

# **SIERRA IRON ORE**

## **GEOLOGICAL ASSESSMENT REPORT**

*(Event 5467617)*

*Work done on Tenures 751682 & 1022260*

*of the 7 claim*

### **TOM CAT 751682 CLAIM GROUP**

*(Work done from September 12-15, 2013)*

**Nicola Mining Division BCGS 092H.097/.098**

**British Columbia, Canada**

*Centred Near:*

**5,536,197 N, 675,952 E**

*UTM (NAD: 83)*

*Author & Consultant:*

**Laurence Sookochoff, PEng.**

**SOOKOCHOFF CONSULTANTS INC.**

*Vancouver, BC Canada*

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## Summary

Sierra Iron Ore owns 12 claims designated as the Tom Cat property located 200 kilometres east-northeast of Vancouver and within the historic Aspen Grove copper camp. Seven of the 12 claims comprise the Tom Cat 751682 Claim Group of which Tenures 751682 & 1022260 of the Tom Cat Claim Group, are the subject of the structural analysis. The Tom Cat 751682 Claim Group is located 19 kilometres west of the formerly productive Elk gold-silver deposit (Minfile 092HNE096) and 39 kilometres west of the formerly productive Brenda copper-molybdenum deposit (Minfile 092HNE047).

At the Elk property, the western area is underlain by steeply west-dipping andesitic to basaltic flows, agglomerates, tuffs and minor siltstone and limestone units of the Nicola Group. The eastern half of the property is underlain by granitic rocks of the Middle Jurassic Osprey Lake batholith. The contact between these units trends northeasterly across the property.

Gold-silver mineralization on the Elk property is hosted primarily by pyritic quartz veins and stringers in altered pyritic granitic and, less frequently, volcanic rocks. From 1992 and 1995 (inclusive) 16,570 tonnes of ore were mined and milled resulting in the production of 1,518,777 grams (48,830 ounces) of gold and 1,903,000 grams (61,183 ounces) of silver.

The Brenda copper-molybdenum deposit is hosted by the “Brenda Stock”, a composite quartz diorite/granodiorite body which forms part of the Early Jurassic Pennask batholith. It is suggested that intermittent east-west compressional forces intensely fractured the rocks of the Brenda stock during several stages of time and tapped a hydrothermal source, either a later phase of the Brenda stock or a separate intrusive system. As each stage of fractures developed, hydrothermal fluids introduced vein material which healed the fractures. Renewed build-up of compressional forces again fractured the rocks, which were again healed. Repetition of this sequence can explain all stages of mineralization within the Brenda deposit. East-west compression continued after ore deposition ceased and produced prominent east-northeast and northwest striking shear zones.

Faults in the Brenda pit are expressed as fracture zones in which the rock is intensely altered to clay minerals, sericite, epidote and chlorite. These fracture zones range in width from a few centimetres to 9 metres.

(The above information on the Brenda copper-molybdenum deposit and on the Elk gold-silver deposit is summarized from the Minfile records which are contained in full herein).

The Aspen Grove area was recognized for its potential in developing economic mineral deposits since the late 1880's when copper mineralization was first discovered in the area. Two of the earlier discoveries, the Tom Cat and the Bunker Hill, were made on the ground covered by the 12 claim Tom Cat Property which now includes ten documented mineral prospects or showings in a localized three by two kilometre area or approximately only one-quarter of the entire Property. The

Although the Tom Cat Property has a history of exploration, the only significant results reported prior to 2006 was a drill intersection of 45.7 metres of 0.32% copper in a 1965 Pyramid Mining drill hole on the Tom Cat showing. Exploration work by Bold Ventures in 2006 & 2007 resulted in the delineation of viable chargeability IP drill targets and copper soil anomalies associated with mineral showings. A drill hole on the Tom Cat showing confirmed the historic result in the intersection of 4.4 meters of 0.54% copper in a 40 meter section of mineralization. The entire 40 meters of mineralization was not sampled.

The 2013 Structural Analysis on Tenures 751682 & 1022260 of the Tom Cat 751682 Claim Group indicated four locations of structural intersections which should be the focus for primary exploration to locate any surficial geological indicators to a potential underlying mineral resource. The north-south and the east-west primary structures is a structural pattern that is comparable to the structural controls at the Elk (Gold Mountain) past producer.

**Summary (cont'd)**

One of the four structural locations on the Tom Cat 751682 Claim Group is near the Minfile Pot 1 mineral showing (Minfile 092HNE204) where a composite chip sample across the showing was reportedly analysed at 2.55 grams per tonne gold and 1.9 grams per tonne silver over 130 metres. Another intersection is on a north-south structure south of the Pot 1 mineral showing which, if the north-south structure is a mineral controlling structure, the southern intersection may be a location or an indication of an associated mineral zone as at the Elk (Figure 8).

A geological examination of the four intersecting locations is recommended and a subsequent localized VLF-EM survey be completed if warranted. The VLF-EM survey may provide information on the favourable structure location and any host mineralization.

**INTRODUCTION**

In September 2013 a Lineament Array Analysis was completed on Tenures 751682 & 1022260 of the seven claim Tom Cat 751682 Claim Group ("Property"). The purpose of the program was to delineate potential structures which may be integral in geological controls to potentially economic mineral zones that may occur on Tenures 751682 & 1022260 or other claims of the Property.

Information for this report was obtained from sources as cited under Selected References.

**Figure 1. Location Map**  
(from MapPlace)



## PROPERTY DESCRIPTION AND LOCATION

The Property consists of seven contiguous claims totaling 2080.5143 ha hectares. Particulars are as follows:

**Table 1. TOM CAT 751682 CLAIM GROUP TENURES**  
(from MtOnline)

<u>Tenure Number</u>	<u>Type</u>	<u>Claim Name</u>	<u>Good Until</u>	<u>Area (ha)</u>
<a href="#">526118</a>	Mineral	POTHOLE LAKE 3	20140930	520.302
<a href="#">751682</a>	Mineral	POTHOLE LAKE 1	20140930	207.8881
<a href="#">1015178</a>	Mineral	TC1281	20141130	270.3828
<a href="#">1015179</a>	Mineral	TC1282	20141130	332.941
<a href="#">1015252</a>	Mineral	TC1211	20141130	187.2796
<a href="#">1015255</a>	Mineral	TC12111	20141130	312.2401
<a href="#">1022260</a>	Mineral	S 91213	20140930	249.4807

The Property is located in the Nicola Mining Division of British Columbia Canada, 200 kilometres east-northeast of Vancouver and 19 kilometres south-southeast of Merritt. The centre of the Property is at 5536197N, 675952E (NAD 83).

## ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE and PHYSIOGRAPHY

Access is southward from Merritt via Highway 5A to the west end of the Kentucky Lake Provincial campsite junction 22 kilometres south of Merritt. From this junction a good secondary road is taken for 1.8 kilometres east and 0.5 kilometres south to the central-northern boundary of the Property. This road, traversing the central portion of the property, in addition to many other secondary roads, provides access to most of the mineral showings on the Property.

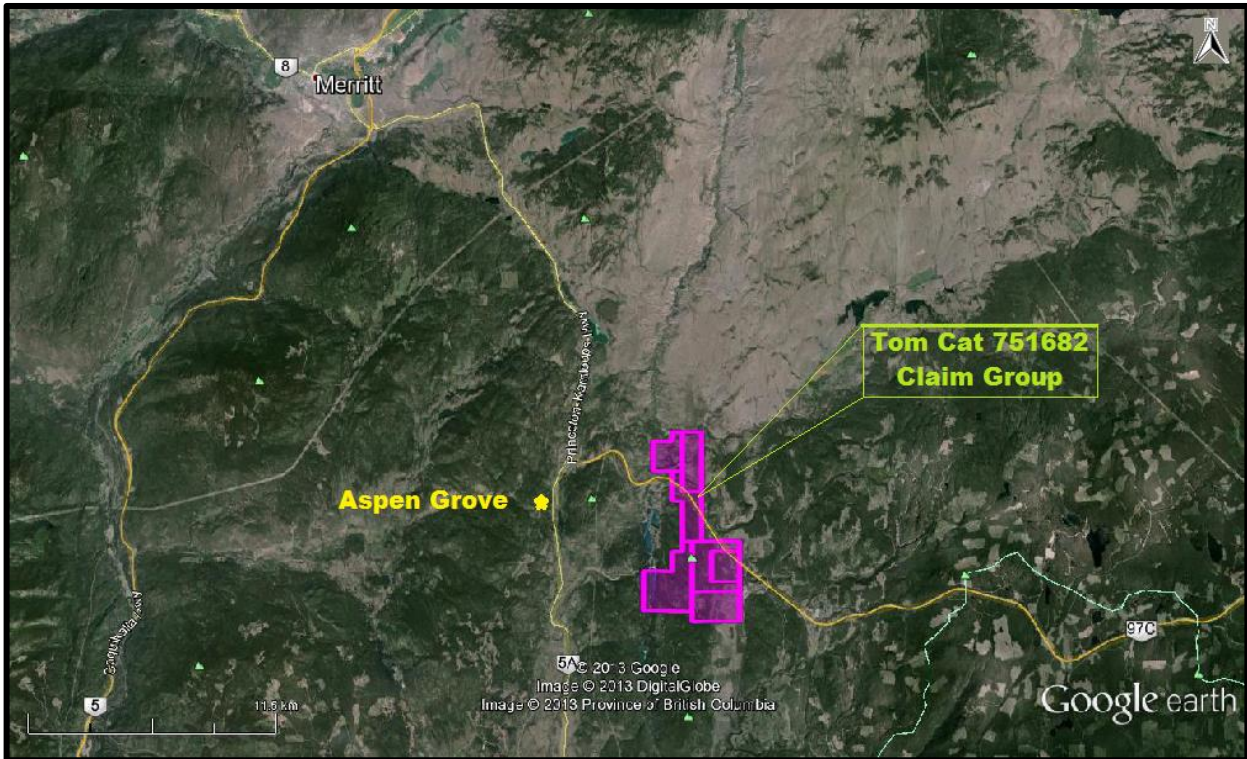
The region is situated within the dry belt of British Columbia with rainfall between 25 and 30 cm per year. Temperatures during the summer months could reach a high of 35° and average 25°C with the winter temperatures reaching a low of -10° and averaging 8°. On the Property snow cover could be from December to April which should not hamper a year-round exploration program.

Merritt or Kamloops, historic mining centres, could be a source of experienced and reliable exploration and mining personnel and a supply for most mining related equipment. Kamloops is serviced daily by commercial airline and is a hub for road and rail transportation. Vancouver, a port city on the southwest corner of, and the largest city in the Province of British Columbia, is four hours distant by road and less than one hour by air from Kamloops.

The Property is situated at the western edge of the Douglas Plateau, which is within the physiographic area designated as the Interior Plateau of British Columbia. Vegetation is grassland with pine groves and thickets of fir at higher elevations.

