates moderately alkaline water
Hardness (CaCO3 equiv)	173.4	mg/L	Soft waters are less than 75mg/L; hard waters are above 150 mg/l

APPROVED BY:
Randy Neumann B.Sc.
Laboratory Manager

Results quoted as zero indicate concentrations below the following detection limits:
Less than 0.01 mg/l Fe, Cu, Zn, Mn, B
Less than 0.05 mg/l Na, Ca, Mg, K, PO4-P, NH4-N, NO3-N
Less than 0.10 mg/l Cl, Fl, SO4-S
Less than 1 mg/l TDS, TSS, carbonate & bicarbonate

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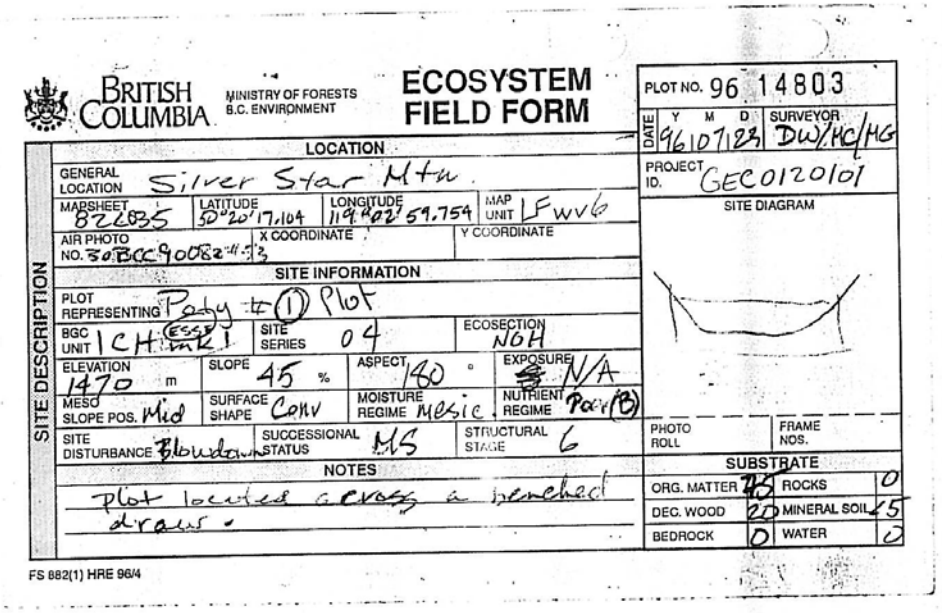
for specific tests registered with the Association

F: Ecosystem Field Forms



BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14803

DATE: Y 96 M 07 D 23 — SURVEYOR: DW/HC/MG

PROJECT ID. GEC0120101

SITE DIAGRAM

SITE DESCRIPTION

LOCATION

GENERAL LOCATION: Silver Star Mtn.

MAPSHEET: 82L035 — LATITUDE: 50°20'17.104 — LONGITUDE: 119°02'59.754 — MAP UNIT: LFwv6

AIR PHOTO NO.: 30BCC90082 11-13 — X COORDINATE — Y COORDINATE

SITE INFORMATION

PLOT REPRESENTING: Poly + (1) Plot

BGC UNIT: ICH (ESSF) mk1 — SITE SERIES: 04 — ECOSECTION: NGH

ELEVATION: 1470 m — SLOPE: 45 % — ASPECT: 140 ° — EXPOSURE: S N/A

MESO SLOPE POS.: Mid — SURFACE SHAPE: Conv — MOISTURE REGIME: Mesic — NUTRIENT REGIME: Poor (B)

SITE DISTURBANCE: Blowdown — SUCCESSIONAL STATUS: MS — STRUCTURAL STAGE: 6

NOTES

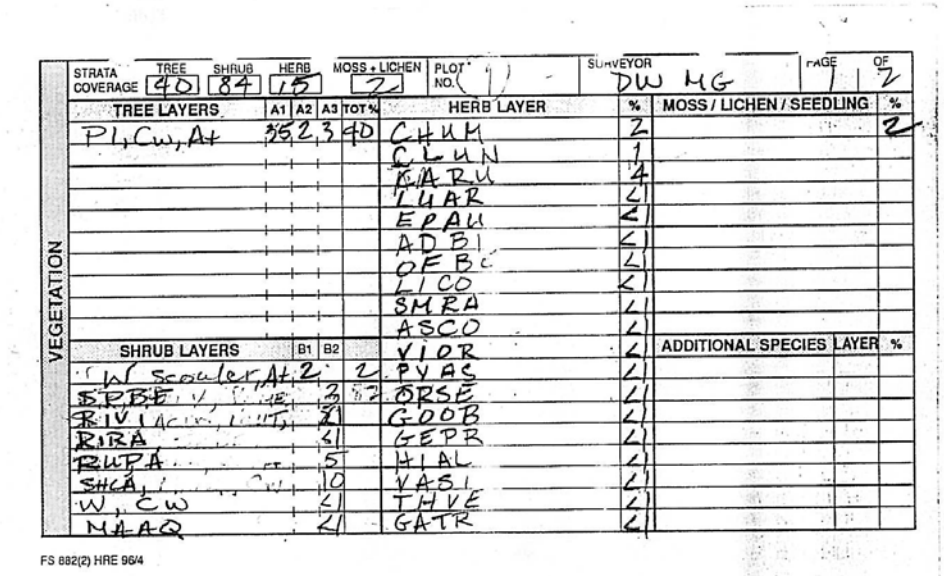
plot located across a trenched draw.

PHOTO ROLL — FRAME NOS.

SUBSTRATE

ORG. MATTER	75	ROCKS	0
DEC. WOOD	20	MINERAL SOIL	5
BEDROCK	0	WATER	0

FS 882(1) HRE 96/4



STRATA COVERAGE: TREE 40 — SHRUB 84 — HERB 15 — MOSS + LICHEN 2 — PLOT NO. (1) — SURVEYOR: DW MG — PAGE 1 OF 2

VEGETATION

TREE LAYERS	A1	A2	A3	TOT %
Pl, Cw, At	35	2	3	40

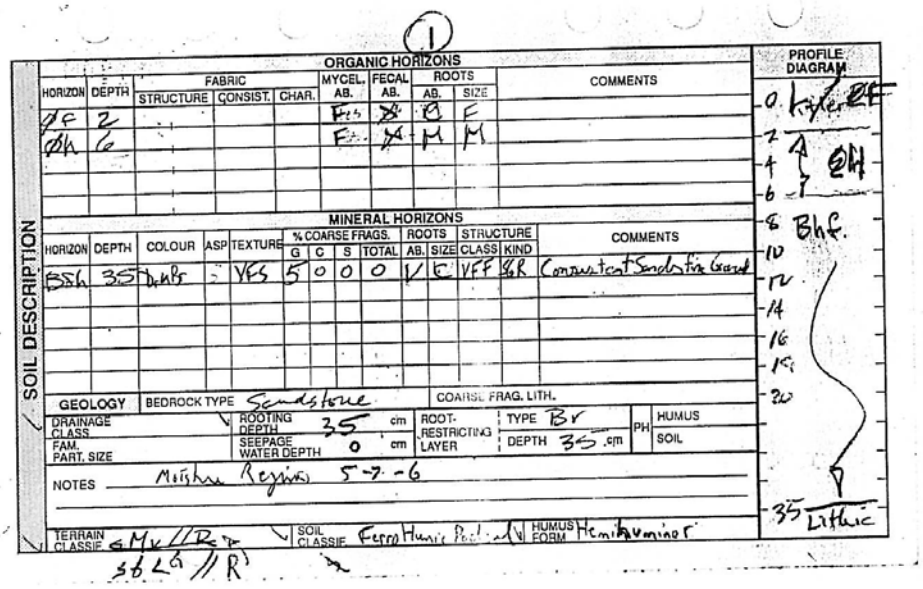
SHRUB LAYERS	B1	B2
W Scouler, At	2	2
SPBE	3	
RIVI	3	
RIRA	<1	
RUPA	5	
SHCA	10	
W, Cw	<1	
MAAQ	<1	

HERB LAYER	%
CHUM	2
CLUN	1
FARU	4
LUAR	<1
EPAU	<1
ADBI	<1
OFBI	<1
LICO	<1
SMRA	<1
ASCO	<1
VIOR	<1
PYAS	<1
ORSE	<1
GOOB	<1
GEPR	<1
HIAL	<1
VASI	<1
THVE	<1
GATR	<1

MOSS / LICHEN / SEEDLING	%
	2

ADDITIONAL SPECIES	LAYER	%

FS 882(2) HRE 96/4



SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC STRUCTURE	FABRIC CONSIST.	FABRIC CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
Of	2				F	X	C	F	
Oh	6				F	X	M	M	

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	ROOTS SIZE	STRUCTURE CLASS	STRUCTURE KIND	COMMENTS
Bfh	35	DkBr	-	VFS	5	0	0	0	V	F	VFF	GR	Consistent Sandy to Gravel

GEOLOGY — BEDROCK TYPE: Sandstone — COARSE FRAG. LITH.

DRAINAGE CLASS — FAM. PART. SIZE — ROOTING DEPTH 35 cm — SEEPAGE WATER DEPTH 0 cm — ROOT-RESTRICTING LAYER: TYPE Br, DEPTH 35 cm — PH — HUMUS — SOIL

NOTES: Moisture Regime 5-7-6

TERRAIN CLASSIF. — SOIL CLASSIF. Ferro Humic Pod. — HUMUS FORM Hemi Humimor

PROFILE DIAGRAM

MENSURATION / WILDLIFE

MENSURATION — SURVEYOR: DW MG MC

TREE #	SPECIES	DBH	HEIGHT CALCULATIONS TOP	BOT.	SD	HD	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	CL. CONK	SCAR.	F. OR C.	F. CRACK	MISTLE.	BL BRAN.	D. OR B. TOP	PEST CODE	PEST SEVER	SITE SERIES
1	Pl	33	100	0		30		32	81												04/03
2	At	19						20	40												
3	Pl	26						25													
4	Pl	28						27													
5	Pl	29						28													
6	Pl	12						10													

WILDLIFE TREE — SURVEYOR: MG DW

TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
01	Pl	D	S	25	8	2	3	0		NA	3	2	3	9	0	P
02	Se	D	S	38	8	2	1	0		NA	7	2	3	4	2	P
03	Pl	D	S	20	0	9	0	8	0	NA	7	2	3	4	2	P
04	W	D	S		70	6	0	8	0	NA	6	8	4	5	4	P
05	Cw	D	S	42		0	3	0		NA	8	7	7	6	0	F
06	Pl	D	S	10		9	0	4	0	NA	7	3	2	4	1	P
07	Pl	D	S	18		9	5	1	2	NA	3	2	2	3	3	P
08	Lw	D	F													
09	Cw	D	F													
10	Cw	D	F													
11	Cw	D	F													
12	Pl	D	F													
13	Pl	D	F													
14	Pl	D	F													
15	Pl	D	F													
16	Pl	D	F													

Pl (12)

VEGETATION

STRATA COVERAGE	TREE	SHRUB	HERB	MOSS + LICHEN	PLOT NO. 11	SURVEYOR DW MG	PAGE 2	OF 2

TREE LAYERS	A1	A2	A3	TOT %

SHRUB LAYERS	B1	B2
W Scouler	1	
Fd	1	
PAMY	40	1
VAME	15	
SOSC	1	
ACGL	2	
LOUT	2	
A.MAL	1	

HERB LAYER	%

MOSS / LICHEN / SEEDLING	%

ADDITIONAL SPECIES	LAYER	%

FS 882(2) HRE 96/4

BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14805

DATE (Y M D): 23 07 23 — SURVEYOR: DW MC MG

PROJECT ID: GEC 0120101

SITE DESCRIPTION

LOCATION

GENERAL LOCATION: Silver Star Park

MAPSHEET: 82L035 — LATITUDE — LONGITUDE — MAP UNIT: RFW6

AIR PHOTO NO.: 90082#53 — X COORDINATE — Y COORDINATE

SITE INFORMATION

PLOT REPRESENTING: Plot (2). (EA Avg. 8) Poly 4

BGC UNIT: ICHmk1 — SITE SERIES: 01 — ECOSECTION: NOH

ELEVATION: 1390 m — SLOPE: 28 % — ASPECT: 210 ° — EXPOSURE

MESO SLOPE POS.: Mid — SURFACE SHAPE: Conc — MOISTURE REGIME: Sub hyd — NUTRIENT REGIME: Med (C)

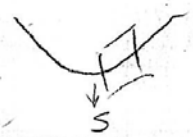
SITE DISTURBANCE: N/A — SUCCESSIONAL STATUS: MC — STRUCTURAL STAGE: 6-7

PHOTO ROLL: video — FRAME NOS.

NOTES

located near a gully

SITE DIAGRAM



SUBSTRATE

ORG. MATTER	80	ROCKS	0
DEC. WOOD	20	MINERAL SOIL	0
BEDROCK	0	WATER	0

FS 882(1) HRE 96/4

STRATA COVERAGE: TREE 80 — SHRUB 40 — HERB 23 — MOSS + LICHEN 2 — PLOT NO. (2) — SURVEYOR: DW MG — PAGE 1 OF 1

VEGETATION

TREE LAYERS	A1	A2	A3	TOT %
Ed	15			15
Bl	5	5	5	15
Cw	20	5	0	25
Pl	15	0	0	15
Se	3	0	0	3
Lw	5	0	0	5

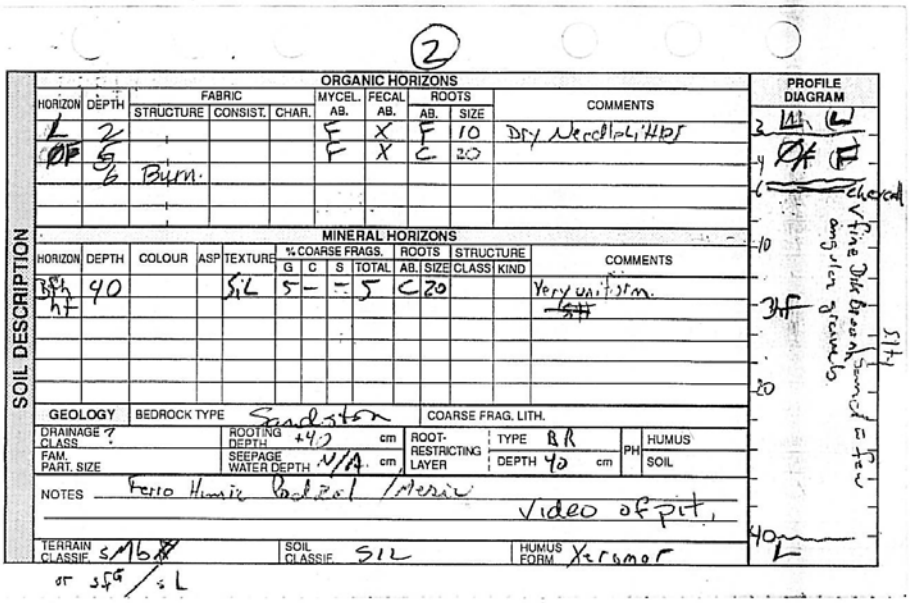
SHRUB LAYERS	B1	B2
Ed	10	
Se	15	
Bl	2	
AlSi	1	0
PaMy		3
VaMe		5
RhAl		1
LoUt		1
SpBe	<1	

HERB LAYER		%
Shrubs cont.	RuPa	<1
	SoSc	<1
	RiLa	1
HERBS.	RuPe	4
	TiUn	8
	MoUn	<1
	AdBi	<1
	ClUn	2
	SmRu	<1
	GoOb	1
	LiBo	2
	CoCa	<1
	CaRu	<1
	StAm	<1
	GaTr	<1
	OsDe	<1
	OrSe	<1
	ViOr	<1
Hooker's Fairy Bells	DiHo	<1

MOSS / LICHEN / SEEDLING	%
	2

ADDITIONAL SPECIES	LAYER	%

FS 882(2) HRE 96/4



(2)

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC STRUCTURE	FABRIC CONSIST.	FABRIC CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
L	2				F	X	F	10	Dry Needle Litter
OF	5 6	Burn.			F	X	C	20	

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	ROOTS SIZE	STRUCTURE CLASS	STRUCTURE KIND	COMMENTS
Bfh ht	40			SiL	5	–	–	5	C	20			Very uniform. SH

GEOLOGY — BEDROCK TYPE: Sandstone — COARSE FRAG. LITH.

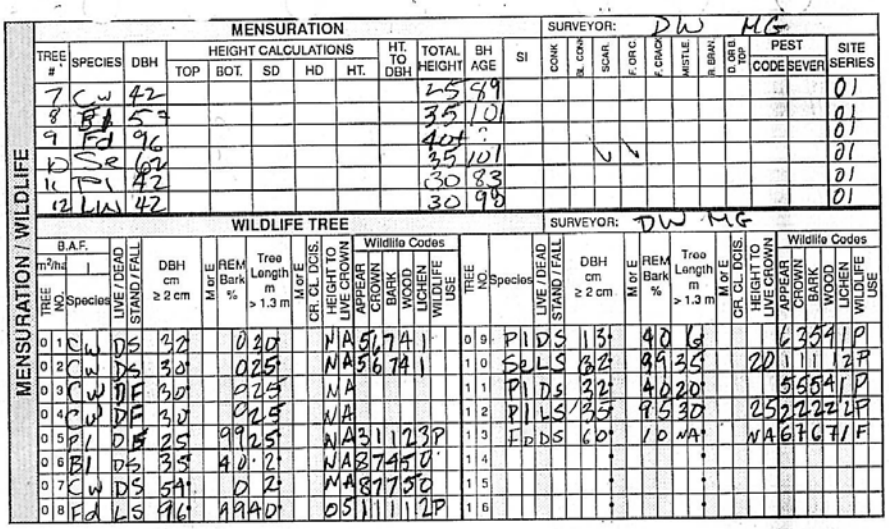
DRAINAGE CLASS: ? — ROOTING DEPTH: +40 cm — ROOT-RESTRICTING LAYER: TYPE BR, DEPTH 40 cm — PH — HUMUS

FAM. PART. SIZE — SEEPAGE WATER DEPTH: N/A cm — SOIL

NOTES: Ferro Humic Podzol / Mesic
video of pit.

TERRAIN CLASSIF. SMB# or SSG / SL — SOIL CLASSIF. SIL — HUMUS FORM Xeromor

PROFILE DIAGRAM



MENSURATION / WILDLIFE

MENSURATION — SURVEYOR: DW MG

TREE #	SPECIES	DBH	HEIGHT CALCULATIONS TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	DL. CONK	SCAR	F. OR C.	F. CANK.	MISTLE.	R. BRAN.	D. OR B. TOP	PEST CODE	PEST SEVER	SITE SERIES
7	Cw	42							25	89												01
8	Bl	54							35	101												01
9	Fd	96							40+													01
10	Se	62							35	101				V	V							01
11	Pl	42							30	83												01
12	Lw	42							30	98												01

WILDLIFE TREE — SURVEYOR: DW MG

TREE NO.	Species	LIVE / DEAD STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. GL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
01	Cw	DS	32		0	20			NA	5	6	7	A	1	
02	Cw	DS	30		0	25			NA	5	6	7	A	1	
03	Cw	DF	30		0	25			NA						
04	Cw	DF	30		0	25			NA						
05	Pl	DS	25		99	25			NA	3	1	1	2	3	P
06	Bl	DS	35		40	21			NA	8	7	4	5	0	
07	Cw	DS	59		0	21			NA	8	7	7	5	0	
08	Fd	LS	96		99	40			05	1	1	1	1	2	P
09	Pl	DS	13		40	6				6	3	5	4	1	P
10	Se	LS	62		95	35			20	1	1	1	1	2	P
11	Pl	DS	32		40	20				5	6	5	4	1	P
12	Pl	LS	35		95	30			25	2	2	2	2	2	P
13	Fd	DS	60		10	NA			NA	6	7	6	7	1	F
14															
15															
16															

BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14806

DATE (Y M D): 96 07 23 — SURVEYOR: DW HG MC

PROJECT ID: GECO120101

SITE DESCRIPTION

LOCATION

GENERAL LOCATION: Silver Star

MAPSHEET: 82L035 — LATITUDE: 50 19 56.784 — LONGITUDE: 119 02 34.794 — MAP UNIT: DTjv5

AIR PHOTO NO.: 90082 #53 — X COORDINATE: — Y COORDINATE:

SITE INFORMATION

PLOT REPRESENTING: Poly #5 Plot 3

BGC UNIT: ICHmk1 — SITE SERIES: 03 — ECOSECTION: NOTT

ELEVATION: 1960 m — SLOPE: 12 % — ASPECT: 80 ° — EXPOSURE: N/A

MESO SLOPE POS.: Crest — SURFACE SHAPE: Conv — MOISTURE REGIME: 3 — NUTRIENT REGIME: C

SITE DISTURBANCE: logging — SUCCESSIONAL STATUS: ML — STRUCTURAL STAGE: 5

NOTES

- occasional vets
- much windthrow
- bug kill - portions of plot logged

SITE DIAGRAM

PHOTO ROLL: — FRAME NOS.:

SUBSTRATE

ORG. MATTER	80	ROCKS	2
DEC. WOOD	10	MINERAL SOIL	0
BEDROCK	10	WATER	0

FS 882(1) HRE 96/4

VEGETATION

STRATA COVERAGE: TREE 40 — SHRUB 40 — HERB 30 — MOSS + LICHEN 3 — PLOT NO. Plot 3 — SURVEYOR: MG DW — PAGE 1 OF 1

TREE LAYERS

	A1	A2	A3	TOT %
Fd	105	10	25	25
Ss	0	8	2	4
Pl	10	10	0	20
Lw	5	0	0	5
Bl	5	2	0	7
Cw	0	8	0	2

SHRUB LAYERS

	B1	B2
Fd	<1	
Sasc	2	1
Bl	4	3
Lw	<1	
Cw		<1
Lolut	3	
VaMe	10	
SpBe	<1	

HERB LAYER

		%
Shrubs cont.	PaMy	20
	RuId	<1
	RiLa	<1
	ChUm	1
	AmAl	1
	RoGy	<1
	ShCa	<1
HERBS GRASS		25
(White Hawkweed)	HiAl	1
	LuAr	1
	OsDe	<1
	GePr	<1
	AsCo	2
	OrSe	<1
	AdBi	<1
	MiNu	<1
	ViOr	<1
	LiCo	<1
	GooB	1

MOSS / LICHEN / SEEDLING

	%
Herbs cont. FrVi	<1
SmRa	<1
AnRa	<1
Moss/Lichen	3

ADDITIONAL SPECIES

LAYER	%

FS 882(2) HRE 96/4

(3)

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC: STRUCTURE	FABRIC: CONSIST.	FABRIC: CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
L	1.0				X	X.	F	5	Needle Debris
S.L	6.0				X	X	C	5	Mineral Layer ?
ØH	8.5				X	X	X	—	Burn Layer.
									No For H horizon

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	ROOTS SIZE	STRUCTURE CLASS	STRUCTURE KIND	COMMENTS
BhF	35.0			Si, VFS	10	—	—	10	C	5	SGR	VFF	Similar to Site 2
	35+												Weathered Bedrock.

