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POTENTIAL FOR SUBAQUEOUS HOT-SPRING (ESKAY CREEK) DEPOSITS IN BRITISH COLUMBIA

By N.W.D. Massey, D.J. Alldrick and D.V. Lefebure

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INTRODUCTION

The Eskay Creek property lies 80 km north of Stewart, near the western margin of the Intermontane tectonic belt. The property includes several deposits of polymetallic sulphide and sulphosalt mineralization as both exhalative massive sulphide and discordant veins (see Appendix 2). These deposits are very attractive because of their enhanced precious metal contents and polymetallic nature. Eskay Creek has a mineable reserve of 1.45 Mt grading 57.7 g/t Au and 2493 g/t Ag as of January 1, 1999. It is the fifth largest silver producer in the world.

The Eskay Creek deposits are examples of shallow subaqueous hot spring deposits (Alldrick, 1995 and Appendix I; MacDonald et al., 1996;.Barrett and Sherlock, 1996), an important new class of submarine mineral deposits that has only recently been recognized in modern geological environments (Hannington, 1998; Poulsen and Hannington, 1996). They are relatively underexplored and poorly recognized within the geological record. The deposit type is transitional between subaerial hot spring Au-Ag deposits and deeper water, volcanogenic massive sulphide exhalites (Kuroko or Besshi types) and shares mineralogical, geochemical and other characteristics of both (Appendix I).

In the 1990s, exploration for subaqueous hot-spring deposits in British Columbia spread out from the Eskay Creek area, but has still been focussed mainly in the northwestern region within the volcanic rocks of Hazleton Group around the edge of the Bowser basin. Potential for their occurrence elsewhere in the province was recognised during the Mineral Potential Project (Kilby, 1996) and several tracts were assessed by expert groups for their potential to host an Eskay Creek-type deposit (see inset on Map 1). This study builds on this early work, compiling and documenting relevant geological and geochemical data useful in identifying areas of potential.

MAP COMPILATIONS

DATA SETS USED

Favourable Geology

Although the type Eskay Creek deposit is hosted in lower to middle Jurassic rocks of the Hazleton Group (MacDonald et al., 1996), there is no reason to believe that other sequences could not also be hosts. Consequently, for this compilation, favourable geological units were identified as those containing mafic to felsic volcanic sequences which developed in submarine or mixed submarine-subaerial environments, regardless of age. All geological units were selected from the digital version of the Tectonic

Assemblage Map of the Canadian Cordillera (Journeay and Williams, 1995) with minor edits and corrections. All stratigraphic units are generally at the Group level (Table 1). The 1:2,000,000 scale, of both source data and final compilation, precludes any more detailed selection of favourable geology based on specific volcanic lithology or geochemistry, for example, or other locally or regionally important characteristics such as alteration zones, extensional structures, etc.

NTP	Masset Fm.
JKG	Gambier Group
JB	Bonanza Group
JH	Hazleton Group
JHL	Harison Lake Group
JL	Ladner Group
TrJN	Nicola Group
TrKU	Kutcho Assemblage
TrS	Stuhini Group
pPS	Skolai Group
DS	Sicker Group
DPCH	Chilliwack Group
DPA	Asitka Group
OTrA	undivided seds/volcs of Alexander Terrane
PPzEK	Eagle Bay Group

Table 1: Stratigraphic units selected as being potential hosts to subaqueous hot-spring deposits.

MINFILE occurrences

Known occurrences of Eskay Creek-type, or of related types of mineralization, are a valuable guide to the indentification of areas potentially hosting undiscovered deposits. Five sets of occurences are included on Map 1:

1. *Known Eskay Creek-type deposits*; derived from Massey (1999).. See Appendix 2 for descriptions of these occurrences.
2. *Precious metal-rich VMS deposits*; derived from Massey (1999), includes all deposits, regardless of type, that are precious metal-rich. Defined as containing

Au>2g/t and/or Ag>100g/t (see fig 6.4-1 in Poulsen and Hannington, 1996) using either production figures, reserve/resource analyses or best assays.

3. *Kuroko-type VMS deposits* not included in the group above; derived from Massey (1999).
4. *Epithermal deposits*; all those occurrences identified in MINFILE as belonging to any of the Mineral Deposit Profile types H02, H03, H04, H05 (Pantleyev, 1996a, b, c, d).
5. Other gold or silver deposits identified in MINFILE as containing any of the "epithermal suite" of minerals, e.g. tetrahedrite, pyrargyite, stibnite, ruby silver, etc.

Some important VMS deposits in neighbouring Yukon and USA have also been included for reference.

During compilation of data for this study, several MINFILE occurrences were noticed that seem to show some of the characteristics of subaqueous hot-spring deposits. These are described in more detail in Appendix 3.

RGS anomalies

Eskay Creek-type deposits are marked by geochemical anomalies in a complex of elements reflecting their mixed volcanic-hosted base-metal massive sulphide (Cu, Zn, Pb, Au, Ag) and epithermal (Au, Ag, As, Sb, Hg) characteristics. An attempt has been made to define a multi-element anomaly based on analytical results for these elements from stream sediment and moss-mat samples from the provincial Regional Geochemical Survey database. Other elements may also be anomalous (e.g. Mo in stream sediments around Eskay Creek itself), but the mineralogical source for these is unknown and their global application uncertain.

A multi-step procedure was used in determining the anomalies. Following standard RGS procedures, data for Au, Ag, Cu, Pb, Zn, As, Sb and Hg were compiled for all 44438 sample locations. Each location was then rated for each element to determine sites anomalous at the 90^{th}, 95^{th} and 98^{th} percentiles (Table 2). A simple multi-element anomaly was then defined depending upon the number of anomalous "epithermal" elements, plus anomalous base and/or precious metals (see Table 3).

Two important restrictions affect the use of the RGS anomalies in identifying potential areas for Eskay Creek deposits. First, the RGS coverage of British Columbia, while extensive, is not complete (see inset on Map 2). Sampling to date provides coverage for only 70 percent of the Province. However, coverage of areas with geology favourable for Eskay Creek deposits is very good and only a few potentially interesting map sheets, e.g. 93D and 104H, have not yet been sampled. Also, over the twenty-three year history of conducting the RGS, analyzed element suites have varied somewhat between map sheets. This results in missing data for some elements and the consequent suppression of, or failure to detect, appropriate anomalies. Within the areas of interest in this study, this lack of data is only a problem for Au and Hg (see inset maps on Map 2).

Second, several areas can be identified on Map 2 where highly anomalous samples lie outside areas of favourable geology, e.g. the Cry Lake area in northern B.C., the Purcell Mountains in southeastern B.C. and the Mount Washington area of Vancouver Island. These areas reflect the fact that the multi-element anomaly used in this study is not uniquely characteristic of Eskay Creek type deposits, but may also be indicative of several other deposit types, e.g. some mesothermal gold veins, polymetallic subvolcanic veins, etc. However, combined with favourable geology and MINFILE occurrences, the anomalies should still be indicators of potential for subaqueous hot-spring deposits.

Element	Analytical method	Medium	Number of samples	90^{th} percentile	95^{th} percentile	98^{th} percentile
Sb	aas	stream sed	23934	1.2	2	3.8
Sb	aas	moss mat	3067	0.7	1.1	1.9
Sb	ina	stream sed	24155	2.2	3.4	5.9
As	aas	stream sed	29656	17	29.5	55
As	aas	moss mat	3067	17	29	57
As	ina	stream sed	24155	23	37	68.1
Hg	aas	stream sed	23503	110	150	240
Hg	aas	moss mat	3067	195	370	1100
Cu	aas	stream sed	38788	62	84	121
Cu	aas	moss mat	3067	135	162	196
Pb	aas	stream sed	38785	16	24	41
Pb	aas	moss mat	3067	9	13	20
Zn	aas	stream sed	38788	128	167	255
Zn	aas	moss mat	3067	106	138	185
Ag	aas	stream sed & moss mat	41850	0.3	0.4	0.6
Au	ina/fa	stream sed	30656	14	28	70
Au	fa	moss mat	3067	50	132	417

Table 2: Determination of anomalies in RGS samples (note all values in ppm, except Hg and Au, ppb). aas, atomic absorption spectroscopy; fa, fire assay; ina, instrumental neutron activation.

Multi-element anomaly	As, Sb, Hg	Cu, Pb, Zn		Au, Ag
Highly anomalous - pronounced epithermal signature	All 3 elements anomalous at the 90th percentile	Any 2 elements anomalous at the 95th percentile	and/ or	Any 1 element anomalous at the 95th percentile
Anomalous - pronounced epithermal signature	Any 2 elements anomalous at the 90th percentile	Any 2 elements anomalous at the 95th percentile	and/ or	Any 1 element anomalous at the 95th percentile
Moderately anomalous - possible epithermal signature	Any 1 elements anomalous at the 90th percentile	Any 2 elements anomalous at the 95th percentile	and/ or	Any 1 element anomalous at the 95th percentile
Anomalous for base or precious metals only	None anomalous	Any 2 elements anomalous at the 95th percentile	and/ or	Any 1 element anomalous at the 95th percentile

Table 3: Designation of multi-element RGS anomalies.

AREAS OF POTENTIAL

Several areas have been outlined on Maps 1 and 2, which may have some potential to host Eskay Creek type deposits. Selection was made based on the overlap of favourable geology with areas of mineralization and/or geochemical anomalies. More detailed information on the geological and geochemical backgrounds of these regions has been summarized in Table 4, in which the areas have been separated into three groups based on their potential (A - highest; C lowest).

Of these areas, the majority are underlain by lower to middle Jurassic sequences. In particular, the A group areas, and many B group areas, are underlain by volcanics of the Hazleton Group, the host of the Eskay Creek deposit. This regionally extensive package of rocks still remains the most important target for exploration for subaqueous hot-spring deposits. Other Jurassic sequences such as the Bonanza, Harrison Lake or Rossland groups appear to have lesser potential.

Paleozoic sequences, e.g. the Sicker Group of Vancouver Island, which are hosts to many precious-metal rich, polymetallic Kuroko-type VMS deposits, appear to have limited potential for Eskay Creek type deposits. These appear to be deeper water sequences lacking in epithermal mineralization, though recognition of shallow water facies is difficult in deformed volcanics and potential may exist in the Eagle Bay and Stikine assemblages. Upper Triassic arc sequences are generally mafic to intermediate in composition, lacking felsic components, and rarely emergent. Their potential appears to be limited.

The choice of areas and their groupings is somewhat subjective and reflects the state of knowledge and exploration in the particular areas. With more detailed geological and exploration information some areas may prove to have higher potential than is suggested here. Also, some of the deposits in Appendix 3, may suggest potential in areas not considered in Table 4.

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Appendix 1:

SHALLOW SUBAQUEOUS HOT SPRING Au-Ag G07

by Dani J. Alldrick

IDENTIFICATION

SYNONYMS: Eskay Creek-type deposit; epithermal massive sulphide; subaqueous hydrothermal deposit.

COMMODITIES (BYPRODUCTS): Ag, Au (Cu, Pb, Zn, As, Sb, Hg).

EXAMPLES (British Columbia - *Canada/International*): Eskay Creek (104B 008), Lulu (104B 376); *Osorezan, Vulcano Islands and Jade hydrothermal field (Japan), Mendeleev Volcano (Kurile Islands, Russia), Rabaul (Papua New Guinea), White Island (New Zealand), Bacon-Manito and Surigao del Norte (Philippines).*

GEOLOGICAL CHARACTERISTICS

CAPSULE DESCRIPTION: Synsedimentary bedded sulphides, replacement sulphides and associated veins are deposited in volcanic rocks and derived sediments in shallow water (<1000 metres depth).

TECTONIC SETTING: Active volcanic arcs (both oceanic island arcs and continental margin arcs), mid-ocean ridges, intraplate hot spot volcanoes, ridge subduction, near-trench volcanoes, rifted fore-arcs, rifted continental margins, oceanic backarcs, intracontinental oceanic rifts.

DEPOSITIONAL ENVIRONMENT / GEOLOGICAL SETTING: 1) Summits of seamounts; 2) Collapsed calderas; 3) Sea-flooded, breached calderas; 4) Unconsolidated shallow marine sediments on the flanks of emergent volcanic islands; 5) Intra-arc rifts; 6) Water-filled reservoirs in active continental volcanic areas (crater lakes, playa lakes, stream flood plains, glacier subfloors).

AGE OF MINERALIZATION: Examples range from Holocene to Archean. More than 50 modern (active) sites have been identified.

HOST / ASSOCIATED ROCK TYPES: Mineralization hosted by intermediate to felsic flows and tuffs and minor intercalated sedimentary rocks. Pillow lavas, coarse epiclastic debris flows, and assorted subvolcanic feeder dikes are all part of the local stratigraphic package.

DEPOSIT FORM: Highly variable. Large, textureless massive sulphide pods, finely laminated stratiform sulphide layers and lenses, reworked clastic sulphide sedimentary beds. Footwall stockwork or stringer-style vein networks. Epithermal-style breccia veins with large vugs, coarse sulphides and chalcedonic silica. All types may coexist in a single deposit.

TEXTURE / STRUCTURE: Range from fine clastic sulphides and framboid-like chemical precipitates to very coarse grained sulphide aggregates in breccia veins. Structural styles include: stratabound and stratiform sulphide lenses and layers, vein stockworks, major breccia veins.

Alldrick, D.J. (1995): Shallow Subaqueous Hot Spring Au-Ag; *in* Selected British Columbia Mineral Deposit Profiles, Volume 1, D.V. Lefebure and G.E. Ray, Editors, *British Columbia Ministry of Energy, Mines and Petroleum Resources*, Open File 1995-20, pages 55-57.

SHALLOW SUBAQUEOUS HOT SPRING Au-Ag G07

ORE MINERALOGY (Principal and *subordinate*): Sphalerite, tetrahedrite, boulangerite, bournonite, native gold, native silver, amalgam, galena, chalcopyrite, enargite, pyrite, stibnite, realgar, arsenopyrite, orpiment; *metallic arsenic, Hg-wurtzite, cinnabar, aktashite, unnamed Ag-Pb-As-S minerals, jordanite, wurtzite, krennerite, coloradoite, marcasite, magnetite, scorodite, jarosite, limonite, anglesite, native sulphur.*

GANGUE MINERALOGY (Principal and *subordinate*): Magnesian chlorite, muscovite (sericite), chalcedonic silica, amorphous silica, calcite, dolomite, pyrobitumen, gypsum, barite, potassium feldspar, alunite; *carbon, graphite, halite and cristobalite.*

ALTERATION MINERALOGY: Massive chlorite (clinochlore)-illite-quartz-gypsum-barite rock or quartz-muscovite-pyrite rock are associated with the near-footwall stockwork zones. Chlorite and pyrite alteration is associated with the deep-footwall stockwork zones where alteration minerals are restricted to fractures. Stratabound mineralization is accompanied by magnesian chlorite, muscovite, chalcedonic silica, calcite, dolomite and pyrobitumen. At the Osorezan hot spring deposits, pervasive silica and alunite microveinlets are the dominant alteration phases.

GENETIC MODEL: Deposits are formed where "hot spring" (i.e. epithermal) fluids vent into a shallow water environment. Fluids are magmatic in character, rather than meteoric. This concept contrasts with some characteristics of the process model for volcanogenic massive sulphides. Lateral and vertical zoning has been recognized within a single lens. Lateral zoning varies from Sb, As and Hg-rich mineral suites outward to Zn, Pb and Cu-rich assemblages. Vertical zoning is expressed as a systematic increase in Au, Ag and base metal content up-section. Fluid conduits are fissures generated by: seismic shock, inflating of the volcano over an expanding magma chamber, or fracturing in response to regional compressional tectonics. A near-surface subvolcanic magma body is the likely source of metals, fluids and heat, but shallow subaqueous hot springs may be distal to the main eruptive centres or subvolcanic heat sources.

ASSOCIATED DEPOSIT TYPES: Hot spring Hg (H02), hot spring Au-Ag (H03), epithermal veins (H04, H05), volcanogenic exhalative massive sulphides (G06).

COMMENTS: This deposit type is the shallow subaqueous analogue of hot spring Au-Ag deposits. The brief discussion by Laznicka (1985, p. 907) seems especially prophetic in light of the subsequent discoveries at Osorezan (1987) and Eskay Creek (1988).

EXPLORATION GUIDES

GEOCHEMICAL SIGNATURE: Ag, Au, Cu, Pb, Zn, As, Sb, Hg (Mo?).

GEOPHYSICAL SIGNATURE: The pyrite associated with the stockwork mineralization and with the widespread alteration should produce a broad induced polarization anomaly. The best drill targets would be local anomalous `peaks' within this anomalous 'plateau'. Airborne magnetometer surveys may help delineate favourable strata and fault offsets.

OTHER EXPLORATION GUIDES: The geological deposit model and its regional setting, coupled with regional stream sediment geochemistry are the best exploration tools. Additional exploration guides include: 1. Broad hydrothermal systems marked by widespread sericite-pyrite alteration; 2. Evidence of a volcanic crater or caldera setting; 3. Accumulations of felsic volcanic strata in a local subaqueous setting in a regionally subaerial environment or along the near shore zone of a regional subaerial/subaqueous volcanic facies transition. Focus on the sedimentary intervals within the volcanic pile (these favourable sedimentary rocks may be recessive).

ECONOMIC FACTORS

GRADE AND TONNAGE: Eskay Creek began production with mineable reserves of 1.08 Mt grading 65.5 g/t Au, 2930 g/t Ag, 5.7 % Zn, 0.77 % Cu and 2.89% Pb and a geological resource of 4.3 Mt grading 28.8 g/t Au and 1 027 g/t Ag. On January 1, 1999 total production reached 460,160 tonnes grading 64.28 g/t Au, 3108 g/t Ag, plus minor lead and zinc, while mineable reserves stood at 1.45 Mt grading 57.7 g/t Au and 2493 g/t Ag.

IMPORTANCE: These deposits are attractive because of their bonanza precious metal grades, polymetallic character, tendency to occur in clusters of deposits and well-constrained geologic settings.

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APPENDIX 2:
ESKAY CREEK-TYPE DEPOSITS IN BRITISH COLUMBIA

The data in this appendix have been extracted from the British Columbia Ministry of Energy and Mines mineral inventory database MINFILE (July 1999). Only the Capsule Geology descriptions are reproduced here unedited and the reader is referred to the complete data set for further information (http://www.em.gov.bc.ca/geology/Minfile/).

Occurrences are derived from Massey (1999).

MINFILE NUMBER: 103P 047 **NAME:LEFT OVER**
Mining Division: Skeena Status: Showing
Commodities: AG PB CU ZN HG AU NTS: 103P11W (NAD 83)
Latitude/Longitude: 55 35 22 N 129 16 47 W UTM: 9 6160239N 482474E

The Left Over occurrence is located at the headwaters of the south fork of the Tchitin River on its south bank, about 17.75 kilometres northeast of Alice Arm. This showing was initially prospected in 1916 and re-discovered in 1980.
The region is underlain by Lower Jurassic Hazelton Group volcanics and sediments situated on the east limb of the north- northwest trending Mt. McGuire anticline. These rocks have been regionally metamorphosed to greenschist facies.
The occurrence consists of a 4 to 6 metre wide rhyolite bed hosted in maroon and green andesitic breccias. The rhyolite bed has been traced for 150 metres, strikes 020 to 040 degrees and dips 45 to 60 degrees southeast. The brecciated to massive rhyolite bed has been silicified and pyritized.
Mineralization consists of massive bands of pyrite and disseminations and blebs of pyrite, galena and minor chalcopyrite. The showing was previously described as a 1.5 metre wide quartz vein containing bands and lenses of galena, chalcopyrite, sphalerite and pyrite (Minister of Mines Annual Report 1916). A 5 metre channel sample across a pyrite rich zone assayed 119 grams per tonne silver, 0.20 per cent lead, 0.26 per cent copper, 0.20 per cent zinc, 0.003 per cent mercury and 0.03 grams per tonne gold (Assessment Report 8904, page 4).

EMPR AR 1916-74,75
EMPR ASS RPT *8904, *9823
EMPR FIELDWORK 1985, pp. 219-224; 1988, pp. 233-240; 1990, pp. 235-243
EMPR OF 1986-2
EMPR MAP 8
EMPR BULL 63
GSC MAP 307A; 315A; 1385A
GSC MEM 175, p. 70

MINFILE NUMBER: 104B 008 **NAME: ESKAY CREEK**
Mining Division: Skeena Status: Producer
Commodities: AU AG ZN CU PB NTS: 104B09W (NAD 83)
Latitude/Longitude: 56 37 59 N 130 27 7 W UTM: 9 6277299N 411052E

The Eskay Creek deposits lie in the centre of the Iskut- Sulphurets gold camp in the Unuk River valley. Bedrock in the Unuk map area consists of a thick (more than 5000 metres) succession of Upper Triassic to Middle Jurassic volcano-sedimentary arc-complex lithologies (Stuhini and Hazelton groups) underlain by Permian and older arc and shelf sequences (Stikine Assemblage) and overlain by Middle and Upper

Jurassic marine-basin sediments (Bowser Lake Group). Rocks have been folded, faulted and weakly metamorphosed, mainly during Cretaceous time. Dioritic to granitic rocks that crop out east and west of the Prout Plateau represent at least four intrusive episodes spanning Triassic to Tertiary time. Remnants of Pleistocene to Recent basaltic eruptions are preserved locally (Exploration in British Columbia 1989).

The Eskay Creek deposits area is underlain by a northwest-facing sequence of interbedded volcaniclastic rocks, flows and sediments of the Lower-Middle Jurassic Hazelton Group. Strata strike north- northeasterly and dip moderately to the northwest. The presence of fossils, pillow lavas and hyaloclastites suggests that many of the rocks were deposited in a subaqueous environment.

An 1100-metre section straddling Eskay Creek is divided into 6 lithostratigraphic sequences, from oldest to youngest: (1) lower volcano-sedimentary unit: inferred basement to the footwall dacite unit including the oldest rocks on the property; (2) footwall dacite unit: dacite lapilli, crystal and lithic tuffs interbedded with black mudstone and waterlain tuff (includes the "datum dacite" member; (3) rhyolite unit: rhyolite breccia and tuff; minor mudstone; (4) contact unit: basal rhyolite-mudstone breccia ("transition zone") grading upwards into carbonaceous mudstone; (5) hanging. wall andesite unit: pillowed andesite flows and breccias with thin carbonaceous mudstone interbeds; and (6) upper sedimentary unit: thin-bedded siltstone and fine sandstone with minor arenite-conglomerate beds.