Gentle to moderate slopes are the norm for Tenures 751682 & 1022260. Elevations range from 1020 m along Bates Creek in the northern portion to 1265 m on a knoll in the south.

Figure 2. **CLAIM LOCATION**  
(Map from MapPlace and Google)



### HISTORY: PROPERTY AREA

The history of exploration in the Aspen Grove copper camp dates to the late nineteenth century when copper mineralization was discovered. The history on some of the more significant mineral MINFILE reported occurrences, prospects, and past producers on and peripheral to the Property (Figure 4) are reported as follows; the distance is from Tenures 751682 & 1022260, the subject of the Structural Analysis.

**MAL** prospect (Cu skarn; Fe skarn; Au skarn)

MINFILE 092HNE002

Three kilometres west

*Initial work consisted of diamond drilling and trenching in the early 1960s on the main showing (Malachite 1 2 and Chalcocite 1-2 claims), on which the occurrence is centred. This is located on access road number 5116, 1 kilometre south of Quilchena Creek, 11.5 kilometres east-northeast of the community of Aspen Grove. A second showing, smaller and less significant but with the same characteristics, is located 1 kilometre to the southwest (Malachite 7, 092HNE269).*

**BRENDA** past producer (Porphyry Cu +/- Mo +/- Au)

MINFILE 092HNE047

Thirty-nine kilometres east-southeast

*The Brenda mine began production in early 1970 with measured geological (proven) reserves of 160,556,700 tonnes grading 0.183 per cent copper and 0.049 per cent molybdenum at a cutoff of 0.3 per cent copper equivalent [eCu = % Cu + (3.45 x % Mo)]. The mine officially closed June 8, 1990.*

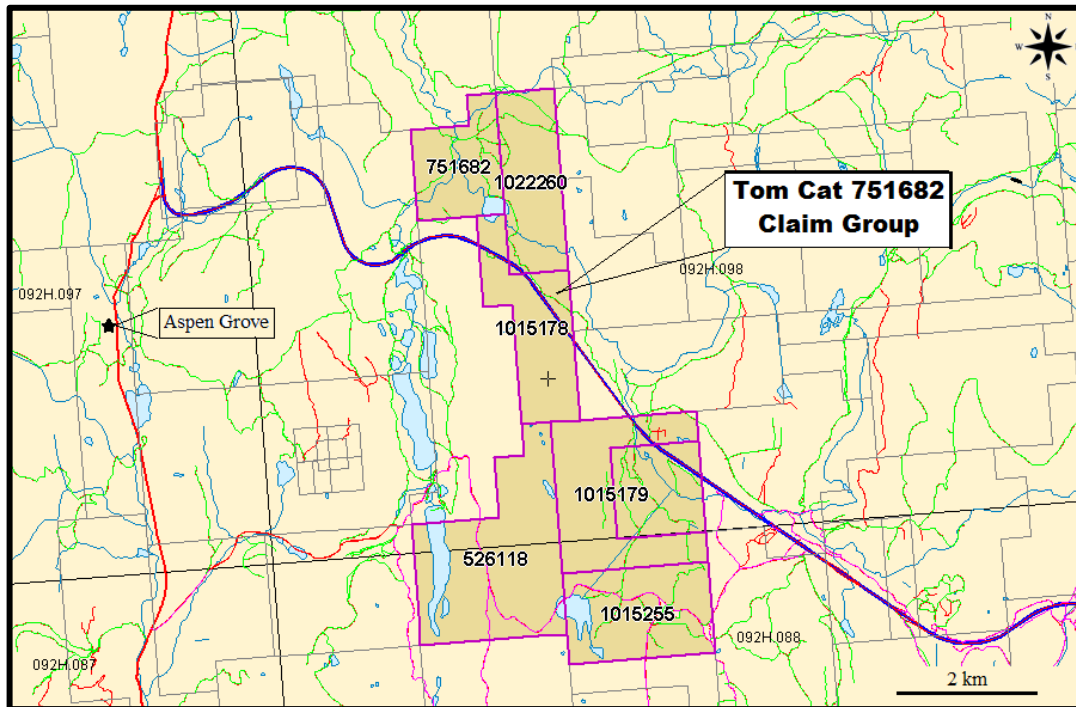
**History: Property Area (cont'd)****HN-WEN** prospect (Volcanic redbed Cu)

MINFILE 092HNE058

Four kilometres southwest

*Adits and trenches were initially cut around 1900; later work included diamond drilling and trenching in the 1960s and 1970s.*

Figure 3. **CLAIM MAP**  
(base map from MapPlace)

**BIG SIOUX** past producer (Volcanic redbed Cu; Alkalic porphyry Cu-Au)

MINFILE 092HNE073

Three kilometres west

*This deposit was one of the first showings to be explored in the Aspen Grove copper camp. It was staked in 1899, and investigated periodically by H.H. Schmidt up to 1914. One shaft, 10 metres deep, an adit, 46 metres long, and numerous pits and trenches were excavated during this time. Forty-four tonnes of ore were shipped in 1918 grading 9.78 per cent copper and 67.9 grams per tonne silver. David Minerals Ltd., Amax Exploration Inc. and Norranco Mining and Refining completed soil and rock geochemical and geophysical surveys over the deposit between 1968 and 1978.*

*The occurrence was restaked in 1989 after copper mineralization was exposed in a roadcut along the north side of the recently completed Coquihalla Highway (Phase 3 - Okanagan Connector). The deposit was subsequently mapped and sampled by Amex Exploration Services Ltd. in 1990, Northair Mines Ltd. in 1991 and Placer Dome Inc. in 1992. Christopher James Gold Corp. drilled the area, including the Big Kidd (092HNE074) in 1997.*



**History: Property Area (cont'd)****BIG KIDD** prospect (Volcanic redbed Cu; alkalic porphyry Cu-Au)

MINFILE 092HNE074

Two kilometres southwest

*This occurrence was first explored by H.H. Schmidt, with the excavation of several trenches and one adit, 69 metres long, between 1900 and 1915. An additional three adits, 12 to 90 metres long, were excavated sometime between 1916 and the 1950s. The deposit was trenched and drilled by Noranda Mines Ltd. in 1956 after completing geological and geophysical surveys. Additional geophysical and soil geochemical surveys were carried out by Norranco Mining and Refining in 1969 and Amax Exploration Inc. in 1971. Amax also mapped and drilled the deposit in 1972. David Minerals Ltd. conducted geological and self-potential surveys, trenching and 112 metres of diamond drilling in three holes between 1975 and 1980. The deposit was sampled by Northair Mines Ltd. in 1991 and Placer Dome Inc. in 1992. Drilling by Placer intersected 71 metres averaging 0.75 gram per tonne gold and 0.2 per cent copper in the north zone of the Big Kidd breccia.*

*Christopher James Gold Corp. drilled 10 holes, totalling 2074 metres in 1997. A 116-metre intersection graded 0.801 grams per tonne gold and 0.124 per cent copper, including a higher grade section of 19.46 metres grading 3.09 grams per tonne gold and 0.113 per cent copper (Exploration in B.C. 1997, page 38). This intersection is from the North zone. The Southwest zone, 350 metres to the south, and the Northeast zone also contained mineralization.*

*The next program by Christopher James Gold was a 2 staged drilling program completed during the fall in 1999. This program drilled a fan of three holes to the southwest and one parallel hole along the Big Kidd Breccia north contact. All four 1999 holes intersected significant lengths of gold-copper mineralized intrusion breccia with late porphyritic monzonite dyke and potassic (K-feldspar) alteration zones.*

*In 2003, Christopher James Gold Corp. drilled 9 holes and dug three trenches to test alkalic porphyry hosted by the Big Kidd breccia. Broad intervals of low-grade mineralization were encountered*

**PAYCINCI** prospect (Volcanic redbed Cu)

MINFILE 092HNE084

Four kilometres west-southwest

*The Cinnattiti deposit was first explored by the Bates brothers in the early 1900s. A number of trenches, and one adit 120 metres long, were excavated between 1899 and 1913. Payco Mines Ltd. and Alscope Consolidated Ltd. conducted geological and geophysical surveys, trenching and diamond and percussion drilling between 1963 and 1967. An additional 15 holes totalling 1000 metres were drilled by Gold River Mines and Enterprises Ltd. in 1973 and Sienna Developments Ltd. in 1979. The deposit was most recently sampled by Pacific Copperfields Ltd. in 1992. In 1998, Christopher James Gold Corp. optioned the property. Reserves are estimated at 1.8 million tonnes grading 1 per cent copper (Tom Schroeter, 1998).*

**ELK** past producer (Intrusion-related Au pyrrhotite veins; Polymetallic veins Ag-Pb-Zn

+/-Au; Au-quartz veins)

MINFILE 092HNE096

Nineteen kilometres southeast

*From 1992 and 1995 (inclusive), 16,570 tonnes of ore were mined and milled and 1,518,777 grams (48,830 ounces) of gold and 1,903,000 grams (61,183 ounces) of silver recovered.*

**History: Property Area (cont'd)****ELK past producer**

*In 1996, Fairfield shipped all remaining stockpiles, estimated to contain 2700 tonnes and grading greater than 12 grams per tonne (Information Circular 1997-1, page 21). A total of 994 metres of ramp access and three development levels exist underground.*

*Reverse circulation drilling, underground diamond drilling, reclamation, road construction, water sampling and aerial photography were also undertaken during this period.*

*Surface and underground diamond drill programs were carried out in the Siwash Mine area from 1994 to 1996 to define the resource. Exploration surface drilling was also carried out during the 1995 and 1996 field seasons to test trench targets between the Siwash mine site and the South Showing area 2.5 kilometres to the south. Limited prospecting and environmental monitoring was undertaken from 1997 to 1999.*

*In 1995, Fairfield Minerals with the support from the Explore B.C. Program carried out an extensive program including geochemistry, 13,972 metres of surface and underground diamond drilling in 315 holes and reserve calculations.*

**AM showing (Volcanic redbed Cu)**

MINFILE 092HNE166

Six kilometres south

*The AM showing is 1.7 kilometres north-northwest of the north end of Bluey Lake and 600 metres west of the south end of Kentucky Lake.*

*A chip sample from an old shaft assayed 2.05 per cent copper over 1.6 metres (Assessment Report 6821, page 4).*

**GEOLOGY: REGIONAL**

Kerr provides an excellent account of the regional geological setting in a 2006 assessment report (AR 28,782). “The project area lies within the Intermontane belt of Mesozoic rocks between Princeton and Merritt. This belt of rocks carries south into the United States and north into the Yukon Territory. The distinguishing and oldest rock group in this belt is the volcanic and sedimentary rocks of the Triassic Nicola group.