GEOLOGY	BEDROCK TYPE: Shists
COARSE FRAG. LITH.	
DRAINAGE CLASS	
FAM. PART. SIZE	
ROOTING DEPTH	±30 cm
SEEPAGE WATER DEPTH	N/A cm
ROOT-RESTRICTING LAYER	TYPE: Br; DEPTH: 30 cm
PH	HUMUS: ; SOIL:

NOTES: Stratig similar to Site 2 except humic layers are thinner and not as well developed

Subxeric / Rich

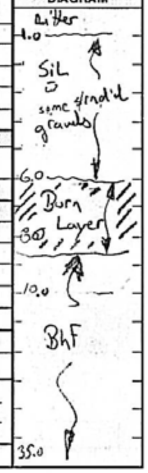
TERRAIN CLASSIF. ±L^G V

SOIL CLASSIF. SiL

HUMUS FORM Velo moder

glacio lacustrine well sorted silty veneer

PROFILE DIAGRAM



MENSURATION / WILDLIFE

MENSURATION

SURVEYOR: DW / MG

TREE #	SPECIES	DBH	TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	Comments
13	Fd.	55							30	105		
14	Pl	29							25	69		
15	Lw	50							25	74		split tree near base.
16	Cw	26							20	69		
17	Bl	77							30	89		split double . core rot.

WILDLIFE TREE

SURVEYOR:

TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	REM Bark %	Tree Length m > 1.3 m	HEIGHT TO LIVE CROWN	APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
01	B	L	S	17	99	30	3					P	D
02	Pl	D	F	15	70	15	NA						
03	Pl	D	F	20	90	16	NA						
04	Pl	D	F	16	60	20	NA						
05	Pl	D	F	19	95	20	NA						
06	Pl	D	F	23	95	20	NA						
07	Pl	D	S	26	75	8	NA	6	6	3	4	2	P
08	Fd	D	S	15	50	2	NA	7	7	5	7	1	F
09	Pl	D	S	17	15	12	NA	6	6	2	3	1	P
10	Fd	D	S	13	95	8	NA	7	7	3	5	3	F
11	Pl	D	S	29	80	10	NA	4	5	3	5	4	F
12	Fd	D	S	53	0	2	NA	8	7	7	6	1	
13	Pl	D	S	18	60	8	NA	7	7	4	4	2	F
14													
15													
16													

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

~~Elev. 1415m~~

BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14807

DATE Y 96 M 07 D 23 — SURVEYOR DW MG MC

PROJECT ID. GEC012[illegible]

SITE DESCRIPTION

LOCATION

GENERAL LOCATION: Silver Star			
MAPSHEET: 82L035	LATITUDE	LONGITUDE	MAP UNIT: [illegible]mu5
AIR PHOTO NO.: 90082#53	X COORDINATE: 558358 1.66m	Y COORDINATE: 781536.48	

SITE INFORMATION

PLOT REPRESENTING: Poly - 4		Plot (4)	
BGC UNIT: ICHmk1	SITE SERIES: 06	ECOSECTION: NOH	
ELEVATION: 1420 m	SLOPE: 28 %	ASPECT: 360 °	EXPOSURE: N/A
MESO SLOPE POS.: toe	SURFACE SHAPE: conc	MOISTURE REGIME: Hygric	NUTRIENT REGIME: med C
SITE DISTURBANCE: no.	SUCCESSIONAL STATUS: MC	STRUCTURAL STAGE: 5	

SITE DIAGRAM

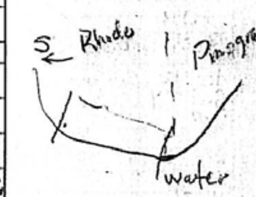


PHOTO ROLL	FRAME NOS.

NOTES

- north asp. bottom slope in moist. receiving area
- oak fern replaced by pinegrass on other side of creek (water) (near

SUBSTRATE

ORG. MATTER	80	ROCKS	0
DEC. WOOD	20	MINERAL SOIL	0
BEDROCK	0	WATER	0

FS 882(1) HRE 96/4

VEGETATION

STRATA COVERAGE: TREE 70 — SHRUB 60 — HERB 60 — MOSS + LICHEN 4 — PLOT NO. Plot (4) — SURVEYOR DW MG — PAGE 1 OF 1

TREE LAYERS	A1	A2	A3	TOT %
Fd	15	0	0	15
Cw	10	0	0	10
Hw	5	0	0	5
Bl	10	[illegible]	[illegible]	22
Sxw	5	0	5	10

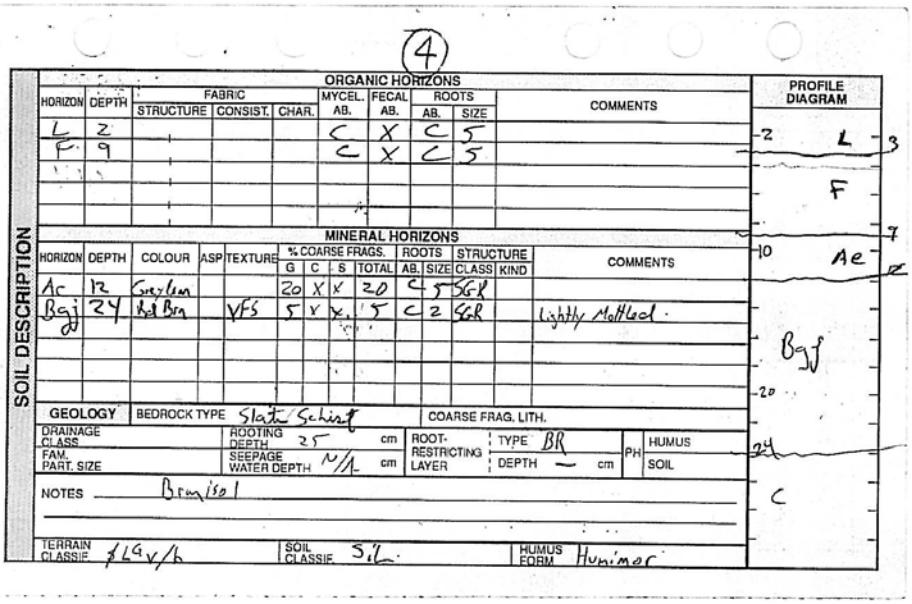
SHRUB LAYERS	B1	B2
Fd	5	2
Bl	5	4
Sxw	2	
Cw	0	2
AlSi	<1	<1
SoSi	<1	<1
PaMy		1
LoUt		3
OPHP	<1	

HERB LAYER		%
SHRUBS cont.	LoIn	<1
	VaMe	3
	RhAl	25
	RiLa	1
	RuPa	3
	V. Fd	1
HERBS	TiUn	15
	VaSi	15
	GyDr	40
	Viola Sp	2
Bracted Lousewort	PeBr	<1
	CoCa	1
	SmSt	<1
	OrSe	<1
	AcRu	<1
Grass of Parnassus	PaFl	<1
	SeTr	<1
	ViGl	<1
	OsDe	<1

MOSS / LICHEN / SEEDLING	%
HERBS cont. ([illegible]) TiCo	<1
RuPe	4
ClUn	2
GoOb	<1
GaTr	<1
LyAn	<1
SmRa	<1
StAm	<1
LiBo	<1
ThOc	1

ADDITIONAL SPECIES	LAYER	%
HERBS cont.		
AyFF	HERB	<1
green flowered PLHY rein orch		<1

FS 882(2) HRE 96/4



(4)

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC STRUCTURE	FABRIC CONSIST.	FABRIC CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
L	2				C	X	C	5	
F	9				C	X	C	5	

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	SIZE	STRUCTURE CLASS	KIND	COMMENTS
Ae	12	Grey/Lem			20	X	X	20	C	5	SGR		
Bgj	24	Rd Brn		VFS	5	X	X	5	C	2	SGR		Lightly Mottled

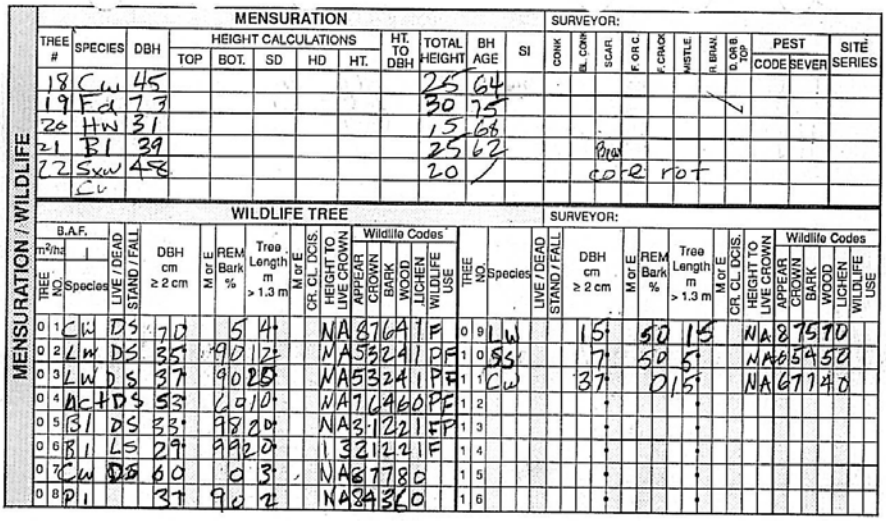
GEOLOGY — BEDROCK TYPE: Slate Schist — COARSE FRAG. LITH.

DRAINAGE CLASS | FAM. PART. SIZE | ROOTING DEPTH 25 cm | SEEPAGE WATER DEPTH N/A cm | ROOT-RESTRICTING LAYER TYPE BR DEPTH — cm | PH | HUMUS | SOIL

NOTES: Bm/sol

TERRAIN CLASSIF. FLGV/b | SOIL CLASSIF. S/L | HUMUS FORM Humimor

PROFILE DIAGRAM



MENSURATION / WILDLIFE

MENSURATION

SURVEYOR:

TREE #	SPECIES	DBH	HEIGHT CALCULATIONS TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	BL. CONK	SCAR	F. OR C.	F. CRACK	MISTLE.	R. BRAN.	D. ORB TOP	PEST CODE	PEST SEVER	SITE SERIES
18	Cw	45							25	64												
19	Fd	77							30	75												
20	Hw	31							15	66												
21	Bl	39							25	62				Broken								
22	Sxw	48							20	/				core rot								
	Cw																					

WILDLIFE TREE

SURVEYOR:

TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
01	Cw	DS		70		5	14			NA	8	7	6	A	T	F
02	Lw	DS		35		90	12			NA	5	3	2	4	1	DF
03	Lw	DS		37		90	28			NA	5	3	2	4	1	DF
04	Ac	HDS		53		60	10			NA	7	6	4	6	0	PE
05	Bl	DS		33		90	8			NA	3	1	2	2	1	F
06	Bl	LS		29		90	9			13	2	1	2	2	1	F
07	Cw	DS		60		0	3			NA	6	7	7	8	0	
08	Pl			37		90	12			NA	8	A	3	6	0	

TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
09	Lw			15		50	15			NA	8	7	5	T	0	
10	Ss			7		50	5			NA	6	5	4	5	0	
11	Cw			37		0	15			NA	6	7	7	4	0	
12																
13																
14																
15																
16																

BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14808

DATE: Y 96 M 07 D 24 | SURVEYOR: DW/MG/MC

PROJECT ID. GEC012001 Plots

SITE DIAGRAM

SITE DESCRIPTION

LOCATION

GENERAL LOCATION: Silver Star

MAPSHEET: 82L035 | LATITUDE | LONGITUDE | MAP UNIT: Hom6

AIR PHOTO NO.: 90082#55 | X COORDINATE | Y COORDINATE

SITE INFORMATION

PLOT REPRESENTING: Poly 9 (5) Plots

BGC UNIT: ICHmw2 | SITE SERIES: 04 | ECOSECTION

ELEVATION: 1345 m | SLOPE: 20% 40% | ASPECT: 130 ° | EXPOSURE: N/A

MESO SLOPE POS.: toe | SURFACE SHAPE: Concave | MOISTURE REGIME: Subhygric | NUTRIENT REGIME: Rich (D)

SITE DISTURBANCE: NO | SUCCESSIONAL STATUS: MOF | STRUCTURAL STAGE: 5-6

PHOTO ROLL | FRAME NOS.

NOTES

Recreum Zone - Moist Lush in ICHmw2 (MOF)

SUBSTRATE

ORG. MATTER	95	ROCKS	0
DEC. WOOD	5	MINERAL SOIL	0
BEDROCK	0	WATER	0

FS 882(1) HRE 96/4

(5) EA Mvg.S

STRATA COVERAGE: TREE 25 | SHRUB 75 | HERB 65 | MOSS + LICHEN 2 | PLOT NO. 5 | SURVEYOR DW/MG | PAGE 1 OF 1

VEGETATION

TREE LAYERS	A1	A2	A3	TOT %
Cw	10	10	10	30
Bl	10	10	0	10
Fd	20	0	0	20
Sx w	5	00		5

SHRUBS cnd. HERBS

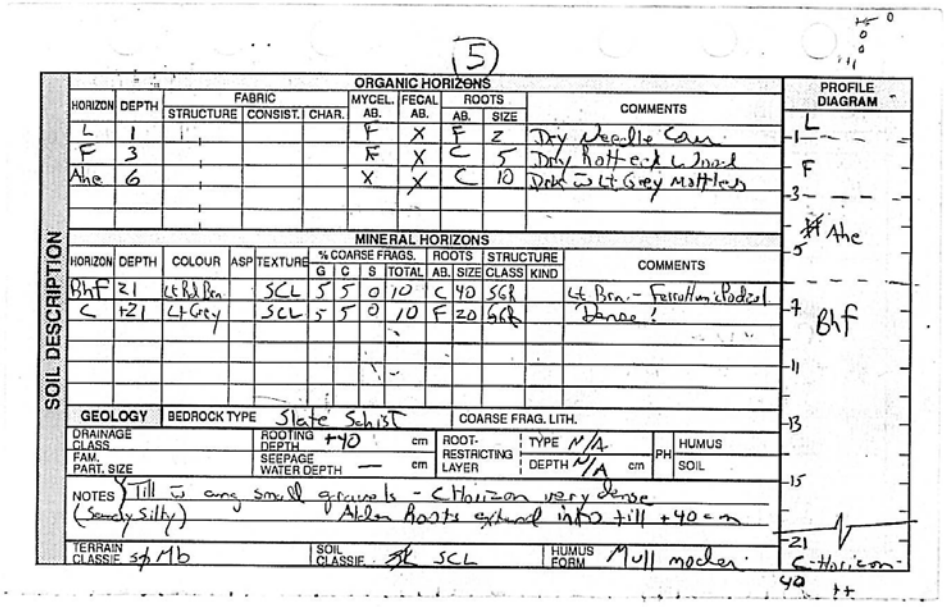
SHRUB LAYERS	B1	B2
SoSx	2	2
SaRa	2	2
AlSi	25	1
Cw	2	2
Fd	1	2
RuPa	40	
VaMe	2	
SpBe	2	

HERB LAYER	%
LoIn	<1
RiLa	1
AnFl	25
TrUn	10
LiTi	<1
CLUn	2
Grass sp	1
SmSt	<1
GyDr	5
CbCa	<1
AdBi	3
OsDe	1
GaTr	2
DrEx	15
VoSi	5
AcRu	<1
SmRa	2
StAm	<1

MOSS / LICHEN / SEEDLING	%
Moss	2

ADDITIONAL SPECIES	LAYER	%

FS 882(2) HRE 96/4



SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC STRUCTURE	FABRIC CONSIST.	FABRIC CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
L	1				F	X	F	2	Dry needle cast
F	3				F	X	C	5	Dry Rotted Wood
Ahe	6				X	X	C	10	Dark to Lt Grey Mottles

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	ROOTS SIZE	STRUCTURE CLASS	STRUCTURE KIND	COMMENTS
Bhf	+21	Lt Rd Brn		SCL	5	5	0	10	C	40	SGR		Lt Brn - Ferruginous Podzol
C	+21	Lt Grey		SCL	5	5	0	10	F	20	SGR		Dense !

GEOLOGY — BEDROCK TYPE: Slate Schist — COARSE FRAG. LITH.

DRAINAGE CLASS — FAM. PART. SIZE — ROOTING DEPTH: +40 cm — SEEPAGE WATER DEPTH: — cm — ROOT-RESTRICTING LAYER — TYPE: N/A — DEPTH: N/A cm — PH — HUMUS SOIL

NOTES: Till w/ some small gravels - C Horizon very dense (Sandy Silty) Alder Roots extend into till +40 cm

TERRAIN CLASSIE: 3/Mb — SOIL CLASSIE: SCL — HUMUS FORM: Mull moder

PROFILE DIAGRAM: L, F, Ahe, Bhf, C-Horizon; 40+

MENSURATION / WILDLIFE

MENSURATION — SURVEYOR: DW MG

TREE #	SPECIES	DBH	HEIGHT CALCULATIONS TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	BL. CONK	SCAR	F. CR CL	F. CRACK	MISTLE	R. BRAN.	D. DEB. TOP	PEST CODE	PEST SEVER	SITE SERIES
23	Fd	63							30	70												
24	Cw	65							30	66												
25	Bl																					
26	Sx	46							30	49												

WILDLIFE TREE — SURVEYOR:

TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
01	Fd	D	S	25		99	35			NA	3	2	1	2	PP	
02	Bl	D	S	51		80	25			NA	3	2	4	3	PP	
03	Pl	D	S	43		80	20			NA	3	2	3	3	FP	
04	Cw	D	S	53		0	41			NA	7	7	7	4	OP	
05	Cw	D	S	49		0	25			NA	5	4	7	3	PP	
06	Cw	D	S	29		0	20			NA	5	4	7	3	OP	
07	Cw	D	S	59		0	25			NA	5	3	7	3	OP	
08	Cw	D	S	69		20	10			NA	6	7	6	8	OP	DR
09	F	D	D	S	42		99	35			NA	7	7	1	2	0	1	
10																		
11																		
12																		
13																		
14																		
15																		
16																		

Heat resisting

BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14809

DATE: Y 96 M 07 D 24 — SURVEYOR: DW/MG/MC

PROJECT ID. CEC0120101

SITE DESCRIPTION

LOCATION

GENERAL LOCATION: Silver Star

MARSHEET: 82 L 035 — LATITUDE — LONGITUDE — MAP UNIT: RF r 6

AIR PHOTO NO.: 90082 #55 — X COORDINATE — Y COORDINATE

SITE INFORMATION

PLOT REPRESENTING: Polygon 08 Site (06)

BGC UNIT: ICHmw2 — SITE SERIES: 03 — ECOSECTION: NOH

ELEVATION: 1355 m — SLOPE: 5 % — ASPECT: 180 ° — EXPOSURE: N/A

MESO SLOPE POS.: Creek — SURFACE SHAPE: Conc — MOISTURE REGIME: 3 mesic — NUTRIENT REGIME: med (C)

SITE DISTURBANCE: No — SUCCESSIONAL STATUS: MC — STRUCTURAL STAGE: 6

NOTES

Top of Knoll elev. 1355 on map

SITE DIAGRAM

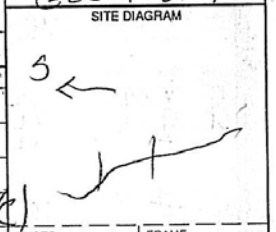


PHOTO ROLL — FRAME NOS.