The lower volcano-sedimentary unit is of unknown thickness and consists of mixed andesitic to dacitic volcaniclastic rocks and immature fine to medium grained sedimentary rocks. This unit is correlated with the Lower Jurassic Betty Creek Formation (Hazelton Group).

The footwall dacite unit comprises in excess of 100 metres of drab grey to white dacite tuff, tuffaceous wacke and mudstone. Dacitic volcanics are predominantly tuff and ash-flow tuff, with lesser volumes of lithic tuff and breccia. An important marker, the datum dacite member, comprises pink to green, fine grained, feldspar phyric tuff and lapilli breccia; it occurs near the top of the unit. The footwall dacite unit was assigned to the Lower Jurassic Mount Dilworth Formation (Hazelton Group) but recent interpretations suggest that it is a member of the Lower Jurassic Betty Creek Formation (Hazelton Group).

The rhyolite unit ranges from 30 to 110 metres thick and consists of grey to white aphyric breccia, tuff breccia, lapilli tuff, tuff and subordinate massive rhyolite. Thin intercalations of mudstone and waterlain tuff occur locally and provide markers. This unit is correlated with the Lower Jurassic Mount Dilworth Formation (Hazelton Group).

The contact unit consists of an areally restricted basal member of rhyolite-mudstone breccia (the "transition zone") that grades into a widespread upper member of carbonaceous mudstone. The entire contact unit ranges from less than 1 to more than 60 metres thick. The upper member is carbonaceous, pyritic and locally tuffaceous, laminated black mudstone. The contact unit can be correlated with the unnamed lower member of the Lower-Middle Jurassic Salmon River Formation (Hazelton Group). It is the host to most of the mineralization in the 21 zone (21A and 21B deposits) (Exploration in British Columbia 1989).

The hangingwall andesite unit is a flow and sill complex in excess of 150 metres thick. It consists of rusty brown weathering, light grey to dark green pillow breccias with subordinate massive flows, dikes or sills, and hyaloclastite horizons. Thin mudstone units occur as interflow sediments. The upper sedimentary unit consists of a thick sequence of thin-bedded (turbiditic) siltstone, shale and fine sandstone. It includes strata of the lithologically similar Salmon River Formation (Hazelton Group) and Middle-Upper Jurassic Ashman Formation (Bowser Lake Group). The Salmon River Formation sediments are distinguished by the presence of volcanic material.

The major structure on the property is interpreted to be an asymmetric anticline which plunges gently to the northeast. The anticline is broken by a series of high-angle faults. Major faults strike north-northeast; minor ones north-northwest. Several northerly to northeasterly trending lineaments also traverse the property.

Many zones of mineralization have been recognized at Eskay Creek. These include the 5, 6, 10, 22, 23, 28 and Porphyry zones; Mackay and Emma adit areas; and the #1 to #5 bluffs. The 21 zone has undergone extensive exploration and underground development and represents a major portion of reserves at Eskay Creek. Two new zones, NEX and Hangingwall, were discovered in 1995.

The bulk of mineralization in the 21 zone occurs as a stratabound sheet within carbonaceous mudstones of the contact unit and underlying rhyolite breccia, beneath mostly barren andesite flows. In the north, sulphide layers also occur in the hangingwall andesite unit. As traced by diamond drilling the entire zone extends 1400 metres along strike, 250 metres downdip and is from 5 to 45 metres thick. It is open to the northeast and downdip.

Mineralization displays both lateral and vertical zoning. Antimony, arsenic and mercury-rich mineral assemblages in the south change to zinc, lead and copper-rich assemblages in the north. Vertical zoning is expressed as a systematic increase in gold, silver and base metal content up-section.

Based on mineral associations and continuity of grade, the 21 zone has been divided into two deposits: the 21A (formerly called the South zone) and the 21B (which includes the former Central and North zones, now linked by drilling). The deposits are separated by 140 metres of weak mineralization. Two new mineral zones, the 21C and Pumphouse, have recently been discovered. The 21C is centred about 450 metres due north of the 21A deposit. It is a discrete mineral zone 100 metres downdip from the 21B deposit and subparallel to it. The Pumphouse zone is located immediately northeast of Pumphouse Lake, east of the southern end of the 21B deposit. Drilling in the 21A deposit area has outlined a mineralized zone approximately 280 metres long and up to 100 metres wide. Thickness is variable, averaging about 10 metres. The deposit is contained within the contact unit and underlying rhyolite unit. The deposit can be subdivided into an upper, stratabound zone of disseminated to near-massive stibnite and realgar within the contact unit, and a lower, stockwork zone of disseminated sphalerite, tetrahedrite and pyrite within the rhyolite unit. High-grade (> 15 grams per tonne) gold and silver mineralization occurs in variably sheared, carbonaceous mudstone and mudstone-rhyolite breccia. A diverse suite of metallic minerals has been identified.

Zones of nearly massive stibnite, realgar and orpiment pass along strike and downdip into disseminated domains where sulphides occur in veinlets, as feathery masses, or as heavy impregnations along shears or in the mudstone matrix. The breccia matrix is variably pyritic. Both breccia matrix and clasts contain needles of stibnite and arsenopyrite. Gold occurs as native gold, amalgam and possibly in mercurian wurtzite. Silver occurs as native silver, amalgam, tetrahedrite and unnamed silver-lead-arsenic-sulphur minerals. Mineralization is associated with areas of intense alteration. Both members of the contact unit are overprinted with varying amounts of magnesian chlorite, muscovite, chalcedonic silica, calcite and dolomite; pyrobitumen is ubiquitous.

Disseminated to microfracture-filling mineralization in the rhyolite unit is characterized by low to moderate tenor gold (1-15 grams per tonne) and locally high silver, associated with base metal sulphides and minor to trace antimony, arsenic and mercury minerals. Tetrahedrite, pyrite, sphalerite and galena predominate, with minor aktashite and chalcopyrite. Realgar and orpiment are rare to nonexistent. Carbon and graphite are absent.

Beneath stratabound mineralization of the contact unit, the rhyolite unit is highly fractured and intensely altered. Fracturing, alteration intensity and metal tenor appear to increase toward the upper contact. Within 3 to 4 metres of the upper contact, rhyolite-hosted mineralization is characterized either by massive chlorite-gypsum-barite rock or by quartz-muscovite-sulphide breccia. Mineralization in the footwall dacite unit commonly occurs in the datum dacite member. It consists of semimassive to disseminated, crystalline pyrite, sphalerite, tetrahedrite, galena and chalcopyrite.

The 21B deposit is approximately 900 metres long, from 60 to 200 metres wide and locally in excess of 40 metres thick. It is displaced on the east by the northeast trending Pumphouse Creek fault and related north trending splays. The deposit is open to the northeast along strike, to the immediate east on fault-offset segments, and is partially open to the west at depth. It displays varied styles of mineralization and alteration.

The southernmost 600 metres of the 21B deposit (the former Central zone) is characterized by stratabound and stratiform high-grade gold and silver-bearing base metal sulphide layers. Banded sulphide mineralization occurs in carbonaceous and tuffaceous mudstones of the contact unit. Sulphides form disseminated, semimassive and massive laminae and bands, up to 12 metres thick, that appear to parallel bedding in the mudstones. In approximate order of abundance sulphide minerals include amber sphalerite, tetrahedrite, boulangerite and bournonite with minor pyrite and galena. Gold and silver occur as 5 to 80-micron grains of electrum within fractured sphalerite, commonly in contact with galena. Realgar and stibnite are absent. Gangue minerals include magnesian chlorite, muscovite and quartz with lesser amounts of dolomite and calcite.

Peripheral to and beneath banded sulphide mineralization are areas of microfracture veinlets and disseminations of tetrahedrite, pyrite and minor boulangerite. Gangue minerals include magnesian chlorite, muscovite, potassium feldspar and calcite. Footwall, rhyolite-hosted stockwork mineralization is volumetrically insignificant in comparison with either the 21A deposit or the northern 21B deposit.

In contrast, the northern 300 metres of the 21B deposit (the former North zone) exhibits considerable geological and structural complexity. Although hostrock stratigraphy is similar to that found to the south, mineralization occurs at several different stratigraphic levels. Gold, silver and base metal-rich lenses occur in hangingwall unit interflow mudstones as well as in the contact unit mudstone and underlying rhyolite unit breccias. Very high grade mineralization occurs deeper in the rhyolite unit in association with crosscutting zones of fracture-related alteration. The mineralized zone is thick and cut by zones of strong shearing. Hangingwall mineralization is hosted by two mudstone beds near the base of the hangingwall andesite unit and is associated with pervasive chlorite alteration and locally heavy barite. Near-massive dark sphalerite, galena and tetrahedrite with lesser amounts of pyrite and chalcopyrite occur as two partially stacked lenses. Mineralization in the contact unit is dominantly comprised of sphalerite, tetrahedrite and possibly boulangerite with varying amounts of galena and chalcopyrite. Alteration minerals are again chlorite, muscovite, quartz and calcite. Mineralized textures vary from crudely banded massive sulphides to thick and thin sulphide bands intercalated with mudstone.

Crosscutting mineralization in the contact and rhyolite units occurs as siliceous (quartz-healed) and carbonate-rich breccias with anastomosing, crustiform veinlets and disseminations of coarse- grained iron-rich sphalerite, fine-grained pyrite, with minor galena, chalcopyrite and tetrahedrite group minerals. Gold occurs as spectacular films, wires or blebs associated with fractured sphalerite.

Lead isotope analyses of galena samples collected from Eskay Creek veins and massive sulphide lenses coincide with early Jurassic lead ratios from the Kitsault, Stewart, Sulphurets and Iskut mining camps. Isotopic data are taken to indicate a widespread, early Jurassic mineralizing event. The Eskay Creek deposits are also products of this event (Exploration in British Columbia 1989).

The 21 zone mineralization is unusual. There is a close spatial, and apparently temporal relationship between what conventional models describe as low-temperature epithermal and volcanogenic massive sulphide deposit types. Epithermal mineralization, characterized by gold, silver, arsenic, antimony and mercury mineral suites, forms massive and stratabound lodes as well as more usual crosscutting veins and disseminations. Massive sulphide mineralization show typical "syngenetic" ore textures but atypical mineralogy and precious metal enrichment.

In 1995 and 1996, drilling and underground exploration on the 21B zone have outlined proven and probable reserves of 1,090,000 tonnes grading 65.14 grams per tonne gold, 2949.0 grams per tonne silver, 5.6 per cent zinc and 0.77 per cent copper (Information Circular 1996-1, page 5). During 1994 the access road to the mine area was completed and construction of minesite facilities was completed by fall. The first shipment of ore started January 1995, two years after application to the provincial government for a Mine Development Certificate. The direct shipping ore was crushed and blended at the mine and then moved by rail from Kitwanga to Noranda's Horne smelter in Quebec, and by sea from Stewart to Dowa Mining's smelter in Japan. At a daily mining rate of 245 tonnes, annual production is estimated at 6220 kilograms of gold and 283,000 kilograms of silver, together with copper and zinc. The operating cost is forecast to be US$187 per ounce gold equivalent. Eskay Creek will become the fourth largest silver producer in the world. Zinc will be recovered using the solvent extraction - electrowinning method (Information Circular 1995-1, pages 9-10).

Late in 1995, the NEX zone was calculated to contain 205,911 tonnes grading 30.1 grams per tonne gold and 1926.5 grams per tonne silver (T. Schroeter, personal communication, 1996).

In 1996, reserves were 1.08 million tonnes at 65.5 grams per tonne gold, 2930 grams per tonne silver, 0.77 per cent copper and 5.6 per cent zinc (Exploration in BC 1996, page B5).

As of January 1, 1997, proven and probable reserves at Eskay Creek were estimated at 1,267,340 tonnes grading 59.38 grams per tonne gold and 2718.86 grams per tonne silver. Geological resources at January 1, 1997 were 252,200 tonnes grading 18.55 grams per tonne gold and 1083.43 grams per tonne silver (George Cross News Letter No. 25 (February 5), 1997).

Production at Eskay Creek Mine:					
Year	Tonnes mined	Ag (g)	Au (g)	Pb (kg)	Zn (kg)
1998	147,350	364,638,530	8,774,000		

1997	110,161	368,498,000	7,591,065		
1996	102,395	369,263,056	6,793,111		
1995	100,243	327,754,000	6,418,078		
1979	9	25,490	1,263	412	1,008
1971	2	7,435	9	29	43
Total	460,160	1,430,186,511	29,577,526	441	1,051

As of January 1, 1998, proven and probable reserves were 1,356,240 tonnes grading 58.05 grams per tonne gold and 2684.57 grams per tonne silver. Geological resources (mineralized material) were 336,565 tonnes grading 20.13 grams per tonne gold and 411.43 grams per tonne silver (Prime Resources Group Inc., Press Release, January 22, 1998).

The Eskay Creek property has a long history of intermittent exploration since its discovery and staking in 1932 by T.S. Mackay. Early work identified more than 30 distinct mineralized zones in upper Coulter and Eskay creeks along a line of gossanous bluffs that extends more than 7 kilometres. Earliest exploration focused on the southern part of this area where the Mackay adit was driven for 110 metres. The Mackay adit lies 9 kilometres southwest of the 21 zone. In the northern part, underground development at the Emma adit totalled 180 metres of drifting and crosscuts. The Emma adit lies 3 kilometres southwest of the 21 zone. Surface work included several thousand metres of diamond drilling, numerous trenches, pits and opencuts. In 1971, a 1.5-tonne sample of high-grade ore was extracted from trenches on the 22 zone, which lies 2 kilometres southwest of the 21 zone. In 1979, these trenches were mined to produce 8.75 tonnes of hand-cobbed ore (Exploration in British Columbia 1989). In 1996, surface and underground exploration diamond drilling totalled 36,576 metres.

Eskay Creek is 100 per cent owned and operated by Homestake Canada Inc. following an amalgamation between Homestake and Prime Resources Group Inc.

Reserves on January 1, 1999 were 1,450,000 tonnes grading 57.7 grams per tonne gold and 2492.57 grams per tonne silver. Additional mineralized material were 453,600 tonnes grading 15.36 grams per tonne gold and 401.14 grams per tonne silver (Exploration in BC 1998, page 23 and www.homestake.com).

Drill targets in 1998 included 21C, a rod-shaped pyritic zone within footwall rhyolite. It reaches the surface at the original 21 zone trenches excavated in the 1930s (near the 21A deposit) and plunges gently northward for 900 metres, passing below and 200 metres downdip of the 21B deposit to its truncation by the Argillite Creek fault. Based on 1998 drilling the 21C zone is estimated to contain 303,000 tonnes of milling ore at a grade of 16.4 grams per tonne gold and 72 grams per tonne silver, with very low levels of deleterious elements (Exploration in BC 1998, page 23).

EMPR AR 1932-A61; 1933-A61; *1934-B30; 1935-B9,B27; 1939-A65; 1946-A85; *1953-87,Fig.4; 1963-10; 1964-20; 1965-44; 1967-30
EMPR ASS RPT 5683, 6075, 11160, 11228, 14099, 18958
EMPR BULL 63
EMPR EXPL 1975-E182; 1976-E182; 1982-383,384; 1985-380; *1989-197-223; 1996-A7,B5; 1997-12; 1998-2,3,4,23
EMPR FIELDWORK 1988, pp. 241-250; *1991, pp. 517-541
EMPR GEM *1970-64; 1971-26,36; *1972-516; 1973-499
EMPR GEOLOGY *1976, pp. 121,122
EMPR INF CIRC 1993-13, p. 9; 1994-1, p. 9; 1994-19, p. 10; 1995-1, pp. 9,10; 1995-9, p.5; 1996-1, pp. 3,5; 1997-1, p. 7; 1998-1, p. 7
EMPR MAP 65 (1989)
EMPR OF 1989-10; 1992-1; 1992-3; 1994-1
EMPR P 1991-4, pp. 116-118
EMPR PF (Geology Map-1:31,250-Newmont Exploration of Canada Ltd.; Golden Coin Resources; Consolidated Stikine Silver Ltd.; Canadian Exploration Ltd.; MacKay Syndicate (Maps), Batten, H.L.; Unuk River and Adjacent Area (map), 1934, Reconnaissance of the Unuk River (map) 1935: Mandy, J.T.;

Vancouver Stock Exchange - Filing Statement; Higgs, T.W., Murphy, F.M. and Stewart, C.J. (~1997): ARD Assessment Program from Exploration to Operation Case Studies from the Eskay Creek Mine)
EMR MIN BULL MR 223 B.C. 324
EMR MP CORPFILE (Premier Gold Mining Company, Limited; Stikine Silver Ltd.; Consolidated Kalco Valley Mines Ltd.; Consolidated Silver Butte Mines Ltd.; Texasgulf Inc.; May-Ralph Resources Ltd.; Kerrisdale Resources Ltd.)
GSC MAP 9-1957; 1418A
GSC P 89-1E, pp. 145-154
GCNL Nov.16, 1973; #164, 1982; #87,#160,#170, 1985; #3, #41, 1986; #27, #102, #213, #218, #224, #227, #248, #249, 1988; #4, #5, #9, #29(Feb.10), #41, #48(Mar.9), #71(Apr.13), #72(Apr.14), #97(May 19), #111(June 9), #119(June 21), #135(Jul.14), #139(Jul.20), #142(Jul.25), #149(Aug.3), #153(Aug.10), #157(Aug.16), #158(Aug.17), #161(Aug.22), #166(Aug.29), #175(Sept.12), #178(Sept.15), #183(Sept.22), #198(Oct.16), #212(Nov.3), #226(Nov.24), #240(Dec.14), #242(Dec.18), #249(Dec.29), 1989; #6(Jan.9), #20(Jan.29), #32(Feb.14), #34(Feb.16), #41(Feb.27), #44(Mar.2), #50(Mar.12), #63(Mar.29), #72(Apr.11), #75(Apr.18), #76(Apr.19), #81(Apr.26), #86(May 3), #94(May 15), #99(May 23), #102(May 28), #116(Jun.15), #119(Jun.20), #121(Jun.22), #124(Jun.27), Aug.29, #180(Sept.18), #197(Oct.11), #206(Oct.24), #211(Oct.31), #214(Nov.5), #222(Nov.16), #236(Dec.6), 1990; #242(Dec.17), #21(Jan.30),#111(June 10), #128(Jul.4), #132(Jul.10), #138(Jul.18), #145(Jul.29), #147(Jul.31), #164(Aug.26), #188(Sept.30), #229(Nov.28), 1991; #24(Feb.4), #100 (May 25), #106(June 2), 1992; #30(Feb.12), #148(Aug.1), 1997; #18 (Jan.27), #36(Feb.20), #50 (Mar.12), #80(Apr.27), #143(July 27), 1998
CIM Special Volume 37 (Lode Gold-Silver Deposits in British Columbia, pp. 178-190)
CMJ Oct. 1998, p. 6
MIN REV March/April 1989; Fall 1998, page 25
N MINER Sept.10, 1983; Nov.7,*14, Dec.5,19, 1988; Jan.2,16,19,30, Feb.6,20, Mar.6, Apr.17,24, May 29, June 26, Jul.24, Aug.14,21,28, Sept.4,11,18,25, Oct.2,9, Nov.6,13, Dec.4,11,18, 1989; Feb.12,26, Mar.5,12,19, Apr.9,16,23,30, May 7,14,21,28, June 4,11,18,25, July 2,9,16,23, Aug.6, Sept.3,7,24, Oct.8,22,29, Nov.5,12, Dec.3,7,17,31, 1990; Jan.21,28, June 10,17,24, July 22, Aug.5, Sept.23, Dec.23, 1991; Jan.27, Feb.3, Mar.1, May 18,25, June 1,29, 1992; Jan.25, Mar.1,8, Apr.12, Jun.21, Aug.2, Oct.4,11, Nov.15, Dec.13, 1993; Feb.28, Mar.21, Apr.11, May 9, Nov.28, Dec.5, 1994; Feb.27, May 15, June 26, Aug.21, Nov.6,13, 1995; Jan.1, Feb.5, Mar.4, May 20, Aug.12, Dec.23, 1996; Feb.17, Mar.10, Oct.27, 1997; Feb.2, Mar.2, May 4, June 1,8, Aug.3, Sept.21, Dec.7, 1998
N MINER MAG Sept., Dec., 1990
NW PROSP March/April, Sept./Oct., Nov./Dec., 1989
PR REL Prime Resources Group Inc., Jan.22, Feb.19, Apr.24, July 24, 1998
V STOCKWATCH Jan.20,26, 1989
W MINER Vol.26, p. 44, Aug., 1953
WWW http://www.homestake.com
Donnelly, D.A. (1976): Study of the Volcanic Stratigraphy and Volcanogenic Mineralization on the Kay claim group, Northwestern British Columbia, Unpublished B.Sc. Thesis, University of British Columbia, 61 pages
Equity Preservation Corp. Stewart-Sulphurets-Iskut Compilation, Dec. 1988, Showing No. B34
Gunning, M.H. (1986): Late Triassic to Middle Jurassic (Norian to Oxfordian) Volcanic and Sedimentary Stratigraphy and Structure in the Southeastern part of the Iskut map sheet, North-Central British Columbia, Unpublished B.Sc. Thesis, University of British Columbia, 85 pages
Times Colonist Sept.6, 1989
Vancouver Sun Jan.14, 1989

MINFILE NUMBER:104B 010 **NAME: BENCH**

Mining Division: Skeena Status: Showing

Commodities: AG ZN PB CU SB MA FE NTS: 104B08W (NAD 83)

Latitude/Longitude: 56 29 27 N 130 29 2 W UTM: 9 6261512N 408750E

The area near the junction of Sulphurets Creek and the Unuk River is underlain by a series of north to northwest trending Hazelton Group rocks which are part of the Lower Jurassic Unuk River Formation. Locally, they consist of red, green and purple volcanic breccia, conglomerate, sandstone and argillaceous siltstone with intercalated crystal and lithic tuff.

The east side of the property is underlain by andesitic pillow lava and volcanic flows. The west part of the property is underlain by altered volcanics comprised mainly of crystal and lithic tuffs with associated argillite and minor conglomerate. Magnetite mineralization occurs within the altered andesites on the Fox 14 and 16 claims.