Preto (Bulletin 69) has subdivided this group into the western, central, and eastern facies. The eastern facies is dominantly intermediate purple/gray/green flows, breccias, tuffs, lahar breccias, with minor sandstones and siltstones. The central facies is intermediate to basic flows, breccias and tuffs, with more dominant limestone, siltstone, argillite, and conglomerate. The western facies is acidic to intermediate flows, breccias and tuffs, with minor limestone. Intruding the Nicola volcanics are numerous stocks, sills, small plutons, batholiths and dikes of various ages and of a varied composition.

The more sizeable intrusions are the Jurassic Pennask batholith, the lower Jurassic Allison Lake pluton, and the Cretaceous Summers Creek stocks. The intrusive rocks are acidic to basic in composition, however most are alkalic in nature. The most dominant rock descriptions are diorite, monzonite and granodiorite. The lower Cretaceous Kingsvale group of dominantly volcanic rocks unconformably overly the Nicola group and earlier intrusions. These rocks are intermediate to felsic flows, tuffs, ash flows and lahar breccias. The Summers Creek stocks intrude rocks of the Kingsvale group, Overlying all rocks are Tertiary basalts and andesites of the Princeton group and sedimentary rocks of the Coldwater beds.”

**GEOLOGY: PROPERTY AREA**

The geology on some of the more significant mineral MINFILE reported occurrences, prospects, and past producers peripheral to the Tom Cat Property are reported as follows; the distance is from Tenures 751682 & 1022260, the subject of the Structural Analysis.

**Geology: Property Area (cont'd)****MAL** prospect (Cu skarn; Fe skarn; Au skarn)

MINFILE 092HNE002

Three kilometres west

*The Malachite occurrence is hosted in the Upper Triassic Nicola Group, which regionally consists of alkalic and calcalkalic volcanics and intrusions of island arc origin, and which is the principal component of the Quesnel Terrane in southern British Columbia (Geological Survey of Canada Maps 41-1989, 1713A). This belt has been of major economic interest because of its potential for porphyry copper-gold mineralisation.*

*The occurrence lies in the northern assemblage of the Eastern belt or facies of the Nicola Group (after Preto, Bulletin 69). This assemblage mainly consists of well-bedded submarine volcanoclastic rocks and volcanic flows.*

*The main Aspen Grove copper camp lies several kilometres to the west in the Central belt, separated by the north-striking Kentucky-Alleyne fault system (Bulletin 69).*

*The area of the Malachite occurrence is underlain by dark green, augite porphyritic andesitic to basaltic volcanics and fragmental rocks, with subordinate black argillite with local limy horizons, and feldspar porphyry (Assessment Reports 449, 1586). Some volcanic flow breccia contains pink trachytic fragments (Assessment Report 9590). Stratified rocks strike north-northwest and dip moderately to steeply west (Geological Survey of Canada Map 41-1989).*

*Within 1 or 2 kilometres to the north of these rocks is the east-trending contact of the Early Jurassic Pennask batholith, a large intrusion of medium-grained granodiorite to quartz diorite.*

*The volcanics and sedimentary rocks have been altered, probably the result of hydrothermal activity related to the Pennask batholith. Epidote alteration is common; potassium feldspar alteration is more restricted. Skarn alteration is most characteristic of this occurrence, as it hosts the main mineralisation. It is closely associated with limy rocks, and is marked by epidote and garnet. North-trending gossanous shear zones have been exposed in trenches near the skarn zones (Assessment Report 449).*

**BRENDA** past producer (Porphyry Cu +/- Mo +/- Au)

MINFILE 092HNE047

Thirty-nine kilometres east-southeast

*The Pennask Mountain area is mainly underlain by a roof pendant comprising westerly younging, Upper Triassic sedimentary and volcanoclastic rocks of the Nicola Group. These are intruded and enclosed to the north, east and south by plutonic rocks of the Early Jurassic Pennask batholith and Middle Jurassic Osprey Lake batholith. Both the Nicola rocks and the Pennask batholith are unconformably overlain by Tertiary sediments and volcanics of the Princeton Group.*

*The Brenda copper-molybdenum deposit is within the "Brenda stock", a composite quartz diorite/granodiorite body which forms part of the Pennask batholith. Several ages and compositions of pre and post-ore dikes cut the stock. The deposit is approximately 390 metres from the contact with Nicola Group rocks to the west.*

*Nicola Group tuffs, volcanic breccias and flows adjacent to the Brenda stock have been altered to "schistose hornfels".*

*This hornfels, which is as wide as 450 metres, is characterized by the development of bands and aligned lenses of felted brown to black biotite. Schistosity generally strikes roughly parallel to the intrusive contact and dips west at 30 to 70 degrees. The schistose hornfels grades westerly into recognizable west-dipping volcanic rocks which in turn are overlain by greywacke, argillite and shales.*

**Geology: Property Area (cont'd)****Brenda past producer (cont'd)**

The Brenda stock is a composite, zoned quartz diorite to granodiorite body which can be divided into two units. Unit 1 is of quartz diorite composition and contains abundant mafic minerals (hornblende > biotite) and angular quartz grains, whereas unit 2 is porphyritic granodiorite and contains fewer mafic minerals (biotite > hornblende), well-defined biotite phenocrysts and subhedral quartz grains. The contact between units 1 and 2 is generally gradational, but locally sharp. At sharp contacts, unit 2 is chilled against unit 1.

Dikes of several ages and compositions cut the Brenda stock. At least four types, aplite-pegmatite, andesite, trachyte porphyry and basalt, have been identified in the Brenda orebody.

Similar dikes, as well as felsite, dacite and quartz diorite have been mapped beyond the limits of economic mineralization. The aplite-pegmatite dikes are cut by all other dikes and by all mineralized fractures. The andesite dikes have been altered and mineralized during ore formation. Two types of quartz diorite dikes are found and both are cut by quartz-sulphide veins. Dacite porphyry and felsite dikes are also cut by quartz-sulphide veins.

A trachyte porphyry dike up to 4.5 metres wide and 300 metres in strike length is exposed in the Brenda pit. A weakly mineralized vein was observed in the dike which suggested an intermineral age for the dike. Further evidence has clearly shown that the dikes cut all stages of mineralization, except some of the latest quartz veins (Canadian Institute of Mining and Metallurgy Special Volume 15). Several post-mineral hornblende lamprophyre dikes also occur within the Brenda orebody and are probably genetically related to the trachyte porphyry dikes.

Irregular, branching basalt dikes, probably related to Tertiary volcanism, have been intruded along pre-existing fault zones. They cut all phases of mineralization and alteration. Initial potassium-argon dating of two samples from the Brenda mine area resulted in different ages for hornblende (176 Ma) and biotite (148 Ma). Interpretation of these results suggests that the Brenda stock crystallized about 176 million years ago.

Biotite samples from the pit area have been dated at about 146 Ma, which probably represents the age of mineralization (Canadian Institute of Mining and Metallurgy Special Volume 15).

Faults in the Brenda pit are expressed as fracture zones in which the rock is intensely altered to clay minerals, sericite, epidote and chlorite. These fracture zones range in width from a few centimetres to 9 metres. Most strike 070 degrees and dip steeply south. Northwest-striking faults exhibit left-lateral movement. The faults transect all mineralization, except some calcite veins. Sulphides, especially molybdenite, have been smeared along fault planes. Shear zones are wider and more numerous in the north half of the pit, where they control bench limits.

**HN-WEN prospect (Volcanic redbed Cu)**

MINFILE 092HNE058

Four kilometres southwest

The HN-WEN occurrence is hosted in the Upper Triassic Nicola Group, which regionally consists of alkalic and calcalkalic volcanics and intrusions of island arc origin, and which is the principal component of the Quesnel Terrane in southern British Columbia (Geological Survey of Canada Maps 41-1989, 1713A). This belt has been of major economic interest because of its potential for porphyry copper-gold mineralization.

The occurrence lies in the northern assemblage of the Eastern belt of the Nicola Group (after Preto, Bulletin 69).

**Geology: Property Area (cont'd)****HN-WEN prospect (cont'd)**

*This assemblage mainly consists of well-bedded submarine volcanoclastic rocks and volcanic flows. The main Aspen Grove copper camp lies several kilometres to the west in the Central belt, separated by the north-striking Kentucky-Alleyne fault system (Bulletin 69).*

*The area of the occurrence is underlain by augite porphyritic volcanic flows of andesitic to basaltic composition, fragmental rocks including tuff and breccia, and argillites (Assessment Reports 1586, 4230).*

*The argillites are dark grey to black, well bedded, and locally limy. They are somewhat carbonaceous and pyritic. Minor rock types present include feldspar porphyry and locally lenses of diorite. About 2.5 kilometres to the northeast is the contact with the Early Jurassic Pennask batholith, a large intrusion of medium-grained granodiorite to quartz diorite.*

*The contact between the volcanic rocks and the argillites passes through the centre of the mineralized area. The contact is parallel to bedding, striking 130 degrees and dipping 40 degrees southwest, with the volcanic rocks on the northeast side (Assessment Report 4230).*

**BIG SIOUX** past producer (Volcanic redbed Cu; Alkalic porphyry Cu-Au  
MINFILE 092HNE073

Three kilometres west

*The Fairweather Hills region is underlain by the Central volcanic facies of the Upper Triassic Nicola Group, comprising intermediate, feldspar and feldspar augite porphyritic pyroclastics and flows, and associated alkaline intrusions. The intrusions vary from diorite to monzonite in composition and are thought to be comagmatic with the Nicola Group, ranging in age from Late Triassic to Early Jurassic.*

*Locally, the area is underlain by red and green laharic breccias, augite andesite porphyry and minor sediments of the Nicola Group (Central belt, Bulletin 69). The units generally strike north-northwest and dip east. This sequence is broken up into a series of tilted fault blocks trending north.*

*The occurrence is hosted in variably amphibole, augite and feldspar porphyritic basaltic andesite, subjected to extensive fracturing, shearing and faulting. Alteration minerals include abundant epidote, and minor silica and chlorite. Some microdiorite and diorite are also present.*

**BIG KIDD** prospect (Volcanic redbed Cu; alkalic porphyry Cu-Au)  
MINFILE 092HNE074

Two kilometres southwest

*The deposit is located along the northern margin of an area of hilly upland situated in the centre of the Aspen Grove copper camp, known as the Fairweather Hills. The Fairweather Hills region is underlain by the Central volcanic facies of the Upper Triassic Nicola Group, comprising intermediate, feldspar and feldspar augite porphyritic ash flows, and associated alkaline intrusions.*

*The intrusions vary from diorite to monzonite in composition and are thought to be comagmatic with the Nicola Group, ranging in age from Late Triassic to Early Jurassic.*

*Locally, the area is underlain by red and green laharic breccias, augite andesite porphyry and minor sediments of the Nicola Group (Central belt, Bulletin 69). The units generally strike north-northwest and dip east. This sequence is broken up into a series of tilted fault blocks trending north.*