SUBSTRATE

ORG. MATTER	90	ROCKS	0
DEC. WOOD	10	MINERAL SOIL	0
BEDROCK	0	WATER	0

FS 882(1) HRE 96/4

(6?) EA Ng.8

STRATA COVERAGE: TREE 60 — SHRUB 50 — HERB 35 — MOSS + LICHEN 1 — PLOT NO. — SURVEYOR — PAGE 1 OF 1

VEGETATION

TREE LAYERS	A1	A2	A3	TOT %
Fd (1)	5			5
Lw (9)	20			20
Sxw (2, 1)	10.5			15
Cw (4)	15			15
Pl (1)	5			5
~~As~~ (1)			2	2
Hw			2	2

SHRUB LAYERS	B1	B2	
AlSi	<1	1	5
Ep		1	1
Bl	7	4	10
Cw	4	1	5
Lw	<1		<1
AcGl	3	<1	3+
(Scouler's Willow) SaSc		2	2
Sxw	1	2	3

HERB LAYER		%
SHRUBS cont	SpBe	1
	RiLa	1
	PaMy	1
	LoIn	<1
	VaMe	20
	SoSc	3
	Lout	2
	RuPa	<1
HERBS	AdBi	5
	OsDe	<1
	OrSe	<1
	TiUn	1
	ClUn	6
	VaSi	3
	SmSt	<1
	GooB	<1
	CoCa	15
	Grass sp.	3
	GaTr	1

MOSS / LICHEN / SEEDLING		%
HERBS cont	SmRa	2
	AcRu	1
	ViOr	<1
	DrFa	4
(Pine grass)	CaRu	<1
	LiCo	<1
	PyCh	<1
	RuPe	1
	LiCa	<1
MOSS/LICHEN		1

ADDITIONAL SPECIES LAYER		%

FS 882(2) HRE 96/4

(6)

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC STRUCTURE	FABRIC CONSIST.	FABRIC CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
L	1				F	X	X	—	
F	3				F	X	C	2	
H	5				X	Y	M	5	

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	ROOTS SIZE	STRUCTURE CLASS	STRUCTURE KIND	COMMENTS
Ae	7	LGrey		SiL	—	—	—	0					
Bf	21	M/Brn		SiL	10	—	—	10	C	5			
C	—			cL	15	—	—	15	X	—			Clay Till

GEOLOGY | BEDROCK TYPE | COARSE FRAG. LITH.

DRAINAGE CLASS | FAM. PART. SIZE | ROOTING DEPTH 21 cm | SEEPAGE WATER DEPTH N/A cm | ROOT-RESTRICTING LAYER TYPE C - Dense DEPTH 1 cm | PH | HUMUS | SOIL

NOTES

TERRAIN CLASSIE $Mb | SOIL CLASSIE Humo-Ferric Podz | HUMUS FORM Mor Moder

PROFILE DIAGRAM

L
F
3
H
5
Ae
7
Bf
21
C

MENSURATION / WILDLIFE

MENSURATION

SURVEYOR: DW MG MC

TREE #	SPECIES	DBH	HEIGHT CALCULATIONS TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	COMP	BL CONK	SCAR	F. ORG. CONK	F. CHAG	MISTLE	R. BRAN.	D. ORB. TOP	PEST CODE	PEST SEVER	SITE SERIES
26	Fd	52							35	110												
27	Cw	41							20	76												
28	Lw	53							35	100												
29	Sx	31							20	91												
30	Pl	41							25	100				1								

WILDLIFE TREE

SURVEYOR:

B.A.F. m²/ha	TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE	TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
	01	LWD	S		52		99	30			NA	1	2	2	2	F	/	09																
	02	FBD	S		85		15	2			NA	8	7	6	7	0	F	/	10															
	03	Fd			28		80	15			NA	3	3	3	4	3	9	/	11															
	04	Fd			60		99	10			NA	7	7	1	5	1	F	D	12															
	05	Fd			22		99	8			NA	3	3	1	3	1	/	/	13															
	06	Pl			32		80	25			NA	3	2	3	4	2	9	/	14															
	07	Pl			38		95	20			NA	3	2	2	3	3	9	/	15															
	08	Fd			39		30	30			NA	3	2	5	4	2	F	/	16															

BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14810
DATE Y 96 M 07 D 24 SURVEYOR DW MC MG
PROJECT ID. GEC0120101

LOCATION

GENERAL LOCATION: Silver St.
MAPSHEET: 82L035 LATITUDE: N5583844 LONGITUDE: E783535 MAP UNIT: DF r6
AIR PHOTO NO.: 90082#55 X COORDINATE: Y COORDINATE:

SITE INFORMATION

PLOT REPRESENTING: Poly 8A Plot (07)
BGC UNIT: ICHmw2 SITE SERIES: 02 (03) ECOSECTION: NOH
ELEVATION: 1368 m SLOPE: 15 % ASPECT: 100 ° EXPOSURE: Sun.
MESO SLOPE POS.: Upper SURFACE SHAPE: Conv MOISTURE REGIME: Subzer 2 NUTRIENT REGIME: B-Poor
SITE DISTURBANCE: B-8 logging SUCCESSIONAL STATUS: MC STRUCTURAL STAGE: 5

NOTES

- Selectively logged site
- grou. d skidder dist.
- much wind throw

SITE DIAGRAM

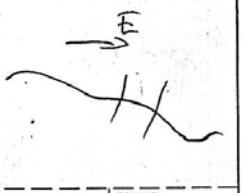


PHOTO ROLL: FRAME NOS.

SUBSTRATE

ORG. MATTER	88	ROCKS	0
DEC. WOOD	10	MINERAL SOIL	2
BEDROCK	0	WATER	0

FS 882(1) HRE 96/4

STRATA COVERAGE: TREE 68 SHRUB 40 HERB 40 MOSS + LICHEN 5 PLOT NO. 07 SURVEYOR DW MG PAGE 1 OF 1

VEGETATION

TREE LAYERS

	A1	A2	A3	TOT %
Fd	1,0	10,2	0	12
Lw	9,1	10,15	0	25
Cw	0,13,5	0,20,5		25

SHRUB LAYERS

	B1	B2
Bl	2,6	
VaMe	25	
SoSc	3	
SxW	7	
AlSi	2	
Hw	1	
VaOv	2	
Lout	2	

HERB LAYER

		%
SHRUB cont	PaMy	3
	Cw	3
	SpBe	3
	ShCa	1
	RhAl	1
	RiLa	<1
HERBS	LiBo	15
	DrSe	3
	HiAl	1
	RuPe	4
	GoOb	1
	LiCa	1
	TiUn	1
	LyCo	<1
	PyAs	3
	CoCa	4
	ChUm	3
	ClUn	1
	ViOr	1

MOSS / LICHEN / SEEDLING

		%
HERBS cont.	SmRa	1
	CaRu	<1
	EpAn	<1
MOSS / SEEDLINGS		
	Fd	<1
	Cw	<1
	MOSS	5

ADDITIONAL SPECIES

	LAYER	%

FS 882(2) HRE 96/4

7

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC: STRUCTURE	FABRIC: CONSIST.	FABRIC: CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
L	0.5				X	X	X	—	
F	3.5				X	X	M	5	
H	4.5				X	X	M	5	

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S'	TOTAL	ROOTS AB.	ROOTS SIZE	STRUCTURE CLASS	STRUCTURE KIND	COMMENTS
Ae	6.5	Grey			30	—	—	30	C	5		SGR	Ang gravels @ Contact
Bhf	16.5	Red/Brn										SGR	Ang
C	—											SGR	

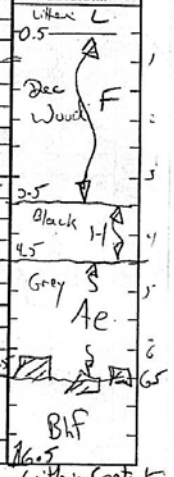
GEOLOGY | BEDROCK TYPE | COARSE FRAG. LITH.

DRAINAGE CLASS | FAM. PART. SIZE | ROOTING DEPTH cm | SEEPAGE WATER DEPTH — cm | ROOT-RESTRICTING LAYER TYPE BR DEPTH 1.00 cm | PH | HUMUS | SOIL 6.5

NOTES: Shallow soils, disturbed site possible mixing

TERRAIN CLASSIF. L6V/R | SOIL CLASSIF. Ferro Humi Podzol | HUMUS FORM Hemihumimor

PROFILE DIAGRAM



MENSURATION / WILDLIFE

MENSURATION

SURVEYOR: DW MC MG

TREE #	SPECIES	DBH	HEIGHT CALCULATIONS: TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	BL. CONK	SCAR.	F.GIR. FORK	F. CRACK	MISTLE.	R. BRAN.	D.GIR.B. TOP	PEST CODE	PEST SEVER	SITE SERIES
31	Fd	59							35	97												
32	Lw	51							30	110												
33	Cw	40							20	75												
All		B1, Pl+ Skw cut blowth																				

WILDLIFE TREE

SURVEYOR:

TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes: APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
01	Pl	D		16		99	41				NA	3	2	1	2	V
02	Ds	DF		43		99	30				NA	3	2	1	F	P
03	Pl	DF		27		90	20				NA	3	2	3	3	P
04	Cw	DS		28		0	21				NA	8	7	7	6	V
05																
06																
07																
08																
09																
10																
11																
12																
13																
14																
15																
16																

BRITISH COLUMBIA MINISTRY OF FORESTS B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14812

DATE Y 96 M 07 D 24 SURVEYOR ~~EA~~ MG/DW/MN/MC

PROJECT ID. GEC 0120101

SITE DIAGRAM

Photos 5, 6, 7

SITE DESCRIPTION

LOCATION

GENERAL LOCATION: Silver Star

MAPSHEET: 82L035 | LATITUDE | LONGITUDE | MAP UNIT: HOK6

AIR PHOTO NO.: 90082 #55 | X COORDINATE | Y COORDINATE

SITE INFORMATION

PLOT REPRESENTING: Poly 12 Plot (08)

BGC UNIT: ICHmw2 | SITE SERIES: 04 (01) | ECOSECTION: NOH

ELEVATION: 1385 m | SLOPE: 20 % | ASPECT: 360 ° | EXPOSURE: NA

MESO SLOPE POS.: UPPER | SURFACE SHAPE: Concave | MOISTURE REGIME: mesic 4 | NUTRIENT REGIME: med

SITE DISTURBANCE: Logging | SUCCESSIONAL STATUS: MC | STRUCTURAL STAGE: 6

PHOTO ROLL | FRAME NOS.

NOTES

SUBSTRATE

ORG. MATTER	90	ROCKS	0
DEC. WOOD	10	MINERAL SOIL	0
BEDROCK	0	WATER	0

FS 882(1) HRE 96/4

STRATA COVERAGE: TREE 60 | SHRUB | HERB | MOSS + LICHEN | PLOT NO. 08 | SURVEYOR MN, DW | PAGE 1 OF 1

VEGETATION

TREE LAYERS	A1	A2	A3	TOT %
Fd	5	0,2	15	0,5 20
We	7	1,0	20	2,0 22
BL	0,2	1	0	5,4 5
Hw	1,0	1,0	20	0,2 2
Lw	3,0	0,1	0	0,2 10

SHRUB LAYERS	B1	B2
AlSi	2	0
Bl	1	2
VaMe	10	
SoSc	<1	
RiLa	2	
LoUt	1	
RuPa	<1	
Cw	1	2

HERB LAYER		%
SHRUBS cont:	SyW	1
	RhAl	1
	LoIn	<1
	PuMy	1
	AmA1	<1
	Hw	<1
HERBS	SmRa	3
	GoOb	1
	RuPe	2
	ViOr	<1
	OrSe	<1
	OsDe	<1
	GaTr	<1
	TiUn	2
	ClUn	6
	AdBi	3
	LiCu	<1
	CoRa	<1
	StAm	<1

MOSS / LICHEN / SEEDLING	%
~~HERBS~~ cont- VaSi	1
PyAs	<1
GyDr	25
Hw	<1
MABS	1

ADDITIONAL SPECIES	LAYER	%

FS 882(2) HRE 96/4

(8)

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC: STRUCTURE	FABRIC: CONSIST.	FABRIC: CHAR.	MYCEL. AB.	FECAL AB.	ROOTS: AB.	ROOTS: SIZE	COMMENTS
L	6				C	X	X	-	needles & twigs, matted underside
F	3				F	X	M	3	
H	9				X	X			dark & rich

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	ROOTS SIZE	STRUCTURE CLASS	STRUCTURE KIND	COMMENTS
Ae	12	4 Grey	N	SiL	0	0	0	0	C	5			
B_1	25	Rel Brn		SiL	10	-	-	10	C	5			
C	3	Gy Brn		SiL	30	-	-	30	X	X			

GEOLOGY — BEDROCK TYPE: slate / schist — COARSE FRAG. LITH.

DRAINAGE CLASS: well drained — ROOTING DEPTH: 25 cm — ROOT-RESTRICTING LAYER: TYPE C- / DEPTH 25 cm — PH — HUMUS

FAM. PART. SIZE — SEEPAGE WATER DEPTH: N/A cm — SOIL

NOTES

TERRAIN CLASSIF. 4 — SOIL CLASSIF.: Dystric Brunisol — HUMUS FORM: Humimor F

PROFILE DIAGRAM

L
F
H
Ae
Bm
C

MENSURATION / WILDLIFE

MENSURATION

SURVEYOR:

TREE #	SPECIES	DBH	HEIGHT CALCULATIONS: TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	BL. CON	SCAR	F. ORC	F. CANK	MISTLE	JR. BRAN	D. CRB TOP	PEST: CODE	PEST: SEVER	SITE SERIES
34	WC	61						1.1	30	80												
35	DF	72						1.0	40	115												
36	HW	54							35	95			V									
37	PW	46							30	95												
38	BI	23							20	72				V								

WILDLIFE TREE

SURVEYOR:

B.A.F. m^2/ha

TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes: APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
01	CW			98		0	21			NA	8	7	7	8	0	
02																
03																
04																
05																
06																
07																
08																
09																
10																
11																
12																
13																
14																
15																
16																

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14813

DATE Y 96 M 07 D 25 SURVEYOR DW MG HC

PROJECT ID. GEC0120101

LOCATION

GENERAL LOCATION: Silver Star			
MAPSHEET: 82L035	LATITUDE	LONGITUDE	MAP UNIT: RS5
AIR PHOTO NO.: 900082 #55	X COORDINATE: N/A		Y COORDINATE: N/A

SITE INFORMATION

PLOT REPRESENTING: Poly 113 Plot (09)			
BGC UNIT: ICHmw2	SITE SERIES: 06 + 08		ECOSECTION: NOH
ELEVATION: map 1359 m	SLOPE: Flat %	ASPECT: Flat °	EXPOSURE: N-S
MESO SLOPE POS.: Flat	SURFACE SHAPE: Flat	MOISTURE REGIME: 5, 6 Hydric	NUTRIENT REGIME: Rich D
SITE DISTURBANCE: NO	SUCCESSIONAL STATUS: MEC		STRUCTURAL STAGE: 5

SITE DIAGRAM

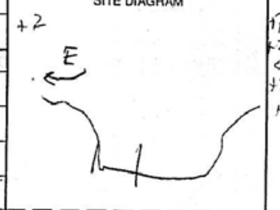


PHOTO ROLL		FRAME NOS.	

NOTES

Flats - North of 2nd Landing. - Minor GPS Data
Steep rising BR E + W
Aspen + Tam. + Pl outside plot.

SUBSTRATE

ORG. MATTER	100	ROCKS	
DEC. WOOD	—	MINERAL SOIL	—
BEDROCK	—	WATER	—

FS 882(1) HRE 96/4

STRATA COVERAGE: TREE 20 | SHRUB 65 | HERB 95 | MOSS + LICHEN 25 | PLOT NO. 09 | SURVEYOR MG DW | PAGE 1 OF 1

VEGETATION

TREE LAYERS	A1	A2	A3	TOT %
Cw (1, 4, 5)	3	10	5	18
Hw (1, 0, 0)	3	0	0	3
Bl (1, 0, 0)	3	0	0	3
Sxw (1, 0, 2)	3	0	3	6

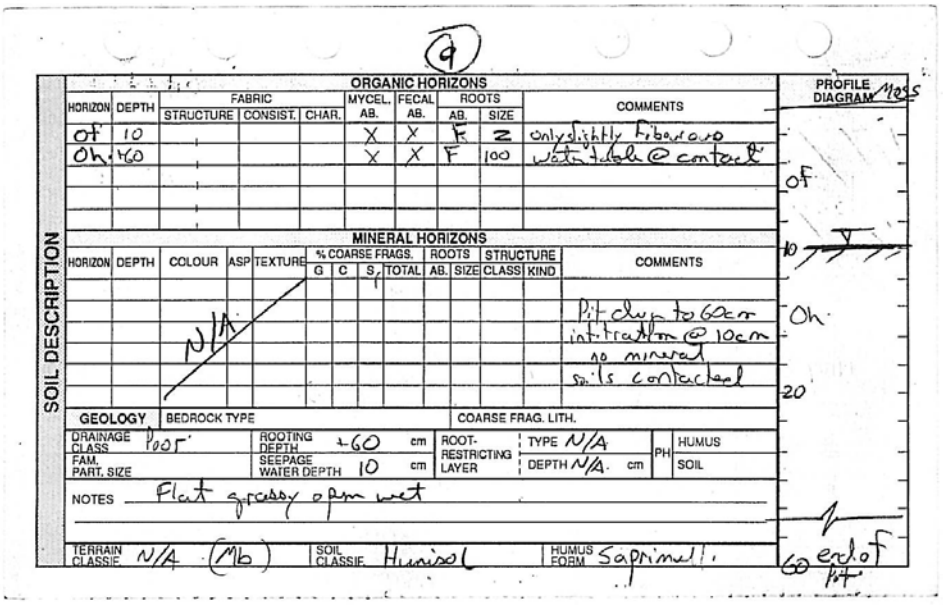
SHRUB LAYERS		B1	B2
Am	Sxw	1	<1
	Cw	5	2
	AlIn	40	3
	AlSi	3	1
	RiLa		4
	RuId		1
	CaSt		2
	Bl		2

HERB LAYER		%
Shrubs at	SoSc	1
Red Swamp Curr.	RiTr	1
	VaMe	3
	VaOv	2
	LoIn	2
	LoUt	1
	SpBe	<1
HERBS with avis	GeBi	<1
	AyFf	65
	GaTr	3
	StAm	3
	RuPe	2
Willowherb	EpCi	2
	TiUn	1
	CoCa	1
Parnassus	PaFi	2
Cinquefoil	PoPa	2
	SpTi	3
	MiNu	1

MOSS / LICHEN / SEEDLING		%
Herbs a.	MiGu	4
	Viola	2
(common)	Equisetum	3
	MiBr	1
	Listera	1
Bog orchid	PlHy	<1
	LiBo	<1
	GePe	1
	PlDi	<1
	OsDe	<1

ADDITIONAL SPECIES LAYER		%
HERBS	CaCr	2
broad-l. twayblade	LiCo	<1
Stiff clubmoss		<1
	VaSi	<1
Bluegrass	PoPr	2
Small bulrush	ScTr	<1
MOSS /		25

FS 882(2) HRE 96/4



(9)

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC STRUCTURE	FABRIC CONSIST.	FABRIC CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
Of	10				X	X	F	2	only slightly fibrous
Oh	60				X	X	F	100	water table @ contact

MINERAL HORIZONS

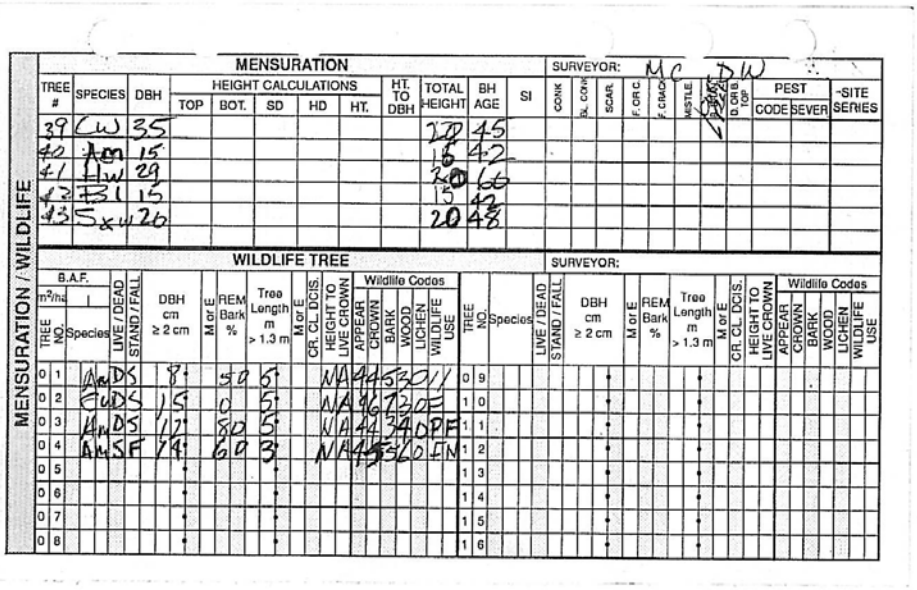
HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	ROOTS SIZE	STRUCTURE CLASS	STRUCTURE KIND	COMMENTS
		N/A											Pit dug to 60cm int. transition @ 10cm no mineral soils contacted

GEOLOGY	BEDROCK TYPE		COARSE FRAG. LITH.
DRAINAGE CLASS Poor	ROOTING DEPTH 60 cm	ROOT-RESTRICTING LAYER TYPE N/A	PH HUMUS
FAM. PART. SIZE	SEEPAGE WATER DEPTH 10 cm	DEPTH N/A cm	SOIL

NOTES Flat grassy open wet

TERRAIN CLASSIF. N/A (Mb) | SOIL CLASSIF. Humisol | HUMUS FORM Saprimull.

