

DRAFT ONLY

004519

BLACK HAWK (0B2LSW007)

By R.M. Barker

(Fig. No.)

LOCATION : Lat. 50° 25' Long. 119° 22' (82L/6W)

KAMLOOPS MINING DIVISION. Approximately 19km NNW
of Vernon.

CLAIMS : AU 100, 200, 300, 400, 500, AU fraction.

ACCESS : From Vernon, NW along Kamloops Road (Highway 97)
for approximately 18km, then west along Irish
Creek Road (unpaved, 2-wheel drive accessible) for
about 3km before turning north. The final 4.5km of
access road is a rough, 4-wheel drive only, track.

OWNER : ANTELOPE RESOURCES LTD.

OPERATOR : Y-H TECHNICAL SERVICES LTD.

COMMODITIES : Gold.

SEP 8 1993

Geological Survey Branch
MEMPR

INTRODUCTION

The Black Hawk property, located northwest of Vernon, B.C., has long been considered a polymetallic, shear and quartz vein hosted, gold prospect. Recent work has, however, taken into account the possibility of it being a stratabound occurrence. The two main showings on the property (the "East" and "West" showings) appear to be parts of the same zone of mineralisation. They were discovered near the turn of the century, and most work done since then has been directed towards extending their known strike lengths, and in particular, attempting to fill in the 500m gap between the two showings. The depth of drift cover, more than any other factor, has rendered the bulk of this work inconclusive. Recent exploration on the property resulted in defining some eastward continuation of the West showing and in discovering a new showing (the "Quartz" showing).

EXPLORATION HISTORY

Moffat Creek, which drains the western part of the Black Hawk property, is one of a number of streams in the area north and west of Okanagan Lake which have a record of minor placer mining activity dating back to the late 1800s. The earliest record of work on the Black Hawk property (then known as Peotich) was in 1899, when prospecting work comprising a shaft, an open cut, and 18m of tunnelling was completed (Norris, 1899).

1900 to 1902 - The tunnel was advanced to 67m.

1903 to 1919 - No details of exploration work are on record for this period. However, inspection by ~~W. J. Thompson~~ ^{Thompson} (1919) showed that two tunnels with an aggregate length of 130m had been completed. Neither had been successful in locating mineralisation. Up to this time, work on what was, by then, known as the Black Hawk is believed to have been concentrated on the East Showing.

1934 - Continuing "minor exploration" was reported.

1960 to 1968 - The property was restaked in 1960, and some bulldozer trenching was done in an unsuccessful attempt to locate extensions of the known mineralised zones. The property was restaked in 1966 and 1968 by different parties, but tenure lapsed in 1969.

1969 - The Black Hawk property was staked in July by Coin Canyon Mines Ltd. (subsequently renamed Coseka Resources Ltd.) who undertook a program of geological mapping, soil geochemical surveying, and limited blast trenching (two 4.7m trenches across the East Showing)(Gutrath, 1970). The claims were allowed to lapse in 1972.

1973 - The property was staked by Keda Resources (1973) Ltd. (N.P.L.) as the Au claim group. They carried out preliminary soil and rock geochemical surveys, and test

lines of magnetometer, IP, and EM surveys later in the same year (Dawson, 1973).

1976 - Gutrath (1976) inspected the property, reviewed the available data, and proposed a substantial exploration program. A detailed soil geochemical survey and geological mapping were carried out, followed by bulldozer trenching of geochemical anomalies (Gruenwald, 1976).

1979 - A diamond drilling program, comprising 163.5m of drilling in 3 holes, was carried out to test the East zone mineralisation at depth. These holes failed to detect any mineralised zone, and its absence at depth was assumed (Kerr, 1980). However, Yorke-Hardy (1986), after reassessing the drilling data, suggested that the failure of the drilling may be attributable to core loss at the zone of interest.

1983 - K.D. Resources Ltd. (previously Keda Resources (1973) Ltd. (N.P.L.)) carried out a detailed VLF-EM survey and some limited soil geochemistry over the area surrounding the main showings. The presence of a strongly anomalous conductor upslope of the main (East) showing was considered to support the hypothesis, originally put forward on the basis of the 1979 drilling results, that the showing may be hosted in a large slump block (Kerr, 1983).