*A vertical or subvertical breccia pipe, nearly circular in outline and about 300 metres wide, is developed in a body of fine-grained diorite, which may in part be recrystallized volcanics. The pipe consists of angular to subrounded clasts of volcanics, fine-grained diorite (microdiorite) and pinkish grey monzonite and syenomonzonite porphyry in a matrix of altered diorite intrusive material and finely comminuted rock. The fragments are 1 centimetre to several metres in diameter.*

**Geology: Property Area (cont'd)****PAYCINCI** prospect (Volcanic redbed Cu)

MINFILE 092HNE084

Four kilometres west-southwest

*The deposit is located in the southern portion of an area of hilly upland situated in the centre of the Aspen Grove copper camp, known as the Fairweather Hills. The Fairweather Hills region is underlain by the Central volcanic facies of the Upper Triassic Nicola Group, comprising intermediate, feldspar and feldspar augite porphyritic pyroclastics and flows, and associated alkaline intrusions. The intrusions vary from diorite to monzonite in composition and are thought to be comagmatic with the Nicola Group, ranging in age from Late Triassic to Early Jurassic.*

*Locally, the area is underlain by red and green laharic breccias, augite andesite porphyry and minor sediments of the Nicola Group (Central belt, Bulletin 69). The units generally strike north-northwest and dip east. This sequence is broken up into a series of tilted fault blocks trending north.*

*Hypogene and supergene copper mineralization occurs in green laharic breccia, near the contact with red laharic breccia to the east. This mineralization consists primarily of disseminated and fracture controlled chalcocite and native copper, accompanied by lesser malachite and azurite, and minor chalcopyrite, bornite, cuprite and pyrite. Drilling indicates chalcopyrite becomes more abundant at depth at the expense of chalcocite. This mineralization is exposed along the crest and east flank of a small northerly trending ridge, over a north-south distance of 400 metres.*

**ELK** past Producer (Intrusion-related Au pyrrhotite veins; Polymetallic veins Ag-Pb-Zn

+/-Au; Au-quartz veins)

MINFILE 092HNE096

Nineteen kilometres southeast

*The Elk property is underlain by Upper Triassic volcanics and sediments of the Nicola Group and by Middle Jurassic granites and granodiorites of the Osprey Lake batholith. The contact between these units trends northeasterly across the property. Early Tertiary feldspar porphyry stocks and dikes of the Otter intrusions occur throughout the property. The western property area is underlain by steeply west-dipping andesitic to basaltic flows, agglomerates, tuffs and minor siltstone and limestone units of the Nicola Group. The eastern half of the property is underlain by granitic rocks of the Osprey Lake batholith.*

**AU-WEN** prospect (Intrusion-related Au pyrrhotite veins; Polymetallic veins Ag-Pb-Zn+/-Au)

MINFILE 092HNE144

One kilometre east

*The AU occurrence is hosted in the Upper Triassic Nicola Group, which regionally consists of alkalic and calcalkalic volcanics and intrusions of island arc origin, and which is the principal component of the Quesnel Terrane in southern British Columbia (Geological Survey of Canada Maps 41-1989, 1713A). This belt has been of major economic interest because of its potential for porphyry copper-gold mineralization.*

*The occurrence lies in the northern assemblage of the Eastern belt of the Nicola Group (after Preto, Bulletin 69). This assemblage mainly consists of well-bedded submarine volcanoclastic rocks, ranging from tuffaceous volcanic siltstones characteristic of the lower part, to coarse volcanic conglomerate and laharic breccias in the upper part.*

*The assemblage is characterized by a paucity of intrusive rocks in comparison to the main Aspen Grove copper camp in the Central belt a few kilometres to the west, separated by the Kentucky-Alleyne fault system (Bulletin 69).*

**Geology: Property Area (cont'd)****AU-WEN prospect (cont'd)**

The AU occurrence is centred on the main gold showing, a small stripped, drilled and trenched area just off a gravel road south of Quilchena Creek (Assessment Reports 5766, 16008). This and most of the surrounding area is underlain by andesitic to dacitic tuff, cherty tuff, black argillite, and volcanic sandstone and siltstone. The rocks are strongly fractured in a variety of orientations. Bedding in the tuff has been measured to strike 060 degrees and dip 54 degrees northwest, but it varies.

About 1 kilometre to the north of the main showing is biotite hornblende granodiorite and quartz monzonite of the Early Jurassic Pennask batholith, and about 500 metres to the west are porphyritic andesitic and basaltic volcanic rocks (Bulletin 69; Assessment Report 16008). Small bodies of diorite and micromonzonite, possibly subvolcanic, are quite common in the area, on the surface and in drill core (Assessment Report 16008).

**AM showing (Volcanic redbed Cu)**

MINFILE 092HNE166

Six kilometres south

Chalcopyrite, bornite and chalcocite form disseminations and stringers in shear zones within massive green volcanic breccia and lahar deposits of the Upper Triassic Nicola Group (Central belt, Bulletin 69).

**GEOLOGY: PROPERTY****POT 1 showing (Volcanic redbed Cu)**

MINFILE 092HNE204

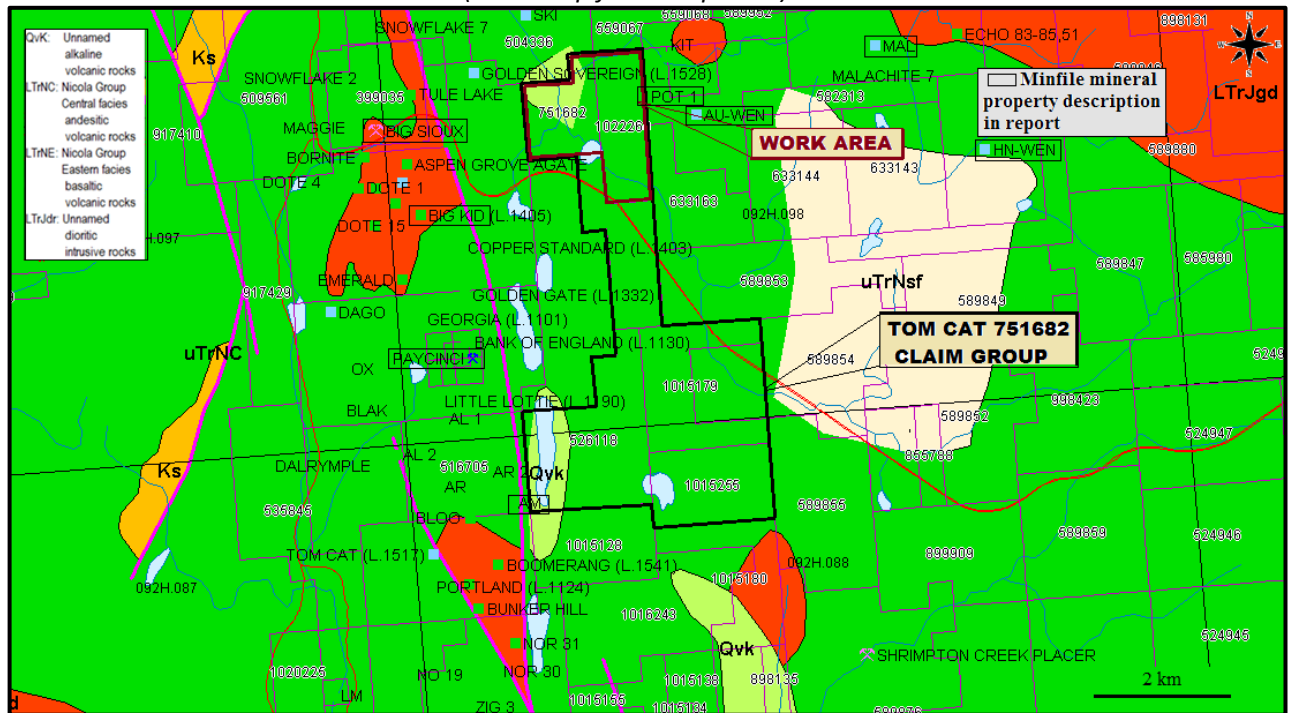
Within Tenure 1022260 of property

The Pot 1 occurrence is hosted in the Upper Triassic Nicola Group, which regionally consists of alkalic and calcalkalic volcanics and intrusions of island arc origin, and which is the principal component of the Quesnel Terrane in southern British Columbia (Geological Survey of Canada Maps 41-1989, 1713A). This belt has been of major economic interest because of its potential for porphyry copper-gold mineralization.

The occurrence lies in the northern assemblage of the Eastern belt or facies of the Nicola Group (after Preto, Bulletin 69). This assemblage mainly consists of alkalic volcanic flows and well bedded submarine volcanoclastic rocks, ranging from tuffaceous volcanic siltstones characteristic of the lower part, to coarse volcanic conglomerate and laharic breccias in the upper part. The assemblage is characterized by a paucity of intrusive rocks in comparison to the main Aspen Grove copper camp in the Central belt a few kilometres to the west, separated by the Kentucky-Alleyne fault system (Bulletin 69).

The area of the Pot 1 occurrence is underlain by purple to grey-green augite plagioclase porphyritic andesite to basalt (or trachyandesite and trachybasalt) (Bulletin 69; Preliminary Map 15). Minor volcanic siltstone, wacke and tuff may be present (Assessment Report 13714). These rocks are intruded by northwest-striking dikes of granodiorite to quartz monzonite. The volcanic rocks at the showing are highly fractured and altered with epidote, quartz-carbonate veins, and minor hematite (Assessment Report 13714).

Figure 4 **Geology, Index & Minfile**  
(Base Map from MapPlace)



### MINERALIZATION: PROPERTY AREA

The mineralization on some of the more significant mineral MINFILE reported occurrences, prospects, and past producers peripheral to the Tom Cat property are reported as follows; the distance is from Tenures 751682 & 1022260, the subject of the Structural Analysis.