PROFILE DIAGRAM Moss



MENSURATION / WILDLIFE

MENSURATION

SURVEYOR: MC DW

TREE #	SPECIES	DBH	HEIGHT CALCULATIONS TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	BL. CONK	SCAR.	F. CR C.	F. CRAD	MISTLE	BROOM	CANKER	PEST CODE	PEST SEVER	SITE SERIES
39	Cw	35							22	45												
40	Am	15							15	42												
41	Hw	29							30	66												
42	Bl	15							15	42												
43	Sx	26							20	48												

WILDLIFE TREE

SURVEYOR:

B.A.F. m²/ha	TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE	TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
1	01	Am	D	S	8		50	5			NA							09																
1	02	Fd	D	S	15		0	5			NA							10																
1	03	Am	D	S	17		80	5			NA							11																
1	04	Am	SF		19		60	3			NA							12																
0	05																	13																
0	06																	14																
0	07																	15																
0	08																	16																

BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14814

DATE (Y M D): 96 07 25 — SURVEYOR: DW MG MC

PROJECT ID.: GEC0120101

SITE DESCRIPTION

LOCATION

GENERAL LOCATION: Silver Star

MAPSHEET: 82L035 — LATITUDE — LONGITUDE — MAP UNIT: DFrw5

AIR PHOTO NO.: 90082 #55 — X COORDINATE: 55B3198.49 — Y COORDINATE: 5553664.85

SITE INFORMATION

PLOT REPRESENTING: Poly 14 Plot 10

BGC UNIT: ICHmw2 — SITE SERIES: 02 (03) — ECOSECTION: NJH

ELEVATION: 1395 m — SLOPE: 15 % — ASPECT: SW 210 — EXPOSURE: Sun.

MESO SLOPE POS.: Upper — SURFACE SHAPE: Conc — MOISTURE REGIME: 2 — NUTRIENT REGIME: C (Med)

SITE DISTURBANCE: Yes — SUCCESSIONAL STATUS: Mat Seral — STRUCTURAL STAGE: 5

NOTES

Logged Area - Trees still on grnd

SITE DIAGRAM

-8 -2
-2 1
1 -2
-8 +4

PHOTO ROLL — FRAME NOS.

SUBSTRATE

ORG. MATTER	95	ROCKS	Y
DEC. WOOD	5	MINERAL SOIL	X
BEDROCK	X	WATER	X

FS 882(1) HRE 96/4

VEGETATION

STRATA COVERAGE: TREE 54 — SHRUB 65 — HERB 35 — MOSS + LICHEN 1 — PLOT NO. 10 — SURVEYOR: DW MG — PAGE 1 OF 1

TREE LAYERS

	A1	A2	A3	TOT %
Cw	2,3	2,6	5,4	15
Lw	8,0	0,14	0,0	14
Sxw	0,0	0,0	1,0	1
Fd	0,0	1,0	0,1	1

SHRUB LAYERS

	B1	B2
Cw	5	
Fd	1	
Bl	3	10
Sxw		3
AlSi	25	5
ShCa		2
SpBe		6
PaMy		20

HERB LAYER

		%
Shrubs cont.	RiLa	2
	Pu	<1
	VaMe	40
	LoUt	5
	MaAg	<1
HERBS	AdBi	1
	LiBo	15
	LiCo	<1
	Goob	1
	OrSe	1
	FeAm	<1
	SmRa	<1
	OsDe	<1
	HyAl	4
	PyAs	2
	Grass sp	12
	VIOr	1
	ClUn	5
	LiCo	<1

MOSS / LICHEN / SEEDLING

	%
Cw seedlings	2
Sxw "	<1
Bl "	<1
MOSS	1

ADDITIONAL SPECIES

	LAYER	%

FS 882(2) HRE 96/4

(10)

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC STRUCTURE	FABRIC CONSIST.	FABRIC CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
L	0.5				F	X	X	—	Mossy Lichen.
F	2.5				F	X	C	2	
H	3.5				C	X	C	2	Burn Layer.

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	ROOTS SIZE	STRUCTURE CLASS	STRUCTURE KIND	COMMENTS
Ae	4.5	AshGrey		VFS	0	0	0	0	C	2		SGR	
Bm	25.0	BrnTan		VFS	10	0	0	10	C	2		SGR	
C	—	BrnGry		VFS	40	0	0	40	X	—		SGR	Weathered Bedrock

GEOLOGY | BEDROCK TYPE | COARSE FRAG. LITH.

DRAINAGE CLASS: Well
FAM. PART. SIZE:
ROOTING DEPTH: 25 cm
SEEPAGE WATER DEPTH: N/A cm
ROOT-RESTRICTING LAYER: TYPE Lithic; DEPTH 25 cm
PH
HUMUS
SOIL

NOTES: Well developed SDI's

TERRAIN CLASSIF.: Mb
SOIL CLASSIF.: Brunisol
HUMUS FORM: Xero mor

PROFILE DIAGRAM

0.5 L
1.0
F
2.0
2.5
H
3.5
Ae
4.5
Bm
25.0

MENSURATION / WILDLIFE

MENSURATION

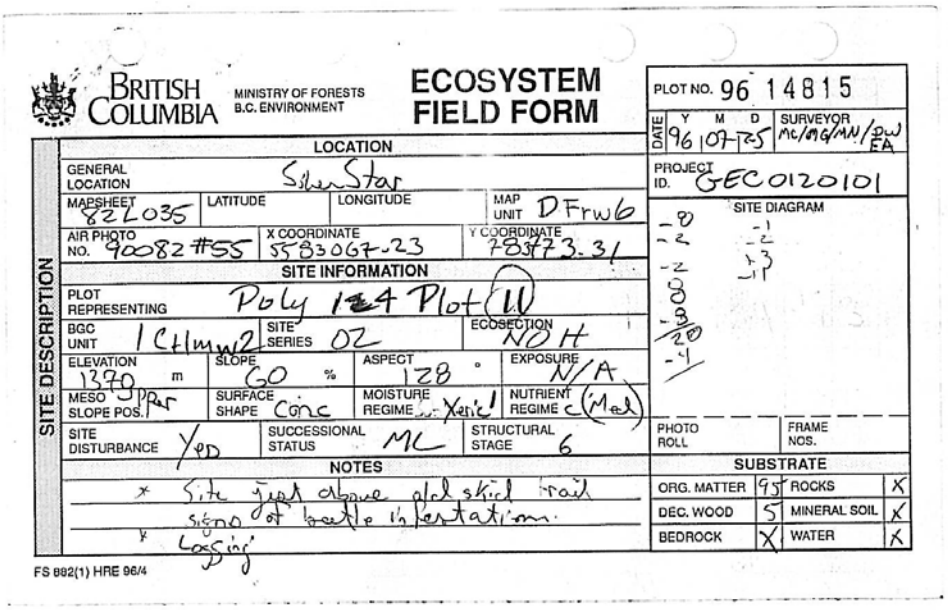
SURVEYOR:

TREE #	SPECIES	DBH	HEIGHT CALCULATIONS TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	GL. CONK	SCAR.	F. CR C.	F. CRACK	MISTLE.	R. BRAN	D. OR B. TOP	PEST CODE	PEST SEVER	SITE SERIES
44	Lw	46							35	107												
45	Cw	50							30	55												
46	Sxw	21							25	96												

WILDLIFE TREE

SURVEYOR:

B.A.F. m²/ha	TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. GL. DOIS.	HEIGHT TO LIVE CROWN	Wildlife Codes APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
1	01	Bl	D	S	4.1		95	2.5			WA	7	5	2	4	0	B
	02																
	03																
	04																
	05																
	06																
	07																
	08																
	09																
	10																
	11																
	12																
	13																
	14																
	15																
	16																



BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14815

DATE: Y 96 M 07 D 25 — SURVEYOR: MC/MG/MN/DW/EA

PROJECT ID. GEC0120101

SITE DESCRIPTION

LOCATION

GENERAL LOCATION: Silver Star

MAPSHEET: 82L035 — LATITUDE — LONGITUDE — MAP UNIT: D Frw6

AIR PHOTO NO.: 90082 #55 — X COORDINATE: 5583067.23 — Y COORDINATE: 78373.31

SITE INFORMATION

PLOT REPRESENTING: Poly 1&4 Plot (1)

BGC UNIT: ICHmw2 — SITE SERIES: 02 — ECOSECTION: NOH

ELEVATION: 1370 m — SLOPE: 60 % — ASPECT: 128 ° — EXPOSURE: N/A

MESO SLOPE POS.: Mod — SURFACE SHAPE: Conc — MOISTURE REGIME: Xeric — NUTRIENT REGIME: c (Med)

SITE DISTURBANCE: Y/D — SUCCESSIONAL STATUS: ML — STRUCTURAL STAGE: 6

NOTES

* Site just above old skid trail
sign of beetle infestation.
* Logging

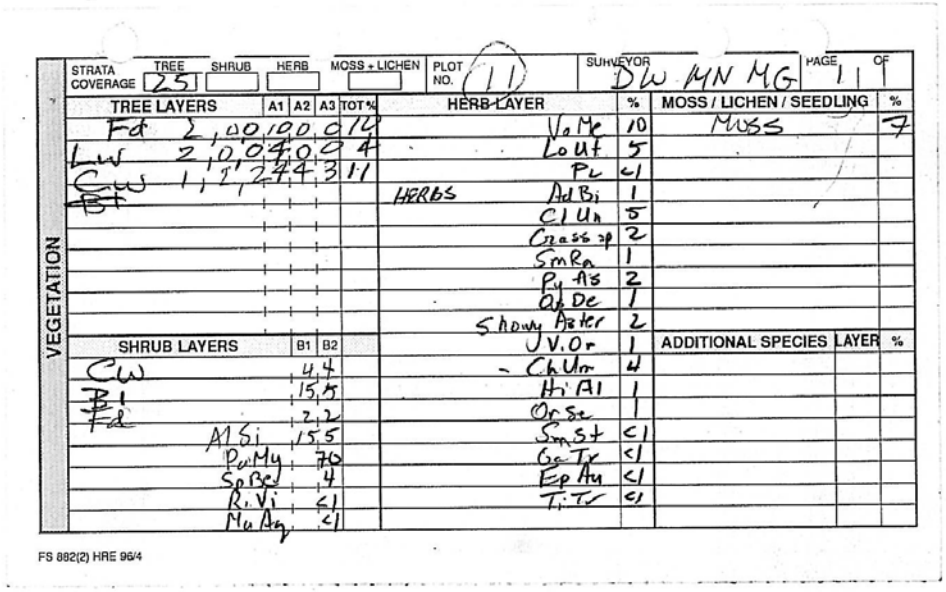
SITE DIAGRAM

PHOTO ROLL — FRAME NOS.

SUBSTRATE

ORG. MATTER	95	ROCKS	X
DEC. WOOD	5	MINERAL SOIL	X
BEDROCK	X	WATER	X

FS 882(1) HRE 96/4



STRATA COVERAGE: TREE 25 — SHRUB — HERB — MOSS + LICHEN — PLOT NO. (1) — SURVEYOR: DW MN MG — PAGE 1 OF 1

VEGETATION

TREE LAYERS	A1	A2	A3	TOT %
Fd	2	10	100	14
Lw	2	10	40	9
Cw	1	1	2	3
~~Bl~~				

SHRUB LAYERS	B1	B2
Cw		4.4
Bl		15.5
Fd		2.2
AlSi		15.5
PuMy		70
SpBe		4
R.Vi		<1
MuAg		<1

HERB LAYER		%
	Va Me	10
	Lo Ut	5
	Pu	<1
HERBS	Ad Bi	1
	Cl Un	5
	Grass sp	2
	Sm Ra	1
	Py As	2
	Ag De	1
	Shrub Aster	2
	V. Or	1
	Ch Un	4
	Hi Al	1
	Or Se	1
	Sm St	<1
	Ge Tr	<1
	Ep Ay	<1
	Ti Ti	<1

MOSS / LICHEN / SEEDLING	%
Moss	7

ADDITIONAL SPECIES	LAYER	%

FS 882(2) HRE 96/4

(11)

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC: STRUCTURE	FABRIC: CONSIST.	FABRIC: CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
L	2.0				X	X	C	/	
Ah	5.0		LS		X	X	C	/	thin to < 0.5cm (Aej)
									* Ah arguable; essentially litter on brown mineral soil.

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	ROOTS SIZE	STRUCTURE CLASS	STRUCTURE KIND	COMMENTS
Bm	49	Brn dg.		LS	10	0	0	0	C	/			
C	49+	Gr-Brn.		LS	40	0	0	40+	X	/			

GEOLOGY — BEDROCK TYPE: Mudstone Schist — COARSE FRAG. LITH.:

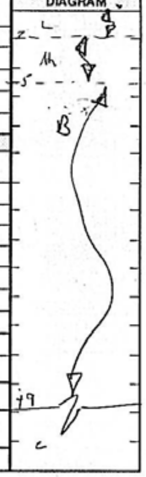
DRAINAGE CLASS: Well — ROOTING DEPTH: 49 cm — ROOT-RESTRICTING LAYER: TYPE Lithic, DEPTH 49 cm — PH: HUMUS / SOIL

FAM. PART. SIZE: — SEEPAGE WATER DEPTH: N/A cm

NOTES:

TERRAIN CLASSIF.: Mb — SOIL CLASSIF.: Brunisol — HUMUS FORM: Velomoder

PROFILE DIAGRAM



MENSURATION / WILDLIFE

MENSURATION

SURVEYOR: DW MN

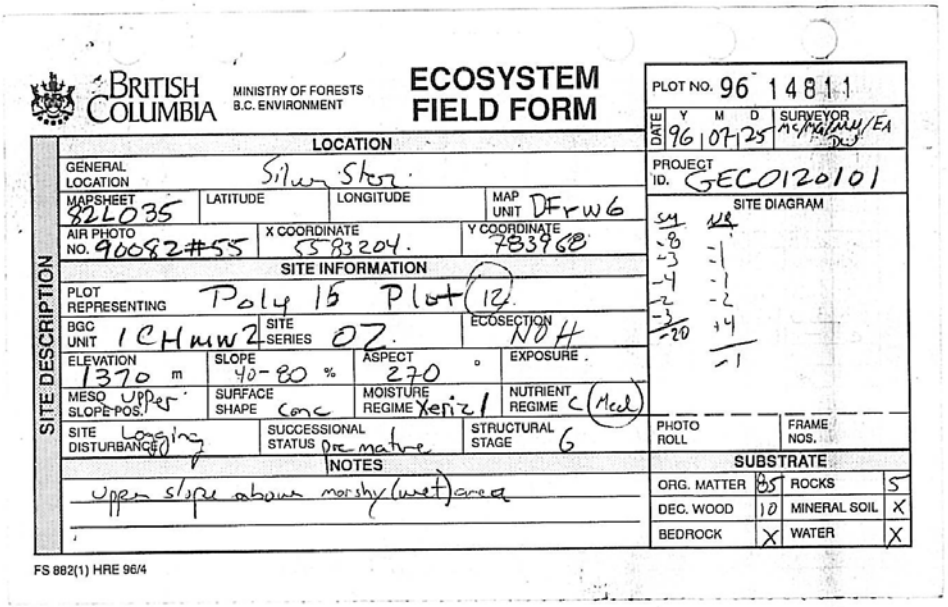
TREE #	SPECIES	DBH	TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	BL. CONK	SCAR	F. OR C.	F. CRACK	MISTLE.	R. BRAN.	D. OR B. TOP	PEST CODE	PEST SEVER	SITE SERIES
47	Fd	80							40	105												
48	Lw	45							35	92												
49	Cw	57							25	88					[illegible]					Ants		

WILDLIFE TREE

SURVEYOR:

TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
01	Fd	D	S	35		95	15				6	6	3	5	2	F
02	Pl	D	S	22		15	10				5	5	4	4		P
03	Bl	D	S	7		99	4				3	2	1	1	4	/
04	Fd	D	S	52		99	35				3	3	1	1	4	FD
05	Ss	L	S	14		95	16				2	2	2	3	0	F
06	Lw	D	S	37		80	20				5	5	4	4	2	PF
07																
08																
09																
10																
11																
12																
13																
14																
15																
16																

– Pileated pecker on down cedar etc.



BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14811

DATE: Y 96 M 07 D 25 — SURVEYOR: MG/MA/MW/EA DW

PROJECT ID. GEC0120101

SITE DESCRIPTION

LOCATION

GENERAL LOCATION: Silver Star

MAPSHEET: 82L035 — LATITUDE — LONGITUDE — MAP UNIT: DFrw6

AIR PHOTO NO.: 90082#55 — X COORDINATE: 5583204. — Y COORDINATE: 783968

SITE INFORMATION

PLOT REPRESENTING: Poly 15 Plot (12)

BGC UNIT: ICHmw2 — SITE SERIES: 07 — ECOSECTION: NOH

ELEVATION: 1370 m — SLOPE: 40-80 % — ASPECT: 270 ° — EXPOSURE:

MESO SLOPE POS.: Upper — SURFACE SHAPE: Conc — MOISTURE REGIME: Xeric 1 — NUTRIENT REGIME: C (Med)

SITE DISTURBANCE: Logging — SUCCESSIONAL STATUS: Immature — STRUCTURAL STAGE: 6

NOTES

Upper slope above marshy (wet) area

SITE DIAGRAM

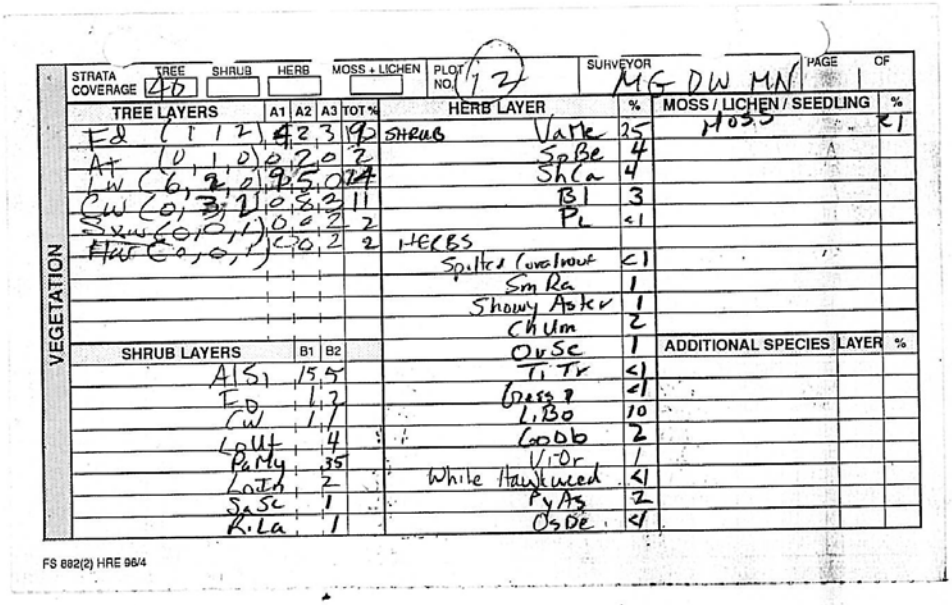
SM / MS
-8 / -1
-3 / -1
-4 / -1
-2 / -2
-3 / +4
-20 / -1

PHOTO ROLL — FRAME NOS.