The mineralization consists of disseminated magnetite with minor associated pyrite and jasper. Alteration consists of silicification and minor carbonitization which reportedly may be associated with the magnetite (Assessment Report 347). The Bench Zone, discovered in 1993, is bounded on the west by the Unuk River, south by Sulphurets Creek, north by a series of small lakes and in the east by a steep hillside. Exploration work included soil geochemical sampling, VLF-EM and magnetometer surveys, geological mapping and hand trenching. In 1996, the area was mapped at a scale of 1:2000 scale and the favorable stratigraphy was tested with seven drill holes.

The Bench Zone is underlain by Salmon River Formation units, preserved in a moderately north plunging syncline. Units include a central core of flow-banded aphyric rhyolite, overlain by a polymictic breccia and mudstone unit, pillowed basalt and mudstone. Footwall to the rhyolite is a thin mudstone unit and massive basalt. The rhyolite has been dated at approximately 172 million years by the MDRU.

In the Bench zone, the rhyolite unit is weakly mineralized with fracture-controlled pyrite, sphalerite and arsenopyrite, usually associated with zones of siliceous alteration and chlorite. The breccia unit locally contains fragments and clasts, up to 2.0 centimeters, of massive pyrite, light-coloured sphalerite, and galena. These same minerals are also disseminated in the breccia matrix. The mudstone unit contains bedding-parallel wispy laminae of pyrite and arsenopyrite, with rare sphalerite and galena. Chip and grab samples revealed assays up to 63.6 grams per tonne silver, 0.8 per cent zinc and 1.0 per cent lead; copper and antimony values exist. No mineralization was intersected in the drill holes.

The Bench zone notes are from the Kenrich Mining Corporation web site (WWW http://www.kenrichmining.com), June 1998. Prime Resources Group acquired the property in 1997.

See also Corey (104B 385) and Cumberland (104B 011).

EM EXPL 1997-15

EMPR AR 1961-116

EMPR ASS RPT *347, 16318

EMPR BULL 58, *63

EMPR FIELDWORK 1988, pp. 241-250

EMPR OF 1989-10

EMPR PF (Geology Map-1:31,250 Scale-Newmont Exploration of Canada, 1960's)

GSC MAP 9-1957; 1418A

GSC P 89-1E, pp. 145-154

WWW http://www.kenrichmining.com/corey/bench.htm

Anderson, R.G., (1988): A Paleozoic and Mesozoic Stratigraphic and Plutonic Framework for the Iskut Map area (104B), Northwestern British Columbia, pp. A1-A5, in Geology and Metallogeny of North-western British Columbia, Smithers Exploration Group, G.A.C. Cordilleran Section Workshop, October 16-19, 1988

Equity Preservation Corp. Compilation: Stewart-Sulphurets-Iskut, Dec. 1988, (Showing No. B54)

MINFILE NUMBER: 104B 011 **NAME: CUMBERLAND (L.265)**
Mining Division: Skeena Status: Prospect
Commodities: AU AG ZN CU PB BA NTS: 104B08W (NAD 83)
Latitude/Longitude: 56 29 19 N 130 29 0 W UTM: 9 6261264N 408779E

The area near the junction of Sulphurets Creek and the Unuk River is underlain by a series of north to northwest trending Hazelton Group intermediate (dacite/andesite) composition volcanic flows, pyroclastics and pillow lavas of the Lower Jurassic Unuk River Formation. Locally, they consist of red, green and purple volcanic breccia, conglomerate, sandstone, argillaceous siltstone with intercalated crystal and lithic tuffs. The stratigraphic and structural relationships are not well defined but the regional strike is to the northeast with an east dip.

Locally, andesite, tuff-volcanic breccia, argillite and conglomerate are the most common rock types. The eastern part of the claim is underlain by pillowed andesite, dark grey to green in color, and forms a massive cliff 30 to 40 metres in height. The tuff is grey to green in color with poorly sorted angular fragments with some flow banding. The volcanic breccia is similar to the tuff with larger unsorted angular fragments. Sediments in contact with the volcanics include a dark green-grey, massive chert and argillic conglomerate, which is characterized by a sandy matrix with rounded cobbles to boulders.

Minor mineralization consisting of disseminated pyrite is ubiquitous throughout the volcanics and argillite. Two mineral deposits were reported to have been developed by constructing two short adits close to the contact between the sediments and volcanics in 1935.

At an elevation of about 370 metres, a sheared and brecciated zone in the volcanics, striking northwest and dipping steeply northeast, contains small, irregular lenses and stringers of quartz, barite and calcite. In an adit driven along the north side of a dyke that cuts the shear zone, is a vein of quartz, calcite and barite which hosts pyrite, galena, sphalerite, tetrahedrite, stibnite and some argentite. In 1935, a grab sample taken from an old dump of these workings assayed 0.69 grams per tonne gold, 3586.2 grams per tonne silver, 0.5 per cent copper, 8.0 per cent lead and 4.0 per cent zinc. A reported 18 tonnes of similar material was mined but never located (Minister of Mines, Annual Report 1935, page B12).

To the northeast of this adit, at an elevation of about 412 metres, is a quartz replacement zone that is reported to consist of veinlets and lenses of quartz with stringers and blebs of chalcopyrite, pyrrhotite, pyrite, sphalerite and galena. The zone strikes about 345 degrees and dips 70 degrees east. Apparently 14 tonnes of this material was mined and left at the portal to the adit. In 1935, a representative sample from this dump assayed 8.9 grams per tonne gold, 82.28 grams per tonne silver, 0.3 per cent copper, 3.0 per cent lead and 10.0 per cent zinc (Minister of Mines, Annual Report 1935, page B12).

In 1987, a 0.5 to 0.75 metre zone was mapped at the Cumberland adit entrance. The host rock in the vicinity of the showing consists of highly fractured andesite with thin quartz-pyrite fracture fillings. Other sulphides include chalcopyrite, sphalerite and traces of galena. The heavily mineralized zone strikes between 140 to 150 degrees and dips 85 degrees northeast. A grab sample from this massive sulphide zone assayed 4.32 grams per tonne gold and 169.37 grams per tonne silver (Assessment Report 16318).

A 5-centimetre chip sample taken along Silver Creek (from Ougma, Lot 269) assayed 3502.2 grams per tonne silver (Assessment Report 16318). The sample was from a silicified carbonate rich shear zone which was reported to host possible ruby silver (pyrargyrite).

The following notes are from the Kenrich Mining Corporation web site (WWW http://www.kenrichmining.com), June 1998.

The Cumberland showing (104B 011) is located on the south bank of Sulphurets Creek, 1500 metres upstream from the confluence with the Unuk River. It is also immediately south of the Bench zone (104B 010). Two adits were excavated on the Cumberland during the 1890's and a very small shipment of hand-sorted ore was reported. The prospect appears to have volcanogenic massive sulphide attributes, and has been frequently examined and partially explored by diamond drilling (Catear and Bighorn, 1988, six holes) and geological mapping and geophysics (Placer Dome, 1991). During the 1993 field program, a limited amount of time was spent re-examining the Placer Dome geological map. As well, several contour soil geochemical lines were completed up hill, south of the showing area. In 1995, preliminary mapping around the showing recognized Salmon River stratigraphy. In 1996, the property was mapped in detail with the discovery of bedded barite mineralization. The showings were trenched and drilled. Drilling demonstrated that these showings are not structurally controlled but are probably stratiform in nature. Two holes were

drilled under the main Cumberland Showing demonstrating that the mineralization is continuous and is not cut off by faulting.
Mineralization at the Cumberland occurs in mafic volcanic units, possibly pillow basalt and breccia and thin mudstone horizons. Mineralization is composed of lenses 0.5 to 3.0 metres wide of massive sphalerite, barite, galena and pyrite. Sampling of this material has returned assay values as high as 9.4 grams per tonne gold, 93 grams per tonne silver, 0.45 per cent copper, 2.70 per cent lead and 9.80 per cent zinc. The zone of mineralization is highly sheared and disrupted and both the mineralization and host rocks have a pronounced mylonitic fabric and a steep plunge. A re-examination of rocks mapped by Placer as conglomerate and mudstone revealed rhyolite breccia and tuffaceous mudstone. The rhyolite is aphyric, cream to white coloured, with flow-banded to massive fragments in a dark gray, siliceous matrix. These rhyolite units possibly lie in the structural footwall of the Cumberland showing. Prospecting and soil geochemical traverses 1000 metres south of the showing (at 800 metres elevation) identified two possible extensions of the rhyolite horizons. In 1997, three outcrops of massive barite mineralization containing galena, sphalerite and associated silver mineralization were discovered and sampled returning assays up to 12,171 grams per tonne silver in grab samples and 4046 grams per tonne silver in a one-metre channel sample.
Prime Resources Group and Kenrich continue to work the property in 1998.

EMPR AR 1901-994; 1903-54; 1906-72; 1919-60; 1923-87; 1935-B9,B11
EMPR ASS RPT *8769, *12255, *16318
EMPR BULL 58, *63
EMPR EXPL 1980-465; 1983-521; 1987-C376; 1996-B10; 1997-15
EMPR FIELDWORK 1988, pp. 241-250
EMPR IND MIN FILE
EMPR OF 1989-10
EMPR PF (Mandy, J.T., (1930): Sketch map of Unuk River, (Map 1930), (1934): Unuk River and Adjacent Area (Map 1934), (1935): Reconnaissance of the Unuk River Area (Map 1935); Geology Map-1:31,250 Scale-Newmont Exploration of Canada, 1960's)
GSC MAP 9-1957; 1418A
GSC P 89-1E, pp. 145-154
GSC SUM RPT 1905, p. 51
GCNL #86(May 5), 1998; #139(July 21), #153(Aug.11), #160(Aug.20), 1998
N MINER July 7, 1997; Oct.12, 1998
PR REL Kenrich Mining Corporation, July 17, Aug. 18, 1998
V STOCKWATCH *Apr.13,Jul.14, 1987
W MINER Oct. 1964, p. 36
WWW http://www.kenrichmining.com/corey/cumbland.htm
Anderson, R.G, (1988): A Paleozoic and Mesozoic Stratigraphic and Plutonic Framework for the Iskut Map area (104B), Northwestern British Columbia, pp. A1-A5, in Geology and Metallogeny of North-western British Columbia, Smithers Exploration Group, G.A.C. Cordilleran Section Workshop, October 16-19, 1988
Equity Preservation Corp. Compilation: Stewart-Sulphurets-Iskut, Dec. 1988, (Showing No. B53)

MINFILE NUMBER: 104B 237 **NAME: TMG**
Mining Division: Skeena Status: Showing
Commodities: CU NTS: 104B08W (NAD 83)
Latitude/Longitude: 56 24 51 N 130 20 44 W UTM: 9 6252804N 417101E

This occurrence is located about 1 kilometre to the west of Ted Mossir Glacier and 7 kilometres east of the South Unuk River. The area is underlain by rocks of the Lower Jurassic Unuk River Formation, Hazelton Group. The formation consists of thick-bedded epiclastic volcanic rocks and lithic tuffs with closely associated pillow lavas, carbonate lenses and thin-bedded siltstones. The rocks are moderately folded and extensively faulted. The eastern contact of the Eocene Lee Brant Stock is found less than 1

kilometre west of the showing. The stock is composed of quartz monzonite and has been dated at 52.4 million years plus or minus 1.8 million years (Pers. Comm., D.J. Alldrick).
Alteration and deformation in the area are complex and are related to regional folding and Jurassic and Tertiary plutonism. In addition, the degree of dynamic metamorphism increases toward the South Unuk River cataclasite zone (Grove, Bulletin 63).
Three showings of chalcopyrite and pyrrhotite occur within 1.5 kilometre of each other at the same elevation along the west-southwest edge of Ted Morris Glacier. The eastern most showing occurs in an area of black phyllite. The central showing occurs as disseminations in an area of schistose argillites and sandstone, and the western most showing occurs in a quartz vein within unknown host rock (Newmont map).
Less than 400 metres southwest of the quartz vein showing, at a lower elevation, is another showing of chalcopyrite and pyrrhotite with up to 5 per cent pyrite (Newmont map).

EMPR ASS RPT 16364, 17404
EMPR PF (*Geology Map - 1:31,250 Scale: Newmont Exploration of Canada Ltd., 1960's)
EMPR BULL 63
EMPR OF 1988-4; 1989-10
EMPR FIELDWORK 1987, pp. 199-209; 1988, pp. 241-250
GSC MAP 9-1957; 1418A
GSC P 89-1E, pp. 145-154
Pers. Comm. (D.J. Alldrick)

MINFILE NUMBER: 104B 242 **NAME: DELTA NORTH**
Mining Division: Skeena Status: Showing
Commodities: AU AG PB ZN FE SB NTS: 104B08E (NAD 83)
Latitude/Longitude: 56 22 32 N 130 7 38 W UTM: 9 6248265N 430501E

The area is underlain by rock of the Middle Jurassic Salmon River Formation siltstone sequence, Hazelton Group (Open File 1988-4). The sediments have been folded into synclines and anticlines with north trending fold axes. Small Eocene feldspar porphyry intrusions cut area rocks.
A large "sedex" pod containing jamesonite and siderite occurs in sediments. Snow cover prevented a complete investigation of this deposit. One sample contained 14.41 per cent lead, 2.77 per cent zinc, 25.94 per cent iron, 6.17 per cent antimony, 1.85 grams per tonne gold, and 73.03 grams per tonne silver (Assessment Report 14607).
The minerals are not indicated but are assumed to be galena, sphalerite, magnetite and stibnite.

EMPR ASS RPT 11716, 13403, *14607, 15645, 16911
EMPR FIELDWORK 1983, pp. 149-164; 1984, pp. 316-341; 1985, pp. 217-224; 1986, pp. 81-102; 1987, pp. 199-209
EMPR OF 1987-22; 1988-4
EMPR BULL 63
EMPR EXPL 1983-520; 1984-386; 1986-C440; 1987-C372
GSC MAP 9-1957; 1418A
GSC P 89-1E, pp. 145-154

MINFILE NUMBER: 104B 376 **NAME: SIB**
Mining Division: Skeena Status: Prospect
Commodities: AU AG SB ZN NTS: 104B09W (NAD 83)
Latitude/Longitude: 56 35 35 N 130 29 19 W UTM: 9 6272895N 408706E

Bedrock in the Unuk map area consists of a thick (more than 5000 metres) succession of Upper Triassic to Middle Jurassic volcano-sedimentary arc-complex lithologies (Stuhini and Hazelton groups) underlain by Permian and older arc and shelf sequences (Stikine Assemblage) and overlain by Middle and Upper Jurassic marine-basin sediments (Bowser Lake Group). Rocks have been folded, faulted and weakly metamorphosed, mainly during Cretaceous time. Dioritic to granitic rocks that crop out east and west of the Prout Plateau represent at least four intrusive episodes spanning Triassic to Tertiary time. Remnants of Pleistocene to Recent basaltic eruptions are preserved locally (Exploration in British Columbia 1989).
The Sib property is situated on the west limb of a 9-kilometre long, 3-kilometre wide north-northeast trending anticline comprised of Lower Jurassic Betty Creek and Mount Dilworth formations (Hazelton Group) volcano-sedimentary lithologies. These are overlain by and/or are in fault contact with synclinally folded Lower-Middle Jurassic Salmon River Formation (Hazelton Group) and Jurassic-Lower Cretaceous Bowser Lake Group sediments. The Betty Creek and Mount Dilworth formations stratigraphy is continuous along the length of both the Sib property and the adjoining Eskay Creek property (104B 008) to the north-northeast. The 21 zone deposits of Eskay Creek are approximately 4 kilometres along strike to the northeast of the Sib property boundary, and are hosted by carbonaceous mudstones and rhyolite-mudstone breccias that are correlated with the unnamed lower member of the Salmon River Formation (see Eskay Creek).
Along the eastern side of the Sib property, Betty Creek Formation lithologies predominate. These include a 396 to 1828-metre thick section of tan weathering, pale green andesitic plagioclase porphyritic lapilli tuff and agglomerate containing lesser amounts of interbedded crystal tuff and black mudstone. A mudstone unit comprises sedimentary-epiclastic rocks interbedded with minor tuffaceous and volcanic fragmental rocks. The unit is from 48 to 914 metres thick and includes interbedded mudstone, sandstone, conglomerate and ash and crystal tuff. An andesitic conglomerate unit occurs as a 487-metre long and up to 91-metre wide lens.
Mount Dilworth Formation rocks occur along the western half of the property. A felsic volcanic unit, ranging in width from 121 metres to greater than 396 metres, comprises massive, banded and brecciated grey to white cherty felsic rock and includes several interbeds of mudstone-looking rock. Black, variably siliceous, carbonaceous mudstone up to 20 metres thick occur as interbeds in the felsic rocks. The Lulu zone mineralization occurs in this mudstone. A mudstone approximately 149 metres lower in the stratigraphic section than the "Lulu mudstone" hosts the Marguerite zone mineralization.
Overlying the Mount Dilworth lithologies are Salmon River Formation interbedded black cherts, carbonaceous mudstone and siltstone, and banded greywacke and siltstone.
Granodiorite dykes/sills are subparallel to stratigraphy within Mount Dilworth felsic rocks and occur in the northwest end of the property. The dykes or sills are up to 24 metres thick and 304 metres long and comprise grey to grey-green aphanitic to augite- feldspar porphyritic granodiorite.
Bowser Lake Group sediments comprised of moderate northwest dipping siltstone, sandstone and conglomerate occur in the extreme northwest corner of the property and are in fault contact with underlying Salmon River Formation rocks.
In general, the rocks on the Sib property form a simple homoclinal sequence trending approximately 035 degrees and dipping 20-80 degrees northwest.
Two distinct parallel zones of alteration occur concordant with stratigraphy at Sib. The eastern zone (or Central Anomalous zone) includes a 9-kilometre long linear trend of conspicuous gossans situated along the western margin of the Betty Creek Formation volcanics, and extends north to the Eskay Creek property. This trend encompasses the North, Battleship Knoll, Adit, 1100, South and Meadow zones at Sib. Alteration along this zone comprises intensely potassium metasomatized, brecciated, quartz flooded, pyritized andesitic tuffs with intermittent zones of discontinuous quartz-potassium feldspar-sulphide veins, vein breccias and stockworks. In 1990, all but one of twenty drill holes testing the eastern zone intersected stockworks carrying gold concentrations in the range of 0.34 to 4.29 grams per tonne over widths of up to 19 metres.

The western zone of alteration occurs west of the eastern zone within the felsic rocks of the Mount Dilworth Formation. The alteration comprises extensive and locally intense pervasive silicification and sodium metasomatism. Albitites have also been extensively developed. Drill holes targeted at mudstone interbedded in the felsic assemblage intersected gold and silver mineralization over wide intervals. Below an extensive interval of silicified and albitized felsic strata, drill hole 90-30 intersected 21 metres of black siliceous carbonaceous mudstone (Lulu mudstone). A 14 metre interval of the mudstone is mineralized with disseminated pyrite, framboidal pyrite, laminar pyrite and disseminated and fracture- controlled stibnite and sphalerite. Native gold, pyrargyrite and arsenopyrite occur in trace amounts. Gold and silver assayed 14.4 grams per tonne and 1059.5 grams per tonne respectively, across 14 metres (Summary Report in Statement of Material Facts #42-91). A short interval of the felsic hanging wall is sericitic. In the immediate footwall of the Lulu mudstone, felsic strata are highly pyritic and sericitic. The Lulu mineralization is underlain, 149 metres lower in the stratigraphic section, by the mineralized "Marguerite mudstone", which is the lowermost mudstone interbedded within the Mount Dilworth Formation felsic volcanics. A drill core assay across 4.5 metre assayed 3.5 grams per tonne gold and 36.3 grams per tonne silver (Summary Report in Statement of Material Facts #42-91).

EMPR ASS RPT 20139
EMPR BULL 63
EMPR EXPL *1989-197-223
EMPR FIELDWORK 1988, pp. 241-250
EMPR OF 1989-10
GSC MAP 9-1957; 1418A
GSC P 89-1E, pp. 145-154
GCNL #229 (Nov.), 1991
PERS COMM J.M. Britton (1991)
Donnelly, D.A. (1976): Study of the Volcanic Stratigraphy and Volcanogenic Mineralization on the Kay claim group, Northwestern British Columbia, Unpublished B.Sc. Thesis, University of British Columbia, 61 pages
Gunning, M.H. (1986): Late Triassic to Middle Jurassic (Norian to Oxfordian) Volcanic and Sedimentary Stratigraphy and Structure in the Southeastern part of the Iskut map sheet, North-Central British Columbia, Unpublished B.Sc. Thesis, University of British Columbia, 85 pages.
*Statement of Material Facts #42-91, May 24, 1991 - Summary Report on the Sib Claims (March 11, 1991)

MINFILE NUMBER: 104B 385 **NAME: COREY (T.V.)**
Mining Division: Skeena Status: Prospect
Commodities: AU AG PB ZN NTS: 104B09W (NAD 83)
Latitude/Longitude: 56 31 45 N 130 27 54 W UTM: 9 6265753N 410004E

At the Corey property, 10 kilometres south of the Eskay Creek mine (104B 008), drilling of 22 core holes by Kenrich Mining Corporation, resulted in the discovery of significant stratabound massive to semimassive gold-silver-zinc-lead mineralization (Hutchings horizon) in the TV (Tim/Val) zone. It lies 700 meters south of the northern boundary of the Corey Property and is within the same structural corridor as the "Jeff Grid" or "710/910" gold- silver-zinc discovery area of the Granges, Springer, Cove claims 700 meters further north. The TV Zone is in steep sided, subalpine terrain, at an elevation of 800 meters.
Rock units had been assigned to the Salmon River Formation felsic and mafic volcanic sequence with interbedded sediments. Rock types observed include amygdaloidal andesite or dacite, flow-banded feldspar-phyric dacite tuff, autobreccia and lapilli tuff and black mudstone. All units are strongly overprinted with orthoclase feldspar and sericite alteration (potassic alteration).
Mineralization comprises pyrite, galena, arsenopyrite, with traces of sphalerite, ruby silver and possibly stibnite. Sulphides occur as disseminated grains, veinlets and colloform in-fillings in breccia, rhyolite and black mudstone.