1986 - Yorke-Hardy (1986) postulated a stratabound mineralisation model for the Black Hawk property and K.D. Resources Inc. carried out a preliminary geochemical resampling program on this basis. A follow-up geochemical survey was conducted, and some test lines of IP and resistivity surveying were run.

1986 to 1987 - K.D. Resources Inc. changed name to Antelope Resources Ltd. A program comprising 790m of backhoe trenching plus rock chip geochemistry succeeded in proving some eastward extension of the West zone mineralisation as well as locating a previously undiscovered showing (the "Quartz" showing) (George Cross News Letter, June 24, 1988; Vancouver Stock Exchange, Filing Statement 20/89).

1988 to present - A major program of trenching (up to 1500m in length) and geophysics (some 15km of EM and magnetometer and 10km of IP) was proposed and Notice-of-Work submitted for winter 1988-89. It is not known whether this work was ever initiated.

REGIONAL GEOLOGY

The property, located northwest of Vernon, on the west side of Highway 97, lies close to the eastern margin of the Quesnellia terrane. The terrane boundary in this area is represented by the

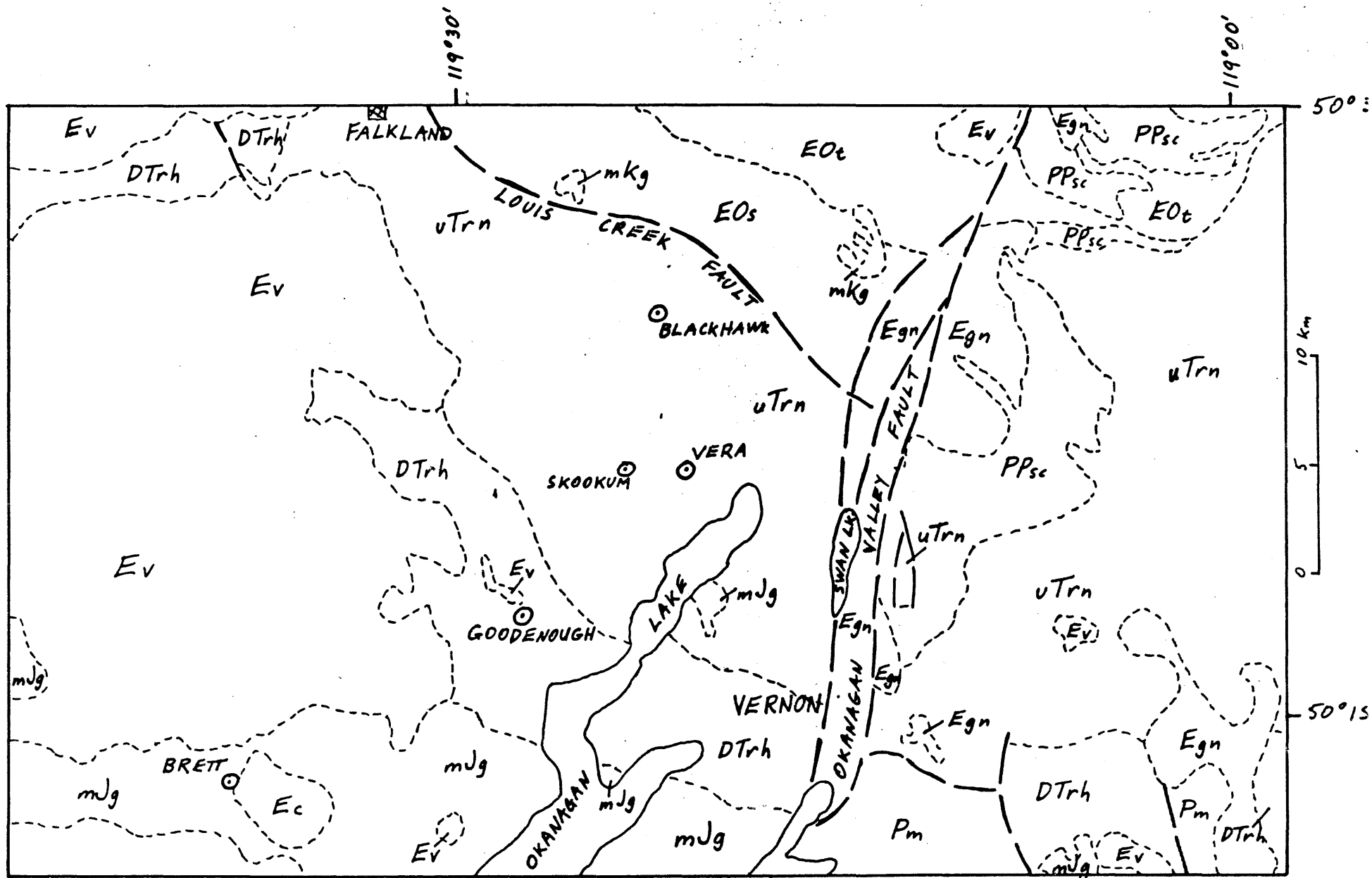
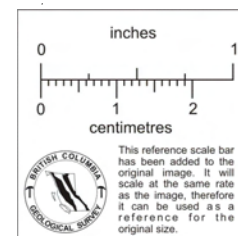