SUBSTRATE

ORG. MATTER	85	ROCKS	5
DEC. WOOD	10	MINERAL SOIL	X
BEDROCK	X	WATER	X

FS 882(1) HRE 96/4



STRATA COVERAGE: TREE 40 — SHRUB — HERB — MOSS + LICHEN — PLOT NO. 12 — SURVEYOR: MG DW MN — PAGE 1 OF

VEGETATION

TREE LAYERS

	A1	A2	A3	TOT %
Ed (1,1,2)	4	2	3	9
At (0,1,0)	0	2	0	2
Lw (6,2,0)	1	9.5	0	14
Cw (0,3,2)	1	0	8	11
Sxw (0,0,1)	0	0	2	2
Hw (0,0,1)	0	0	2	2

SHRUB LAYERS

	B1	B2
Als	15	5
Ed	1	2
Cw	1	1
Lolu		4
PuMy		35
Lolh		2
SaSc		1
R.La		1

HERB LAYER

		%
SHRUB	VaMe	25
	SpBe	4
	ShCa	4
	Bl	3
	Pt	<1
HERBS	Spotted Coralroot	<1
	Sm Ra	1
	Showy Aster	1
	ChUm	2
	OvSc	1
	Ti Tr	<1
	Grass ?	<1
	L.Bo	10
	GoOb	2
	ViOr	1
	White Hawkweed	<1
	PyAs	2
	OsDe	<1

MOSS / LICHEN / SEEDLING

	%
Moss	<1

ADDITIONAL SPECIES

	LAYER	%

FS 882(2) HRE 96/4

(12)

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC: STRUCTURE	FABRIC: CONSIST.	FABRIC: CHAR.	MYCEL. ABS	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
L	4				F	X	C	1	Badly Branched
F	1				F	X	C	1	
H	5.0				F	X	C	1	
									X - abundant cut rotted log

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	SIZE	STRUCTURE CLASS	KIND	COMMENTS
Aej	6.0	Grey		SL	–	–	–	–	C	1		SBR	
Bm	36.0	Br/Orbn		SL	60	–	–	60	C	1		SBR	
C	–	Dr/Grey		SL	80	–	–	80	X	–		SGR	

GEOLOGY | BEDROCK TYPE | COARSE FRAG. LITH.

DRAINAGE CLASS: Well | FAM. PART. SIZE | ROOTING DEPTH: 36.0 cm | SEEPAGE WATER DEPTH: N/A cm | ROOT-RESTRICTING LAYER: TYPE Rock, DEPTH 40 cm | PH | HUMUS | SOIL

NOTES: Site situated near base of BSG (40m x 15m)

TERRAIN CLASSIF.: SMx | SOIL CLASSIF.: Brun FGO | HUMUS FORM: Leptic mader

PROFILE DIAGRAM: L, F, H, Aej, Bm, C; 36.0

MENSURATION / WILDLIFE

MENSURATION

SURVEYOR:

TREE #	SPECIES	DBH	HEIGHT CALCULATIONS: TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	BL. CON	SCAR	F. CR C.	F. CRACK	MISTLE	R. BRAN.	D. OR B TOP	PEST CODE	PEST SEVER	SITE SERIES
~~50~~	Fd	47							35	80										Bark Beetles		
51	At	16							20	27												
52	Cw	19							20	83												
53	Lw	47							40	162												
54	Hw	22							12	62												

WILDLIFE TREE

SURVEYOR:

TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes: APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
01	Fd	D	S	28		99	26				7	3	2	3	F	
02	Lw	D	S	13		90	22				5	4	3	4	F	
03	Bl	D	S	9		99	8				3	2	1	1	3	
04	Hw	D	S	10		99	8				5	4	2	2	1	
05																
06																
07																
08																
09																
10																
11																
12																
13																
14																
15																
16																

BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14816

DATE Y	M	D	SURVEYOR
96	07	25	MG/MC/MN EA/DW

PROJECT ID.

SITE DESCRIPTION

LOCATION

GENERAL LOCATION	Silver Star
MAPSHEET	82L035
LATITUDE	-
LONGITUDE	
MAP UNIT	HFm6
AIR PHOTO NO.	90082 #55
X COORDINATE	5582842.59
Y COORDINATE	78 2811.55m

SITE INFORMATION

PLOT REPRESENTING	Poly 6e Plot (13)
BGC UNIT	ICHmw2
SITE SERIES	01
ECOSECTION	NOH
ELEVATION	1315 m
SLOPE	5-25 %
ASPECT	140 °
EXPOSURE	
MESO SLOPE POS.	Mid
SURFACE SHAPE	conc
MOISTURE REGIME	Mesic 4
NUTRIENT REGIME	Med C
SITE DISTURBANCE	No
SUCCESSIONAL STATUS	mature
STRUCTURAL STAGE	6

SITE DIAGRAM

MP	NR
0	-1
0	7.0
0	10
10	7.0
10	0
0	13
0	0
0	13

PHOTO ROLL 34 FRAME NOS. 5

SUBSTRATE

ORG. MATTER	95	ROCKS	X
DEC. WOOD	5	MINERAL SOIL	X
BEDROCK	X	WATER	X

NOTES

White Pine observed

FS 882(1) HRE 96/4

VEGETATION

STRATA COVERAGE: TREE 25 | SHRUB 65 | HERB 30 | MOSS + LICHEN 35 — PLOT NO. 13 — SURVEYOR MH DW MG — PAGE 1 OF 1

TREE LAYERS	A1	A2	A3	TOT %
PL	18	4	0	23
Sxw	1	0	2	3
Bl	1	2	1	<1
Fd	0	1	0	1
~~Lw~~				
Hw	0	1	0	1
Cw	0	2	0	2

SHRUB LAYERS	B1	B2
Sxw	1	1
SaSc	2	1
Cw	4	2
VaMe		25
Fd		2
MaAq		1
LoUt		3
SoSc		2

HERB LAYER		%
Shrubs cont.	RiVi	<1
	Fd	2
	PL	<1
	PaMy	25
	SpBe	3
	ShCa	2
	RoAc	1
	LoIn	<1
	RuPa	<1
	AcGl	<1
HERBS	ChUm	5
	CoCa	8
	ClUn	8
	TiUn	3
	LnAr	1
	Goob	1
	AdBi	<1
	SmRa	1
Ground Cedar	LyCo	<1

MOSS / LICHEN / SEEDLING	%
HERBS EpAn	<1
White Hawkweed	<1
SmSt	<1
LiBo	3
PyAs	1
Grass sp	<1
Listera sp	<1
Moss	35

ADDITIONAL SPECIES LAYER %

FS 882(2) HRE 96/4 Larch, white pine obs out of plot. dead 15%

13

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC: STRUCTURE	FABRIC: CONSIST.	FABRIC: CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
L	1.0				C	X	M	2	
F	5				C	X	M	3	
H	12				C	X	M	3	

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	ROOTS SIZE	STRUCTURE CLASS	STRUCTURE KIND	COMMENTS
Ah	14	Grey		SiL	–	–	–	–	–				
B1	40	Ch Brn		SiL	5	X	X	5	F	1			
B2	70	Gr Brn		L	20	X	X	20	X	X			integrates into C
C	–	Grey		–	50	X	X	50	X	X			

GEOLOGY — BEDROCK TYPE: Muckstone Schist — COARSE FRAG. LITH.

DRAINAGE CLASS: Well — ROOTING DEPTH: 50 cm — ROOT-RESTRICTING LAYER: TYPE Cliffs, DEPTH 70 cm — PH — HUMUS — FAM. PART. SIZE — SEEPAGE WATER DEPTH: N/A cm — SOIL

NOTES

TERRAIN CLASSIF. M5 — SOIL CLASSIF. Brunisol — HUMUS FORM Leptomor

PROFILE DIAGRAM: L / F / H / Ah / B1 / B2 (C) / C — 1 — 5 — 12 — 14 — 40 — 70

13

MENSURATION / WILDLIFE

MENSURATION

SURVEYOR:

TREE #	SPECIES	DBH	HEIGHT CALCULATIONS: TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	BL. CONK	SCAR	F. OR C	F. CHADK	MISTLE.	R. BRAN	D. OR B TOP	PEST: CODE	PEST: SEVER	SITE SERIES
55	PJ	34							30	71												
56	SxW	32							35	115												
57	HW	26							20	59												
58	BL	19							20	42												
59	CW	26							20	55												

WILDLIFE TREE

SURVEYOR: Dave Williams

B.A.F. m²/ha	TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes: APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE	TREE NO.	Species	LIVE / DEAD	STAND / FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	Wildlife Codes: APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
	01	Bl	D	S	25		80	25				4	3	3	4	3	F	09	PL	D	S	16		80	12				6	6	3	4	1	1
	02	PL	D	S	15		95	05				6	6	3	3	1	P	10	PL	D	S	13		91	08				5	5	3	4	3	1
	03	PL	D	S	17		99	10				3	3	2	3	2	P	11	Bl	D	S	16		95	05				4	4	3	2	3	1
	04	PL	D	S	17		99	11				4	4	3	3	3	P	12	PL	D	S	23		99	07				4	3	3	3	3	1
	05	PL	D	S	14		99	12				3	3	2	3	3	P	13	PL	D	S	16		99	15				3	3	3	2	3	1
	06	PL	D	S	14		98	08				4	4	3	5	2	1	14																
	07	PL	D	S	09		90	10				5	5	3	3	1	1	15	4 more #1 + PL															
	08	PL	D	S	22		99	10				6	6	3	4	0	1	16																

BRITISH COLUMBIA — MINISTRY OF FORESTS, B.C. ENVIRONMENT

ECOSYSTEM FIELD FORM

PLOT NO. 96 14817

DATE: Y 96 M 07 D 25 — SURVEYOR: MC/MG/EA/MN

PROJECT ID. GEC01 20101 (DW)

SITE DESCRIPTION

LOCATION

GENERAL LOCATION: Silver Star			
MAPSHEET: 82L035	LATITUDE	LONGITUDE	MAP UNIT: SG js 6
AIR PHOTO NO. 90082	X COORDINATE: 5582988.9	Y COORDINATE: 781916.4	

SITE INFORMATION

PLOT REPRESENTING: Poly 7 Plot (14)			
BGC UNIT: ICHmk1	SITE SERIES: 05	ECOSECTION: NOH	
ELEVATION: 1350 m	SLOPE: 24 %	ASPECT: E 090°	EXPOSURE
MESO SLOPE POS. MID	SURFACE SHAPE: Conc	MOISTURE REGIME: 5 Subhygric	NUTRIENT REGIME: Rich (D)
SITE DISTURBANCE: No	SUCCESSIONAL STATUS: MatureClimax	STRUCTURAL STAGE: 6	

NOTES

* Skid road through site

SITE DIAGRAM

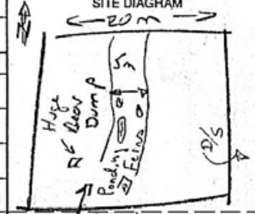


PHOTO ROLL: 14 — FRAME NOS.: 6

SUBSTRATE

ORG. MATTER	90	ROCKS	X
DEC. WOOD	10	MINERAL SOIL	X
BEDROCK	X	WATER	X

FS 882(1) HRE 96/4

VEGETATION

STRATA COVERAGE: TREE 70 — SHRUB 50 — HERB 40 — MOSS + LICHEN 5 — PLOT NO. 14 — SURVEYOR: DW MN MG — PAGE 2 OF 1

TREE LAYERS	A1	A2	A3	TOT %
Fd	3	1	0	15
Bl	1	3	2	10
Lw	1	0	0	2
Cw	5	2	2	30
Sxw	2	2	0	5
Pl	2	0	0	5
At	1	0	0	<1

SHRUB LAYERS	B1	B2
Cw	3	4
AlSi	2	2
CoSt	1	1
TaBr		15
LoUt		3
Sxw		2
SpBe		2
LoIn		1

HERB LAYER	%
AcGl	2
PaMy	3
RhAl	8
VaMe	6
PoTr	1
RiLa	2
Bl	2
HERBS Equisetum	5
SmRa	2
LiBo	3
TiUn	6
Shrub Abh	1
RuPe	2
VaOv	1
GaTr	1
MiNu	<1
AdBi	<1
Green/Bog Orchid	<1
OrSe	<1

MOSS / LICHEN / SEEDLING	%
Herbs ClUn	3
GoOb	1
CoCa	2
ChUm	<1
StAm	1
OsDe	<1
Palmate ColtsFoot	<1
Grass / Rushes	<1
Spotted Coralroot	<1
AtFf	<1

ADDITIONAL SPECIES	LAYER	%
DrEx		<1
Moss		5

FS 882(2) HRE 96/4

(14)

SOIL DESCRIPTION

ORGANIC HORIZONS

HORIZON	DEPTH	FABRIC: STRUCTURE	CONSIST.	CHAR.	MYCEL. AB.	FECAL AB.	ROOTS AB.	ROOTS SIZE	COMMENTS
L	2				F	X	–	–	
Of	5				C	Y	C	3	
H	12				X	Y	C	10	
Of	60				X	Y	C	10	L f H
Oh?	70				X	X	C	10	0-2 2-5 5-9 9-12
W									

MINERAL HORIZONS

HORIZON	DEPTH	COLOUR	ASP	TEXTURE	% COARSE FRAGS. G	C	S	TOTAL	ROOTS AB.	SIZE	STRUCTURE CLASS	KIND	COMMENTS
					N/A								

GEOLOGY — BEDROCK TYPE: Mudstone Schist. COARSE FRAG. LITH.:

DRAINAGE CLASS: Mod Poor. ROOTING DEPTH: 30 cm. ROOT-RESTRICTING LAYER — TYPE: H_2O; DEPTH: 60 cm. PH — HUMUS: ; SOIL:

FAM. PART. SIZE: SEEPAGE WATER DEPTH: 60 cm

NOTES:
- receiving site
- moister than most of Poly

TERRAIN CLASSIF.: N/A. SOIL CLASSIF.: Histic Folisol (dominated by Fibrisol). HUMUS FORM: Saprimull

PROFILE DIAGRAM: L, F, H, 12 Of, Of, 60 Oh? W, 70

MENSURATION / WILDLIFE

MENSURATION

SURVEYOR: MN DW

TREE #	SPECIES	DBH	TOP	BOT.	SD	HD	HT.	HT. TO DBH	TOTAL HEIGHT	BH AGE	SI	CONK	BL. CONK	SCAR	F. DR C. FORK	F. CRACK	MISTLE.	R. BRANCH	D. OR B. TOP	PEST CODE	PEST SEVER	SITE SERIES
60	Lw	55							40	400												
61	Fd	77							45	105												
62	Cw	59							35	95												
63	At	17							25	28 est				core rot								
64	Pl	28							30	55												
65	Sw	32							25	70									V			

WILDLIFE TREE

B.A.F. m²/ha: 1?

TREE NO.	Species	LIVE/DEAD	STAND/FALL	DBH cm ≥ 2 cm	M or E	REM Bark %	Tree Length m > 1.3 m	M or E	CR. CL. DCIS.	HEIGHT TO LIVE CROWN	APPEAR	CROWN	BARK	WOOD	LICHEN	WILDLIFE USE
01	Pl	D	S	19		80	20				4	4	3	4	1	
02	Pl	D	S	23		0	12				6	7	7	6	0	
03	Cw	D	S	27		0	15				6	7	7	7	0	F
04	Cw	D	S	17		0	15				6	7	7	7	0	F
05	Sx	D	S	21		95	12				4	4	3	2	1	PF
06	Pl	D	S	18		0	15				6	7	7	7	0	F
07	Sx	L		30		95	25				3	2	3	3	1	
08	Pl			21		60	20				4	3	5	4	1	F
09	Lw			17		90	12				4	3	4	5	0	
10	"					90	12				|	|	|	|	|	
11	"					90	14				|	|	|	|	|	
12	"			17		95	12				|	|	|	|	|	
13	SxL			18		60	17				3	2	5	3	2	F
14	WRC			17		0	10				5	4	1	2	0	
15	WRC			30			15				5	4	1	2	0	
16																

54m + Fd noted at   Dead & Down 10%

G: Wildlife Data Forms

FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P01

BRITISH COLUMBIA WILDLIFE DATA FORM

PROJECT ID. SILVER STAR | PAGE 1 OF 1

PLOT NO. 1 | SUBPLOT | HUMAN ACTIVITY: DISTANCE / TYPE 2

SURVEYOR: MARTIN GEBAUER

SPECIES CODE	SIGHTING N	SIGN N	SIGN CODE	SEASON OF USE	HABITAT USE	LANDFORM	ADJ. COVER	PRES. PROD.	POT. PROD.	PRES. SUIT.	CAPABILITY	COMMENTS
ODHE		/	E	S	F?	/	3	3	3	3	3	1
URAM				S	F					4	4	2
BATS										A	A	
WOOD										L	L	3
AMPH										N	N	
TAHU	2											
RECR	3											
DEJU	1											
BRCR	1											

COMMENTS: 1 - USED AS FEEDING IN SUMMER - POTENTIAL RUTTING AREA IN FALL

FS 882A HRE 96/4 2) - some berry / forb production
3) - prime areas for nesting & foraging (not extensive)

BRITISH COLUMBIA WILDLIFE DATA FORM

PROJECT ID. SILVER STAR | PAGE 1 OF 1

PLOT NO. 2 | SUBPLOT | HUMAN ACTIVITY: DISTANCE / TYPE

SURVEYOR: MARTIN GEBAUER

SPECIES CODE	SIGHTING N	METHOD	SIGN N	SIGN CODE	SEASON OF USE	HABITAT USE	LANDFORM	ADJ. COVER	PRES. PROD.	POT. PROD.	PRES. SUIT.	CAPABILITY	COMMENTS
ODHE					S	U	F	/	3	4	3	4	5?	1
URAM											4	4	
BATS											A	A	
WOOD											M	M	2
AMPH											L	L	
MOCH	1	S											
TAHU			5	F									
DEJU	1	S											
RECR	2	S											

COMMENTS: 1 - MODERATE FORAGE PLANTS
2 - GOOD # OF SNAGS/WILDLIFE TREES

FS 882A HRE 96/4

FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P08

COARSE WOODY DEBRIS TRANSECT NO. 1 & 2

Azimuth: 0 (A) & 90 (B) Line Length Observed: 24 m of 48 m

PLOT NO. 1

MEASUREMENT DATE (Y Y M O N D D): 96 JUL 23

CREW (Initials): Person 1: MG Person 2:

COMMENTS

NO. (A)	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)	NO. (B)	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
01	Pl	10	1	10	1.0	16	Cw	15	3	12	1.0+
02	Pl	18	1	08	1.5	17	"	35	5	10	"
03	Pl	20	3	16	0.5	18	Pl	15	1	05	2.0
04	Pl	15	3	05	1.5	19	Cw	15	1	05	3.5
05	Pl	23	2	03	1.5	20					
06	Pl	12	2	15	1.5	21					
07	Pl	30	1	05	3.5	22					
08	Cw	45	2	05	2.5	23					
09	Cw	20	2	05	2.0	24					
10	Lw	25	1	08	3.5	25					
11	Cw	50	3	15	2.0	26					
12						27					
13						28					
14						29					
15						30					

COARSE WOODY DEBRIS TRANSECT NO. 1 & 2

Azimuth: 90 (A), 180 (B) Line Length Observed: 24 m of 48 m

PLOT NO. 2

MEASUREMENT DATE (Y Y M O N D D): 96 JUL 23

CREW (Initials): Person 1: MG Person 2:

COMMENTS

NO. (A)	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)	NO.	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
01	Lw	20	5	01	5	16	At	15	4	15	1.0
02	Pl	30	1	03	5	17	"	30	5	15	0.5
03	Pl	25	2	8	2.5	18	Ba	30	1	20	3.0
04	Cw	40	3	8	3.5	19	Lw	10	4	25	0.5
05	Pl	25	2	5	2.0	20	Pl	30	3	13	3.5
06	Pl	20	2	5	3.0	21					
07						22					
08						23					
09						24					
10						25					
11						26					
12						27					
13						28					
14						29					
15						30					

FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P02

BRITISH COLUMBIA **WILDLIFE DATA FORM**

PROJECT ID. SILVER STAR PAGE 1 OF 1

PLOT NO. 3 SUBPLOT HUMAN ACTIVITY DISTANCE 1 TYPE 6

SURVEYOR MARTIN GEBAUER

SPECIES CODE	SIGHTING	SIGN (N N CODE)	HABITAT EVALUATION	PRES. SUIT.	CAPABILITY	COMMENTS
			SU F / 3 3 3	3	3	1
ODHE		2 F		4	4	4
URAM		1 F		P	P	2
BATS				L	L	2
WOOD				N	N	
AMPH						
SPGR	3					
TAHU		3 F				
GCKI	1 S					

COMMENTS
1 - SOME SUMMER RANGE - FALL RUTTING AREA
2 - SOME FORAGING OPP. ON FR. CLEARED AREAS
FG 082A HRE 90/4 3 - YOUNGER SERAL STAGE FOREST 4) Feedg on Bl cambium (bark)/

BRITISH COLUMBIA **WILDLIFE DATA FORM**

PROJECT ID. Silver Star PAGE 1 OF 1

PLOT NO. 4 SUBPLOT HUMAN ACTIVITY DISTANCE 3 TYPE 4

SURVEYOR Martin Gebauer

SPECIES CODE	SIGHTING	SIGN (N N CODE)	HABITAT EVALUATION	PRES. SUIT.	CAPABILITY	COMMENTS
			SU F / 3 2 2	2	2	1
ODHE			SU F	3	3	
URAM				P	P	2
BATS				M	M	3
WOOD				M	M	4
AMPH						
TAHU		3 F				