**MAL** prospect (Cu skarn; Fe skarn; Au skarn)

MINFILE 092HNE002

Three kilometres west

*Copper mineralisation is concentrated in the skarn zones. Pyrite and subordinate magnetite and chalcopyrite are associated with quartz-calcite veins, or are disseminated in variable amounts (Assessment Report 1586). Chalcocite and malachite are also present at the main showing (Assessment Report 8453).*

**BRENDA** past producer (Porphyry Cu +/- Mo +/- Au)

MINFILE 092HNE047

Thirty-nine kilometres east-southeast

*The Brenda orebody is part of a belt of copper-molybdenum mineralization that extends north-northeast from the Nicola Group-Brenda stock contact. Mineralization of economic grade (0.3 per cent copper equivalent) is confined to a somewhat irregular zone approximately 720 metres long and 360 metres wide. Ore-grade mineralization extends more than 300 metres below the original surface. Lateral boundaries of ore-grade mineralization are gradational and appear to be nearly vertical.*

*Primary mineralization is confined almost entirely to veins, except in altered dike rocks and in local areas of intense hydrothermal alteration which may contain minor disseminations.*



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**Mineralization: Property Area (cont'd)****Brenda past producer (cont'd)**

The grade of the orebody is a function of fracture (vein) density and of the thickness and mineralogy of the filling material. The average total sulphide content within the orebody is 1 per cent or less. Chalcopyrite and molybdenite, the principal sulphides, generally are accompanied by minor, but variable, quantities of pyrite and magnetite. Bornite, specular hematite, sphalerite and galena are rare constituents of the ore. Johnson (1973), in a study of 17 samples from the deposit, reported minor pyrrhotite, mackinawite, carrollite, cubanite, ilmenite, rutile and native gold (?), as well as several secondary sulphides (Canadian Institute of Mining and Metallurgy Special Volume 15). Pyrite is most abundant in altered andesite dikes and in quartz-molybdenite veins. The ratio of pyrite to chalcopyrite in the orebody is about 1:10, with the chalcopyrite content diminishing beyond the ore boundaries.

Because mineralization is confined almost entirely to veins in relatively fresh homogeneous rock, the veins are divided into separate stages, based on crosscutting relations and their mineralogy and alteration effects on the hostrock. The vein density within the orebody is not uniform.

Ranges are recorded from less than 9 per metre near the periphery of the orebody to 63 per metre and occasionally 90 per metre near the centre of the orebody. Some veins have very sharp contacts with wallrocks, but most contacts are irregular in detail where gangue and sulphide minerals replace the wallrock.

A vein may show features characteristic of fracture-filling in one part and of replacement in another. Mineralized solutions were introduced into fractures and, during development of the resultant veins, minor replacement of the wallrock ensued.

The chronological stages of mineralization are as follows: (1) biotite-chalcopyrite (oldest); (2) quartz-potassium feldspar-sulphide; (3) quartz-molybdenite-pyrite; (4) epidote-sulphide-magnetite; and (5) biotite, calcite and quartz. Stages 1 through 4 are all genetically related to a single mineralizing episode, which was responsible for the orebody.

Stage 5 represents a later, probably unrelated, event(s) (Canadian Institute of Mining and Metallurgy Special Volume 15). Stage 2 veins form the bulk of the mineralization in the deposit, and are the most important source of ore.

Hydrothermal alteration at the Brenda deposit generally is confined to narrow envelopes bordering veins. These alteration envelopes commonly grade outward into unaltered or weakly propylitic-altered rock. Where veins are closely spaced, alteration envelopes on adjacent veins may coalesce to produce local areas of pervasive alteration. For the most part, hydrothermal alteration at the Brenda deposit is exceptionally weak for a porphyry copper system.

Four types of alteration are recognized in the Brenda deposit, three of which are related to the mineralizing process. Two of these are potassic (potassium feldspar) and biotite, and the other is propylitic. Later argillic alteration has been superimposed on the system along post-mineral faults.

Potassium feldspar and biotite alteration generally are separated in space, but locally occur together. Both types of alteration accompanied sulphide deposition. Potassium feldspar replaces plagioclase adjacent to most stage 2 and, to a lesser extent, stage 3 veins. These irregular envelopes range in width from a centimetre or less up to a metre, with an average of about 2 centimetres. Potassium feldspar also occurs as a minor constituent of stage 1 veins.

Hydrothermal biotite replaces magmatic mafic minerals (hornblende, biotite) and, more rarely, plagioclase in hostrock adjacent to stage 2 and especially stage 3 veins. These envelopes of hydrothermal biotite range in width from less than 1 millimetre to several centimetres.

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**Mineralization: Property Area (cont'd)****Brenda past producer (cont'd)**

*Weak to intense propylitic alteration, which is characterized by the development of chlorite and epidote, as well as less obvious microscopic sericite and carbonate, is sporadically distributed throughout the Brenda stock. Large areas within the orebody have not been propylitized and in these areas, veins with potassic alteration envelopes clearly cut across propylitized quartz diorite, indicating an early hydrothermal or even a pre-ore origin for the propylitization (Canadian Institute of Mining and Metallurgy Special Volume 15). A second period of propylitization accompanied the development of stage 4 veins and is reflected as envelopes of epidote and chlorite.*

*Locally intense argillic alteration is confined to post-mineral fault zones where the hostrock has been highly shattered. Kaolinite, sericite and epidote have almost completely replaced the host rocks.*

*Surface weathering, which is expressed predominantly by the development of limonite, extends as a highly irregular blanket over the mineralized zone for depths ranging from a few metres to greater than 30 metres. In this weathered area, limonite stains all fractures. Fault zones have been especially susceptible to surface weathering, and the argillic alteration of these zones may be primarily the result of groundwater action. Secondary minerals developed during weathering, all highly subordinate in quantity to limonite, include malachite, azurite, hematite, ferrimolybdate, powellite and cupriferos manganese oxides. Cuprite, covellite, chalcopyrite, native copper, tenorite and ilsemanite are rare constituents.*

*Copper-molybdenum mineralization in the Brenda deposit was developed during several sequential stages, all of which constitute one mineralizing episode.*

*Each stage occupies unique sets of fractures, which are filled with specific combinations of metallic and gangue minerals. Although the attitudes of veins in each stage are unique in detail, most stages include conjugate steeply dipping sets of northeast and northwest striking veins. If these veins occupy shear fractures, it is probable that they were formed by generally east-west compressive forces.*

*Examination of the structure in the Nicola Group rocks to the west reveals that north-northwest and north trending fold axes also indicate an east-west compression.*

*It is suggested that intermittent east-west compressional forces intensely fractured the rocks of the Brenda stock during several stages of time and tapped a hydrothermal source, either a later phase of the Brenda stock or a separate intrusive system.*

*As each stage of fractures developed, hydrothermal fluids introduced vein material which healed the fractures. Renewed build-up of compressional forces again fractured the rocks, which were again healed. Repetition of this sequence can explain all stages of mineralization within the Brenda deposit. East-west compression continued after ore deposition ceased and produced prominent east-northeast and northwest striking shear zones (Canadian Institute of Mining and Metallurgy Special Volume 15).*

**HN-WEN prospect (Volcanic redbed Cu)**

MINFILE 092HNE058

Four kilometres southwest

*The mineralization is restricted to the volcanics. It is exposed in 3 adits and at least 8 trenches, and is marked by alteration, mainly epidotization, silicification, carbonatization, moderate chloritization and local pyritization. Chalcopyrite is the only copper mineral: it is disseminated, or concentrated in quartz and calcite veins and veinlets between 0.3 and 30 centimetres thick, usually about 8 centimetres thick. Pyrite, pyrrhotite and rare specular hematite are also present in the veins. Locally oxidation has produced abundant malachite, azurite and limonite.*

**Mineralization: Property Area** (cont'd)**HN-WEN** prospect (cont'd)

The mineralized zone measures 760 by 90 metres and has a depth of about 75 metres. Diamond drilling indicates that it strikes 160 degrees and dips vertically or steeply east, so it is not parallel to the volcanic-sedimentary contact, indicating that the contact is not the controlling factor.

Rather, the veins hosting the mineralization are structurally controlled by numerous faults and fractures which consistently strike 160 degrees and dip 85 degrees east (Assessment Report 4230). Incidentally, the Echo occurrence (092HNE059) lies on this trend, 2 kilometres to the north-northwest, and the mineralization may also extend south-southeast of the HN-WEN occurrence (Assessment Report 4230).

Some significant copper and silver values have been obtained from the workings and diamond drill core. A 1.5-metre chip sample from Adit Number 1 was assayed at 4.39 per cent copper, 92.6 grams per tonne silver, and 0.7 gram per tonne gold (Assessment Report 4230).

A grab sample from here was assayed at 4.84 per cent copper, 46.6 grams per tonne silver and 0.7 gram per tonne gold (Assessment Report 4230). Both samples were from oxidized material and may not be representative of grade throughout the deposit (Assessment Report 4230). A drill core sample (hole HNS 72-1) assayed 1.12 per cent copper and 3.4 grams per tonne silver (Assessment Report 4230).

The average grade of the whole deposit has been estimated at 0.08 per cent copper, with a generally low gold and silver content (Assessment Report 4230).

**BIG SIOUX** past producer (Volcanic redbed Cu; Alkalic porphyry Cu-Au)

MINFILE 092HNE073

Three kilometres west

Pyrite, pyrrhotite, chalcopyrite and arsenopyrite are disseminated sporadically in the tuffaceous rocks and argillite, up to about 1 per cent, and also occur in fractures (Assessment Reports 11241, 16008). Native gold is associated with the sulphides in narrow quartz-filled fractures in these rocks (Assessment Report 16008). Minor malachite occurs in volcanics.

The overall extent of the mineralization has not been determined, although diamond drilling has demonstrated that minor pyrite, pyrrhotite and chalcopyrite, disseminated or associated with quartz or calcite fracture veinlets, does persist below the surface (Assessment Reports 11241, 16008).

Gold values in the area are generally low, but high values have been obtained from trench sampling and drill core at the main showing. Significant gold assays in chip samples range from 6.8 grams per tonne over 5.1 metres to 10.8 grams per tonne over 4.9 metres (Assessment Report 16008).

**BIG KIDD** prospect (Volcanic redbed Cu; alkalic porphyry Cu-Au)

MINFILE 092HNE074

Two kilometres southwest

Mineralization is erratic and consists of abundant magnetite, and pyrite, lesser chalcopyrite, and traces of bornite and chalcocite, as disseminations, lenses, scattered blebs and veinlets. Cuprite and native copper are also reported. This mineralization tends to favour the zones of alteration, but is not proportional to the intensity of alteration. The sulphides are in part controlled by zones of shearing and fracturing in the northeastern portion of the deposit. Limonite, malachite and azurite are present at or near surface. Pyrite occurs primarily as disseminations up to 5 millimetres in diameter. The mineral also occurs along fractures in association with chalcopyrite, orthoclase, quartz and/or carbonate. Chalcopyrite tends to be finely disseminated and is usually associated with magnetite, intimately associated with pyrite, and forms pseudomorphs after pyrite. Pyrite-chalcopyrite intergrowths are prevalent along fractures. Bornite is often found in magnetite-chalcopyrite blebs and veinlets, which often display epidote halos.

**Mineralization: Property Area (cont'd)****BIG KIDD** past producer (cont'd)

Copper content is quite variable, and precious metal values are low but anomalous. Channel sampling of an adit yielded 0.901 per cent copper, 0.141 gram per tonne gold and 13.66 grams per tonne silver over 14 metres (Assessment Report 7100, page 8, adit no. 1) Channel sampling of a trench, 90 to 190 metres west of the adit, yielded 0.237 per cent copper, 0.095 gram per tonne gold and 3.37 gram per tonne silver over 35 metres (Assessment Report 7100, page 9, trench no. 12). Trenching and sampling of the northern margin of the breccia pipe yielded gold values of up to 1.97 grams per tonne over 6 metres (Assessment Report 8743, Figure 3.)