Figure 1. Regional geology of the ~~Vera~~ Black Hawk area. Compiled from Okulitch (1979) and Okulitch (1989).

(see 'Vera' for original)



EOCENE

EV

Undifferentiated volcanic rocks;
may include Kamloops Group.

Egn

"Okanagan Gneiss"
(orthogneiss grading to mylonite)

Ec

CORYELL SYENITE and equivalent
(syenite and quartz monzonite)

CRETACEOUS

mkg

Quartz diorite, granodiorite

JURASSIC

mg

NELSON PLUTONIC ROCKS
(granodiorite, quartz diorite, and granite)

TRIASSIC

uTrn

NICOLA GROUP
(volcanic and sedimentary rocks)

DEVONIAN TO TRIASSIC

DTrh

HARPER RANCH GROUP
(volcaniclastic sedimentary rocks,
limestone, minor volcanics)

CAMBRIAN TO ORDOVICIAN

Eos

SICAMOUS FORMATION
(argillite, phyllite, siltstone, greenstone)

EOT

TSALKOM FORMATION
(greenstone, phyllite, limestone, conglomerate)

3 PALAEOZOIC & /or MESOZOIC

Pm **PPsc**

OKANAGAN METAMORPHIC COMPLEX
(gneiss, schist, marble)

? PALAEOZOIC

PPsc

SILVER CREEK FORMATION
(schist and gneiss)