The TV zone has been traced up to 1500 metres on strike with widths over 90 metres (Information Circular 1996-1, page 25). A 12.3-metre diamond drilling intersection assayed 2.07 grams per tonne gold and 120.3 grams per tonne silver (WWW http://www.kenrichmining.com), June 1998.
In 1996, Kenrich drill tested the TV, Cumberland (104B 011) and Bench (104B 010) zones. In addition, an 1100-kilometre airborne magnetic and radiometric was completed. Drilling on the Cumberland prospect identified two zones of massive pyrite, barite and sphalerite, including a new zone of high grade silver mineralization. The TV zone was extensively re-mapped and drilling located a new silver-rich (pyrargarite) portion hosted by black shales, extending the zone to the north and east. Three drill holes tested the Bench zone. The company estimates the mineral inventory of the TV zone at approximately 3920 kilograms of gold and 111,000 kilograms of silver (Information Circular 1997-1, page 29).
Homestake Canada Inc., under option from Kenrich, mapped the southwestern part of the PRU block. On the Kenrich block, Kenrich conducted geological mapping and prospecting and developed drill targets on the HSOV (104B 387), Mandy Creek, Nica 1, Sheelagh Creek (104B 389), TM (104B 354) and GFJ (104B 233) occurrences. Other showings in the block consist of Battlement (see Web site), CB (104B 388), C-10 (104B 240), MM (104B 390) and Kumiko.
The Kumiko showing is located on the south bank of Kumiko Creek at an elevation of 700 metres. The showing consists of a sheared zone of intermediate volcanics, approximately 2 metres in width with a trend of about 170 degrees. Discontinuous lenses and veins of quartz occur throughout and mineralization is spotty. Mineralization consists of pyrite, chalcopyrite, galena with minor malachite and azurite staining. An initial grab sample yielded assay results of 3.31 grams per tonne gold, 864 grams per tonne silver and 3.04 per cent lead. Follow up work consisted of chip sampling across the face of the shear zone. A series of four, one metre chip samples (true width 0.8 metres) were taken with one sample returning values of 12.96 grams per tonne gold and 56.6 grams per tonne silver. Notes on the Kumiko are from the Kenrich Mining Corporation web site (http://www.kenrichmining.com), June 1998.

EM EXPL 1996-B10; 1997-15
EMPR BULL 63
EMPR INF CIRC 1995-9, p. 25; *1996-1, p. 25; 1997-1, p. 29; 1998-1,p. 28
EMPR OF 1988-4; 1989-10
GSC MAP 9-1957; 1418A
GSC P 89-1E, pp. 145-154
N MINER May 19, July 7, 1997; May 4, 1998
PR REL Kenrich Mining Corporation, Aug.6, 1998
WWW *http://www.kenrichmining.com

MINFILE NUMBER: 104B 387 **NAME: HSOV**
Mining Division: Skeena Status: Showing
Commodities: ZN NTS: 104B08W (NAD 83)
Latitude/Longitude: 56 28 0 N 130 24 0 W UTM: 9 6258899N 413743E

The HSOV showing, discovered in September 1996, is located across the valley to the east of Mount Madge at approximately 1440 metres elevation. The showing lies at the contact between rhyolite breccias and black shales; the horizon has been traced for one kilometre along strike and 500 metres down dip. Mineralization consists of a zone of semi-massive to massive marcasite and pyrite, with minor gypsum, anhydrite and sphalerite in a black, sooty matrix. The main part of the showing consists of three imbricate segments of a layer up to 3.5 metres thick which is exposed for 35 metres along strike with a thinner layer offset to the east which is up to one metre thick and exposed for 30 metres along strike. Blocky altered mudstone and felsic volcanic clasts are supported within a sponge like matrix of sulphides and sulphosalts along with gypsum associated with sulphidic tubules. Strong shearing and associated thrust faulting has complicated stratigraphy, however it remains that the mineralization is located at or near the mudstone/felsic breccia contact. The mineralogy, texture and setting all suggest that the showing is related to a submarine exhalative vent system (’black smoker’).

Notes are from the Kenrich Mining Corporation web site (http://www.kenrichmining.com), June 1998. A grab sample returned 2.18 grams per tonne gold, 505.9 grams per tonne silver and 1.26 per cent copper (June 4, 1998 Press Release).

EM EXPL 1996-B10
EMPR BULL 63
EMPR FIELDWORK 1987, pp. 199-209; 1988, pp. 241-250
EMPR INF CIRC 19981, p. 28
EMPR OF 1988-4; 1989-10
GSC MAP 9-1957; 1418A
GSC P 89-1E, pp. 145-154
GCNL #230(Dec.1), 1997
N MINER May 4, 1998
PR REL Kenrich Mining Corporation, June 4,Aug.6, 1998
WWW *http://www.kenrichmining.com

MINFILE NUMBER: 104G 144 **NAME: GOZ**
Mining Division: Skeena Status: Prospect
Commodities: AU AG ZN CU PB NTS: 104G02E (NAD 83)
Latitude/Longitude: 57 0 14 N 130 38 48 W UTM: 9 6318840N 400100E

Gold enriched chalcopyrite, sphalerite, galena, pyrite, and arsenopyrite-bearing veins are hosted by maroon intermediate volcanic rocks comprising felsic tuffs and rhyolite flows, which are Mt. Dilworth and Eskay Creek facies equivalent, belonging to the Hazelton Group. These rocks are overlain by thinly bedded siltstone of Lower to Jurassic age. Mineralization consists of gold-enriched polymetallic quartz veins in silicified and pyritized rhyolite and felsic tuffs and subvolcanic porphyritic monzonite intrusions. The exploration target is precious metal enriched polymetallic massive sulphide deposit, similar to Eskay Creek. The prospect is adjacent to the Forrest Kerr fault and is faulted against Paleozoic rocks of the Stikine assemblage.
Wedge zone is 11.6 grams per tonne gold over 4.4 metres. South Boundary zone is 23.9 grams per tonne gold over 11.6 metres. Main Gossan zone if 18.6 grams per tonne over 0.4 metres.
Pathfinder Resources Ltd. surveyed the area in 1996. A quartz- sulphide vein breccia in a northeast fault is traced for 130 metres, with grades of 3.1 grams per tonne gold, 0.49 per cent lead and 1.13 per cent zinc across a true width of 8.3 metres (Exploration in BC 1996, page 10).

EM EXPL 1996-B11
EMPR ASS RPT *20769, 21366, 24057, 25336
EMPR FIELDWORK *1991, pp. 161-178
N MINER Sept. 16, 1991

APPENDIX 3:
SELECTED OCCURRENCES WHICH EXHIBIT SOME OF THE CHARACTERISTICS OF ESKAY CREEK-TYPE DEPOSITS

The data in this appendix have been extracted from the British Columbia Ministry of Energy and Mines mineral inventory database MINFILE (July 1999). Only the Capsule Geology descriptions are reproduced here unedited and the reader is referred to the complete data set for further information (http://www.em.gov.bc.ca/geology/Minfile/).

MINFILE NUMBER: 082M 003 **NAME: J & L**
Mining Division: Revelstoke Status: Developed Prospect
Commodities: AU AG ZN PB AS SB NTS: 082M08E (NAD 83)
Latitude/Longitude: 51 17 10 N 118 7 19 W UTM: 11 5682020N 421835E

The J & L property is located at the confluence of Carnes and Mckinnon creeks. Prior exploration work between 1983 and 1993 was directed towards the exploration for gold, and was conducted by Pan American Minerals, BP Selco, Equinox Resources Ltd., and Cheni Gold Mines Inc. In 1997, Weymin Mining Corporation issued a prospectus on the J & L property. The J & L adits are located at 830 metres and 986 metres elevation and are accessible by road and trail, respectively.
The J & L property lies near the north end of the Kootenay Arc, a northerly trending belt of Late Proterozoic to Late Paleozoic metasedimentary and metavolcanic rocks that are characterized by tight to isoclinal folds and generally west verging thrust faults. Lowermost within this assemblage is the Hadrynian Horsethief Creek Group (Windermere Supergroup), which is overlain by a Hadrynian to Lower Cambrian succession that includes the Hamill Group, the Mohican Formation, the Badshot Formation and the Lower Cambrian and younger Lardeau Group. The Hamill Group is the host to sulphide mineralization at J & L. Structurally the area has undergone at least two phases of folding. The earliest phase was pre to synregional metamorphism and formed large nappe-like structures overturned to the southwest, with second phase tight to isoclinal folds developed in the overturned limbs.
The main zones of mineralization on the J & L property are hosted by Hamill Group metasedimentary and metavolcanic rocks. These rocks are interlayered, or in possible fault contact elsewhere on the property, with the Early Cambrian Mohican and Badshot formations and the Lower and Upper Index formations of the Cambrian and younger Lardeau Group. Minor diorite, lamprophyre and amphibolite intrusive rocks are also present.
The Hamill Group consists of impure quartzites, limestone, phyllites, chloritic and sericitic quartz-mica schists, minor chert and graphitic schists. Chloritic and sericitic phyllites are developed throughout the sequence and constitute the bulk of the lithologic sequence hosting the deposit. They are gradational in composition both laterally and vertically from chlorite-rich to sericite-rich, making subdivision difficult. Quartz-rich and quartz-poor mica schists are also highly variable in composition and are prominent in the hanging wall. Sericite and quartz-sericite schists are associated with most mineralized zones. Iron staining is common in sections adjacent to mineralization and forms a narrow alteration envelope with sericite, chlorite and sulphides.
A typical section in the footwall of the main sulphide zone comprises quartz-chlorite and quartz-sericite phyllites and schists, quartzites and limestone. In the immediate footwall of the massive sulphides, the quartzites and pelitic rocks are usually overlain by two distinct carbonate units. The lower unit is a massive banded medium to dark grey limestone, which ranges in thickness from a few metres to more than 20 metres and contains little or no mineralization. It is overlain by a dark grey graphitic or carbonaceous limestone, which averages between 1 and 2 metres in thickness and contains discontinuous wispy laminations of yellowish brown crystalline sphalerite. The unit is locally silicified, has a cherty texture and is commonly cut by irregular and deformed carbonate veins and minor quartz veinlets, which may also transect the adjacent massive sulphides.

In the hanging wall, the sulphide body is normally in contact with sulphide-rich sericitic schists or phyllites of variable thickness; locally it may contact sphalerite-pyrite bearing carbonaceous limestone. Further into the hanging wall, quartzite or micaceous rocks may be interlayered with minor limestone and disseminated sulphides, which gradually decrease in abundance, giving way to phyllitic rocks with only trace amounts of disseminated pyrite.

The rocks within the main zone of the deposit are extensively deformed. They generally strike northwesterly 320-325 degrees, with an average dip of about 55 degrees to the northeast. The entire sequence is strongly to intensely sheared and most individual units are transposed. Sulphides exhibit sheared, cataclastic and weak mylonitic textures. Detailed underground mapping suggests that four or possibly five phases of deformation have affected the main zone sulphide sequence. The most prominent folds are tight to isoclinal, generally upright, with variable plunges trending northwesterly, parallel to regional structural trends. Stratigraphic and structural studies of the main zone suggest that the deposit has a moderate plunge to the southeast.

The J & L deposit is stratiform and generally conforms to the host stratigraphy, which strikes northwest and dips about 55 degrees east. The Main zone, which lies south of McKinnon Creek, has been traced on surface for approximately 1.85 kilometres and over 800 metres underground, and has an average true width of 1.6 metres. Forty sulphide occurrences containing arsenopyrite and pyrite, with variable amounts of zinc and lead, occur on the north side of McKinnon Creek and form the North zone in 4 parallel subzones. This zone was traced 1.54 kilometres along strike northwest of the Main zone and is possibly an extension of the Main zone.

The Main zone is a complex tabular or sheet-like body that tends to follow the limestone-phyllite/schist contact and, in places, splits into multiple semiparallel sheets or branches. The most abundant metallic minerals in the zone include pyrite, arsenopyrite, sphalerite and galena, with lesser amounts of chalcopyrite, pyrrhotite, tetrahedrite, silver-lead-antimony sulphosalts and lead-antimony sulphosalts.

The deposit consists of nearly continuous, but structurally deformed zones of massive sulphides, flanked or locally enveloped by disseminated and stringer sulphide zones, which are most prominent in the hanging wall. The lowermost section of sulphides usually forms a sharp contact with the footwall limestone. Massive sulphide sections vary, from pyrite and arsenopyrite rich to sphalerite +/- galena rich. Increasing sphalerite usually coincides with a notable decrease in arsenopyrite. Sulphide content and composition is highly variable laterally and vertically, with massive, banded and disseminated zones of contrasting composition being complexly interleaved or interfingered, possibly due to shearing. The overall thickness of the sulphide zone tends to follow the thickness of the footwall carbonaceous limestone, such that the thickness of the zone increases with increased thickness of the limestone and is usually accompanied with increases in sphalerite and galena content.

Detailed studies generally indicate that the lowermost massive zone tends to be pyrite-rich, with or without arsenopyrite and sphalerite, and has a weakly to moderately developed banded texture. It is overlain by a gold-rich arsenopyrite-pyrite zone, with laminated sphalerite +/- galena, progressing upwards to a "disseminated" sulphide zone with laminated or intrafolial sphalerite and arsenopyrite. Hanging wall sulphides tend to be more arsenical, with arsenopyrite +/- pyrite exhibiting a coarse grained, "milled", mylonitic texture near the zone margins. Laterally, some zones are sphalerite-rich, arsenopyrite (and gold)-poor and vice-versa. In sections where there are overlying massive sulphide layers, they are commonly separated by up to 10 metres of sericitic schist, that is rich in disseminated sulphides. Although they tend to be restricted in size, some hanging wall disseminated zones are zinc-rich, low in arsenopyrite and may be sufficiently concentrated, in places, to be classed as ore grade material.

Analytical data indicate that gold is most strongly associated with arsenopyrite and silver occurs with galena.

The following reserves, published in a prospectus by Weymin Mining Corporation dated February 27, 1997, are reported to be the most up-to-date and had as their source two Equinox Resources Ltd. exploration program reports from 1991. The indicated (proven and probable) resource in the Main zone is 1,700,000 tonnes grading 2.64 per cent lead, 4.43 per cent zinc, 7.38 grams per tonne gold and 75.9 grams per tonne silver. The inferred (possible) resource in the Main zone is 1,907,000 tonnes grading 7.12 grams per tonne gold, 85.5 grams per tonne silver, 3.32 per cent lead and 3.48 per cent zinc. Total for the Main zone is 3,607,000 tonnes grading 7.24 grams per tonne gold, 81.0 grams per tonne silver, 3.00 per cent lead and 3.93 per cent zinc (WWW http://www.weymin.com/projects.htm). The indicated (probable) resource in the Yellowjacket zone 693,000 tonnes grading 52.3 grams per tonne silver, 2.45 per cent lead and 7.06 zinc.

The inferred (possible) resource for the Yellowjacket zone is reported at 337,000 tonnes grading 53.1 grams per tonne silver, 2.5 per cent lead and 7.15 per cent zinc. Total for the Yellowjacket zone is 1,030,000 tonnes grading 52.5 grams per tonne silver, 2.47 per cent lead and 7.09 per cent zinc. The lead-zinc-silver mineralization at the Yellowjacket zone is hosted in a quartzite/limestone sequence and differs from the Main zone in that it contains no arsenic.

Extensive and intense deformation of the J & L deposit has distorted or destroyed most original ore textures and ore-wallrock relationships. Most textures now observed result from an overprinted tectonic fabric, making interpretation of the timing and environment of deposition difficult, at best. There are two schools of thought on the deposit classification. Early interpretations classed the deposit as an epigenetic shear zone replacement, or vein deposit. Other proponents support a syngenetic sedimentary-exhalative origin. The deposit exhibits characteristics of both models and the dispute continues.

The J & L area has undergone a long history of exploration dating back to 1865. The main J & L zone was discovered in 1912 and development to date over several work periods includes approximately 1900 metres of underground drifts, crosscuts, raises and shafts. Several bulk samples have also been extracted for metallurgical testing and pilot milling in order to resolve the problems due to the high arsenical content of the ore.

Prior exploration work between 1983 and 1993 was directed towards the exploration for gold, and was conducted by Pan American Minerals, BP Selco, Equinox Resources Ltd., and Cheni Gold Mines Inc. In 1997, Weymin Mining Corporation issued a prospectus on the J & L property. They drilled 3 holes totalling 503 metres, to expand the Yellowjacket and Main zones. A June 11, 1998 press release describes metallurgical test results on a bulk sample (GCNL #115(June 16), 1998).

EMPR AR 1905-148,150; 1912-144; 1915-117; 1916-193; 1922-215; 1923-232; 1924-204; 1925-258; 1926-269; 1927-290; 1946-174; 1965-204; 1966-227
EMPR ASS RPT 10664, *10939, *12616, 12634, *14405, 19469, 20716
EMPR BULL 1, p. 119
EMPR EXPL 1982-118; 1983-162, xxxii; 1986-C121; *1989-81-89; 1997-39-40
EMPR FIELDWORK *1984, pp. 101-104
EMPR INF CIRC 1985-1, p. 38; 1986-1, p. 52; 1999-1, pp. 5-6, 11
EMPR MAP 65 (1989)
EMPR OF 1992-1
EMPR PF (*Kidd, D.F. (1942): Report on the J & L Property, Carnes Creek Revelstoke Mining Division, British Columbia, unpublished report; Hopkins, P.E. (1929): Report on J & L Property, Carnes Creek Revelstoke Mining Division, unpublished report; Starr, C.C. (1928): Report of Examination of the J & L Mine, Revelstoke, B.C., unpublished report; BP-Selco-Pan American Report, 1985; Starr, C.C. (1926): Preliminary Report on J & L Property, Carnes Creek, unpublished report; Weymin Mining Corporation, Prospectus, February 27, 1997)
EMR MIN BULL MR 223 B.C. 75
EMR MP CORPFILE (Porcupine Goldfields Development and Finance Co.; Raindor Gold Mines Ltd.; Consolidated Raindor Mines Limited; Westairs Mines Limited; Quebec Gold Mining Corporation; Pan American Energy Corporation; BP Canada Inc.)
GSC EC GEOL 4, pp. 77-79
GSC MAP 7219G; 12-1964
GSC P *64-32, pp. 30-31
GSC SUM RPT 1928 Part A, pp. 165-171
CANMET IR 1926, No.243, pp. 13-15
CIM District 6 Meeting - Kamloops, (*Grant, B. (1984): The J & L Deposit, Abstract, p. 23)
GCNL Mar.17, 1981; Apr.14, 1982; Feb.17, 1983; Jan.18, July 10, Sept.10, Nov.26, 1984; Feb.21, July 30, 1985; #206, 1988; #16, #36, #51(Mar.14), #60, #111, #167, #64(Apr.4), 1989; #25(Feb.5), #171, #192(Oct.3), #218, #232(Nov.30), #236(Dec.6), 1990; #8(Jan.11), #23(Feb.1), #47(Mar.7), #65(Apr.4), #66, #98(May22), #147(Jul.31), #212(Nov.4), 1991; #32(Feb.14), 1992; #64(Apr.3), #135(Jul.15), #198(Oct.15), #221(Nov.18), #229(Nov.28), 1997; #16(Jan.23), #115(June 16), 1998
MIN REV May/June 1984: Selco Division of BP Explorations of Canada Limited, p. 82

N MINER Apr.29, 1982; Sept.1, 1983; Jan.26, Dec.6, 1984; Feb.28, Mar.14, 1985; Feb.13, Apr.10, Sept.11, 1989; Oct.15, Dec.10, 1990; Jan.21, Mar.25, Apr.8, Aug.5, 1991; Mar.15, 1993; May 4, 1998
PR REL Weymin Mining Corporation, June 11, 1998
WWW http://www.weymin.com/projects.htm

MINFILE NUMBER: 082M 025 **NAME: HOMESTAKE (L.827)**
Mining Division: Kamloops Status: Past Producer
Commodities: AG PB ZN AU CU BA MI NTS: 082M04W (NAD 83)
Latitude/Longitude: 51 6 40 N 119 49 44 W UTM: 11 5665766N 302061E

The Homestake deposit is hosted by quartz-talc-sericite schists, sericite-quartz phyllite and sericite-chlorite-quartz phyllite derived from felsic to intermediate volcanic rocks (Unit EBA) of the Lower Cambrian and older(?) to Mississippian Eagle Bay Formation. The rocks are overlain by intermediate to felsic volcanic and volcaniclastic rocks (Unit EBF) which hosts the Rea Gold deposit (082M 191), 4 kilometres north. These units are overlain by metasedimentary rocks consisting of argillites, siltstones and grits, which are structurally overlain, to the east by mafic volcanic rocks (Unit EBG) (see Map 56 for unit descriptions). The deposit lies on the southern limb of a northwest trending, tight, overturned syncline. An east dipping thrust fault is inferred to separate the felsic to intermediate metavolcanics and the more mafic metavolcanics to the east.
Several barite lenses with variable amounts of sulphides occur near the top of a bleached, rusty-yellowish weathered zone of pyritic sericite-quartz schist interpreted to be a highly altered, felsic tuff. The schistosity and compositional layering dip at shallow to moderate angles to the northeast.
The main mineralized areas occur as two tabular horizons separated by 4 to 5 metres of schist. The largest, called the "barite bluff", is 5 to 6 metres wide on surface and contains most of the sulphides. A lower horizon, 1 to 2 metres thick, is banded with only minor sulphides. Underground, the barite-sulphide lenses have been traced several hundred metres.
The main horizon consisting of massive to banded barite, metallic minerals and quartz-sericite are cut by veins and lenses of quartz. The metallic minerals include tetrahedrite, galena, sphalerite, pyrite, chalcopyrite, argentite, native silver and trace ruby silver and native gold.
Several small sulphide lenses, known as the Victory Group, were intersected by old workings at 600, 1700 and 2100 metres respectively, southeast of the Homestake deposit (Property File - Stevenson, 1936b).
Twelve hundred metres northwest of the Homestake deposit, old workings intersected several conformable quartz lenses with pyrite, chalcopyrite, galena and sphalerite. These showings were known as the Silver King and Silver Queen (Minister of Mines Annual Report 1936).
Bands, up to 600 metres wide, of talc-sericite and quartz-talc- sericite extend for up to 7 kilometres from Squaam Bay northwest. The talc-sericite schist is fine-grained, fissile and weathers yellow due to ferric sulphate coating. Nodules of augen-like quartz give the rock a mottled appearance (Z.D. Hora, personal communication, 1990). X-ray diffraction analyses in 1987, by the Ministry of Energy, Mines and Petroleum Resources found talc to be a component in a number of samples of quartz-sericite schist.
Probable reserves are 249,906 tonnes grading 226.6 grams per tonne silver, 36.7 per cent barite, 0.28 per cent copper, 1.24 per cent lead, 2.19 per cent zinc and 0.58 grams per tonne gold (Statement of Material Facts 06/06/86, Kamad Silver Company Ltd.). Caving occurs in unsupported ground. Test milling in 1981 was completed for flow sheet design.
The large sericite envelope of the deposit represents a metamorphosed alteration zone that is of potential interest as a source of mica and may contain substantial reserves of fine-grained muscovite within the sericite schist.