**PAYCINCI** prospect (Volcanic redbed Cu)**MINFILE 092HNE084***Four kilometres west-southwest*

Hypogene and supergene copper mineralization occurs in green laharc breccia, near the contact with red laharc breccia to the east. This mineralization consists primarily of disseminated and fracture controlled chalcocite and native copper, accompanied by lesser malachite and azurite, and minor chalcopyrite, bornite, cuprite and pyrite. Drilling indicates chalcopyrite becomes more abundant at depth at the expense of chalcocite.

This mineralization is exposed along the crest and east flank of a small northerly trending ridge, over a north-south distance of 400 metres.

Drill indicated reserves are 54,000 tonnes grading 0.876 per cent copper (Assessment Report 7654, page 1). Precious metal values are generally low. Six rock samples analysed 1.1 to 2.4 per cent copper, 0.005 to 0.010 gram per tonne gold and 1.3 to 5.7 grams per tonne silver (Assessment Report 14108, Figure 5, samples 2051 to 2056).

**ELK** past producer (Intrusion-related Au pyrrhotite veins; Polymetallic veins Ag-Pb-Zn +/-

Au; Au-quartz veins)

**MINFILE 092HNE096***Nineteen kilometres southeast*

Gold-silver mineralization on the Elk property is hosted primarily by pyritic quartz veins and stringers in altered pyritic granitic and, less frequently, volcanic rocks.

Crosscutting relationships indicate that the veins are Tertiary in age; they may be related to Tertiary Otter intrusive events.

To date, mineralization has been located in four areas on the Elk property: Siwash North, South Showing (092HNE261), North Showing (092HNE281) and Siwash Lake (092HNE041, 295).

The Siwash Lake zone is 800 metres south of the Siwash North deposit; the North Showing and South Showing areas are 2 and 3 kilometres south of Siwash North respectively.

In the Siwash North area, gold occurs in veins measuring 5-70 centimetres wide, hosted by a zone of strongly sericitic altered granite and, in the west, volcanic rocks. In general, the mineralized zone trends east-northeast with southerly dips from 20-80 degrees (from east to west), and appears to be related to minor shearing. Quartz veining occurs in a number of parallel to subparallel zones.

Each zone consists of one or more veins within an elevation range of 5 to 10 metres that can be correlated as a group to adjacent drill holes. In the eastern parts of the area, up to six subparallel zones occur. Five of these zones are consistent enough to be labelled the A, B, C, D and E zones.

**Mineralization: Property Area (cont'd)****Elk past producer (cont'd)**

Mineralization in the west has been identified in one or locally two zones (the B and C zones). The main mineralized zone (B) is consistent, with only minor exceptions, across the entire drill grid.

The Siwash North structure has been tested to 335 metres down dip and along a strike length of 925 metres. The zone remains open to depth and along strike.

At surface, supergene alteration has leached out most of the sulphides with some pyrite and chalcopyrite remaining. Mineralization occurs primarily as native gold, occasionally as spectacular aggregates of coarse flakes in frothy quartz (strong pyrite boxwork) or in fractures in the vein. Electrum was noted in one area as very coarse-grained flakes associated with strong manganese staining. Gold is rarely seen in boxworks in sericitic (phyllic) alteration.

In drill core, mineralization has not been affected by supergene processes. Metallic minerals in drill core include pyrite, chalcopyrite, sphalerite, galena, tetrahedrite, maldonite? pyrrhotite and native gold in order of decreasing abundance.

Gold is strongly associated with pyrite and with a blue-grey mineral. Photomicrographs show the gold commonly in contact with this mineral, which may be a gold-bismuth alloy (maldonite?) or a copper-bismuth-antimony sulphosalt.

Gangue mineralogy consists primarily of quartz and altered wallrock fragments. Ankerite is commonly present, with lesser amounts of calcite. Minor barite is also present. Fluorite was noted in one vein as very small (less than 1 millimetre) zoned purple cubes scattered in the quartz.

Stronger alteration generally accompanies higher grade gold mineralization. Seven main types of alteration were recognized in the granitic rocks throughout the property: propylitic, argillic, sericitic, potassium feldspar stable phyllic, phyllic, advanced argillic and silicic. Locally, potassic alteration, skarnification and silicification are evident, but are relatively minor and do not appear to be related to mineralization.

Propylitic alteration is generally light green with biotite and hornblende altered to chlorite, and plagioclase is saussuritized.

In volcanics, the colour is generally olive green, and the rock is soft. Argillic alteration is exemplified by bleached rock, with plagioclase white and clay-altered; potassium feldspar is slightly altered.

Volcanics are bleached to light green or grey. Sericitic alteration is typically pale green with a micaceous sheen, with plagioclase altered to sericite; trace disseminated pyrite may be present. This type of alteration is often associated with quartz veins and appears to be the lowest grade alteration associated with gold mineralization. It is not recognized in volcanics.

Potassium feldspar stable phyllic alteration is light pink, green or yellowish with potassium feldspar fresh and pink and blocky. Plagioclase and mafic minerals are altered to fine-grained quartz-sericite-pyrite. It often occurs with veins and is associated with gold mineralization; it is not recognized in volcanics.

Phyllic alteration is generally grey, fine-grained quartz-sericite-pyrite alteration usually associated with veins and often gradational to quartz and often auriferous. Advanced argillic alteration is exemplified by most or all of feldspar being destroyed, quartz is "free-floating". The alteration is often sheared and white in colour and is often associated with quartz veins. Volcanics are white or blue coloured.

**Mineralization: Property Area (cont'd)****Elk past producer (cont'd)**

Silicic alteration is quartz veining or replacement that is hard with moderate conchoidal fracture. There is a strong symmetrical zoning of alteration around the quartz veins: vein-advanced argillic-phyllitic-potassium feldspar stable phyllic-argillic-propylitic.

Measured geological reserves of the Siwash North deposit are 308,414 tonnes grading 22.17 grams per tonne gold and 24.68 grams per tonne silver using a cutoff grade of 10 grams per tonne gold.

Reserves are based on results from 107 drillholes at 50-metre grid spacings along 804 metres of strike length to 304 metres downdip. All veining intercepts have been adjusted for true width and assays diluted to 2-metre mining widths (George Cross News Letter No. 223 (November), 1991).

The revised drill indicated reserve, based on more realistic open pit and underground mining widths of 0.39 to 0.79 metre with 20.5 grams per tonne gold cutoff grade, is 122,458 tonnes averaging 54.5 grams per tonne gold (George Cross News Letter No. 65 (April 2), 1993).

Surface drilling was done on fences 10-50 metres apart, underground drilling on fences 10 metres apart. Reserve calculations by the company and consultant Roscoe Postle gave the following results (Explore B.C. Program 95/96 - A38):

Probable (undiluted) 16,991 tonnes at 28,200 tonnes at 50.2 g/t gold 26.6 g/t gold

Possible (undiluted) 50,260 tonnes at 66,400 tonnes at 42.0 g/t gold 31.4 g/t gold

The 1996 exploration program consisted of 6873 metres of drilling in 91 holes. The Siwash zone has been traced along a 914 metre strike length and downdip to 245 metres.

Reserves estimated by the company at January 1, 1996 were 121,350 tonnes grading 25.4 grams per tonne gold and 35.3 grams per tonne silver.

These include a diluted, probable open-pit resource of 11,340 tonnes grading 58.97 grams per tonne gold, an underground probable resource below the open pit of 20,225 tonnes grading 26.74 grams per tonne gold, and a further possible underground resource of 89,790 tonnes grading 23.66 grams per tonne gold (Information Circular 1997-1, page 21).

Surface diamond drilling totaling 1413.96 metres in 12 holes was completed on the Siwash Mining lease during 2000 testing the B, WD and Gold Creek West (GCW) zones.

A trenching program was carried out in 2001 in the Siwash East Area consisting of six trenches totaling 202 meters. Almaden Resources and Fairfield Minerals Ltd. merged into Almaden Minerals Ltd. in February, 2002.

In 2002, Almaden undertook a 26 hole surface diamond drill program for a total of 4995.67 metres testing the B, WD, GCW and Bullion Creek zones. During the 2003 field season a 6570 metre, 30 hole, diamond drill program was carried out by Almaden in the Siwash North area testing the WD zone. The WD vein system is located approximately 100 metres north of the Siwash B zone vein and has been tested over a strike length of 610m and down dip for 380m.

By the end of May 2004, a total of eight mineralized veins had been discovered on the property. Four vein systems had been drilled in the Siwash area: the B system with a strike length of 900 m has been tested down dip to 320 m; the WD zone with a strike length of 650 m has been tested to 370 m down dip; the GCW zone with a strike length of 300 m has been tested to 130 m down dip and the Bullion Creek (BC) zone which has been tested with two holes to a depth of 75 m.

**Mineralization: Property Area (cont'd)****Elk past producer (cont'd)**

A new 43-101 compliant resource was calculated using drill data for the Siwash B and WD veins, just two of eight known mesothermal vein structures on the property.

Global (bulk-tonnage and underground mineable) measured and indicated resources were reported to total 668,300 tonnes grading 9.66 grams per tonne gold (207,600 ounces) plus an additional 1,317,200 tonnes grading 4.91 grams per tonne gold (207,800 ounces) in the inferred category (News Release, Almaden Minerals Limited, May 28, 2004).

Included in the global figures is a higher grade, underground-mineable resource totaling 164,000 tonnes grading 33.69 g/t gold in the measured and indicated category, plus another 195 200 tonnes grading 16.38 g/t gold in the inferred category.

In 2004 a diamond drill program consisting of 10,265 meters of NQ drilling in 44 holes was completed. As reported by Almaden in 2001, a possible extension to the B and WD vein systems was found roughly two kilometres along strike to the east, on the other side of an area of overburden cover and no outcrop, as part of a trenching program.

Grab samples of the vein material taken at surface returned averaged analyses of 31.6 grams per tonne gold and 104.4 grams per tonne silver (News Release, Almaden Minerals Limited, March 4, 2005. This discovery added about two kilometres of prospective, unexplored strike length to the high-grade vein system.

**AU-WEN prospect (Intrusion related Au pyrrhotite veins; Polymetallic veins Ag-Pb-Zn+/-Au)**

MINFILE 092HNE144

One kilometre east

Pyrite, pyrrhotite, chalcopyrite and arsenopyrite are disseminated sporadically in the tuffaceous rocks and argillite, up to about 1 per cent, and also occur in fractures (Assessment Reports 11241, 16008). Native gold is associated with the sulphides in narrow quartz-filled fractures in these rocks (Assessment Report 16008). Minor malachite occurs in volcanics. The overall extent of the mineralization has not been determined, although diamond drilling has demonstrated that minor pyrite, pyrrhotite and chalcopyrite, disseminated or associated with quartz or calcite fracture veinlets, does persist below the surface (Assessment Reports 11241, 16008).