COMMENTS
1 - MANY HERBS - EXCELLENT FORAGE OPP.
2 - SOME FORAGING & ROOSTING OPP.
FG 082A HRE 90/4 3) many snags for feeding - some cavity nstg (moist undrst. - good CW)
4) - standing water - some [illegible]

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P09

COARSE WOODY DEBRIS TRANSECT NO. 3

Azimuth (N) 180 (B) 270 Line Length Observed 24 m of 48 m

PLOT NO. 3

MEASUREMENT DATE (YY MON DD): 96 JUL 23

CREW (Initials): Person 1: MG Person 2:

COMMENTS:

NO.	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)	NO.	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
01	P1	15	2	02	10	16	U	35	5	02	05
02	P1	10	1	10	15	17	LW	25	2	23	15
03	P1	17	1	01	30	18	U	30	5	20	10
04	P1	25	1	01	20	19	U	20	4	13	10
05	P1	15	1	08	20	20	U	25	5	15	15
06	P1	17	3	02	20	21					
07	P1	12	1	05	30	22					
08	P1	26	3	10	01	23					
09						24					
10						25					
11						26					
12						27					
13						28					
14						29					
15						30					

COARSE WOODY DEBRIS TRANSECT NO. 4

Azimuth (A) 270 (B) 360 Line Length Observed 24 m of 48 m

PLOT NO. 4

MEASUREMENT DATE (YY MON DD): 96 JUL 23

CREW (Initials): Person 1: MG Person 2:

COMMENTS:

NO. (A)	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)	NO.	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
01	U	10	3	15	20	16	U	30	5	10	20
02	U	20	5	10	15	17	U	15	5	02	15
03	U	30	5	15	10	18	U	25	3	02	01
04						19	U	30	3	01	15
05						20	U	30	5	01	05
06						21	P1	16	1	08	10
07						22	B1	18	1	08	35
08						23					
09						24					
10						25					
11						26					
12						27					
13						28					
14						29					
15						30					

FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P03

BRITISH COLUMBIA WILDLIFE DATA FORM

PROJECT ID. SILVER STAR | PAGE 7 OF 11

PLOT NO. 5 | SUBPLOT | HUMAN ACTIVITY: DISTANCE 2, TYPE 2

SURVEYOR: MARTIN GEBAUER

SPECIES CODE	SIGHTING N	SIGN N	SIGN CODE	SEASON OF USE	HABITAT USE	LANDFORM	ADJ COVER	PRES PROD	POT PROD	PRES SUIT	CAPABILITY	COMMENTS
ODHE				SU	F	1	3	2	2	2	2	1
URAM										2	2	2
BATS										D	D	3
WOOD										M	M	4
AMPH										L	L	5
TAHY		2	F									
PIWO		2	F									
WIWR	1											

COMMENTS:
1 - EXC. PROD - GOOD FORAGE PLANTS
2 - GOOD BERRY PRODUC' - BREWN FORBS
FS 882A HRE 96/4 3) ROOST & FORAGE POTENTIAL 4) Good snags 5) stream nearby

BRITISH COLUMBIA WILDLIFE DATA FORM

PROJECT ID. SILVER STAR | PAGE 7 OF 1

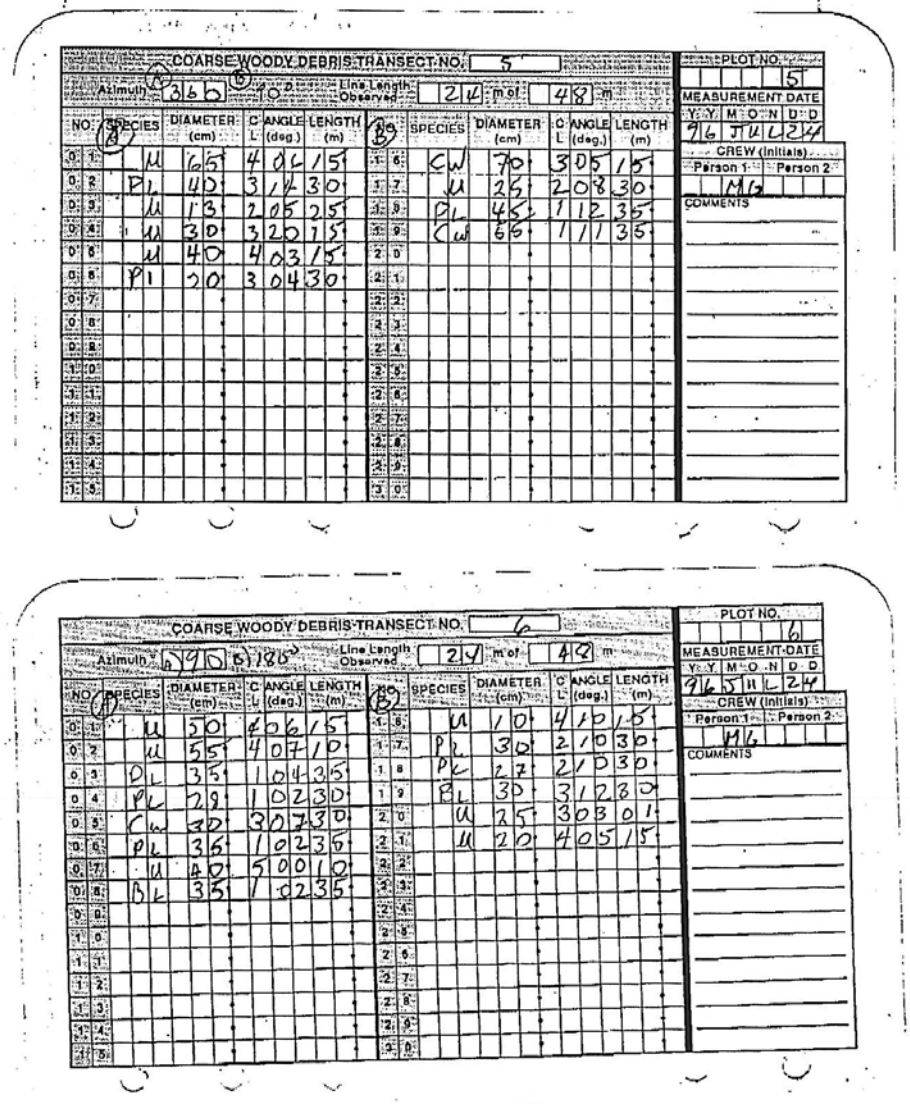
PLOT NO. 6 | SUBPLOT | HUMAN ACTIVITY: DISTANCE 3, TYPE L

SURVEYOR: MARTIN GEBAUER

SPECIES CODE	SIGHTING N	SIGN N	SIGN CODE	SEASON OF USE	HABITAT USE	LANDFORM	ADJ COVER	PRES PROD	POT PROD	PRES SUIT	CAPABILITY	COMMENTS
ODHE				SU	F	1	3	4	4	3	3	1
URAM										4	4	
BATS										P	P	2
WOOD										M	M	3
AMPH										A	A	
BRCR	2											
TAHM		2	F									
BCCH	3											
DEJU	2											
RECR	3											

COMMENTS:
1 - LOW FORAGE PRODUC'N - POSSIBLE RUTTING
2 - OPEN CANOPY - POSSIBLE FORAGE - ROOST?
FS 882A HRE 96/4 3) many snags - more mature trees

FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P10



COARSE WOODY DEBRIS TRANSECT NO. 5

Azimuth (A) 360 (B) 102 Line Length Observed 24 m of 48 m

PLOT NO. 5

MEASUREMENT DATE Y Y M O N D D: 96 JUL 24

CREW (Initials) Person 1: MG Person 2:

COMMENTS

NO.	(A) SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)	(B) SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
01	U	65	4	04	15	CW	70	3	05	15
02	PL	40	3	14	30	U	25	2	08	30
03	U	13	2	05	25	PL	45	1	12	35
04	U	30	3	20	15	CW	66	1	11	35
05	U	40	4	03	15					
06	PL	20	3	04	30					

COARSE WOODY DEBRIS TRANSECT NO. 6

Azimuth (A) 190 (B) 280 Line Length Observed 24 m of 48 m

PLOT NO. 6

MEASUREMENT DATE Y Y M O N D D: 96 JUL 24

CREW (Initials) Person 1: MG Person 2:

COMMENTS

NO.	(A) SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)	(B) SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
01	U	50	4	06	15	U	10	4	10	15
02	U	55	4	07	10	PL	30	2	10	30
03	DL	35	1	04	35	PL	27	2	10	30
04	PL	29	1	02	30	BL	30	3	12	30
05	CW	30	3	07	30	U	25	3	03	01
06	PL	35	1	02	35	U	20	4	05	15
07	U	40	5	00	10					
08	BL	35	1	02	35					

FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P04

BRITISH COLUMBIA **WILDLIFE DATA FORM**

PROJECT ID. Silver Star PAGE 1 OF 1

PLOT NO. 7 SUBPLOT HUMAN ACTIVITY DISTANCE TYPE L SURVEYOR Martin Gebauer

SPECIES CODE	SIGHTING N	N	N	SEX	AGE	ACTIVITY	METHOD	HABITAT STRUCTURE CODE	W/L Dist.	W/L Code	SIGN N	N	CODE	N	N	CODE	METHOD	HABITAT STRUCTURE CODE	HABITAT EVALUATION SEASON OF USE	HABITAT USE	LANDFORM	ADJ. COVER	PRES. PROD	POT. PROD	MAINTENANCE	ENHANCEMENT Object.	Poten.	Techn.	PRES. SUIT	CAPABILITY	COMMENTS
OLDPE											3	E							S	U	T	1	3	5	5				4	4	1
WILAM																													5	5	2
BLACS																													R	P	3
WILOO																													L	L	4
AMRO																													A	A	
DEJU	(nearby, not in plot)																														
HYRE	(seen near plot nearby)																														
TRHIA											0	2	E																		

COMMENTS 1- PROBABLY USED MAINLY DURING BUILDING
2- VERY FEW FORAGING SIGNS
3) may forage on open, cleared areas 4) some foraging opp.

FS 882A HRE 96/4

BRITISH COLUMBIA **WILDLIFE DATA FORM**

PROJECT ID. SILVER STAR PAGE 1 OF 1

PLOT NO. 8 SUBPLOT HUMAN ACTIVITY DISTANCE 1 TYPE L SURVEYOR Martin Gebauer

SPECIES CODE	SIGHTING N	N	N	SEX	AGE	ACTIVITY	METHOD	HABITAT STRUCTURE CODE	W/L Dist.	W/L Code	SIGN N	N	CODE	N	N	CODE	METHOD	HABITAT STRUCTURE CODE	HABITAT EVALUATION SEASON OF USE	HABITAT USE	LANDFORM	ADJ. COVER	PRES. PROD	POT. PROD	MAINTENANCE	ENHANCEMENT Object.	Poten.	Techn.	PRES. SUIT	CAPABILITY	COMMENTS
OLDPE																			S	U	T	1	3	4	4				5	5	1
WILAM																													A	A	
BLACS																													L	L	2
WIOO																													A	A	
AMRO											3	E																			
TRHIA																															

COMMENTS 1- NOT FOUND FORAGING - POSSIBLY BUILDING
2- NOT HEAVY SIGNS/WILDLIFE TREES

FS 882A HRE 96/4

FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P11

COARSE WOODY DEBRIS TRANSECT NO. 7
Azimuth (A) 180 (B) 270 Line Length Observed 24 m of 48 m
PLOT NO. AF
MEASUREMENT DATE Y Y M O N D D 96 JUL 24
CREW (Initials) Person 1 MG Person 2
COMMENTS

NO.	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
01 (A)	PL	28	1	05	35
02	BI	15	2	02	10
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					

NO.	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
16 (B)	BI	12	1	06	30
17	BI	40	2	05	05
18	U	18	3	26	05
19	U	36	5	08	16
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

COARSE WOODY DEBRIS TRANSECT NO. 8
Azimuth (A) 270 (B) 360 Line Length Observed 24 m of 48 m
PLOT NO. B
MEASUREMENT DATE Y Y M O N D D 96 JUL 24
CREW (Initials) Person 1 MG Person 2
COMMENTS

NO.	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
01 (A)	BI	22	1	05	25
02	PL	28	2	03	10
03	LW	15	1	30	05
04	U	15	2	20	10
05	U	40	4	23	20
06	U	30	5	26	05
07	U	35	4	26	10
08					
09					
10					
11					
12					
13					
14					
15					

NO.	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
16 (B)	CW	25	3	03	12
17	CW	40	3	08	15
18	U	50	5	10	20
19	CW	10	2	00	08
20	PL	20	3	00	10
21	BI	30	3	06	20
22					
23					
24					
25					
26					
27					
28					
29					
30					

FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P05

BRITISH COLUMBIA WILDLIFE DATA FORM

PROJECT ID. SILVER STAR — PAGE 1 OF 1

PLOT NO. 9 — SUBPLOT — HUMAN ACTIVITY: DISTANCE 1, TYPE L

SURVEYOR MARTIN GEBAUER

SPECIES CODE	SIGHTING (N)	SIGN (N / CODE)	SEASON OF USE	HABITAT USE	LANDFORM	ADJ. COVER	PRES. PROD.	POT. PROD.	PRES. SUIT.	CAPABILITY	COMMENTS
ODHE			SU	F	1	3	2	2	2	2	1
URAN									2	D	
BATS									P	P	3
WOOD									H	A	
AMPH									P	P	4
TAHU		1 F									
ATAT		1.0 T									1

COMMENTS
1 - MANY MOOSE TRACKS IN WETLAND
2 - EXC. FORAGE PLANTS
3 - FORAGING - exc. potential 4) exc. for amphibians (as well as nest/mound sites)

FS 882A HRE 96/4

BRITISH COLUMBIA WILDLIFE DATA FORM

PROJECT ID. SILVER STAR — PAGE 1 OF 1

PLOT NO. 10 — SUBPLOT — HUMAN ACTIVITY: DISTANCE, TYPE

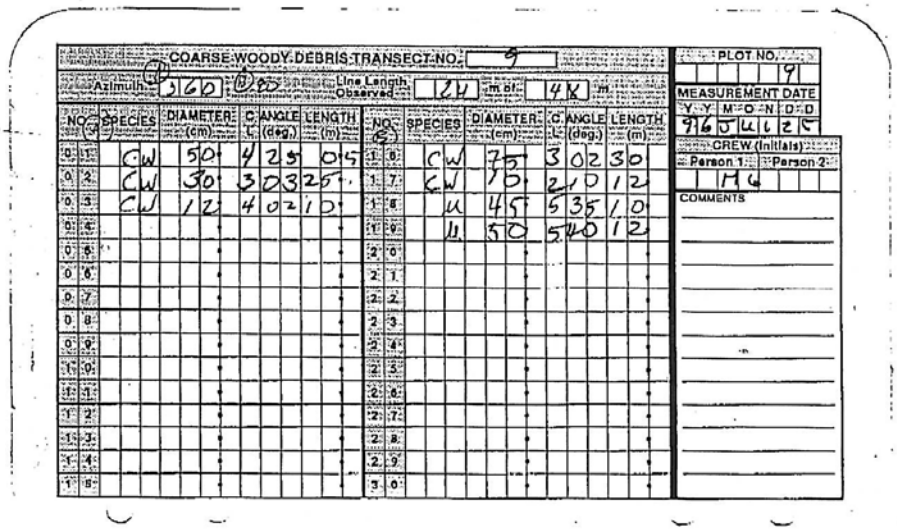
SURVEYOR MARTIN GEBAUER

SPECIES CODE	SIGHTING (N)	SIGN (N / CODE)	SEASON OF USE	HABITAT USE	LANDFORM	ADJ. COVER	PRES. PROD.	POT. PROD.	PRES. SUIT.	CAPABILITY	COMMENTS
ODHE			SU	E	1	3	4	4	4	4	1
URAM			SU	F					4	4	2
BATS									P	P	3
WOOD									L	L	4
AMPH									A	A	
SWTH	2										
RECR	3 (60)										
Chipmunk	1										
BUHU	1										
PAWO	1										

COMMENTS
1 - SOME FORAGING POTENTIAL - RUTTING
2 - GOOD 4% OF HUCKLEBERRY - SOME GRASSES ETC
3 - feeding possible / few roost sites 4) some foraging / few nesting

FS 882A HRE 96/4

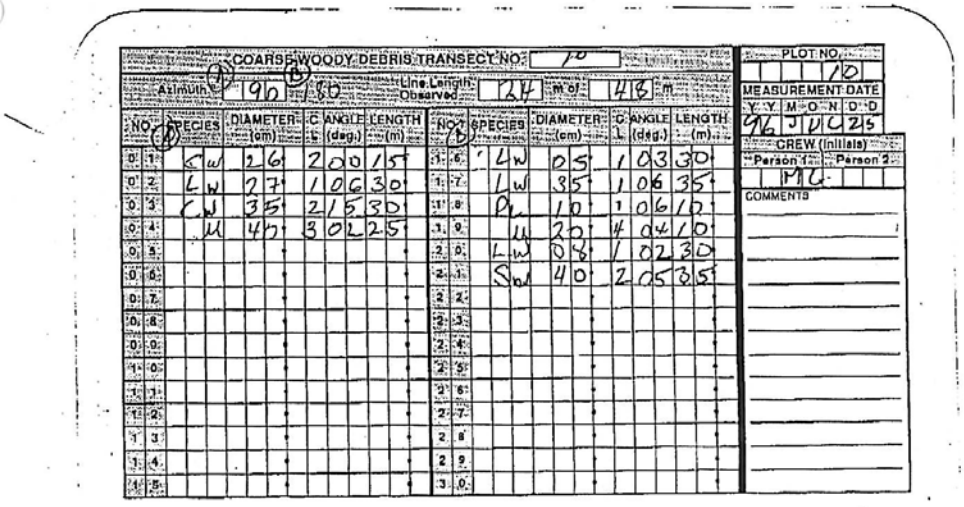
FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P12



COARSE WOODY DEBRIS TRANSECT NO: 9
Azimuth: (A) 360 (B) 85 Line Length Observed: 24 m of: 48 m
PLOT NO: 9
MEASUREMENT DATE: Y Y M O N D O D 96 JUL 25
CREW (Initials): Person 1: MG Person 2:
COMMENTS

NO. (A)	SPECIES	DIAMETER (cm)	C. ANGLE L. (deg.)	LENGTH (m)
01	CW	50	4 25	05
02	CW	30	3 03	25
03	CW	12	4 02	10

NO. (B)	SPECIES	DIAMETER (cm)	C. ANGLE L. (deg.)	LENGTH (m)
16	CW	75	3 02	30
17	CW	70	2 10	12
18	U	45	5 35	10
19	U	50	5 40	12



COARSE WOODY DEBRIS TRANSECT NO: 10
Azimuth: (A) 90 (B) 60 Line Length Observed: 24 m of: 48 m
PLOT NO: 10
MEASUREMENT DATE: Y Y M O N D O D 96 JUL 25
CREW (Initials): Person 1: MG Person 2:
COMMENTS

NO. (A)	SPECIES	DIAMETER (cm)	C. ANGLE L. (deg.)	LENGTH (m)
01	CW	26	2 00	15
02	LW	27	1 06	30
03	CW	35	2 15	30
04	U	47	3 02	25

NO. (B)	SPECIES	DIAMETER (cm)	C. ANGLE L. (deg.)	LENGTH (m)
16	LW	05	1 03	30
17	LW	35	1 06	35
18	PL	10	1 06	10
19	U	20	4 04	10
20	LW	08	1 02	30
21	SW	40	2 05	35

BRITISH COLUMBIA WILDLIFE DATA FORM

PROJECT ID. SILVER STAR — PAGE 1 OF 1

PLOT NO. 1/1 — SUBPLOT — HUMAN ACTIVITY: DISTANCE 1, TYPE 4

SURVEYOR: MARTIN GEBAUER

Species Code	Sighting N	Sign N	Sign Code	Season of Use	Habitat Use	Landform	Adj. Cover	Pres. Prod.	Pot. Prod.	Pres. Suit.	Capability	Comments
ODHE		3 / 1	E / F	SU	F	1	3	4	4	4	4	1
URAM				SU	F					5	5	2
BATS										P	P	3
WOOD										L	L	4
AMPH										A	A	
										N	N	
BIRD												
TAHU		1	F									

COMMENTS:
1 - SOME FORAGING POTENTIAL - RUTTING
2 - GOOD #S OF HUCKLEBERRY
3) Some feeding potential / few roost ...
4) some foraging / few nesting