EMPR FIELDWORK 1978, pp. 36-37; 1979, pp. 28-36; 1984, pp. 67-76; 1985, pp. 59-68
EMPR AR 1893-1068-1069; 1894-751; 1895-696; 1897-575; 1902-191; 1913-208; 1917-221-223,236; 1918-236; 1922-147; 1923-170; *1924-154-157; 1925-171; 1926-185; *1927-201-204,403; 1929-218; 1935-A24,G46; *1936-D32-36,G48; 1937-A35; 1941-24,58; 1942-57; 1943-61; 1947-203; 1964-99
EMPR PF (Richmond, A.M. (1932): Barite in British Columbia, Non-Metallic Mineral Investigations Report No. 1, pp. 13-14; *Stevenson, J.S. (1936b): Special Report, Victory Group; *Stevenson, J.S.

(1936c): Special Report, Silver King and Silver Queen Group; *Goring, A.W. (1974): Private Report on Homestake Mine)
EMPR GEM 1969-234; 1970-317; 1971-437; 1972-86; 1973-114; 1974-96
EMPR MAP 56; 65 (1989)
EMPR ASS RPT *2915
EMPR OF 1988-19, p. 69; 1992-1; 1992-9
GSC SUM RPT 1894, p. 21A; *1921, Pt. A, pp. 103-104
GSC OF 637
GSC MAP 48-1963; 5320G
GSC P 91-1A, pp. 27-31
EMR MP CORPFILE (Kamloops Homestake Mines, Limited; Allied Mines Ltd.; Taylor (Bride River) Mines, Limited; Kamad Silver Co. Ltd.; Canadian Reserve Oil and Gas Ltd.)
CANMET IR 493; 711; 774
GCNL #271, 1969; July 22, 1971; Nov.29, 1978; #132, 1979; #244, 1985; #206, 1989
N MINER Dec.25, 1980; Dec.9, 1985; Nov.27, 1989
CMH 1983-84, p. 181
FIN POST Survey of Mines (1963), p. 81
Dickie, G.J., Preto, V.A. and Schiarizza, P. (in preparation 1986): *Mineral Deposits of the Adams Plateau-Clearwater Area
Preto, V.A. and Schiarizza, P. (1985): *Geology and Mineral Deposits of the Adams Plateau-Clearwater Region in GSA Cordilleran Section Meeting May 1985, pp. 16-1 to 16-11
EMR MIN BULL 223 B.C. 70

MINFILE NUMBER: 082M 055 **NAME: BECA**
Mining Division: Kamloops Status: Past Producer
Commodities: AG PB CU ZN AU NTS: 082M04E (NAD 83)
Latitude/Longitude: 51 2 50 N 119 43 4 W UTM: 11 5658370N 309575E

The property is underlain by Devonian to Mississippian part of the Eagle Bay Formation. The rocks consist of phyllites and schists (EBA) derived from felsic to intermediate volcanic and volcani- clastic rocks. The strata strikes 070 to 110 degrees and dips 25 to 45 degrees north.
The Beca showings occur within a medium green chloritic schist containing lighter coloured siliceous clasts. The main showing is a 0.5 metre thick conformable sulphide-rich lens of rusty siliceous schist. Mineralization consists of fine grained pyrite, arsenopyrite, chalcopyrite, galena and sphalerite bands up to 2 centimetres thick. Three typical samples gave average assay values of 16.5 grams per tonne gold, 342.8 grams per tonne silver, 1.9 per cent lead, 1.3 per cent zinc and 0.8 per cent copper (Assessment Report 6680).
Several other narrow conformable lenses of siliceous pyritic rock occur over 500 metres. One of these, 120 metres north of the main showing is a narrow mineralized zone containing pyrite, galena, chalcopyrite and sphalerite. The average of two grab samples gave 4.5 grams per tonne gold, 54.9 grams per tonne silver, 3.6 per cent lead, 0.6 per cent zinc and 1.8 per cent copper. A minor showing 400 metres north of this showing consists of a 10 centimetre pyrite-galena bed assaying 2.75 per cent lead with only trace copper, zinc and silver (082M 111).

EMPR ASS RPT 1114, *2650, 4504, *6680, *7040, 11353, 12959, 13138
EMPR AR 1926-A186; 1967-134
EMPR GEM 1973-113-114
EMPR EXPL 1978-E102; 1979-E109-E110; 1985-C99
GSC OF *637
EMPR FIELDWORK 1980, pp. 15-23; 1984, pp. 67-76
Dickie, G.J., Preto, V.A. and Schiarizza, P. (in preparation 1986): *Mineral Deposits of the Adams Plateau-Clearwater Area

Preto, V.A. and Schiarizza, P. (1985): Geology and Mineral Deposits of the Adams Plateau-Clearwater Region in GSA Cordilleran Section Meeting May 1985, pp. 16-1 to 16-11
EMPR MAP *56
GSC MAP 48-1963; 5320G

MINFILE NUMBER: 082M 169 **NAME: ADAM 10**
Mining Division: Kamloops Status: Showing
Commodities: ZN CU PB AG NTS: 082M04E (NAD 83)
Latitude/Longitude: 51 3 10 N 119 34 44 W UTM: 11 5658637N 319330E

The area is underlain by a Lower Cambrian part of the Eagle Bay Formation rocks consisting of greenstone schists, phyllites and quartz schists. A mafic felsic volcanic contact trends northeastward across the area and is truncated to the east by a north- south fault. Rocks east of the fault consist of mixed greenstones, phyllites and limestone. The rocks are cut by north-south trending quartz-feldspar porphyry dykes and plugs.
Lenses and disseminations of pyrite with traces of chalco- pyrite, and minor stringers and fracture fillings of sphalerite occur in felsic volcanics. A 3.0 centimetre sample assayed 6.5 per cent zinc, 0.05 per cent lead, 0.05 per cent copper and 14.8 grams per tonne silver (Assessment Report 14277).

EMPR ASS RPT 46, 6513, 7693, *14277
EMPR EXPL 1977-E89; 1978-E103; 1979-110; 1985-C98
GSC OF 637
EMPR MAP 56
GSC MAP 48-1963

MINFILE NUMBER: 082M 191 **NAME: REA GOLD**
Mining Division: Kamloops Status: Developed Prospect
Commodities: AG ZN PB AU CU NTS: 082M04W (NAD 83)
Latitude/Longitude: 51 8 50 N 119 49 14 W UTM: 11 5669758N 302798E

The Rea Gold deposit is hosted by chloritic phyllites, quartz- sericite schists and chert derived from predominantly mafic with minor intermediate to felsic volcanic and volcaniclastic rocks (Unit EBF) of the Lower Cambrian and older(?) to Mississippian Eagle Bay Formation (Map 56). The rocks are underlain by sericitic phyllites, derived from felsic to intermediate volcanics (Unit EBA) which host the Homestake deposit (082M 025), 4 kilometres south. These units are overlain by metasedimentary rocks consisting of argillites, siltstones and grits, which are structurally overlain to the east by mafic metavolcanics (Unit EBG). The deposit lies on the inverted northern limb of a northwest trending, northeast dipping, tight, overturned syncline.
Two massive sulphide lenses, 250 metres apart and at about the same stratigraphic level, occur at the stratigraphic top of a silicified tuff and exhalative chert sequence that lies above a thicker sequence of mafic ash, crystal and lapilli tuffs. Both lenses are stratigraphically overlain by a thin sequence of mafic tuff which grades up into argillites, wackes and grits. The southern lens is "capped" by a layer of massive barite.
The massive sulphides are underlain by a footwall feeder and alteration zone, characterized by intense silicification, pervasive pyrite and sericite development. As the stratigraphic succession is inverted, the "footwall alteration zone" or "stockwork feeder zone" forms the structural hanging wall of the sulphide lenses.
Mineralization within the sulphide lenses include pyrite, sphalerite, galena, arsenopyrite, chalcopyrite and tetrahedrite- tennantite. The sulphides range from fine-grained, massive with a faint breccia texture, to medium-grained and banded (Fieldwork 1984). Gold and silver is associated with the massive sulphides and barite.

The southern lens (L98 lens) has a surface strike length of 75 metres and a downdip extension of at least 80 metres. Massive sulphide widths to 8 metres have been intersected by drilling.
The northern lens (L100 lens) or Discovery lens, has a surface strike length of about 50 metres, a width of about 4 metres, and a down dip projection of at least 120 metres. The lens strikes 140 degrees and dips 50-60 degrees north eastward. Measured geological reserves are estimated at 242,849 tonnes grading 6.51 grams per tonne gold, 73.37 grams per tonne silver, 2.14 per cent lead, 2.24 per cent zinc and 0.52 per cent copper (George Cross News Letter #8, 1987).
The southern lens or L98 lens, contains measured geological reserves of 133,536 tonnes grading 61.71 grams per tonne silver, 5.41 grams per tonne gold, 0.69 per cent copper, 2.4 per cent lead and 2.4 per cent zinc (Northern Miner - November 30, 1987).
See Samatosum (082M 244) for related information.
Indicated reserves for the northern and southerm lenses are 376,000 tonnes grading 0.33 per cent copper, 2.2 per cent lead, 2.3 per cent zinc, 6.1 grams per tonne gold and 69.4 grams per tonne silver (George Cross News Letter No.8, 1987; Northern Miner November 30, 1987).

EMPR P 1991-4, pp. 112,114
EMPR OF 1992-1
EMPR FIELDWORK 1984, pp. 67-76; *1984, pp. 77-83; *1985, pp. 59-68
EMPR ASS RPT *12737, *14185, 15718
EMPR GEM 1970-316
EMPR EXPL 1983-xxxii,157; 1986-B7-B19,C113
N MINER Dec.1,8, 1983; March *8,22, May 3, June 21, July 5, Aug.16, 23, Oct.4, 1984; Jan.3,31, March 7, Aug.29, Dec.30, 1985; Jan.13, March 31, June 12, July 14,21, Aug.4, 1986; Jan.26, May 11, Nov. 30, 1987
W MINER Feb., Apr., June, 1984; Vol.57, No.6, 1984
IPDM Nov/Dec 1983; *Jan/Feb 1984; May/June 1985; Feb. 1986
GCNL #209, #213, #218, #222, #227, #228, #235, 1983; #7, #9, #60, #61, #82, #89, #113, #217, 1984; #11, #41, #49, #60, #71, #99, #214, #243, #247, #250, 1985; #4, #57, #131, #135, #153, #172, #177, #201, 1986; #8, #76, #96, #108, #111, #112, #116, #117, #118, #133, #224, 1987; #26, #44, #85, 1988
NAGMIN Jan.15, March 30, July 6, Nov.9, 1984
NW PROSP Aug. 1984; Winter 1985; Jan. 1987
CMH 1984-85, p. 323; 1987-88, pp. 272,330
GSC OF 290; 637
*Dickie, G.J., Preto, V.A. and Schiarizza, P. (in preparation 1986): Mineral Deposits of the Adams Plateau - Clearwater area
*Preto, V.A. and Schiarizza, P. (1985): Geology and Mineral Deposits of the Adams Plateau - Clearwater Region; GSA Cordilleran Section Meeting, May 1985, pp. 16-1 to 16-11
EMPR MAP *56; 65 (1989)
GSC MAP 48-1963; 5320G
V STOCKWATCH Nov. 28, 1986; Dec. 23, 1987
GSC P 64-32
EMR MIN BULL MR 223 B.C. 72

MINFILE NUMBER: 082M 244 **NAME: SAMATOSUM**
Mining Division: Kamloops Status: Past Producer
Commodities: AG AU ZN PB CU SB NTS: 082M04W (NAD 83)
Latitude/Longitude: 51 8 40 N 119 48 34 W UTM: 11 5669420N 303563E

The Samatosum deposit is located in structurally complex metasedimentary and metavolcanic rocks of the Paleozoic (Lower Cambrian and older(?) to Mississippian) Eagle Bay Assemblage (Formation). The assemblage has a complex deformational history involving multiple stages of thrust faulting and folding during the Jura-Cretaceous which produced strongly foliated and overturned rocks trending northwest and dipping northeast. These Paleozoic rocks are intruded by mid-Cretaceous granodiorite and quartz

monzonite (such as the Baldy batholith about 30 kilometres to the north of the deposit), and Early Tertiary quartz-feldspar porphyry, basalt and lamprophyre dykes. These are all locally overlain by Miocene plateau lavas, now represented in the area by occasional erosional remnants.

The deposit area can be divided into several northwest trending, northeast dipping units. From northeast to southwest these are: 1) the Tshinikan Limestone which forms steep, massive landforms dominating the area; 2) mixed sediments consisting of interbedded cherts and argillite; 3) mafic volcanics; 4) the "Mine Series" of rocks which consist of a zone of more mixed sediments and mafic volcanics, with minor felsic to intermediate volcanics, which form the host stratigraphy for both the Samatosum and Discovery or Rea Gold zone (082M 191) deposits; and finally 5) a thick unit of argillites and wackes and a package of felsic rocks which lie in the structural footwall of the Mine Series.

The generalized ore stratigraphy reveals the apparent stratabound nature of the orebody within the hanging wall portion of the heavily strained and highly altered Mine Series rocks. The orebody lies near the interface of altered mixed sediments and predominantly altered argillites/wackes. Original terms such as "sericitic tuffs" for the mixed sediments, and "muddy tuffs" for the altered argillite/wackes are now largely out of favour as it is really alteration products that one sees rather than original lithologies (Friesen, 1990). The mixed sedimentary unit (SERT) is characterized by a strong yellow to white sericitic content, interbedded with up to 30 per cent cherty/quartz lenses. The altered argillites (MUT) are characterized by light silvery grey muscovite and sericite. They may also often locally contain up to 60 per cent very fine-grained pyrite and host low grade values of base and precious metals. Both units represent altered lithologies; their protoliths were probably variations of an original argillite/wacke/tuff sequence.

Both the SERT and MUT lie structurally below a thick unit of chloritic mafic volcanics, which in the deposit area are most commonly tuffaceous to lapilli in texture; but with an occasional pillowed component.

Both the Samatosum and original Discovery zone or Rea Gold zone (082M 191) 500 metres to the southwest are contained in a very similar stratigraphy: within a package of mixed sediments, argillites and their sericitic equivalents of SERT and MUT, and both are structurally overlain by mafic pyroclastics. There is much speculation regarding their structural and genetic associations. There is a strong suggestion of repetition by folding and/or faulting (which supports a long favoured theory of a thrust fault zone located between the deposits). Alternatively, but currently discounted, the two deposits may exist within similar stratigraphic cycles overprinted by a crosscutting alteration package (Friesen, 1990).

The Samatosum deposit is an early, highly deformed quartz vein system containing massive to disseminated components of tetrahedrite, sphalerite, galena and chalcopyrite hosted in structurally complex wallrocks. The upper portion of the orebody is tabular, averages about 5 metres in thickness, has a northwesterly strike length of about 500 metres and dips at an average of 30 degrees northeasterly for 100-150 metres. In the northern half of the deposit the tabular nature of the orebody gives way downdip to an apparent synformal structure, which is currently interpreted to be caused by slicing and imbrication by local overturning and thrust faulting. The northern half of the orebody has a northwesterly plunge of about 20 degrees, whereas the southern half displays a very slight plunge to the southeast (phase 2 folding?).

Tetrahedrite is the most valuable mineral in the ore zone, followed by sphalerite, chalcopyrite and galena. The tetrahedrite contains 36 per cent copper, 25 per cent sulphur, 23 per cent antimony, 5 per cent zinc, 4 per cent silver, 3 per cent arsenic and 2 per cent iron. Tetrahedrite appears to be the most uniformly distributed, while the sphalerite, galena and chalcopyrite often appear more erratically distributed in the northern end of the orebody as semimassive to massive lenses within the quartz vein host; perhaps indicating more than one mineralizing episode. It is important to note to note that whereas chalcopyrite, sphalerite and galena can be present in minor amounts in virtually any quartz vein occurrence throughout the property; tetrahedrite has so far been rarely found outside the immediate ore zone (Friesen, 1990).

The principal ore-related gangue minerals are quartz (30 per cent), dolomite (19 per cent) and pyrite (11 per cent).

Sericite and muscovite are by far the dominant alteration minerals in the Mine Series rocks and are thought to be a deformational product of the original ore-related alteration. All units from the lower portion of the mafics through the entire Mine Series stratigraphy are sericitic. Muscovite/sericite alteration fronts producing MUT commonly crosscut bedding and foliation, often leaving behind unaltered argillite/wacke remnants.

Other significant alteration in the deposit area includes: silicification or silica flooding of portions of wallrock surrounding the orebody (eg. many original "quartzites" and black cherts are now believed to be silicified MUT and argillites); dolomite, much more intense than previously believed, the bulk of which is

probably a late-stage fault-related overprint; pyritization, as a replacement feature of lapilli in the mafic pyroclastics; and the green mica fuchsite, so far almost entirely restricted to a several metre thick occurrence associated with the argillites/MUT along the immediate sheared footwall portion of the ore zone.

Underground mineable reserves at Samatosum are 80,278 tonnes grading 1.2 per cent copper, 2.9 per cent zinc, 1.7 per cent lead, 1021.5 grams per tonne silver and 1.7 grams per tonne gold (Northern Miner - August 5, 1991). Both open pit and underground reserves are expected to be exhausted by October 1992. The underground reserve is the strike extension of the open pit deposit and extends approximately 198 metres beyond the pit wall before it is structurally terminated.

The Samatosum deposit was discovered in 1986. During 1988 a feasibility study determined the deposit could be mined economically by open pit methods, despite an unusually high 25:1 waste-to-ore stripping ratio. Mine stripping began in March 1989; ore production and milling began in May 1989; shipments began in June 1989.

Mining ceased in July 1992 and milling ceased in September 1992.

EMPR OF 1992-1

EMPR FIELDWORK 1984, pp. 67-83; 1985, pp. 59-68

EMPR ASS RPT 12737, 14185, 18571, 19199, 19200, 21689

EMPR EXPL 1983-xxxii, 157; 1986-B7-B19,C113

N MINER Dec.30, 1985; Jan.13, March 31, July 14,21, Aug.4, 1986; Jan. 26, May 11, 1987; March 7, May 2,23, Oct.24, 1988; June 5,12, Nov.6,13, 1989; Feb.6, Mar.19, Sept.10, 1990; Apr.1,15, May 6, Jul.15, Aug.5, Oct.21, 1991

IPDM Feb. 1986

GCNL #4, #57, #131, #135, #153, #172, #177, #210, 1986; #8, #76, #96, #108, #111, #112, #116, #117, #118, *#133, 1987; #33, #70, #78, #207, 1988; #1(Jan.3), #56(Mar.21), #123(June 27), #205(Oct.25), 1989; #19(Jan.26), #52(Mar.14), #90(May 9), #179(Sept.17), #186(Sept.26), 1990; #38(Feb.22), #52(Mar.14), #68(Apr.9), #127(Jul.3), #147(Jul.31), #200(Oct.17), 1991

NAGMIN Jan.15, March 30, July 6, Nov.9, 1984

NW PROSP Jan. 1987

CMH 1987-88, pp. 272,330

GSC OF 637

Dickie, G.J., Preto, V.A. and Schiarizza, P. (1986): Mineral Deposits of the Adams Plateau - Clearwater area

Preto, V.A. and Schiarizza, P. (1985): Geology and Mineral Deposits of the Adams Plateau - Clearwater Region - GSA Cordilleran Section Meeting, May 1985, pp. 16-1 to 16-11

EMPR MAP 56; 65 (1989)

GSC MAP 48-1963; 5320G

V STOCKWATCH Nov.28, 1986; May 22,28, July 13, Dec.17, 1987

Pirie, I. (1988): Geology and Mineralization of the Samatosum (Rea Gold) Deposit, Adams Plateau, B.C., MEG Talk, January 1988 - Notes taken by T. Schroeter and C. Lund

N MINER MAG *June 1989, pp. 15-18

EMPR PF (Friesen, R.G. (1990): Geology of the Samatosum Deposit - Field Trip B2, GAC-MAC Joint Annual Meeting, Vancouver 1990, Mineral Deposits of the Canadian Cordillera; Preliminary Engineering Geology, Hydrogeology and Rock Mechanics Assessments for the Proposed Underground Mine, Samatosum Project - May 1991; Memorandum to Geological Survey Branch, P. Schiarizza - June 14, 1990; PR REL Rea Gold Corporation, Feb.21, 1991)

EMPR ENG INSP Annual Report 1989, 1990

EMPR MINING 1988

MINFILE NUMBER: 092GNE021 **NAME: SHREW**
Mining Division: New Westminster Status: Showing
Commodities: CU ZN PB AG AU NTS: 092G09E (NAD 83)
Latitude/Longitude: 49 32 17 N 122 1 34 W UTM: 10 5487541N 570564E

The Shrew showing is located 3.7 kilometres north of the Eagle Creek/Chehalis River confluence.
Property exploration on the Shrew showing began in 1976 and 1977 when Chevron focused on the potential for copper-lead-zinc volcanogenic mineralization in the area. The property was restaked in 1989 by J. Cuttle, who carried out prospecting and soil, silt and rock geochemical sampling in 1991 and 1992.
On a regional scale, the volcano-sedimentary strata found between Harrison Lake and Chehalis Lake area contains two distinct episodes; Middle Jurassic Harrison Lake Group in the south and Lower Cretaceous Fire Lake Group in the north. The Brokenback Hill Formation represents a relatively complete section of bimodal island arc volcanics and associated clastic sediments. These two lithological packages are separated by shales and volcaniclastic sediments of the Middle Jurassic Mysterious Formation and Upper Jurassic Billhook Formation. The Harrison Lake fault and Fire Creek thrust form major northwest trending fault structures to the northeast of the Shrew showing.
Much of the showing is underlain by a sequence of highly faulted felsic to intermediate volcanics and associated agglomerates, tuffs, shales and sandstones of the Harrison Lake Formation. These are overlain by finely banded tuff and argillite of the Echo Island Member and grey to black shale and argillite of the Mysterious Creek Formation. A fault bound sliver of dacitic to rhyolitic tuff and andesitic flows of the Lower Cretaceous Brokenback Hill Formation occurs along the northern edge of the Eagle 1 claim. Bedding of the units is generally very flat with dips to the west and southwest of approximately 20 to 45 degrees. These units have been intruded by feldspar porphyry and quartz diorite plugs.
Two types of mineralization occur at the Shrew showing. Extensive skarn mineralization and hornfels occurs along the northwest trending contact between the Harrison Lake Group and Echo Island Member. The skarn and hornfels are mineralized with massive coarse pyrite, pyrrhotite and minor arsenopyrite. Other float and limited outcrop samples indicate polymetallic mineralization occurs discontinuously, over a 540 metre length, in a snow chute on the west side of Eagle Creek. Float boulders contain massive and banded pyrite, pyrrhotite, sphalerite with minor chalcopyrite and arsenopyrite. This mineralization is confined to at least three northeast trending faults of limited extent and gossanous zones.
Samples (mostly float) from the central gossanous zone in a creek gully on the Eagle 1 claim have yielded up to 13.7 per cent zinc, 8.9 per cent arsenic, 25.71 grams per tonne silver, 0.3 per cent lead, 0.2 per cent copper and 0.90 gram per tonne gold (Assessment Report 21083). The samples were highly epidote altered mafic and lesser rhyolitic volcanics.
In 1990, a total of 23 rock float samples and 1 rock outcrop sample were taken. Sample Eag-JC-28 from outcrop, yielded 1.5 grams per tonne silver, 0.01 per cent zinc and 0.01 gram per tonne gold (Assessment Report 21083). Float samples yielded up to 26.0 grams per tonne silver, 12.1 per cent arsenic, 0.20 per cent lead, 13.7 per cent zinc and 0.9 gram per tonne gold (Assessment Report 21083). Additional rock float samples taken in 1991 yielded similar values. A second creek was prospected in 1991, which yielded anomalous values from 4 rock float samples. Sample 32012 yielded 0.04 per cent copper, 0.84 per cent zinc, 0.01 per cent lead, 0.05 gram per tonne gold and 2.5 grams per tonne silver (Assessment Report 22533). A copper (plus/minus gold and barium) and a arsenic soil anomaly were determined in the area in 1991.