Gold values in the area are generally low, but high values have been obtained from trench sampling and drill core at the main showing. Significant gold assays in chip samples range from 6.8 grams per tonne over 5.1 metres to 10.8 grams per tonne over 4.9 metres (Assessment Report 16008).

Copper is associated with the gold mineralization; one rock sample from the main trench yielded 0.29 per cent copper (Assessment Report 7293). Another sample yielded 26 grams per tonne silver and 0.14 per cent lead (Assessment Report 7293). Silver in diamond drill core is generally under 1 gram per tonne (Assessment Report 11241).

Grab and select samples assayed between 14.4 and 91 grams per tonne gold (Assessment Reports 5766, 16008). The best drill core intersection assayed 4.97 grams per tonne gold over 1.5 metres (Assessment Report 16008).

**AM showing (Volcanic redbed Cu)**

MINFILE 092HNE166

Six kilometres south

A chip sample from an old shaft assayed 2.05 per cent copper over 1.6 metres (Assessment Report 6821, page 4).

## MINERALIZATION: PROPERTY

**POT 1** showing (Volcanic redbed Cu)

MINFILE 092HNE204

Within Tenure 1022260 of property

*Mineralization comprises erratically disseminated chalcopyrite, malachite, azurite and pyrite (Preliminary Map 15; Assessment Report 13714). The copper minerals occur in narrow zones striking southwest, transverse to the regional strike but parallel to a fault 1 kilometre to the northwest (Bulletin 69).*

*Individual rock samples from the showing were analysed at up to 0.95 gram per tonne gold and 4.8 grams per tonne silver (Assessment Report 13714). A composite chip sample across the showing was analysed at 2.55 grams per tonne gold and 1.9 grams per tonne silver over 130 metres (Assessment Report 13714, Drawing No. 2, sample W301). Gold and silver values appear to be proportional to the degree of alteration and copper mineralization (Assessment Report 13714).*

## STRUCTURAL ANALYSIS

Hillside Shade maps obtained from MapPlace were utilized as the base map for the structural analysis on Tenures 751682 & 1022260.. A total of 99 lineaments were marked (Figure 5), compiled into a 10 degree class interval, and plotted as a rose diagram as indicated on Figure 6.

**Figure 5. Tenures 751682 & 1022260 Indicated Structures**  
(Base map from MapPlace)

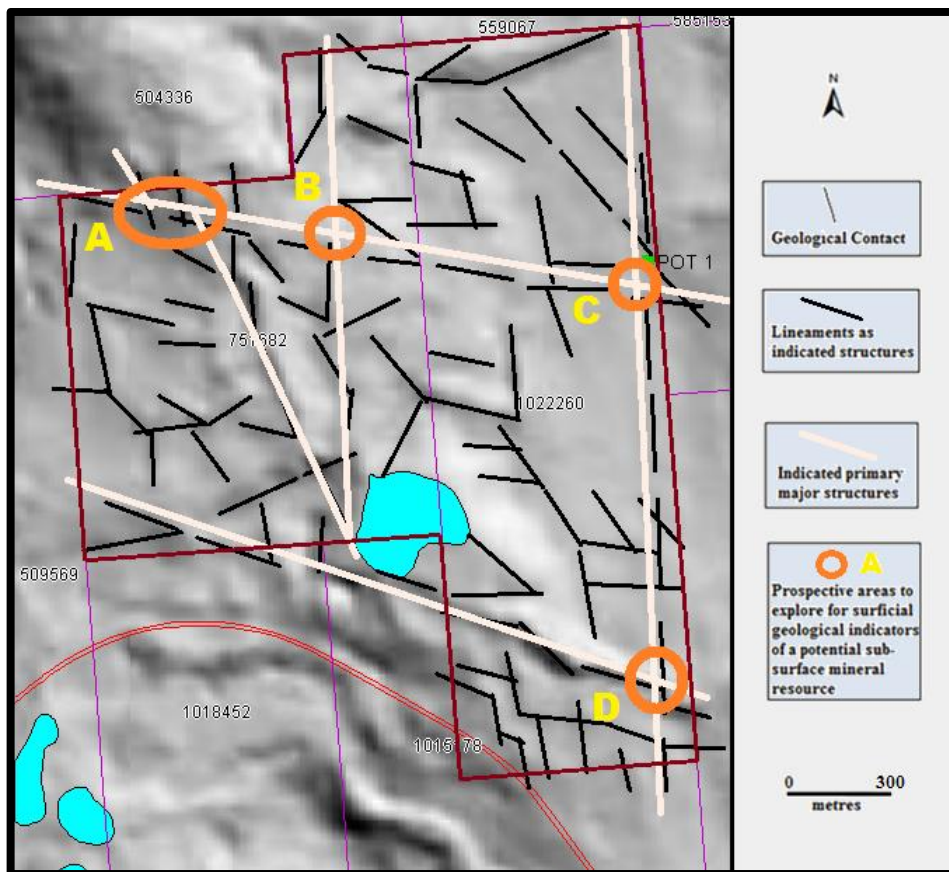
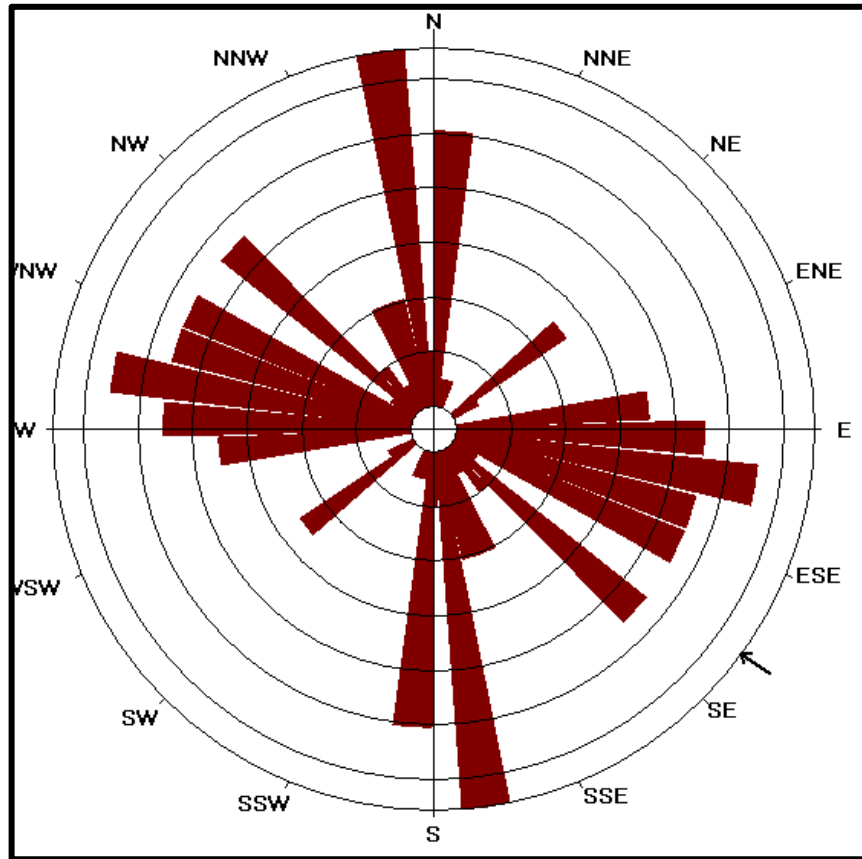




Figure 6. Tenures 751682 & 102260 Rose Diagram  
(Based on Lineaments from Figure 5)



### STATISTICS

Axial (non-polar) data

No. of Data = 99

Sector angle = 8°

Scale: tick interval = 2% [2.0 data]

Maximum = 11.1% [11 data]

Mean Resultant dir'n = 126-306

[Approx. 95% Confidence interval = ±22.2°]  
(valid only for unimodal data)

Mean Resultant dir'n = 125.8 - 305.8

Circ. Median = 117.0 - 297.0

Circ. Mean Dev. about median = 34.1°

Circ. Variance = 0.26

Circular Std. Dev. = 44.67°

Circ. Dispersion = 3.68

Circ. Std Error = 0.1929

Circ. Skewness = -2.18

Circ. Kurtosis = -7.17

kappa = 0.62

(von Mises concentration param. estimate)

Resultant length = 29.35

Mean Resultant length = 0.2965

'Mean' Moments: Cbar = -0.0936; Sbar = -0.2813

'Full' trig. sums: SumCos = -9.2687; Sbar = -27.8473

Mean resultant of doubled angles = 0.3527

Mean direction of doubled angles = 010

(Usage references: Mardia & Jupp,

'Directional Statistics', 1999, Wiley;

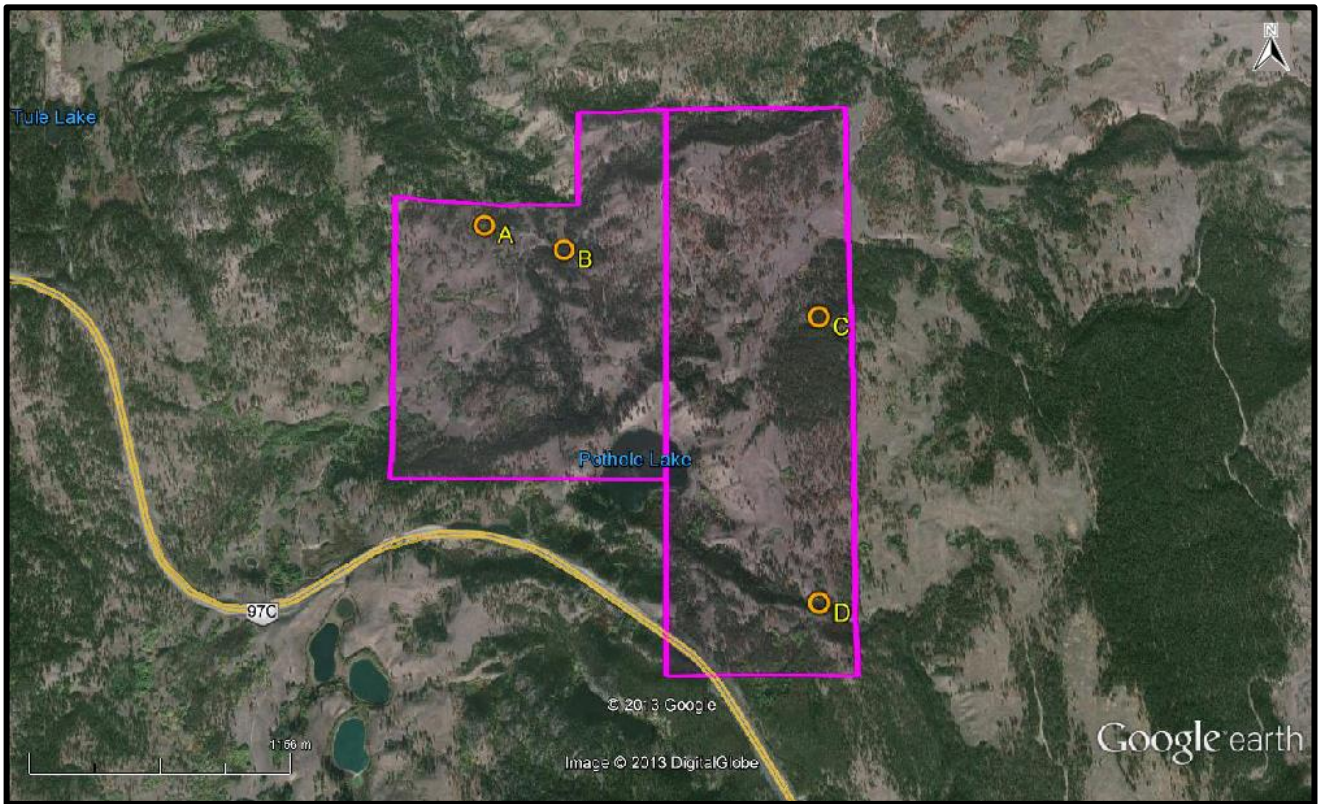
Fisher, 'Statistical Analysis of Circular Data',