FS 882A HRE 96/4

BRITISH COLUMBIA WILDLIFE DATA FORM

PROJECT ID. Silver Star — PAGE 1 OF 1

PLOT NO. 1/2 — SUBPLOT — HUMAN ACTIVITY: DISTANCE 2, TYPE 4

SURVEYOR: Martin Gebauer

Species Code	Sighting N	Sighting note	Sign N	Sign Code	Season of Use	Habitat Use	Landform	Adj. Cover	Pres. Prod.	Pot. Prod.	Pres. Suit.	Capability	Comments
ODHE					SU	F	1	2	5	5	5	5	1
URAM					SU	F/W					5	5	2
BATS											P	P	3
WOOD											L	L	4
AMPH											A	A	
NOGO	1	(visual)											
TAHU			1	F									

COMMENTS:
1 - LITTLE FORAGE - ROOSTING?
2 - DEN SITE IN CW IN VALLEY BELOW
3) Possible @ low abundance because of open habitats
4) some large nesting

FS 882A HRE 96/4

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

COARSE WOODY DEBRIS TRANSECT NO. 1

Azimuth (A) 180 (B) 270 Line Length Observed 24 m of 48 m

PLOT NO. 11

MEASUREMENT DATE (YY MON DD): 96 JUL 25

CREW (Initials): Person 1: HG Person 2:

COMMENTS

NO. (A)	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)	NO. (B)	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
01	CW	40	2	18	35	16	PL	15	1	22	15
02	U	35	2	35	10	17	PL	22	2	28	10
03	Ad	07	2	27	05	18	CW	25	2	12	25
04	As	13	2	34	10	19	PL	10	1	16	10
05	CW	12	1	15	25	20					
06						21					
07						22					
08						23					
09						24					
10						25					
11						26					
12						27					
13						28					
14						29					
15						30					

COARSE WOODY DEBRIS TRANSECT NO. 12

Azimuth (A) 270 (B) 360 Line Length Observed 24 m of 48 m

PLOT NO. 12

MEASUREMENT DATE (YY MON DD): 96 JUL 25

CREW (Initials): Person 1: HG Person 2:

COMMENTS

NO. (A)	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)	NO. (B)	SPECIES	DIAMETER (cm)	C L	ANGLE (deg.)	LENGTH (m)
01	PL	35	1	29	35	16	CW	20	2	22	25
02	U	20	3	08	05	17	PL	25	2	10	20
03	PL	30	1	06	35	18	U	30	5	05	10
04	PL	08	1	33	10	19	PL	25	2	23	20
05	As	06	1	08	07	20	PL	30	2	05	15
06	As	08	3	05	05	21	U	50	5	18	10
07						22	LW	10	1	15	09
08						23	LW	25	2	18	20
09						24	LW	08	1	12	15
10						25					
11						26					
12						27					
13						28					
14						29					
15						30					

FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P07

BRITISH COLUMBIA **WILDLIFE DATA FORM**

PROJECT ID: Silver Star PAGE 1 OF 1

PLOT NO. 13 SUBPLOT HUMAN ACTIVITY DISTANCE / TYPE

SURVEYOR: Martin Gebauer

SPECIES CODE	SIGHTING N	SIGHTING (other)	SIGN N	SIGN CODE	SEASON OF USE	HABITAT USE	LANDFORM	ADJ. COVER	PRES. PROD.	POT. PROD.	PRES. SUIT.	CAPABILITY	COMMENTS
ODHE			1	E	SU	F	1	3	5	5	5	5	1
URAM					SU	F					5	5	1
BATS											A	A	
WOOD											L	L	
AMPI											A	A	
RECR	5	[illegible]	2	r									
TAHU													

COMMENTS: 1 - POSSIBLY USED IN RUTTING

FS 882A HRE 96/4

BRITISH COLUMBIA **WILDLIFE DATA FORM**

PROJECT ID. SILVER STAR PAGE 1 OF 1

PLOT NO. 14 SUBPLOT HUMAN ACTIVITY DISTANCE / TYPE

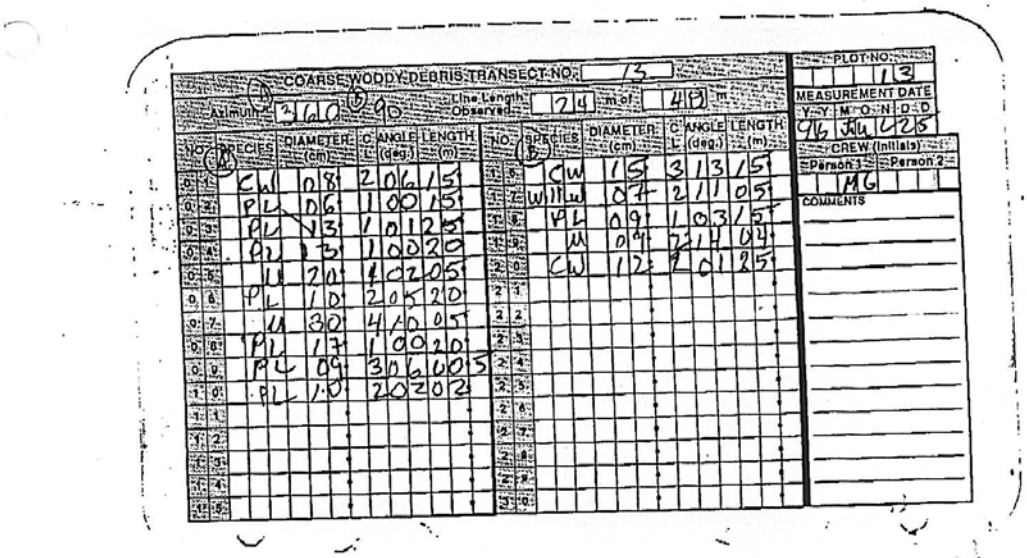
SURVEYOR: Martin Gebauer

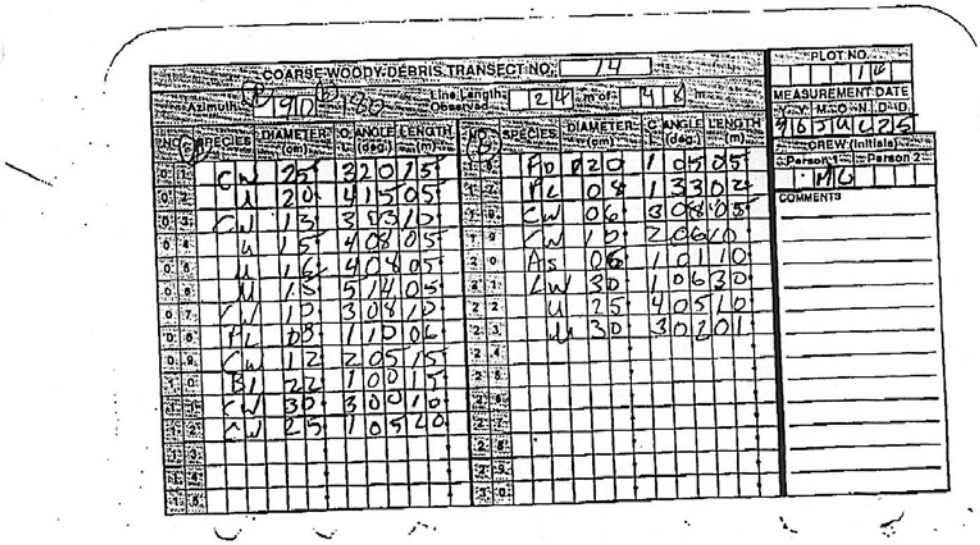
SPECIES CODE	SIGHTING N	SEX	SIGN N	SIGN CODE	SIGN N	SIGN CODE	SEASON OF USE	HABITAT USE	LANDFORM	ADJ. COVER	PRES. PROD.	POT. PROD.	PRES. SUIT.	CAPABILITY	COMMENTS
ODHE							SU	F	1	3	3	U	3	3	
URAM			2	E	1	D	SU	F					3	3	2
BATS													P	P	3
WOOD													M	M	4
AMPI													P	P	5
TAHU			10	F											1
SPGR	1	B	10	E											

COMMENTS:
1 - SEVERAL HUGE MIDDEN HERE
2 - GOOD FEEDING - ALSO SOME DENNING

FS 882A HRE 96/4 3) good roosting / some feeding 4) Foraging & cov. nesting opp. 5) Quite a [illegible] site

FROM : ENVIRO-PACIFIC CONSULTING PHONE NO. : 604 541 4197 P14





H: Stream Survey Forms

DFO / MOE
STREAM SURVEY FORM

Stream Name (geo.) Coldstream Ck (local) | Access V4 | Method
Watershed Code 3.1.10.9.3.9.4.1.5.4 | Reach No. | Length(km)
Location East Fork at 1800 m elevation | Map 82 L/6 | Site No. 1 | Length(m) 200 | HC
Main Stem | UTM 542763 | Fish Grid Y | Fish ☒ Rist ☐
Date Y M D 97 07 25 | Time 11:30 | Agency GmA | Crew MN/EA/ | Photos 4 | Air Photos

C	PARAMETER	VALUE	METH.	SPECIFIC DATA
	Ave.Chan.Width (m)	1.8	MS	1.8, 2.0, 1.5
	Ave.Wet Width (m)	1.0	MS	1.4, 0.8, 0.7
	Ave.Max.Riffle Depth (cm)	3	MS	3 4 3
	Ave.Max.Pool Depth (cm)	29	MS	18 20 50
	Gradient %	2	CL	
	%Pool 10 %Rifle 50 %Flat 40 %Cascade		E	
	Side Channels 0 0-10% 0 10-40% 0 >40%		E	
	Oxbow Area% 0 0-5% 0 5-10% 0 >10%		E	
	Stable %	90	E	
	COVER: Total %	80	E	

Comp. sum 100%	Op Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
T	20	0	0	60	20	

Crown Closure % 10 | Aspect 190

BED MATERIAL

		%
Fines	clay,silt,sand (<2mm)	40
Gravels	small (2-16mm)	30
	large (16-64mm)	30
Cobbles	sm.cobble (64-128mm)	
	lge.cobble (128-256mm)	
	boulder (>256mm)	
Bedrock		

D_{90}(cm) 10 | Compaction (L) M H

BANKS

Height(m) 0.6 | %Unstable 0 | Texture (F) G L R

Confinement	EN	CO	(FC)	OC	UC N/A
Valley: Channel Ratio	0-2	2-5	(5-10)	10+	N/A
Stage	Dry	(L)	(M)	H	Flood
Flood Signs Hi(m)	—		Braided	Y	(N)
Bars (%) <5	pH	—		O_2(ppm)	—
Water Temp (°C) 9	Turb.(cm) >100		Cond.(25°C) ~~160~~		

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	0.3	MS	
Mean Depth (m)	0.03	MS	
Mean Velocity (m/s)	0.61	C2	
Discharge (m^3/s)	0.006		

REACH SYMBOL (Fish) 259

(Width,Valley Channel,Slope) (Bed Material)

REVISED DEC 87 SS187

FISH SUMMARY

C	Species	No.	Size Range(mm)	Life Phase	Use	Method(s)
	6 Traps set 17:30 July 24, Collected 11:00 July 25 - no fish					
	Electrofished 100 m u/s from road, 1,125 seconds, 400 Volts 80 hz, single open pass - no fish					

STREAM/VALLEY CROSS-SECTION (Looking Downstream) ☐ L R
PLANIMETRIC VIEW ☐

COMMENTS

Channel Stability ☐ Debris ☐ Management Concerns ☐ Obstructions ☐ Riparian Zone ☐ Valley Wall Processes ☐ Etc.

1 Culvert at forestry road, 4% slope, 0.8m diameter, 14 m long

Veg: Twinberry, Thimbleberry, Gooseberry, Alder, Hellebore sp., Lady fern, Horsetail, Fireweed, Spruce, Cedar, Cottonwood, Fir, Twisted stalk, High bush - cranberry, devils club, red osier dogwood.

Edited by: MN
Date Y M D:

DFO/MOE STREAM SURVEY FORM

Stream Name (gaz.) Vance Creek (local) | Access V4 | Method
Watershed Code 1 2 8 3 5 5 5 4 1 3 5 2 | Reach No. | Length(km)
Location 6.8 km up Vance Creek Forestry Road from Twinity Valley Road | Map 82L/7 | U.T.M. 587 785 | Site No. 2 | Length(m) 100 | HC
Date Y M D 96 07 24 | Time 12:30 | Agency GMA | Crew MN/EA/ | Photos 1-9 | Air Photos | Fish Obsd Y (N) | Fish X | Hab

PARAMETER	VALUE	METH.	SPECIFIC DATA
Ave.Chan.Width(m)	3.4	T	3.0 4.5 2.5 4.0 3.0
Ave.Wet.Width(m)	1.6	T	1.5 1.8 1.5 1.3 2.0
Ave.Max.Riffle Depth (cm)	9	MS	10 15 8 8 5 12 8
Ave.Max.Pool Depth (cm)	39	MS	25 40 25 50 35 50 50
Gradient %	7	CL	
%Pool 20 %Rif 50 %Cascade 30		E	
Side Chan % (0 / 0-5 / 5-10 / 10-20 / >20)		E	
Debris Area % (0 / 0-5 / 5-10 / >20)		E	
Debris Stable %	60		
COVER: Total %	30		
Comp. sum 100% — Dp Pool 30, L.O.D. 20, Boulder 0, In Veg 0, Over Veg 40, Cutbank 10			
Crown Closure % 10	Aspect 140		

BED MATERIAL (%): Fines clay,silt,sand (<2mm) 20; Gravels small (2-16mm) 35; large (16-64mm) 15; Larges sm.cobble (64-128mm) 10; lge.cobble (128-256mm) 10; boulder (>256mm) T; Bedrock (R)
D_{90}(cm) 40 Compaction L (M) H

BANKS: Height(m) 0.8 %Unstable 65; Texture (F) S L R; Confinement EN (CO) FC OC UC N/A; Valley: Channel Ratio (0-2) 2-5 5-10 10+ N/A; Stage Dry L (M) H Flood; Flood Signs Ht(m) 0.8 Braided Y (N); Bars (%) 5 pH — O_2(ppm) —; Water Temp.(°C) 8 Turb.(cm) >100 Cond.(25°C) 160

OBSTRUCTIONS

C	Ht(m)	Type	Loc'n
1	0.6	X	20m
2	0.6	X	30m
3	1.0	X	80m

REACH SYMBOL (Fish) 229

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)	0.9	MS	
Mean Depth (m)	0.11	MS	
Mean Velocity (m/s)	0.18	FL	8.8, 8.3, 8.5 sec / 2m X 0.75
Discharge (m^3/s)	0.02		

(Width,Valley,Channel,Slope) (Bed Material)

QP-16935 REVISED DEC 87 SS187

FISH SUMMARY

C	Species	No.	Size Range(mm)	Life Phase	Use	Method/Bait
	6 Minnow traps set 17:20					
	July 24. Collected 10:00					
	July 25 - No Fish.					
	Electrofished 1st pass 1350 seconds					
	2nd pass 972 seconds					
	400 Volts, 80 Hz					
	no fish captured					

STREAM/VALLEY CROSS-SECTION (Looking Downstream) ☐ L R
PLANIMETRIC VIEW ☐

COMMENTS

Channel Stability ☐, Debris ☐, Management Concerns ☐, Obstructions ☐, Riparian Zone ☐, Valley Wall Processes ☐, Etc.

1 0.6 m obstruction of wood & sediment, 0.4 m pool u/s & d/s
2 wood & sediment
3 1 m sediment filled debris jam - alders.

Riparian Vegetation: Devil's club, Lady fern, alder, Thimbleberry, Black gooseberry, cottonwood, cedar, hemlock, foam flower, oak fern

Edited by: MN
Date Y M D:

CASCADE ENVIRONMENTAL
RESOURCE GROUP LTD

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.)	Vance Creek (local)	Access	V4
Watershed Code	1.28.8.3.5.5.5.4.1.3.5.2	Length (km)	
Location	Downstream of proposed lift station	Map	82 L/6
		U.T.M.	553796
Site No.	1		200 HC
	Y (N)		
Date Y/M/D	96 07 23	Time	10:45
Agency	Gov't	Crew	MN/EA/
Photos	8-10	Air Photos	
Method			

PARAMETER	VALUE	METH.	SPECIFIC DATA
Ave. Chan. Width (m)	4.9	MS	6.5, 4.0, 5.5, 5.0, 4.8, 4.5, 4.5, 6.0, 3.5
Ave. Wet Width (m)	2.3	MS	1.7, 3.1, 1.6, 3.5, 2.5, 1.5, 2.5, 3.0, 1.8
Ave. Max. Riffle Depth (cm)	5	MS	5, 5, 8, 5, 7, 7, 4, 5, 7
Ave. Max. Pool Depth (cm)	31	MS	18, 45, 28, 25, 30, 32, 24, 60, 15
Gradient	14	CL	
% Pool 40, Riffle 55, 5		E	
Side Chan.		E	
Debris		E	
Stable %	10		
COVER: Total %	20	E	

Comp. sum 100%	Dp Pool	L.O.D.	Boulder	In Veg	Over Veg	Cutbank
	35	5	35	0	20	5

Crown Closure %: <5 — Aspect: 120

BED MATERIAL		%
Fines	clay, silt, sand (<2mm)	20
Gravel	small (2-16mm)	15
	large (16-64mm)	15
	sm. cobble (64-128mm)	15
Large	lge. cobble (128-256mm)	15
	boulder (>256mm)	20
Bedrock (R)		

D_{90} (cm): 60 — Compaction: L (M) H

BANKS			
Height (m)	1.0	% Unstable	25
Texture	F (G) (L) R		

Confinement	EN	(CO)	FC	OC	UC N/A
Valley: Channel Ratio	(0-2)	2-5	5-10	10+	N/A
Stage	Dry	L	(M)	H	Flood
Flood Signs Ht (m)	0.5	Braided	Y (N)		
Bars (%)	5	pH	—	O_2 (ppm)	—
Water Temp (°C)	11	Turb. (cm)	>100	Cond. (25°C)	200

OBSTRUCTIONS	Type	Loc'n
0.6	X	

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m^3/s)	0.02	E	

REACH SYMBOL (Fish) 302

(Width, Valley, Channel, Slope) (Bed Material)

REVISED DEC 87 SS187

QP - 16935

FISH SUMMARY

Species	No.	Size Range (mm)		Use	
6	Minnow traps		set		12:20
	July 23, 96,		Collected		07:05
	July 24, 96.		No fish,		one
	water shrew (dead)				
Electrofishing	1st pass,		1096 Seconds,		
2nd	pass	1080 Seconds			
3rd	pass	840 seconds			
400	volts, 80 Hz				
no	fish captured				

STREAM/VALLEY CROSS-SECTION ☐
(Looking Downstream)

PLANIMETRIC VIEW ☐

L R

COMMENTS

Channel Stability ☐; Debris ☐; Management Concerns ☐; Obstructions ☐; Riparian Zone ☐; Valley Wall Processes ☐; Etc.

Aquatic orgs: caddis fly, stone fly
Tributary stream on left
Banks / side slopes up to 7m high slumping into channel in several locations
log creates 0.6 m drop. mid channel bar contains mixed gravels & wood debris
1 m high, suggest small jam blow-out. 30 m of creek looks like
debris flood / torrent.

Riparian Vegetation: willow, alder, horsetail, black gooseberry, thimbleberry, fern,
cow's parsnip, devil's club, Douglas maple, foam flower, red-osier dogwood
cottonwood, fireweed.
Spruce, Douglas fir, cottonwood

Edited by: MN
Date Y M D:

DFO / MOE
STREAM SURVEY FORM

Stream Name (gaz.) Putnam Creek (local)
Access V4 Method
Watershed Code 1,2,8,8,3,5,5,2,5,7,5,1,8,4,1
Length (m) 200 HC
Location 500m upstream of lift station
Map # 82L/6
U.T.M. 560 844
Fish Sp. No. 1
Y N
Date Y M D 96 07 23 Time 14:30 Agency Creek Crew MN/EA/
Photos 1-7 Air Photos

PARAMETER	VALUE	METH.	SPECIFIC DATA
Ave. Chan. Width (m)	3.5	MS	3.0, 3.0, 4.0, 4.5, 3.0
Ave. Wet. Width (m)	2.2	MS	1.8, 1.8, 1.8, 2.0, 2.5
Ave. Max. Riffle Depth (cm)	11	MS	10, 12, 10, 15, 8, 10, 12
Ave. Max. Pool Depth (cm)	51	MS	110, 35, 60, 30, 35, 50, 35
Gradient %	5	CL	
% Pool 20 Riffle 40 Run 40 Other		E	
Side Chan. %		E	
Debris Area %		E	
Stable %	60	E	
COVER: Total %	35	E	
Comp. sum 100%	Dp Pool 20, L.O.D. 35, Boulder 5, In Veg 0, Over Veg 35, Cutbank 5		
Crown Closure %	10	Aspect 120	

BED MATERIAL (%)
Fines: clay, silt, sand (<2mm) 30
Gravels: small (2-16mm) 30; large (16-64mm) 20; sm cobble (64-128mm) 10
Larges: lge. cobble (128-256mm) 5; boulder (>256mm) 5
Bedrock (R) 0
D90 (cm) 25 Compaction L M H

BANKS
Height (m) 1.5 % Unstable 45
Texture F G S R
Confinement: EN CO FC OC UC N/A
Valley Channel Ratio 0-2 2-5 5-10 10- N/A
Channel Type: Dry L M H Flood
Flood Signs Ht (m) 0.4 Braided Y N
Bars (%) <5 pH — O2 (ppm) —
Water Temp (°C) 10 Turb. (cm) >100 Cond. (25°C) 180

OBSERVATIONS

Dist.	Type	Loc'n
0.7	X	
0.5	X	
0.4	X	

DISCHARGE

Parameter	Value	Method	Specific Data
Wetted Width (m)			
Mean Depth (m)			
Mean Velocity (m/s)			
Discharge (m³/s)	0.03	E	

REACH SYMBOL (Fish) 241
(Width, Valley Channel, Slope) (Bed Material)

REVISED DEC 87 SS187
QP-16935

FISH INFORMATION

Species	No.	Size Range (mm)	Capture Method	Use	Tag No./Rel.