EMPR ASS RPT 3622, *6159, 6449, *21083, *22533
EMPR EXPL 1971-255; 1976-E119; 1977-E118
EMPR FIELDWORK 1980, pp. 165-184; 1984, pp. 42-53; 1985, pp. 120-131
GSC MAP 1069A; 1151A; 1386A
GSC MEM 335, pp. 42-44
GSC P 86-1B, pp. 699-706; 89-1E, pp. 177-187; 90-1E, pp. 183-195, 197-204; 90-1F, pp. 95-107
Arthur, A. (1987): Mesozoic Stratigraphy and Paleontology of the West Side Of Harrison Lake, Southwestern British Columbia, unpublished M.Sc. thesis, University of British Columbia
Ditson, G.M. (1978): Metallogeny of the Vancouver-Hope Area, British Columbia, unpublished M.Sc. Thesis, University of British Columbia

MINFILE NUMBER 092GNW016 **NAME: CROFTON**
Mining Division: Vancouver Status: Showing
Commodities: CU ZN PB AG NTS: 092G11W (NAD 83)
Latitude/Longitude: 49 34 25 N 123 22 49 W UTM: 10 5491105N 472606E

The Crofton occurrence is underlain by granodiorite of the Cenozoic-Mesozoic Coast Plutonic Complex which contains a small pendant of Lower Cretaceous Gambier Group metavolcanic rocks. Mineralization occurs at the sheared, well-defined northwest trending contact between the pendant and intrusive rocks. Pyrite, chalcopyrite, sphalerite and galena occurs as irregular lenses filling fissures in the sheared volcanic rocks, and as disseminations in the volcanics. A grab sample taken from an outcrop near a shaft assayed 7.8 per cent copper, 11 per cent zinc, 5 per cent lead and 116.5 grams per tonne silver (Minister of Mines Annual Report 1924).
Past work included a shallow shaft and open cuts.

GSC OF 611
GSC MAP 42-1963; 1386A
GSC P 89-1E, pp. 177-187; 90-1E, pp. 183-195; 90-1F, pp. 95-107
EMPR FIELDWORK 1980, pp. 165-178
GSC MEM 158
EMPR AR *1924-B240,B241
Ditson, G.M. (1978): Metallogeny of the Vancouver-Hope Area, British Columbia, M.Sc. Thesis, University of British Columbia

MINFILE NUMBER: 092GNW051 **NAME: RED TUSK**
Mining Division: Vancouver Status: Prospect
Commodities: CU ZN PB AG AU NTS: 092G14W (NAD 83)
Latitude/Longitude: 49 46 7 N 123 19 9 W UTM: 10 5512765N 477116E

The Red Tusk area occurs in the Clowhom pendant, an elongate pendant of Lower Cretaceous Gambier Group volcanic and sedimentary rocks. The pendant is surrounded by quartz diorite/diorite of the Cenozoic-Mesozoic Coast Plutonic Complex and appears to have undergone local hornfelsing, folding and faulting.
The Red Tusk occurrence is underlain by a series of marine sediments and volcanics in a relatively undisturbed sequence of north to northwest trending and moderately to steeply west dipping units. Stratigraphic tops also face west. The sedimentary units are composed of cherts and argillites and do not constitute a large portion of the stratigraphy volumetrically, but are important as marker horizons. The cherts are generally massive but occasionally are well laminated. The argillites are frequently hornfelsed, uniformly fine-grained, black pyritic rocks, occasionally containing narrow (10 centimetres and less) beds of semi-massive pyrite/pyrrhotite and rarely sphalerite. The dominant pendant rocks are andesites and include agglomerates, flows and tuffs. The intrusive rocks are diorite to quartz diorite in composition with minor differentiated zones of granodiorite and gabbro.
The volcanic rocks are variable in composition and include basalts, dacites, rhyodacites, rhyolites, massive andesite porphyries and laminated tuffs, and a distinctive fragmental unit. Late mafic dykes cut the stratified sequence and usually strike northeast and dip vertically. Some folding is evident and faulting is randomly distributed, with little or no movement. An altered siliceous horizon trends north across the property and is comprised of a light grey to grey massive, aphanitic siliceous rhyolitic unit with a characteristic chalky white weathering. Prominent foliation and shearing accompanied by quartz veining is present along the entire length of the unit.
Intermediate to felsic volcanics occupy the central portion of the property. The rocks are dacite to rhyodacite in composition and include flows, gritty lapilli tuffs and finely laminated ash tuffs. A fragmental volcanic rock unit (polymictic volcanic breccia) occurs and is composed of crowded, angular to sub-angular, mixed pebble to cobble size clasts of tuffs, flows, chert and argillite in a fine grained dusty matrix.

This unit generally overlies two thin units of andesite agglomerate and tuff which in turn overlies andesite flows.
Mineralization on the Red Tusk property is associated with the altered siliceous rhyolite horizon which varies from 30 to 100 metres in width and is 2000 metres long. The North, South and North Extension zones occur within this unit.
The North zone is a 350 metre long segment of this horizon with a width of 40 metres. Mineralization is found in a barite-rich section of altered, siliceous, pyritic rhyolite, rhyolite breccia and in highly chloritized andesite. A sulphide assemblage of pyrite, chalcopyrite, sphalerite and galena is generally confined to fractures and vein-like structures. A smaller sub-zone, the Silver Spider, is 6 to 8 metres wide and 100 metres long and consists of a steeply dipping barite-rich rhyolite. Grab samples from here assayed 0.12 per cent copper, 20.06 per cent zinc, 17.89 per cent lead, 5694.59 grams per tonne silver and 15.28 grams per tonne gold (Assessment Report 18615).
The South zone, 800 metres south of the North zone, contains several subparallel north trending faults that have apparently offset and repeated the siliceous rhyolite unit. Altered, bleached white rock with micro-quartz veining in siliceous rhyolite flows have been faulted and shuffled producing a sequence of north trending slivers of altered and unaltered rocks stacked in an east-west direction. Some sericitic alteration of the rhyolite has left it with a greenish cast. Grab samples from a steeply dipping, silicified rhyolite tuff assayed up to 14.32 grams per tonne gold (Assessment Report 18615).
The North Extension zone is located 500 metres north of the North zone and is underlain by gossanous andesitic to dacitic volcanics. A rock sample from this area assayed 310.1 grams per tonne silver, 1.68 grams per tonne gold and 0.1 per cent lead (Assessment Report 18615).
The Mavis zone is 500 metres east of the South zone and is underlain by andesitic flows, agglomerates or breccias and argillites. A mineralized zone trends northeast through the andesitic stratigraphy and is up to 3 metres wide and 100 metres long, and contains disseminations and pods of semi-massive to massive sphalerite-chalcopyrite-galena. Rock samples assayed up to 3.87 per cent copper, 2.56 per cent zinc, 1.12 per cent lead, 73.35 grams per tonne silver and 1.33 grams per tonne gold (Assessment Report 18615).
The Cirque zone is located 900 metres east of the Mavis zone and is underlain by a sequence of andesite, rhyolite and argillite. Massive pods of sphalerite-chalcopyrite-galena occur in andesite. Chip samples from a trench excavated on the Gossanous Island zone, a subzone of the Cirque zone, assayed up to 1.47 per cent copper, 7.63 per cent zinc, 1.74 per cent lead, 77.13 grams per tonne silver and 0.4 grams per tonne gold (Assessment Report 18615).

GSC OF 611
GSC MAP 42-1963; 1386A
GSC P 89-1E, pp. 177-187; 90-1E, pp. 183-195; 90-1F, pp. 95-107
EMPR FIELDWORK 1980, pp. 165-178
GSC MEM 158
EMPR ASS RPT 10279, 11180, 12660, *14478, *18615
EMPR PF (Prospectus, Schellex Gold Corp., June 20, 1988)
Ditson, G.M. (1978): Metallogeny of the Vancouver-Hope Area, British Columbia, M.Sc. Thesis, University of British Columbia

MINFILE NUMBER: 092HSW166 **NAME: SILVERTIP**

Mining Division: New Westminster Status: Showing
Commodities: ZN PB CU AG NTS: 092H03E (NAD 83)
Latitude/Longitude: 49 10 26 N 121 14 23 W UTM: 10 5448278N 628299E

The Silvertip showing is located in the southern headwaters of the Sumallo River, 1.5 kilometres northeast of Mount Rideout and 2 kilometres northwest of Silvertip Mountain (Assessment Report 23026).
Mineralization was apparently discovered in the Silvertip showing area in the early 1960s. A diamond drilling program was carried out between 1965 and 1966 by Allison Pass Mining Ltd. Two hole were

drilled for a total length of 405 metres. Suecon Development Corp. evaluated the property in 1983 and 1984. In 1993, A.E. Angus staked the Silvertip claim and requested the services of W.C. Day to conduct geochemical sampling and prospecting on the property.
The Silvertip showing is underlain by the Hozameen Group, composed predominantly of ribbon chert, greenstone, tuff, limestone and argillite.
Mineralization at the Silvertip showing consists of sphalerite and lesser chalcopyrite and galena occurring in three distinct modes. Layered cherty argillite carries pyrrhotite, sphalerite, chalcopyrite and minor magnetite along bedding? planes. Tuffs host up to 2 per cent disseminated magnetite with fracture fillings and blebs of chalcopryite and pyrite. The last mode of mineralization consists of brecciated tuff healed with pyrrhotite, magnetite and minor chalcopyrite.
Several samples (samples 48654, 48657, 48658, 48661 and 48663) yielded greater than 2 per cent zinc (Assessment Report 23026). Sample 48660 yielded greater than 2 per cent lead, 1.88 per cent zinc and greater than 50 grams per tonne silver (Assessment Report 23026). Sample 48655 yielded the highest copper value of 0.09 per cent copper (Assessment Report 23026).
Surface showings were reported traced for 183 metres. A surface sample (sample 17) across 4.88 metres was reported to have yielded 3.42 per cent zinc, 0.1 per cent lead and 0.08 per cent copper (Assessment Report 23026).
The results of samples from two drillholes indicated significant mineralization intersected at depth. Drillhole 1A yielded 1.18 per cent lead, 0.93 per cent zinc, 20.58 grams per tonne silver and 0.05 per cent copper over 2.44 metres (Assessment Report 23026). Drillhole 2A yielded 0.28 per cent lead, 0.07 per cent zinc and 0.7 per cent copper over 30.48 metres (Assessment Report 23026).

EMPR ASS RPT *23026
GSC BULL 238
GSC MAP 56A; 737A; 1069A; 12-1969; 41-1989
GSC P 69-47

MINFILENUMBER: 092P 160 **NAME: SC**
Mining Division: Kamloops Status: Showing
Commodities: AG AU NTS: 092P08E (NAD 83)
Latitude/Longitude: 51 17 40 N 120 0 14 W UTM: 10 5686618N 708966E

The area is underlain by a series of felsic volcanic centres with accompanying rhyolite flows and breccias interbedded with massive sediments. These strike 140 to 160 degrees and dip 50 to 80 degrees to the east. The rocks belong to the Devonian to Permian Fennell Formation.
A silicified and sericitized quartz-feldspar porphyry rhyolite dome contains extensive quartz-pyrite stockwork. A drill hole (Bar No. 3) intersected 30 centimetres of massive pyrite with 134 grams per tonne silver and 18 grams per tonne gold (Assessment Report 15856).

EMPR ASS RPT *15856
EMPR OF 53

MINFILE NUMBER: 093D 006 **NAME: NIFTY**
Mining Division: Skeena Status: Showing
Commodities: AG CU AU ZN BA PB NTS: 093D09W (NAD 83)
Latitude/Longitude: 52 34 52 N 126 25 2 W UTM: 9 5828594N 675108E

The Nifty showing is underlain by the Lower Cretaceous Gambier Group. The Gambier Group is an assemblage of supracrustal rocks distributed along the eastern margin of the Coast Plutonic Complex east of Bella Coola. The Coast Plutonic Complex consists pre- dominantly of crystalline rocks ranging in age from

Paleozoic to Tertiary which exhibit a variety of fabrics ranging from pre-to post- kinematic. Interspersed within the plutonic complex are (?)Paleozoic paragneisses, younger deformed metasediments and volcanics related to the Stikinia Terrane.
The Gambier Group consists of felsic volcanic rocks, mainly tuff but with some rhyolitic flows, overlain by tuffs of more intermediate composition with interbedded fine grained epiclastic rocks.
The stratigraphy in the vicinity of the Nifty showing, although characterized by rapid facies changes, has been determined to comprise a lower, middle and upper unit. The lower unit, of unknown thickness, consists of fine-grained tuff with chlorite and epidote spots. The middle unit consists of mainly felsic lapilli tuff with thin interbedded andesitic lapilli tuff, breccias and barite horizons, totalling 40 to 50 metres. The upper unit consists of dominantly andesitic, fine grained tuff and interbedded siltstone.
Mineralization of the Nifty showing is typical of Kuroko type massive sulphide deposits. In the middle unit a massive sulphide zone containing coarse grained sphalerite, galena and pyrite is overlain by a silver rich barite horizon. Underlying the massive sulphide zone, galena, sphalerite and pyrite occur within argillic and sericitic altered rocks as disseminations and stringers. Copper mineralization in the form of local occurrences of chalcopyrite and malachite is associated with chlorite and manganese in shear zones. The relationship between this mineralization and the massive sulphides is unclear. The strata dip 40 to 60 degrees northeast.
Sample D7055 taken in 1981 from drill hole 81-2 between 291 and 293 metres assayed 0.7 gram per tonne silver, 0.2 gram per tonne gold, 0.01 per cent copper, 0.01 per cent zinc, 0.2 per cent barite and less than 0.01 per cent lead (Assessment Report 10409).
Exploration has failed to discover an economic sulphide deposit in the area of the Nifty showing. The Keen showing to the south is similar (093D 007). Wildrose Resources Ltd. held the property in 1998.

EMPR AR 1930-A61; 1931-A34
EMPR ASS RPT *6735, *6836, *8528, *9586, *9748, *10409, 12747, 14115, 14244
EMPR EXPL 1978-E196; 1980-314; 1984-299; 1985-C281
EMPR FIELDWORK *1978, pp. 94-95
EMPR GEOL 1977-1981, p. 103
EMPR PF (Wildrose Resources Ltd. Corporate Information, March/April 1998)
GSC MAP 1327A; 1424A
GSC MEM 372
GCNL #49,#163, 1981; #4 (Jan.7), #29 (Feb.11), 1998
WWW http://www.direct.ca/eastfield/wildrose

MINFILE NUMBER: 093L 025 **NAME: DEL SANTO**
Mining Division: Omineca Status: Prospect
Commodities: CU ZN AG AU PB NTS: 093L10E (NAD 83)
Latitude/Longitude: 54 39 30 N 126 41 31 W UTM: 9 6059007N 648994E

The Del Santo prospect is located near the headwaters of Deep Creek and the main showing is comprised of a north-trending band of massive pyrrhotite, chalcopyrite, and minor sphalerite which occupies a fold closure. The host rock is an east dipping chlorite-epidote altered amygdaloidal andesitic basalt of the Lower Jurassic Hazelton Group, Nilkitkwa Formation. Overlying the massive sulphide mineralization and to the east of the property are thinly bedded shaly siltstones and argillaceous limestones of the Middle Jurassic Hazelton Group, Smithers Formation. A biotite granodiorite intrusion is exposed to the southeast of the showing and has been dated at 47.1 +/- 1.6 million years.
Samples taken from the main mineralized zone in 1986, assayed 0.02 grams per tonne gold, 562 grams per tonne silver, 1.16 per cent copper, 0.026 per cent lead, and 0.31 per cent zinc (Fieldwork 1986, page 217).
Telkwa Gold Corporation drilled in 1998.

EMPR AR 1928-168; 1929-170
EMPR ASS RPT 1665, 2238, 2543, 7286, *17255, 17478, 17874, 23023

EMPR EXPL 1979-228; *1988-C170
EMPR FIELDWORK 1984, pp. 193-213; *1986, pp. 201-222; *1988, pp. 195-208
EMPR GEM 1969-120; 1970-158
EMPR MAP 69-1
EMPR OF *1987-1; 1994-14
GSC BULL 270
GSC MAP 671A; 971A
GSC OF 351
GSC P 40-18, p. 12

MINFILE NUMBER: 104A 024 **NAME: ENTERPRISE (L. 5346)**
Mining Division: Skeena Status: Prospect
Commodities: CU AU AG PB ZN BA NTS: 104A04E (NAD 83)
Latitude/Longitude: 56 7 19 N 129 42 3 W UTM: 9 6219689N 456548E

The Enterprise showing is located on Lot 5346, near the headwaters of the Bear River, about 2.3 kilometres northwest of Strohn Lake and 850 metres north of the Stewart highway.
Considerable work, including an adit (30 metres long) was reported on the Lucky Frenchman claim group before 1919; the work may have been done in 1910-11. George restaked the ground in 1919, and again in 1922, as the Enterprise claims. High grade silver-bearing float was reported west of the Frenchman tunnel in 1922 and 1925. Mineralized zones were reported in this area in 1927. In 1928, the George Enterprise Mining Company Ltd. was formed to acquire the claims. During 1928-31, considerable tunnelling and open cutting were reported. At least 6 further adits were emplaced.
Tunnel A was driven about 260 metres southwest of the Frenchman tunnel. The 100-metre long Enterprise tunnel was driven about 40 metres northwest of the Frenchman tunnel. A drift was driven to connect the Frenchman and Enterprise tunnels. Several other tunnels were driven along a northwest-trending zone of mineralization, above and to the northwest of the Frenchman tunnel. Further work, mainly prospecting, was reported in 1946 and 1950. Tournigan Mining Explorations Ltd. conducted reconnaissance mapping in the area in 1976 and prospecting and sampling in 1978.
The area is underlain by east-trending, gently north-dipping Upper Triassic to Lower Jurassic Unuk River Formation (Hazelton Group) andesitic tuffs and flows. The main workings are in pyritic pyroclastic or volcaniclastic felsic rocks that are variably chloritized. The iron formation unit which hosts the George Gold-Copper deposit (104A 029, 129) lies below the workings.
Small veins, stringers, pods, disseminations, mineralized shear zones and stockworks contain chalcopyrite that is accompanied in places by galena, sphalerite, chlorite, quartz and calcite. Mineralization does not appear to be continuous from outcrop to outcrop.
The best mineralization is in the Frenchman tunnel, where a northwest-striking, vertical fault gouge is well mineralized with chalcopyrite, pyrite and malachite. Grab samples collected from this zone in 1978 assayed up to 7.0 per cent copper, 3.4 grams per tonne gold and 24.0 grams per tonne silver (Assessment Report 7201).
Samples from fault and fracture zones in the Enterprise tunnel assayed 0.1 to 0.2 per cent copper and 3 to 14 grams per tonne silver; one sample assayed 1.0 gram per tonne gold (Assessment Report 7201).
In tunnel A, pyritic felsic tuff-agglomerate is mineralized with stringers and disseminations of chalcopyrite and veinlets of quartz and calcite. A grab sample collected in 1978 assayed 1.86 per cent copper, 15.8 grams per tonne silver and 13.8 per cent barium (Assessment Report 7201).
Above and northwest of the Enterprise tunnel, the country rock is pyritic, andesitic or dacitic tuff. Several small mineralized zones are exposed in pits and tunnels. The zones comprise narrow veins, stringers or disseminations in fault breccia and shear zones. Wallrocks are variably sericitized and chloritized. A channel sample, collected in 1946(?) across a northeast-striking, east-dipping fracture contained pyrite, chalcopyrite, tetrahedrite, galena and sphalerite. The sample assayed 1.8 per cent copper, 1.0 gram per tonne gold and 147.4 grams per tonne silver across 0.28 metre (Minister of Mines Annual Report, 1946).