--- Geological boundary

--- Fault

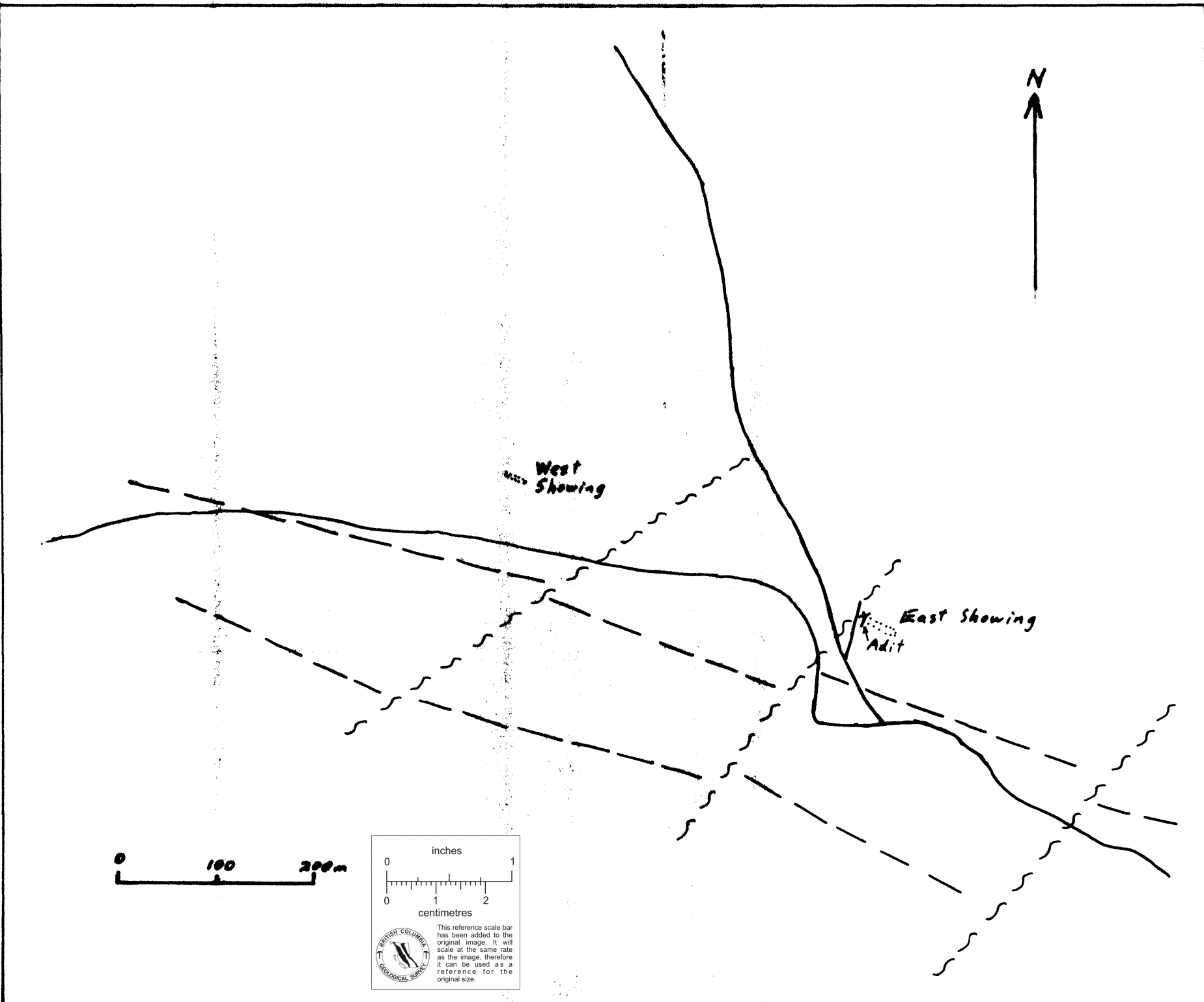


Figure 2. Sketch of Black Hawk showings area. (Adapted from Kerr, 1983)

Perhaps add a claim map sketch!

Legend

- Inferred EM conductors
- ~ ~ Inferred faults

west-dipping Okanagan Valley Fault (to the east) and the southwest-dipping Louis Creek Fault (to the north). The Okanagan Valley Fault is a major, low angle, crustal shear. Sense of movement on the fault is normal. It has been interpreted as an Eocene "detachment" fault (Tempelman-Kluit and Parkinson, 1986). The nature of the Louis Creek Fault is poorly understood, and its exact location is, in fact, a point of some conjecture.

The Black Hawk property is located in a northwest-trending belt of sediments and volcanics assigned by Okulitch (1989) to the Triassic to Jurassic Nicola Group. To the southwest they rest unconformably on the Carboniferous to Permian Harper Ranch Group, while to the north they are faulted against Lower Palaeozoic rocks of the Sicamous Formation (Fig. 1). Wheeler and McFeely (1987) place the faulted northern boundary of the Nicola Group (the Louis Creek Fault) to the south of the property, and group the sediments and volcanics extending north from the fault into the Shuswap Lake area as part of the Upper Proterozoic to Palaeozoic Eagle Bay Assemblage. The above units have been folded and faulted along northwest trending axes and regionally metamorphosed to lowermost greenschist facies.

Some 11km to the west of the property the Nicola Group is unconformably overlain by an extensive sheet of volcanics and minor sediments of the Eocene Kamloops Group.