6 Minnow traps set 16:35 July 23
Collected 07:55 July 24 - no fish

Electrofishing - 1st. pass - 1665 sec.
2nd pass - 1050 seconds
3rd pass - 792 seconds
400 volts, 80 Hz
no fish captured.

STREAM/VALLEY CROSS-SECTION (Looking Downstream) ☐
L R
PLANIMETRIC VIEW ☐

COMMENTS
Channel Stability ☐ Debris ☐ Management Concerns ☐ Obstructions ☐ Riparian Zone ☐ Valley Wall Processes ☐ Etc.

Riparian vegetation: hemlock, alder, devil's club, fern, red-osier dogwood, horsetail, twisty stalk, false flower, oak fern, lady fern, western columbine.
Canopy: hemlock, cedar, lesser amounts of Douglas fir, spruce
Aquatic inv.: caddis fly, stonefly, dragon fly
Deep pool at start of survey, 1.1m deep with 0.8m jump over debris jam.
Tributary entering from left, <5 l/s

Edited by
Date Y M D

I: Wastewater Treatment Plant – Summary of Operations

GEOALPINE

ENVIRONMENTAL CONSULTING

MEMORANDUM

DATE: September 17, 1997
TO: Dick Munn, Silver Star
CC: Dennis O'Farrell, Silver Star
FROM: Michael JB Cole, P.Eng., Geoscience Engineer
RE: Sewage Treatment Plant –Summary of Operations
FILE #: GEC 012/01/03

1.0 INTRODUCTION

The following is a summary of the information collected as a result of interviews with Silver Star staff regarding the sewage treatment plant (STP).

1.1 Overall Situation

The sewage treatment plant has been in operation since 1981 (i.e., 16 years) and has been marginally upgraded since it's inception. The operation of this facility may change significantly based on the development of a golf course on the lands adjacent to the Silver Star Ski area. It is the objective of Silver Star to review the past operation of the sewage treatment plant and determine the future needs in relation to the proposed facilities.

1.2 Project History

Dennis O'Farrell (Silver Star) and Mike Cole (GeoAlpine) met in May 1997during the Canada West Conference in Harrison, BC to discuss the history of the STP operation and the water quality monitoring program. During this interview, Mr. Cole reviewed the information gathered by Dennis and his staff during the past several years and arranged for copies of the pertinent information to be sent to GeoAlpine's office.

In late May, compilation of the data was temporarily suspended due to uncertainties in deadlines arising from local Native issues. In mid June, Dennis' staff supplied GeoAlpine with the requested information. This information was reviewed and a summary report was issued although no comprehensive report was created.

During the July 14th meeting in Vancouver, it was decided that Sam Turk NOVATEC would finish compiling the information gathered and process the information, as NOVATEC will complete a detailed design assessment on the STP. GeoAlpine has since passed along all information compiled by GeoAlpine to NOVATEC.

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2.0 POTABLE WATER SOURCE

An associated issue to the sewage treatment plant is the source of potable water. The potable water for Silver Star Resort is located on the slopes of the ski hill but owned by North Okanagan Regional District (NORD) but maintained by Silver Star maintenance staff. The system consists of two components:

1. 5-6 deep water wells (drilled to 300-500 feet) used to fill two-100 000 gallon closed cisterns: and
2. a shallow groundwater-fed open pond.

These systems are managed coincidentally to supply potable water.

3.0 SEWAGE TREATMENT PLANT

The sewage treatment plant (STP) is located on the watershed boundary of Coldstream and Vance Creeks. The sewage facility consists of a Level 1 - activated sludge STP that has evolved since commencement in 1981 in response to the growth of the residential and commercial facilities. Dennis O'Farrell, maintenance manager, Silver Star and Warren McKim, supervisor, operate the STP facility. The British Columbia Water and Wastewater Operators Certification Program Society (BCWWOCPS), as specified by MOELP certify both.

The original STP design included:

- ◊ 2-one million gallon aeration cells, feeding through a
- ◊ sand filter and then to
- ◊ a 20 million gallon detention pond.

Water from the detention pond was to be used for snowmaking.

Presently the design includes:

- ◊ three aeration cells,
- ◊ a sand filter and
- ◊ a 13 million gallon infiltration pond

No water is presently used for snowmaking. Rather the effluent enters into the storage reservoir and is allowed to percolate into the substrate, as the pond is unlined. It is assumed that since no flow data for an overflow structure exists that all flows are reporting to the groundwater table. Effluent is expected to report to both Vance and Coldstream Creek Watersheds.

An effort has been made to maximize the efficiency of the system in recent years. Commercial available bacteria have been introduced into the aeration ponds to help neutralize the effluent. These bacteria have been used successfully at other ski resorts (including Big White) in similar situations.

There is some indication from the water level data that infiltration into the detention pond occurs during snowmelt (3rd week of March to mid-June).

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3.1 Effluent Release Permit (PR-6738)
The Sewage Permit for this plant states that effluent quality must meet the following criteria at the outlet of the 3rd aeration cell prior to entering the sand filter:

- ◊ BOD (biochemical oxygen demand) <45 mg/L
- ◊ SS (suspended solids) <60 mg/L

To ensure that these criteria are met a water sampling program has been conducted weekly for the past several years.

3.2 Water Quality Sampling
Water quality sampling is undertaken throughout the system from the tertiary aeration cell to several locations along both Vance and Coldstream Creeks (both surface and groundwater). During the past five years, water samples have been sent to two separate testing laboratories (JB and Caro Env. Services). Water quality data supplied by Silver Star is appended.

In addition to the sample collected by Silver Star, total coliform and faecal coliform counts have been analyzed weekly by MoH provincial laboratory (May 09 96 – Apr 23 97 present in binder) covering five locations:

- ◊ Open Reservoir
- ◊ Pinnacles
- ◊ Grandview
- ◊ Firehall
- ◊ Maintenance Shop

All samples were at or below 1mg/100ml.

3.3 Pond Capacity
At the request of Silver Star staff a volume elevation curve for the infiltration pond is enclosed. The curve was produced based on elevation data provided from the as-built survey by Russell N. Short. The information provided on the original design plan was not useable, as the berm elevation did not match with the contour data provided on the plan. The as-built plan that GeoAlpine has used for this work is a crude photocopy and most of the details are missing but we believe that the numbers produce will aid you in determining the pond volume. These numbers do not take into account any infilling of the pond. If more accurate numbers are required it would be worth your while to have a surveyor come up and rune two or three cross sections through the pond.

Based on the topography provided, the total volume of the pond is approximately 60 000 m^3 or 13 million gallons (Imp.) at an elevation of 1527 m. The top of berm is listed as 1527.05 m.

3.4 Non-compliance
During the past 16 years there have been two periods when the STP had been found in non-compliance. One incident (Dec 1995) relates to a block sewer main that caused an overflow situation prior to reaching the STP and the second relates to an unacceptable BOD levels in 1992. The data suggests that there are other periods when the STP has been in non-compliance but not reprimanded by MOE.

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The data also suggests that conditions at the STP are improving and that out of compliance results are.

4.0 COMMUNITY CONCERNS

There are some concerns from community watersheds regarding the water quality downstream of Silver Star Resort. Vance Creek supplies the community of Lavington and Coldstream Creek supplies the community of Coldstream. Coldstream was historically a ranching community that supports an increasing number of residents and has their own water and sewer system. Concerns have also been raised regarding water quality in Kalamalka Lake. It is understood that Coldstream Creek has been identified as one of the ten worst polluted river in BC.

Cattle grazing occurs on the intermediate slopes between Silver Star's STP and the community intake. Cattle are known to graze with the park boundaries based on observations made during field studies in the summer of 1996. Nutrient loading from cattle grazing is a possible and likely component to any decrease in water quality downstream.

4.1 Future Projected Usage's

Future expansions on Silver Star are slated to occur separate from the proposed golf course. These would include a subdivision expansion (Meadowview) and a hotel expansion above Vance Creek Lodge. Estimated increase in sewage loading is not known.

5.0 RECOMMENDATIONS AND CONCLUSIONS

The information provided herein is a summary of the data compiled by GeoAlpine with the help of Silver Star staff. The final report is to be completed by NOVATEC in conjunction with further information regarding the golf course. The following are some recommendations regarding the present operations:

1. Consolidate the water sampling programs by sending all samples to one laboratory. As the samples have been split between the two different testing labs for the past few years, there is a need to verify the results of both labs – Over the next 12 months, two complete sampling suites should be taken and sent to both labs and the results compared. After this period the complete sampling suites should sent to one lab.
2. The infiltration rates from upslope sources should be monitored to determine whether this is a concern. If this is the case then French drains and trench dams could be used to redirect the groundwater from the pond area.
3. A capacity study should be undertaken to determine projected growth of the townsite and the results incorporated into the work being completed by NOVATEC.
4. Notify MOE of effluent discharge into Coldstream (i.e., change wording in Permit section 1.1 (permit # PE 6738) to include Coldstream as well as Vance)
5. As a safety precaution, all GW testing wells should be secured with tamper proof caps – this will ensure that wells are not contaminated by the curious.

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6.0 CONTACT LIST

SILVER STAR STAFF		
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Rick Guillton,	Former Site Hydrogeologist	
Gov't Officials		
Mike Knollan,	Water Engineer, NORD	(250)
Rose Gunoff	Municpal technician, MOELP	(250) 490-8200
Bob Brody,	BC Lands	
Labs		
Caro Environmental Services (Formerly Chemac Env. Services)		(250) 765-9646
JB Labs, Victoria		(250) 385-6112
Provincial Laboratory, MoH	(Vince Nickel)	(250) 549-5714

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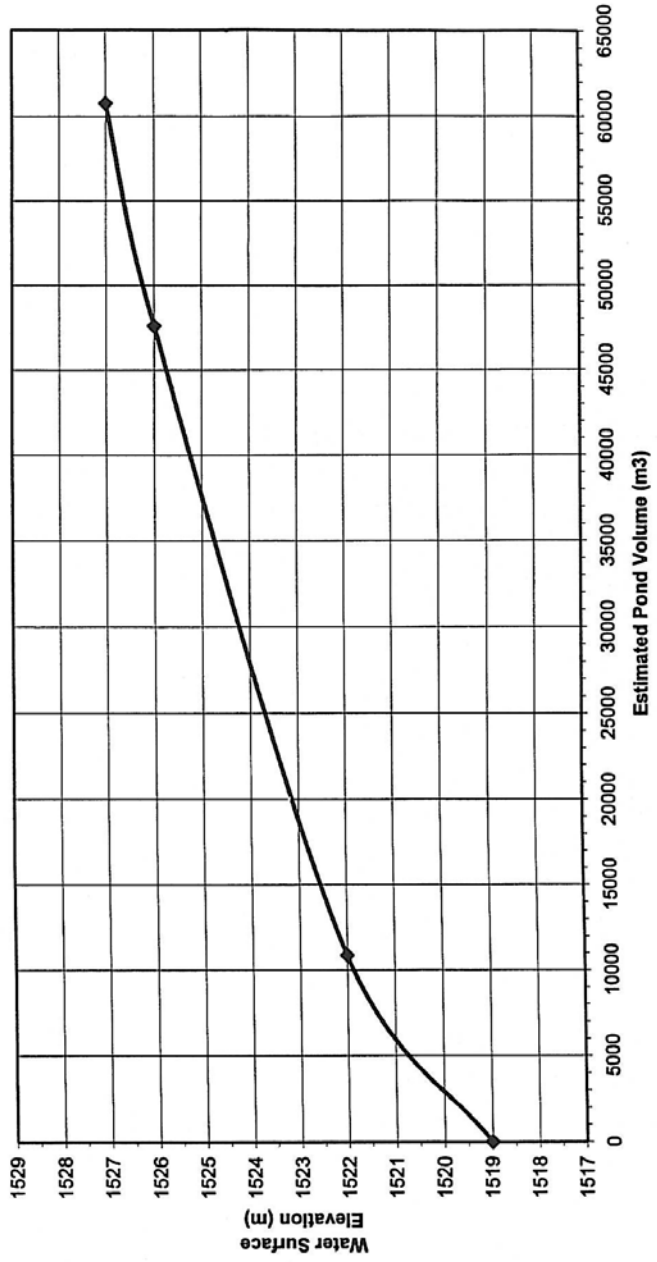
17/09/97

Volume Elevation Chart
Silver Star Effluent Pond
(see attached memo dated Sept 17, 1997)



GeoAlpine Envirnmental Consulting Ltd.
GEC 012/03/01

Silver Star - Water Sampling Data

GEC 012/03/01

DATE	SITE	BOD (mg/L)	S.S. (mg/L)	N02 + N03 (mg/L asN)	T. K.N. (mg/L as N)	T. N. (mg/L as N)	T. P. (mg/L as P)
3/22/95	20 m Overflow	12	4	1.3	18	19.3	3.8
4/17/95	20 m Overflow	<10	<1	0.03	29	29	2.37
7/17/95	20 m Overflow	312	86	0.01	40.5	40.5	4.2
8/15/95	20 m Overflow	17	24	0.8	-	-	1.1
1/18/95	20 m Polishing Pond	28	6	1.5	25	26.5	5.8
2/9/95	20 m Polishing Pond	<10	<1	1.23	21	22.2	5.6
10/23/95	20 m Reservoir	13	9	2.4	-	-	2.2
1/3/96	20m Set. Pond	<10	2	2.9	-	-	2.6
1/31/96	20m Set. Pond	13	3	1.2	-	-	3.5
3/6/96	20m Set. Pond	27	<1	0.01	-	-	4.8
4/4/96	20m Set. Pond	<10	4	0.12	-	-	3.4
7/5/96	20m Set. Pond	<10	2	0.95	-	-	1.9
10/9/96	20m Set. Pond	<10	2	3.3	-	-	2
12/7/96	20m Set. Pond	<10	5	2.15	-	-	2.15
12/21/96	20m Set. Pond	<10	2	1.85	-	-	1.8
1/23/97	20m Set. Pond	<10	3	0.6	-	-	3.6
2/21/97	20m Set. Pond	16	8	<0.01	-	-	5.4
3/5/97	20m Set. Pond	28	8	0.03	-	-	6.2
3/20/97	20m Set. Pond	13	6	0.03	-	-	6
4/30/97	20m Set. Pond	<10	9	0.15	-	-	0.51
10/5/94	Cell #2	43	70	15	8.5	23.5	4.6
1/7/92	Cell #2 Effluent	49	53	0.01	56.3	56.3	7.6
3/2/96	Cell #3	70	23	0.95	43	43.5	9.1
3/2/94	Cell#2	79	59	0.95	49	49.95	10.2
1/18/95	Cell#2 Overflow	94	84	0.1	62	62.1	11.6
2/9/95	Cell#2 Overflow	42	72	0.14	46	46.1	10.4
3/22/95	Cell#2 Overflow	74	76	0.11	50	50.1	9.6
4/17/95	Cell#2 Overflow	52	71	0.18	50	50.2	9.35
7/17/95	Cell#2 Overflow	33	106	6.75	21	27.75	5
8/15/95	Cell#2 Overflow	48	67	10.4	-	-	5.75
10/23/95	Cell#2 Overflow	20	45	13.5	-	-	4.5
1/3/96	Cell#2 Overflow	59	57	0.2	-	-	8.2
1/31/96	Cell#2 Overflow	52	69	0.16	-	-	9.3
3/6/96	Cell#2 Overflow	69	72	0.14	-	-	8.4
4/4/96	Cell#2 Overflow	46	11	0.13	-	-	8.7
7/5/96	Cell#2 Overflow	30	20	1.7	-	-	2.4
10/9/96	Cell#2 Overflow	39	32	5	-	-	5.1
12/7/96	Cell#2 Overflow	35	24	1.75	-	-	5.4
12/21/96	Cell#2 Overflow	81	53	0.18	-	-	7
1/23/97	Cell#2 Overflow	49	52	<0.01	-	-	8.4
2/21/97	Cell#2 Overflow	59	53	<0.01	-	-	8.3
3/5/97	Cell#2 Overflow	51	66	0.07	-	-	7.6
3/20/97	Cell#2 Overflow	62	70	0.07	-	-	8.8
4/30/97	Cell#2 Overflow	19	41	0.28	-	-	5.4
10/5/94	Cell#3	<10	20	7.6	3.3	10.9	2.3
1/18/95	Cell#3 Overflow	80	27	0.27	60	60.3	11
2/9/95	Cell#3 Overflow	25	35	0.21	48	48.2	10.8
3/22/95	Cell#3 Overflow	47	31	0.18	50	50.2	10
4/17/95	Cell#3 Overflow	152	85	0.65	52	52.7	10.2
7/17/95	Cell#3 Overflow	37	78	2.8	12	14.8	3.5
8/15/95	Cell#3 Overflow	15	48	9.25	-	-	3.6
10/23/95	Cell#3 Overflow	<10	18	14.8	-	-	3.2
1/3/96	Cell#3 Overflow	33	24	0.7	-	-	6.5
1/31/96	Cell#3 Overflow	27	26	0.25	-	-	8.5
3/6/96	Cell#3 Overflow	39	20	0.16	-	-	8
4/4/96	Cell#3 Overflow	32	5	0.16	-	-	8
7/5/96	Cell#3 Overflow	14	16	1.7	-	-	1.4
10/9/96	Cell#3 Overflow	27	16	4.4	-	-	3.2

Silver Star - Water Sampling Data

GEC 012/03/01

	12/7/96	Cell#3 Overflow	14	11	6.25	-	-	4
	12/21/96	Cell#3 Overflow	65	25	0.93	-	-	5.5
	1/23/97	Cell#3 Overflow	29	28	0.18	-	-	8
	2/21/97	Cell#3 Overflow	31	18	0.18	-	-	7.6
	3/5/97	Cell#3 Overflow	40	24	0.16	-	-	7.6
	3/20/97	Cell#3 Overflow	33	29	0.15	-	-	8.5
	4/30/97	Cell#3 Overflow	23	20	0.35	-	-	6.4
	3/3/92	Effluent	46	22	0.06	65.6	65.7	10.6
	10/5/94	Infiltration Pond	<10	2	0.3	2	2.3	1.8
	6/23/94	no site given	22	26	1.43	6	7.43	1.8
	6/8/92	Silver Star Effluent	24	49	1.47	7	8.5	3.8
	7/21/92	Silver Star Effluent	21	30	0.45	10.5	11	3.2
	9/22/92	Silver Star Effluent	22	37	1.9	14.5	16.4	1
	1/4/93	Silver Star Effluent	74	70	0.07	55	55.1	8.5
	2/3/93	Silver Star Effluent	61	57	0.09	50	50.1	10
	4/7/92	Silver Star Mountain	27	19	0.09	44	44.1	7.6
	2/24/93	Silver Star Mtn. Effluent	73	52	0.15	51	51.2	8.4
	7/6/93	Silver Star Mtn. Effluent	17	79	1.9	14.8	16.7	2
	9/14/93	Silver Star Mtn. Effluent	<10	53	7.5	6	13.5	2.3
	1/20/94	Silver Star Mtn. Effluent	48	46	0.11	47	47.1	8.5
	7/17/95	WW#3	64	614	5.25	40	45.25	8.3
	8/15/95	WW#3	16	46	10	-	-	4
	10/23/95	WW#3	10	15	13.8	-	-	3.2
	1/3/96	WW#3	31	32	0.75	-	-	6.8
	1/31/96	WW#3	35	27	0.28	-	-	8.5
	3/6/96	WW#3	39	26	0.19	-	-	7.9
	4/4/96	WW#3	28	6	0.2	-	-	7.7
	7/5/96	WW#3	10	20	1.4	-	-	1.2
	10/9/96	WW#3	15	11	5	-	-	3
	12/7/96	WW#3	15	10	6.75	-	-	4
	12/21/96	WW#3	32	23	0.93	-	-	5
	1/23/97	WW#3	53	22	0.19	-	-	8
	2/21/97	WW#3	27	22	0.2	-	-	7.8
	3/5/97	WW#3	47	21	0.23	-	-	7.4
	3/20/97	WW#3	34	27	0.17	-	-	8
	4/30/97	WW#3	21	20	0.4	-	-	5.8