Several silver-rich boulders have been located southwest of these showings. The source has not been found. In 1946, samples of one boulder assayed 10.3 grams per tonne gold and 5,136 grams per tonne silver (Minister of Mines Annual Report, 1946).
Significant, but sporadic, gold values have been reported over the years from the Enterprise showing. In 1928, a sample across 1.5 metres, from a cut 27 metres above the Frenchman tunnel, assayed 27.4 grams per tonne gold, 68.6 grams per tonne silver and 2.3 per cent copper (Minister of Mines Annual Report, 1928).

EMPR AR 1919-67; 1922-77; 1925-94; 1927-95; 1928-110; *1929-100, 506; 1930-108; 1931-43; *1946-79; 1950-78
EMPR EXPL 1977-E221; 1978-E256
EMPR BULL 63
EMPR ASS RPT *6382, *7201, 20379, 22172
EMPR MAP 8
EMPR PF (Plan of 1943 Sampling, Enterprise Showing)
EMR MP CORPFILE (George Enterprise Mining Company, Limited; Keith Copper Ltd.; Tournigan Mining Explorations Ltd.)
GSC MEM 159, p. 32; 175, p. 118
GSC MAP 28A; *216A; *217A; 307A; *315A; 9-1957; 1418A
GSC OF 2582
GCNL #127, #136, 1976; #161, 1978

MINFILE NUMBER: 104B 128 **NAME: 4-J**
Mining Division: Skeena Status: Showing
Commodities: ZN PB AG AU CU SB NTS: 104B08E (NAD 83)
Latitude/Longitude: 56 18 34 N 130 7 31 W UTM: 9 6240905N 430501E

The area is underlain by rock of the Middle Jurassic Salmon River Formation, Hazelton Group. The occurrence area is comprised of black argillite, conglomerate, greywacke, andesitic tuffs, and volcaniclastics. Bedding attitudes generally vary from north to north- east with steep to moderate western dips. The sediments and volcanics are intruded by two distinct phases of intrusive rocks. The intrusive, a chloritic feldspar porphyry occurs as plugs and sills, and is generally in contact with the volcanic rocks. The younger in- trusives, light green, 1 to 3 metre wide fine-grained hornblende- feldspar porphyry dykes, cut all the other rock types and exhibit a very consistent northwest trend.
A zone of alteration from 10 to 50 metres in width extends hundreds of metres intermittently in a north-south direction. The zone consists of volcaniclastics and feldspar porphyry hydrothermally altered to carbonate-quartz-sericite-pyrite-limonite. This type of hydrothermal action is represented in the argillites as abundant hair- line limonite-quartz-carbonate veins.
Mineralization occurs locally within the alteration zone and consists of:

1) Narrow 1 to 10 centimetre wide quartz veins with minor amounts of sphalerite, galena, and bournonite.
2) Narrow 10 to 50 centimetre wide veins and shears of pyrite plus or minus arsenopyrite plus or minus sphalerite.
3) Disseminated pyrite in felsic tuffs and argillite.
4) Black argillite hosting stratiform mineralization in the form of very fine-grained laminar wisps of sphalerite and galena. Antimony minerals such as bournonite are present with galena. In addition several types of mineralized float occur:
5) Vuggy quartz veins boulders with abundant galena and bournonite or bournonite and sphalerite.
6) Altered argillite cobbles with
    a) sphalerite, bournonite, and antimony,
    b) banded sphalerite and galena,
    c) native antimony.

7) Massive sphalerite-pyrite cobbles.

Stratiform mineralization (type 4) was discovered when a wallrock sample of apparently barren, black argillite assayed 21.4 per cent lead, 30.2 per cent zinc, 194.74 grams per tonne silver, and 1.30 grams per tonne gold over a sample width of 0.28 metres (Prospectus - Wedgewood Resources Ltd.)

Mineralized types 1, 2, and 3 do not contain appreciable amounts of precious and/or base metals. One sample of Type 3 contained a high of 1.6 grams per tonne gold. A sample of Type 1 material contained 0.86 per cent zinc, 0.37 per cent lead, 0.19 per cent arsenic, 0.18 per cent antimony, 6.8 grams per tonne silver and 0.44 grams per tonne gold. Samples of Type 5 (float) contained high silver and gold with one sample containing 1217 grams per tonne silver, 2.12 grams per tonne gold, 48.2 per cent lead, 0.02 per cent zinc, 0.04 per cent arsenic and 3.54 per cent antimony (Assessment Report 14386).

EMPR ASS RPT *12387, *14386
EMPR FIELDWORK 1983, pp. 149-164; 1984, pp. 316-341; 1985, pp. 217-224; 1986, pp. 81-102; 1987, pp. 199-209
EMPR OF 1987-22; 1988-4
EMPR BULL 63
EMPR EXPL 1983-520; 1986-C438
EMPR PF (*Prospectus - Wedgewood Resources Ltd., 1988)
GSC MAP 9-1957; 1418A
GCNL #36, 1985
GSC P 89-1E, pp. 145-154
Equity Preservation Corp. (Stewart-Sulphurets-Iskut Compilation, Dec. 1988, Showing No. B78)

MINFILE NUMBER: 104B 377 **NAME: ROCK AND ROLL**

Mining Division: Liard Status: Developed Prospect

Commodities: ZN PB CU AU AG NTS: 104B11E (NAD 83)

Latitude/Longitude: 56 43 6 N 131 14 2 W UTM: 9 6288076N 363401E

The Rock and Roll property is underlain by a thick sequence of northwest trending, moderately deformed sedimentary and volcanic rocks of probable Triassic age. Four types of intrusive stocks and dykes outcrop in the area.

The occurrence area is divided into two generalized lithological packages along a northwest boundary that bisects Lost Lake. To the west, limestone and calcareous pelitic sediments occur with andesite flows and minor fine buff ash tuff; small-scale intrusives comprising andesite porphyry dykes, melanocratic plagioclase porphyry and melanocratic hornblende diorite occur in this area. To the east the geologic setting is distinguished by the absence of limestone and an increase in the volcanic component. Lithologies include phyric to aphyric andesite tuffs or flows, intermediate ash crystal tuff, hypabyssal andesite to diorite, siltstone, argillite, graphitic argillite and minor chert. Medium-grained melanocratic hornblende diorite stocks outcrop just north of Lost Lake and bounds the mineralized Black Dog zone to the northeast. A felsic feldspar porphyry dyke outcrops 300 metres east of the Black Dog zone.

Detailed mapping and drilling at the Black Dog zone indicate phyric/aphyric andesite tuffs or flows are conformably interbedded and overlie siltstone, argillite and graphitic argillite. Further down sequence, apparently conformable and fault-bounded hypabyssal hornblende diorite occurs in close association with porphyritic andesite. This unit appears to be underlain by additional siltstone and argillite units. Fine ash crystal tuff occurs throughout the sequence.

Sulphide mineralization at the Black Dog zone is hosted within structurally deformed silicified mudstone to graphitic argillite units at or near phyric/aphyric tuff contacts. The Black Dog zone is characterized structurally by pervasive moderate to strong shearing and cataclastic deformation, with abundant small-scale folds visible. Northeast and northwest normal(?) faults trend through the area; northeast shears cut sulphide mineralization in one trench.

Petrographic studies of core samples identified the alteration products clinozoisite and actinolite and minor chlorite and sericite. Quartz and calcite exist as stringers.

The Black Dog horizon is a stratigraphic section hosting three zones of base metal mineralization that occur as wispy stringers, and disseminated to well-laminated semimassive and massive sulphides. The sulphides consist of pyrrhotite, pyrite, sphalerite, galena and minor chalcopyrite with lesser arsenopyrite and tetrahedrite. This mineralization strikes northwest and dips 20-30 degrees southwest. Each zone averages 7 metres in width; overall, the Black Dog horizon is approximately 25 metres thick. Drilling has tested the horizon over a 250 metre length and a downdip length of 200 metres. A recent discovery, the SRV zone, has also been made.
Preliminary (indicated) reserves within a 700-metre portion of the Black Dog horizon are 580,544 tonnes grading 3.08 per cent zinc, 0.79 per cent lead, 0.64 per cent copper, 2.4 grams per tonne gold and 335.9 grams per tonne silver (Northern Miner - October 28, 1991, page 3).

GSC MEM 246
GSC MAP 9-1957; 311A; 1418A
EMPR ASS RPT 19566, *20884, 21670
EMPR PF (Redstar Resources Corp., prospectus, March 7, 1997)
N MINER Sept.17, Dec.24, 1990; Feb.11,18, Apr.8,15, May 20, Oct.7,28, 1991
GCNL #151(Aug.15) ,#169(Aug.31), #197(Oct.11), #213(Nov.2), #235(Dec.5), 1990; #23(Feb.1), #33(Feb.15), #35(Feb.19), #37(Feb.21), #43(Mar.1), #55(Mar.19), #64(Apr.3), #66(Apr.5), #74(Apr.17), #84(May 1), #86(May 3), #106(June 3), #112(June 11), #123(June26), #187(Sept.27), #202(Oct.21), 1991
PR REL *Prime Equities Inc. Jan.30, 1991 - Rock and Roll Project
Anderson, R.G. (1988): A Paleozoic and Mesozoic Stratigraphic and Plutonic Framework for the Iskut Map Area (104B), Northwestern B.C. pp.A1-A5 in Geology and Metallogeny of Northwestern B.C., Smithers Exploration Group, G.A.C. Cordilleran Section Workshop Oct.16-19, 1988
GSC P 89-1E, pp. 145-154
EMPR OF 1991-6; 1990-16; 1990-19; 1990-7; 1992-1; 1992-3
EMPR INF CIRC 1991-21

MINFILE NUMBER: 104K 011 **NAME: BWM**
Mining Division: Atlin Status:
Showing
Commodities: CU AG ZN AU PB SB NTS: 104K10W (NAD 83)
Latitude/Longitude: 58 44 26 N 132 54 10 W UTM: 8 6512888N 621499E

The area is underlain by the Upper Triassic Stuhini Group, King Salmon Formation which is comprised of a thick-bedded, mixed assemblage of sediments, minor andesitic volcanics, volcaniclastics and limestone. To the northeast, the Upper Triassic Sinwa limestone is found along the northeast dipping King Salmon thrust fault. These rocks are intruded by intermediate composition Jurassic and/or Cretaceous plutons and younger porphyritic dykes, possible Tertiary in age.
The structure in the area is dominated by the northwest trending, northeast dipping King Salmon thrust fault and associated smaller faults. Perpendicular to these faults is another set that trend northeast, which offset the King Salmon thrust fault.
On the property the King Salmon Formation rocks are mainly dark green andesitic or tuffaceous volcanics with disseminated pyrite and chloritic siltstone and argillite which also contain disseminated pyrite. The rocks are highly fractured and alteration consists mainly of minor silicification, pyritization with occasional epidote stringers. Minor crosscutting quartz stringers are mineralized with chalcopyrite.
A large gossanous zone adjacent to a small quartz diorite stock, that cuts the Upper Triassic volcanics and sediments, is crosscut by tabular and irregular masses of pink quartz-feldspar porphyry. The main mineralization consists of a breccia pipe which is irregular in outline and is about 396 metres long and 140 metres wide. The breccia is mainly feldspar porphyry fragments in a matrix of quartz, carbonate, pyrite, chalcopyrite, and pyrrhotite. The breccia pipe shows large euhedral pyrite and chalcopyrite in a vuggy quartz matrix. Chalcopyrite is the most abundant sulphide and usually forms massive, irregular fragments or may be disseminated in calcite and quartz gangue. Sphalerite, pyrrhotite, and stibnite occur in the chalco-

pyrite and show exsolution textures. Stibnite occurs occasionally with calcite in late veins. A few euhedral grains of magnetite are also present. The pyrite is weathered and forms limonite, hematite, and jarosite. Fractures also show coatings of malachite.
Selected samples from the breccia, taken in 1971, assayed 0.04 grams per tonne gold, 127.0 grams per tonne silver, 1.10 per cent copper, 1.2 per cent zinc, 0.2 per cent lead, and trace gold, 265 grams per tonne silver, 19.7 per cent copper, 2.3 per cent zinc, 0.003 per cent lead, and less than 0.01 per cent antimony (Assessment Report 3208).
The breccia occurs in the King Salmon Formation siltstone and shale. The quartz-feldspar porphyry dyke which cuts this zone, is about 30 metres wide and exhibits strong propylitic alteration and in places strong pervasive silicification.. Traces of tourmaline are also reported.
Magnetite-skarn mineralization occurs within the Sinwa Formation limestone north of the King Salmon thrust fault (refer to Barb 104K 107).

EMPR AR 1950-75,76
EMPR GEM 1971-51
EMPR ASS RPT *586, *1171, *3208, *9541, *11107, *11508, *12144
EMPR EXPL 1981-59; *1983-545
GSC MEM *362, p. 55
GSC MAP 6-1960; 1262A

MINFILE NUMBER: 104K 089 **NAME: OYA**
Mining Division: Atlin Status: Showing
Commodities: AU AG PB ZN CU AS SU NTS: 104K13E (NAD 83)
Latitude/Longitude: 58 48 44 N 133 36 43 W UTM: 8 6519798N 580292E

The area is underlain by a Paleozoic to Lower Triassic volcano- sedimentary belt which extends north-northwest and consists mainly of andesitic to felsic flows, tuffs, breccia, and minor sedimentary lime- stone, chert, and siltstone. These are intruded by a Tertiary- Cretaceous quartz monzonite pluton which is thought to be correlative with the Sloko Group volcanics. The volcano-sedimentary rocks have undergone regional greenschist facies metamorphism.
On the property the rocks are divided into two packages, one dominated by andesitic sediments and tuffs with prominant limestone intervals and the other dominated by felsic volcanic rocks mixed with volcanic-cherty-carbonate sediments. Massive and disseminated volcanogenic sulphides occur in both packages.
The property hosts one known zone of mineralization. Immediately below the glacier is a thick limestone unit which contains sphalerite- galena-pyrite-arsenopyrite-chert lenses up to 20 centimetres wide and 10 to 15 metres long which parallel the bedding. In 1981, two samples from this sulphide lens returned 20.9 grams per tonne gold, 2200 grams per tonne silver, 0.16 per cent copper, 16.6 per cent lead, 11.65 per cent zinc, 7.1 per cent arsenic, and 24 grams per tonne gold, 1887 grams per tonne silver, 0.13 per cent copper, 13.6 per cent lead, 9.85 per cent zinc, and 4.75 per cent arsenic, respectively (Assessment Report 9007).
Near the massive sulphides, several breccia lenses, up to 30 metres in length, occur. They consist of angular limestone clasts surrounded and partly replaced by pyrite-sphalerite-galena matrix. The breccias are thought to be the result of sulphide remobilization during deformation. Due west of the sulphide showing, the limestone is seamed with a stockwork of native sulphur veins and larger, mala- chite stained cherty veins.

EMPR EXPL 1980-496,497; 1981-137
EMPR ASS RPT *9007
GSC MEM *248, pp. 63,70; 362
GSC MAP 6-1960; 931A; 1262A
GSC P 45-30
GCNL #173, 1980; #84,May 4, 1981

Appendix 4:
References for Table 4.

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OPEN FILE 1999-14

(Sheet 1 of 2)

POTENTIAL FOR SUBAQUEOUS HOT-SPRING (ESKAY CREEK) DEPOSITS IN BRITISH COLUMBIA MAP 1: MINERAL OCCURRENCES

Compiled by N.W.D. Massey

100 0 100 200 km

Scale 1:2,000,000

A1 — Areas with potential for hosting subaqueous hot-spring deposits (see Table 4 for summary data)

Submarine-subaerial volcanic sequences that may be potential hosts for subaqueous hot-spring deposits

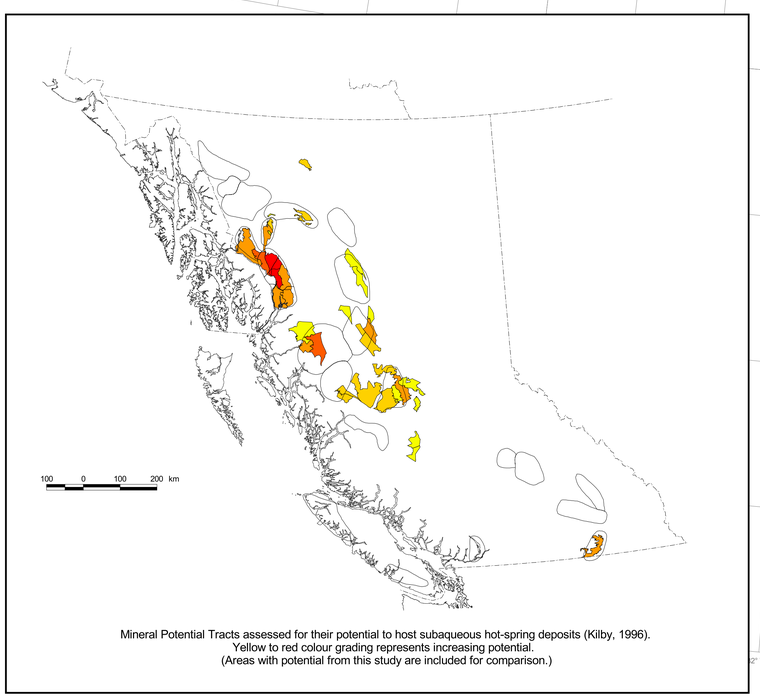
- Tertiary
- Juro-Cretaceous
- Lower to Middle Jurassic
- Triassic
- Paleozoic

MINFILE occurrences

VMS deposits
- Eskay type VMS
- Precious metal-rich VMS
- Other Kuroko-type VMS

Other deposits
- Epithermal deposits
- Au-Ag deposits with As +/- Sb

▲ Selected US volcanogenic massive sulphide deposits



Mineral Potential Tracts assessed for their potential to host subaqueous hot-spring deposits (Kilby, 1996).
Yellow to red colour grading represents increasing potential.
(Areas with potential from this study are included for comparison.)

Albers Equal Area Projection; standard parallels 50°00'N and 58°30'N.

CAUTION: This map has been plotted using a HP 650C Inkjet Plotter. The ink used is not waterproof. It will also fade if exposed to bright light. A digital plot file can be downloaded from http://www.em.gov.bc.ca/geology/

Basemap amended from Journeay and Williams (1995); Geological Survey of Canada Open File 2948 (v. 1.0).

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Geological Survey Branch

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(Sheet 2 of 2)

POTENTIAL FOR SUBAQUEOUS HOT-SPRING (ESKAY CREEK) DEPOSITS IN BRITISH COLUMBIA MAP 2: GEOCHEMISTRY

Compiled by N.W.D. Massey

100 0 100 200 km

Scale 1:2,000,000

A1 — Areas with potential for hosting subaqueous hot-spring deposits
(see Table 4 for summary data)

Submarine-subaerial volcanic sequences
that may be potential hosts for subaqueous hot-spring deposits

- Tertiary
- Juro-Cretaceous
- Lower to Middle Jurassic
- Triassic
- Paleozoic

Anomalous Regional Geochemical Survey samples
(stream sediment and moss-mat sediment)

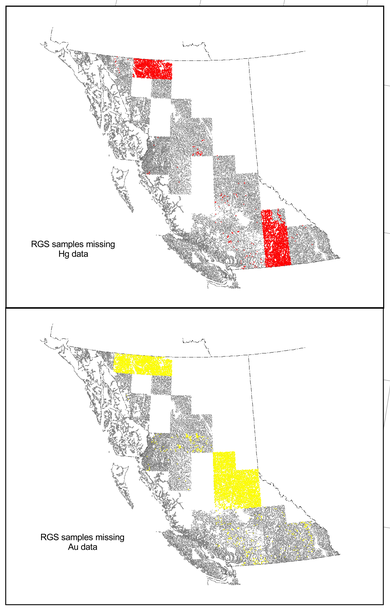
Highly anomalous - pronounced epithermal signature
- Epi + base + prec
- Epi + base
- Epi + prec

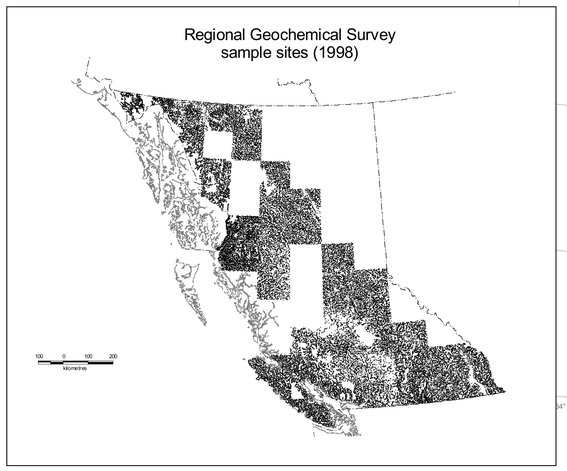
Moderately anomalous - possible epithermal signature
- Epi + base + prec
- Epi + base
- Epi + prec

Anomalous - pronounced epithermal signature
- Epi + base + prec
- Epi + base
- Epi + prec

Anomalous for precious and/or base metals only
- base + prec
- prec
- base

For definition of anomalies see tables 2 and 3.





Albers Equal Area Projection; standard parallels 50°00'N and 58°30'N.

CAUTION: This map has been plotted using a HP 650C Inkjet Plotter. The ink used is not waterproof. It will also fade if exposed to bright light. A digital plot file can be downloaded from http://www.em.gov.bc.ca/geology/

Basemap amended from Journeay and Williams (1995); Geological Survey of Canada Open File 2948 (v. 1.0).

Table 4: Summary geological, mineral and geochemical data for selected areas of potential for subaqueous hot-spring deposits in British Columbia. Areas are outlined on Maps 1 and 2. References in Appendix 4.