1993, Cambridge University Press)

Note: The 95% confidence calculation uses

Fisher's (1993) 'large-sample method'

**Figure 7. Prospective areas to explore for surficial geological indicators of a potential sub-surface mineral resource**  
 (Based on Lineaments and locations from Figure 5)



**Table II. Approximate location of Figure 7 areas A to D**  
 (UTM NAD 83)

<b>Area</b>	<b>UTM East</b>	<b>UTM North</b>	<b>Elevation</b>
<b>A</b>	675,175	5,536,714	944
<b>B</b>	675,759	5,536,609	945
<b>C</b>	676,850	5,536,275	1,076
<b>D</b>	676,880	5,534,903	1,039

Figure 8. Mineral zones associated with the north-south Elk Fault (from Gold Mountain)

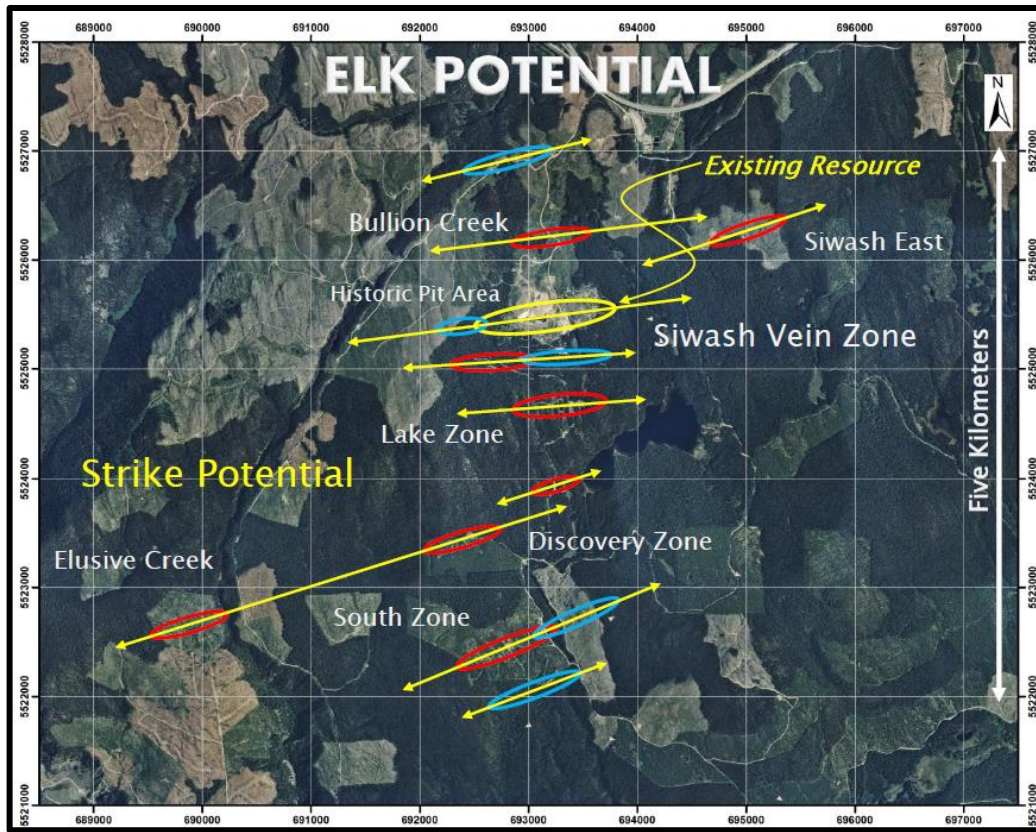


Figure9 . Historic pit location (Fairfield Mines) (see Figure 8 for location)



## INTERPRETATION and CONCLUSIONS

The Structural Analysis on Tenures 751682 & 1022260 of the Tom Cat 516703 Claim Group indicated predominantly major north-south, east-westerly, and local vari-oriented structures.

The two major directional structures are common in the area and in one case, controlling structures to the formerly productive Elk mineral resource and associated mineral zones to the primary Elk fault 16 kilometres east where it transects both Nicola rocks and intrusives. The north-south Elk fault system is topographically indicated for a minimum 25 kilometer distance and locally displaced by the northwesterly or east-west Magwump and the Snow faults. At the Elk (*Minfile 092HNE096*) the mineral zones are shown to be distributed along and proximate to the Elk fault.

The Brenda past producer (*Minfile 092HNE047*) is another example of a structurally controlled mineral resource in the area. the mineralization within the localized Brenda stock, which forms part of the Pennask batholith, decreases outwardly from the most intensely fractured/mineralized rock and the centre of the main mineral zone.

Thus, the significance of the structures, and/or brecciation, shearing and cross fractures is in the provision for a means of the ultimate deposition of hydrothermal solutions. The mineral bearing solutions could be expressed mineralogically as sulphides in quartz veins, as replacements in various carbonated rock units, or any variation thereof as indicated in the Minfile properties reported herein. The cross-structural locations could be of greater significance as a means for tapping a hydrothermal source at depth and its delivery to the structural host. As a result, the cross-structural locations would also be prime areas to explore for surficial geological indicators of a potential mineral source or resource to depth such as a mineralized intrusive

The Structural Analysis on Tenures 751682 & 1022260 of the Tom Cat 516703 Claim Group indicated four intersecting locations, A to D, which should be focus of primary exploration to locate any surficial geological indicators to a potential underlying mineral resource. Three of the intersections, A to C, are associated with one significant primary east-west structure which transects the two Tenures.

Location C, an intersection between the easterly and a northerly structure, may have provided the controls for the deposition of the minerals at the nearby Minfile Pot 1 mineral showing (*Minfile 092HNE204*) where a composite chip sample across the showing was reportedly analysed at 2.55 grams per tonne gold and 1.9 grams per tonne silver over 130 metres.

Location D is significant, as it is on the north-south structure south of the Pot 1 mineral showing and may be comparable to the many mineral zones associated with the Elk structure.

Locations B and C, to the west of the Pot 1 mineral showing, are underlain by a capping of volcanics which may not display comparable indicative geological features as the Nicola volcanics.

A geological examination of the four intersecting locations is recommended and a subsequent localized VLF-EM survey be completed if warranted. The VLF-EM survey may provide information on the favourable structure location and any host mineralization.

Respectfully submitted,  
Sookochoff Consultants Inc.



Laurence Sookochoff, PEng

## STATEMENT OF COSTS

The structural analysis on Tenures 751682 & 1022260 was completed from September 12, 2013 to September 15, 2013 for the following costs.

Laurence Sookchoff, PEng.: three days @ \$1,000.00 /day -----	\$ 3,000.00
Maps -----	750.00
Report -----	<u>4,500.00</u>
	\$ 8,250.00
	=====

**REFERENCES**

**Balon, E.A.** - 2003 Geochemical Report on the AU Property for Fairfield Minerals Ltd. **AR 23,446.**

Google - Downloads

**Gold Mountain Mining Corporation** – Corporate Presentation January 2012.

**Holcombe, R.** – 2009: GEORient, ver 9.4.4. Stereographic Projections and Rose Diagram Plots

**Kerr, J.R.** – - Geophysical and Geochemical Report on the Kentucky Lake Property for

Max Investments Inc. on behalf of Bold Ventures Inc., dated January 15, 2007.

AR 28,782.

- Diamond Drill Report on the Kentucky Lake Property, for Bold Ventures Inc.,

dated March 7, 2008. **AR 29,728.**

**MapPlace** – Map Data downloads

**Mark, D.G.** – Geophysical-Geochemical Report on VLF-EM and Soil Sample Surveys on the AR

Claim for Belmont Resources Ltd., dated June 5, 1978. **AR 6,761.**

**Marshak, S., Mitra, G.** – Basic Methods of Structural Geology. pp 258-259, 264\*

.Prentice-Hall Inc. 1988

**MtOnline** - MINFILE downloads.

**Sheldrake, R.** - 3D Induced Polarization Survey on the Kentucky Lake Property, Merritt Area BC.

October, 2006.

- 3D Induced Polarization Survey. Geophysical Report for Max Investments on behalf of Bold Ventures Inc. on the Kentucky Lake Project. September 25, 2006.

**Sookochoff, L.** Geological Assessment Report on the Tom Cat 751642 Claim Group for Naina

Capital Corporation. May 21, 2011. **AR 32,248.**

***CERTIFICATE***

I, Laurence Sookochoff, of the City of Vancouver, in the Province of British Columbia, do hereby certify:

That I am a Consulting Geologist and principal of Sookochoff Consultants Inc. with an address at 120 125A-1030 Denman Street, Vancouver, BC V6G 2M6.

I, Laurence Sookochoff, further certify that:

- 1) I am a graduate of the University of British Columbia (1966) and hold a B.Sc. degree in Geology.
- 2) I have been practicing my profession for the past forty-seven years.
- 3) I am registered and in good standing with the Association of Professional Engineers and Geoscientists of British Columbia.
- 4) The information for this report is based on information as itemized in the Reference section of this report and from a Tom Cat property examination.
- 5) I have no interest in the Tom Cat property as described herein.
- 6) I am a director of Sierra Iron Ore



*Laurence Sookochoff, PEng.*