	NAME	GEOLOGY	MINERAL DEPOSITS	RGS ANOMALIES	REFERENCES	COMMENTS
A1	Hankin Peak	uTrS Stuhinni Group: volcanic derived sediments (siltstone, feldspathic sandstone, greywacke, augite bearing greywacke), limestone, lesser augite-phyric flows and tuffs (*More Creek sedimentary facies*) lmJH Hazleton Group: siltstone and sandstone; subaerial to submarine massive rhyolite, andesite flows and tuffs (*Unuk River, Betty Creek, Mt Dilworth fms*); siltstone, bimodal pillow basalt, tuff and breccia (*Salmon River Fm - Eskay Creek facies*).	Porphyry Cu-Au mineralization (Little Les, Biskut). Polymetallic subvolcanic veins (Forgold) and silicified shears (Mal, Snoball). No VMS deposits. Polymetallic sub-volcanic veins (GOZ/RDN) may be Eskay related.	Significant multielement anomalies along tributaries to More and Bull creeks. Sparse moderate anomalies in northern part of area.	Souther, 1972 Logan et al., 1997	Area borders Mt Edziza Park; significant ice cover around Hankin Peak.
A2	Eskay-Sulphurets	lmJH Hazleton Group: subaerial and submarine andesite pyroclastics and flows, turbiditic tuffaceous sandstones and conglomerate, plag-Kspar-hornblende porphyry (*Unuk River Fm*); subaerial-submarine andesite to dacite tuffs and flows, volcanic sediments (*Betty Creek Fm*); thin subaerial felsic pyroclastics (*Mt Dilworth Fm*); siltstone, shale, limestone, pillow lava and breccia (*Salmon River Fm - Eskay Creek facies*).	Type area for Eskay-type VMS with 8 deposits (eg Eskay Creek, Corey); numerous deposits of both high- and low-sulphidation Au-Ag epithermal type (e.g. Brucejack Lake, Treaty Glacier), plus porphyry mineralization, are of early Jurassic age.	Numerous high multi-element anomalies spatially related to both Eskay-type deposits and epithermal deposits (eg Sulphurets). Anomalies in TrS related to porphyry deposits (eg Kerr).	Britton et al., 1989 Britton et al., 1990 Grove, 1986 Anderson & Thorkleson, 1990 MacDonald et al., 1996	Eskay Creek deposit hosted in lower Salmon River Fm.
A3	Stewart-Salmon River	lmJH Hazleton Group: dominantly subaerial andesite pyroclastics and flows, turbiditic siltstone, plag-Kspar-hornblende porphyry (*Unuk River Fm*); subaerial andesite to dacite tuffs and flows, volcanic sediments (*Betty Creek Fm*); thin subaerial felsic pyroclastics (*Mt Dilworth Fm*); interbedded black cherty radiolarian-bearing shale and white tuff, minor limestone, conglomerate (*Salmon River Fm - Troy Ridge facies*).	2 possible Eskay-type deposits (Delta North, 4-J) in Salmon River Fm; several ?Kuroko type VMS in cherty iron formation at top of ?Unuk River (e.g. George Gold, Vet). Numerous Jurassic-age Au-pyrrhotite (Scottie Gold) and Au-Ag-base metal veins (Big Missouri, Silbak Premier), as well as Eocene Ag-Pb-Zn veins (e.g. Prosperity-Porter Idaho).	Numerous high and moderate multi-element anomalies probably related to epithermal vein deposits (104B, 103P). No RGS for 104A.	Alldrick, 1993 Britton and Alldrick, 1988 Greig et al., 1994 Anderson & Thorkleson, 1990 Grove, 1986	Significant ice cover in higher parts of area.
A4	Alice Arm	*Kitsault:* lmJH Hazleton Group: subaqueous, andesitic tuffs and breccia, flows, minor limestone, siltstone, sandstone, chert (*Unuk River Fm*); volcanic breccia and conglomerate, siltstone,sandstone (*Betty Creek Fm*); dacitic flows, tuffs and lapilli tuffs ?waterlain (*Mt Dilworth*); siliceous siltstone, sandstone, wackes, minor limestone, conglomerate (*Salmon River Fm*). *Anyox pendant:* ?Tr/J: pillowed and massive tholeiitic basalt, breccia, minor tuffs; saccharoidal meta-chert (*?Salmon River Fm - Eskay Creek facies*); flysch - shales and siltstones, minor limestone and coarse clastics (*?Bowser Lake Group*). *Georgie River "pendant":* ?lmJH Hazleton Group: massive to pillowed basalt to andesite flows, coarse volcanic conglomerate, breccia, sandstone, minor siltstone and felsic tuff; pyritic siltstone and shale, minor volcanic sandstone; massive ?subaqueous rhyolite flows, breccia, conglomerate.	*Kitsault:* one possible Eskay type (Left Over) plus possible ?Kuroko-type VMS (Sault) and Jurassic-age epithermal Ag-Pb-Zn veins (Torbrit, Dolly Varden) in Unuk River Fm. Shear-hosted base-metal veins in Illiance River area *Anyox:* numerous lenses of Cyprus-type VMS (eg Hidden Creek). *Georgie River:* Au-base metal quartz veins probably Eocene age.	*Kitsault:* Numerous high and moderate multi-element anomalies within and peripheral to Hazleton rocks. *Anyox:* one multielement anomaly and several single element anomalies but peripheral to volcanic outcrop area. *Georgie River:* moderate multi-element anomalies on SE periphery (along Sutton River)	Alldrick, D.J., 1986 Dawson & Alldrick, 1986 Greig, 1992 Devlin and Godwin, 1986 Evenchick and Holm, 1997 Evenchick and Snyder, 1999.	

A5	Houston-Babine	lmJH Hazleton Group (*Telkwa Fm*) - subaerial calc-alkaline andesitic pyroclastics; amygdaloidal basaltic flows and tuff; siliceous pyroclastics (*Howson facies*). Overlain by lJ *Nilkitkwa Fm* - marine black shale, limestone and greywacke; and, E of Babine Lake, predominantly subaerial lmJ *Saddle Hill volcanics* - rhyolite flows and pyroclastics; basalt flows, breccia and tuff; and feldspathic tuffs, minor marine sediments.	3 VMS deposits at or near Telkwa/Nilkitkwa contact - Ascot and Del Santo contain tetrahedrite. Numerous epigenetic polymetallic quartz veins (Cu-Zn-Pb-Ag-As) of several generations (Jurassic - Tertiary) hosted in sheared volcanics and intrusions (Grouse Mtn, Dome Mtn). Porphyry Cu-Mo deposits (eg Granisle).	Highly anomalous multi-element RGS anomalies related to Dome Mtn and ?Mt Cronin. Several single element Ag anomalies in south. No anomalies in eastern part of the area.	Tipper & Richards, 1976 MacIntyre et al., 1987 MacIntyre et al., 1989 MacIntyre et al., 1996 MacIntyre et al., 1997 Wojdak, 1999	Telkwa Fm basalt flows preferred host for Cu-Ag veins Saddle Hill volcs = ?Mt Dilworth + Salmon River fms (same age, bimodal) though subaerial
A6	Bait-Sikanni Ranges	lmJH Hazleton Group (*Telkwa Fm*) - dominantly intermediate calcalkaline pyroclastics and flows, basalt common, rhyolite rare, subaerial (*Bear Lake facies*); basalt-andesite amygdaloidal flows, pillowed flows, breccia, tuffs, limestone lenses, shale, greywacke, submarine (*Kotsine facies*); well-bedded pyroclastics and coarse sediments, dominantly intermediate-felsic, subaerial (*Sikanni facies*); Overlain by submarine lJ *Nilkitkwa Fm* - pelite, greywacke, tuffaceous sediments, andesite-rhyolite tuff, basaltic volcanic members.	One gold-rich Kuroko-style VMS (Day-Porcupine Zone). Numerous Cu occurrences - either porphyry-Cu related or volcanic redbed Cu.	Several moderate multi-element anomalies.	Richards, 1976 Tipper & Richards, 1976	?Nilkitkwa correlative with Mt Dilworth + Salmon River fms in Eskay area 93M 141 - stockwork py-sp-gn in submarine Nilkitkwa. RGS anomalies include epi-elements but not recorded in deposits!
B1	Taku River	CPS Stikine Assemblage (*Mt Eaton suite*): massive to brecciated mafic flows, felsic flows, breccia, volcaniclastics, massive limestone (lower division); augite-plagioclase phyric breccia, agglomerate, tuff, volcanic turbidite (middle division); volcanic conglomerate and sandstone, coarse debris flows, tuffs, volcanogenic turbidites, pillowed K-spar basalt, intermediate to mafic, breccia and flows, limestone (upper division). uTrS Stuhinni Group: conglomerate, argillite; subaqueous augite-phyric tuff, flows, breccia, pillowed flows, hyaloclastite, heterolithic lapilli tuff; massive limestone; coarse debris flows, volcanic sandstone, calcareous siltstone, argillite, greywacke and grit (*King Salmon fm*).	Precious metal-rich Kuroko-type VMS hosted in Stikine Assemblage lower division rocks (Tulsequah Chief, Big Bull); ?Jurassic mesothermal Au-quartz veins (Polaris Taku). Eocene epithermal veining common.	Many high and moderate multi-element anomalies in the area including areas underlain by uTrS rocks; ?related to Eocene epithermal mineralization.	Mihalynuk et al., 1994 Mihalynuk et al., 1995 Souther, 1971 Sherlock et al., 1996	BWM not VMS (though still ?Eskay related) - breccia pipe, epithermal, age uncertain. Ericksen-Ashby - Kuroko type VMS or skarn?
B2	Telegraph Creek	uTrS Stuhinni Group: subaqueous to subaerial mafic pyroxene-phyric tuffs, breccia, massive and pillowed flows, bladed feldspar porphyry, andesitic tuffs and flows, conglomerate, tuffaceous wacke, siltstone, minor limestone. LmJH Hazleton Group: subaerial to submarine massive andesite flows and tuffs, breccia, siltstone, wacke, felsic flows and tuff.	Mesothermal and porphyry-Cu related base and precious metal veins; One gold-rich ?VMS/vein in uTrS (Tuff).	One high (S of Barrington River) and a few scattered moderate multi-element anomalies; several single element precious metal anomalies. No RGS for 104J.	Brown & Greig, 1990 Brown et al., 1992 Gabrielse, 1977 Souther, 1959 Souther, 1972	lmJH restricted in outcrop (Mt Kirk-Helveker Creek). Note: No MINFILE shown in area of RGS multi-element high!!
B3	Spatsizi Plateau	lmJH Hazleton Group: subaerial basalt to andesite flows and breccias, intermediate-felsic tuff and sills (*Griffith Creek volcs*); marine and subaerial, bimodal alkaline to tholeiitic mafic flows, rhyolite tuff and sills (*Cold Fish volcs*); marine fine-grained clastic sediments (*Spatsizi Fm*); subaerial mafic flows, felsic volcaniclastics (*Mount Brock volcs*).	No VMS. Several occurrences of Jurassic age, intrusion-related porphyry Cu-Au mineralization hosted in Triassic and Jurassic rocks (Red Chris, Edon, Rose of Klappan).	Several multi-element (epi + prec) anomalies in western part of area. No RGS data for 104H.	Souther, 1972 Evenchick & Thorkleson, 1993 Ash et al., 1997 Marsden & Thorkleson, 1992	Area includes Spatsizi Plateau Wilderness Park.

B4	Iskut River	uTrS Stuhinni Group: submarine mafic-intermediate, plagioclase-hornblende-phyric flows, breccia, tuff, wacke, conglomerate and limestone; submarine pyroxene-phyric volcanics and turbiditic sediments; subaerial alkalic flows, tuffs and epiclastics. lmJH Hazleton Group: intermediate-felsic tuffs, lapilli tuffs, agglomerate, volcanic conglomerate, wacke and siltstone (*Unuk River, Betty Creek fms*); subaerial felsic tuffs, lapilli tuffs, siltstone (*?Betty Creek, Mt Dilworth fms*)	One precious-metal enriched VMS (Rock & Roll) ?Besshi-type; alkalic porphyry-Cu (Galore Creek) deposits in northern part; variety of mesothermal (Tr-J) gold-base-metal veins (Johnny Mt, Snip). Mesothermal gold-base-metal veins (Inel).	A few moderate multi-element anomalies, scattered single element precious metal anomalies. No RGS anomalies. (?sample distribution)	Britton et al., 1990 Anderson & Thorkleson, 1990 Logan & Koyanagi, 1994	Extensive ice cover at higher elevations No RGS anomaly around Rock and Roll. Correlation uncertain. ? if Salmon River Fm (Snippaker Mtn facies).
B5	Bulkley Ranges	lmJH Hazleton Group (*Telkwa Fm*) - calc-alkaline andesitic subaerial pyroclastics; amygdaloidal mafic flows; felsic flows, domes and pyroclastics (*Howson facies*). Overlain by *Nilkitkwa Fm* - black shale, limestone and greywacke; non-marine red tuff, volcanic sediments and marls (*Red Tuff Mbr = Eagle Peak Fm*).	VMS mineralization limited to the Kitimat area (Bow Byes); ubiquitous epigenetic polymetallic quartz veins (Cu-Zn-Pb-Ag-As) of several generations (Jurassic - Tertiary) hosted in sheared volcanics and intrusions. Some may be related to porphyry Cu-Mo showings.	Numerous moderate multi-element anomalies throughout the area. Probably relate to the extensive epigenetic mineralization	Tipper & Richards, 1976 Duffell & Souther, !964 Gareau et al., 1997 MacIntyre et al., 1989 Desjardins et al., 1990	?Eagle Peak Fm (Red Tuff Mbr) is equivalent to Mt Dilworth. Subaerial, however. Telkwa Fm basalt flows preferred host for Cu-Ag veins
B6	Tahtsa-Whitesail	lmJH Hazleton Group (*Telkwa Fm*) - dominantly subaerial andesitic pyroclastics, lesser mafic-felsic flows (shallow submarine in Michel Lake area, 93E/10). Overlain by subaerial to submarine felsic volcanics and chert (*"Whitesail Fm"*).	Only one possible Kuroko-style VMS (Poor Sam); quartz-basemetal-gold veins, some with tetrahedrite, occupy northeasterly trending faults (?Tertiary).	One highly anomalous and several moderately anomalous multi-element RGS anomalies throughout the area.	MacIntyre, 1985 Diakow & Mihalynuk, 1987 Diakow & Koyanagi, 1988 Diakow & Drobe, 1989 Diakow, 1990	Generally porphyry-Cu and epigenetic quartz-Au country. Host of Poor Sam uncertain (?Kasalka).
B7	Adam's Lake	Middle Devonian to Mississippian Eagle Bay Assemblage: units *EBA* - felsic to intermediate metavolcanics (chlorite-sericite-quartz phyllite and schist), local mafic metavolcanics (chlorite schist), minor metasediments (phyllite and siltstone); and *EBF* - intemediate feldspathic metatuff and metabreccia. Calc-alkaline to alkaline. Probably submarine.	Numerous Kuroko-type VMS and base-metal veins in units EBA and EBF including precious metal-rich deposits (e.g. Rea Gold, Homestake). U-Th-F-pyrite replacements in EBF. No epithermal mineralization though several deposits contain tetrahedrite +/- argentite or ruby silver (Homestake, Rea Gold, Samotosun).	A few moderate multi-element anomalies (in area of Rea-Samotosun-Homestake), several single element precious or base-metal anomalies. No Hg data.	Schiarizza & Preto, 1987 Höy, 1999	One highly anomalous RGS sample probably related to Fennell Fm or Blackpool fault. No Epi min, ?Homestake-Rea area - deposits all show some epi character.
B8	Bella Coola	lmJH Hazleton Group: *"Hotnarko volcanics"* - marine to non-marine volcaniclastics, flows, breccias and intercalated shales and volcanic sandstones. Bimodal - predominantly mafic-intermediate, minor rhyolite, ?calc-alkaline. (Includes pendants formerly mapped as Gambier Group)	Area is poorly explored. Two VMS prospects (Nifty, Keen) show some Eskay Creek-type characteristics.	No RGS data available.	van der Hayden, 1990 van der Hayden, 1991 Ray et al., 1998 Baer, 1973	Area adjacent to Tweedsmuir Park Area is poorly mapped and understood. Volcanics ?time equivalent to Salmon River +/- Ashman fms, though one eJ age date. Mid-Coast RGS (1999) may include this area.
B9	Nechako River	lmJH Hazleton Group: *Entiako Fm* - deep to near-shore, mudstone, arkosic sandstone, sharpstone conglomerate, subaerial rhyolite flows, tuffs and lapilli tuff, minor mafic lapilli tuff; *Naglico Fm* - augite-phyric mafic flows, tuffs, breccia, scarce marine volcanic sediments, tholeiitic to calc-alkaline (previously mapped as uTrS).	Epithermal mineralization of Late Cretaceous and Tertiary age. No massive sulphides.	No RGS data available. Till and lake sediment data available for parts of area. Anomalies can be related to epithermal mineralization.	Diakow et al., 1997 Anderson & Snyder, 1998 Anderson et al., 1998 Struik et al., 1999 Lane & Schroeter, 1997	Age equivalents to Salmon River & ?Nilkitkwa fms. Nomenclature being revised.

C1	Tatsamenie Lake	CPS Stikine Assemblage: chloritic intermediate metavolcanics, tuffs and flows, feldspar and augite-phyric tuffs and flows, rare pillow basalt, argillite; felsic-intermediate tuff, tuffaceous sandstone and argillite, local conglomerate; slate, phyllite, minor siltstone, limestone; felsic phyllitic metatuff, chloritic intermediate to mafic metavolcanics, dolomite, marble, phyllite; limestone, crinoidal limestone, carbonaceous limestone. uTrS Stuhinni Group: mafic-intermediate augite-plagioclase pyroclastics, flows and sills, volcanic turbidites, pillow basalt, minor limestone, chert, conglomerate.	No known VMS, though stratabound pyritic alteration zones occur in Stikine Assemblage volcanic rocks; Jurassic and Tertiary epithermal veining (Au +/- base-metals) in silicified zones in Stikine Assemblage limestone (Golden Bear, Fleece); quartz-base metal veins occur in Stuhinni Group volcanics (Bandit, Honk).	Scattered high and moderate multi and single element anomalies. Appear to be peripheral to intrusions.	Bradford & Brown, 1993 Souther, 1971 Oliver & Hodgson, 1990	
C2	Toodoggone	lmJH Hazleton Group (*Toodoggone Fm*) - interstratified, dominantly intermediate to felsic, high-K calcalkaline flows and pyroclastics in 2 volcanic cycles. Subaerial; rare late submarine sediments.	Profusion (>100!!) of epithermal Au-Ag deposits (Lawyers, Chapelle, Al), syngenetic with volcanism. No VMS.	Several moderate multi-element anomalies; numerous single-element anomalies - base-metals to NE, precious-metals throughout.	Diakow et al., 1991 Diakow et al., 1993	?becoming submarine to NE (poorly mapped in that area).
C3	Harrison Lake	lmJHL Harrison Lake Fm - calc-alkaline, mafic - felsic, early volcanics are shallow water to subaerial, later subaqueous with local subaerial to shallow water. KG Fire Lake Group (*Brokenback Hill Fm*) - mafic to intermediate pyroclastics & flows, slates, wackes, rare felsics. Lower units submarine, Upper unit subaerial.	Weaver Creek member of JHL hosts Kuroko VMS and basemetal veins. Seneca and Fleetwood are precious metal-rich. No epithermal mineralization. Epigenetic Au-Ag veins & disseminated deposits probably Tertiary in age (related to Oligocene intrusions)	1 highly anomalous sample, 2 moderate. 1 moderate multi-element anomaly; a few precious metal anomalies.	Mahoney et al., 1995 Sherlock et al., 1996 Lynch 1992	Felsics at top of Weaver Creek mbr - submarine!, shallow water portion is mafic.
C4	Slocan	uTr Slocan Group: argillite, quarzitic argillite, limestone, minor tuff. Submarine (deep water). Massive intermediate to felsic grey tuff (uTrS) and greenstone (?lJR) in Nakusp area	One massive sulphide deposit (Kusp) ?Kuroko-type. Epigenetic precious metal veins of the Slocan Camp are Eocene in age.	Strong to moderate multi-element anomalies in the Slocan Camp area; many moderate anomalies elsewhere in the belt. No Hg data for western part of area (82L)	Hedley, 1952 Little, 1960 Beaudoin et al, 1992 Hyndman, 1968	Mostly sediments - volcanics in Nakusp area though no felsics. Mineralization later
C5	Rossland	lJR Rossland Gp: (*Elise Fm*): dominantly mafic flows and pyroclastics, local sediments and rare felsic flows. K-rich calc-alkaline to alkaline. Deep to shallow submarine becoming subaerial in upper units.	Only one possible Kuroko-type VMS deposit (Perrier - Lucky Boy Adit). Polymetallic veins of several generations, many bearing tetrahedrite, arsenopyrite or stibnite. However, all are Middle Jurassic, post-Elise Fm.	A few moderate multi-element anomalies; single element precious or base-metal anomalies. Related to known polymetallic vein mineralization.	Höy & Dunne, 1997 Fyles, 1984 Höy & Andrews, 1991	Rare felsics, Ag mineralization is later. Some debate regarding presence of VMS deposits.
C6	Quatsino-Kyuquot	lmJB Bonanza Group: siliceous siltstone, argillite, sandstone, limestone, debris flows, mafic-intermediate subaqueous tuff, breccia and flows; subaerial, mafic - felsic, calcalkaline flows and pyroclastics, minor volcanic conglomerate and sandstone.	Acid-sulphate transitional to epithermal mineralization hosted in subaerial rhyolites (Expo zone, LeMare Lake). No massive sulphides.	Scattered moderate to highly anomalous multi-element anomalies; ?spatially related to faults and mesothermal Au-carbonate mineralization; moderate anomalies in north reflect transitional mineralization.	Nixon et al., 1993 Nixon et al., 1994 Nixon et al., 1995 Panteleyev & Koyanagi, 1993	Submarine volcanics are dominantly mafic; felsics only in upper subaerial sequence.
C7	Nitinat-Cowichan	lmJB Bonanza Group: subaqueous maroon tuffs, tuffaceous sandstone, conglomerate, argillite (*Redbed Creek facies*); subaerial, calcalkaline, plagiophyric mafic to intermediate flows, lapilli and crystal tuffs, felsic lapilli tuffs and welded tuffs (*Klanawa facies*).	Massive sulphides (Jasper) and epithermal deposits rare; mesothermal Au-carbonate veins are Tertiary.	Moderate multi-element and anomalous gold samples scattered throughout the area; ?related to mesothermal veins and older quartz-gold veins.	Massey, 1995 Yorath et al., 1999	Volcanics in submarine section are predominantly mafic to intermediate, felsics are subaerial.