The Jurassic Pennask-Okanagan plutonic complex crops out within about 20km south of the property; Cretaceous satellite stocks of

the Salmon Arm pluton intrude the Sicamous Formation about 4km to the northeast.

PROPERTY GEOLOGY

Okulitch (1979) and Jones (1959) interpret the structure and stratigraphy of the area somewhat differently; Okulitch places the property well within a predominantly volcanic part of the Nicola Group, while Jones mapped it as being on the boundary between a predominantly volcanic sequence (to the south) and a sedimentary sequence (to the north). Jones (1959) also mapped a major northwest-trending fault structure to the immediate northeast of the Black Hawk showings. Much of the work done in the 1960s and 70s used Jones' interpretation as a starting point.

Detailed mapping of the sparse outcrop on the property by Gruenwald (1976) has shown the Black Hawk property to be underlain by an interbedded sequence of low grade meta-sediments and meta-volcanics, with the volcanics probably predominant. The sediments comprise mainly argillite, which is generally dark grey to black, fine-grained, and carries up to 1 or 2 percent pyrite; quartzite is present locally as thin interbeds in the argillite; phyllite and limestone have been mapped on the western part of the property, but are rare. The volcanics comprise andesitic flows, tuffs, and minor agglomerate, and ~~a possibly intrusive~~ ^{include a distinctive} hornblende porphyry. The flows are generally massive while the tuffaceous rocks are commonly schistose; both are dark to pale green, fine to medium-grained, and metamorphosed to greenschist

[The porphyry exhibits ?flow breccia texture and is probably also a flow.

facies. The hornblende porphyry is probably also andesitic in composition, and shows evidence of greenschist facies metamorphism with chloritisation of the hornblende phenocrysts (Gruenwald, 1976). The presence of large hornblende porphyry clasts in an altered volcanic breccia on the property (^{W. Taylor}~~ST. Haber~~, pers. comm.) indicates that the porphyry was coeval with the rest of the volcanic pile.

The volcanic-sedimentary sequence strikes generally northwest, with dip variable from steep northeast to 20° to 70° southwest, and is cut by a number of west to northwest trending shear zones (Yorke-Hardy, 1986). One such zone hosts the East (and West) Showing mineralisation. A shear zone, greater than 6m wide, trending about 120°, was exposed by trenching about 35m east of the West showing adit. This zone is also exposed in the adit portal where it cuts both argillite and volcanics. (This adit, at least 20m long, does not appear to match the description of the previously known, very short, West Showing adit. However, no other adit was located by a brief search of the area.)

Dawson (1973) interpreted geophysical and geochemical results to indicate a series of parallel or *en echelon* west-trending shear or fault zones, with the two known showings located in one such zone. These zones appeared to be offset by minor north to north-northwest trending faults with displacement "of the order of tens to hundreds of feet".

Kerr (1980) interpreted a detailed VLF-EM survey to confirm the presence of two subparallel west-northwest trending anomalous

zones, both south of the known mineralised zones. These appear to be offset by two northeast trending fault zones.

MINERALISATION AND ALTERATION

Two significant showings of mineralisation at the Black Hawk property (the East and West Showings) have been investigated over many years. A third showing - the "Quartz Showing" has been discovered recently. The East and West Showings are associated with shearing, appear to be on the same west-northwest trend (although 500m apart), and hence have long been considered to be hosted by the same shear zone. The Quartz Showing is poorly documented, but is believed to occur south of this trend, and is probably stratigraphically higher.

The East Showing is the larger of the two main showings. It is a mineralised, quartz-veined, breccia zone, hosted in andesitic tuff and hornblende porphyry. It averages about 3m in width (ranging between 2 and 6m) and has been exposed over a strike length of more than 45m. Its attitude is also extremely variable with strike ranging from 060° to 135° and dip from 40° to 60° southwest. Minor cross-cutting shear zones appear to form partial boundaries to mineralisation and thus control the width of the sulphide zone. ^{J. Hubner}~~W. Taylor~~ (pers. comm.) noted an apparent offset of about 5m between mineralised exposures at 2 adits at the East Showing, suggesting faulting.

Drillholes angled beneath the East Showing failed to prove its existence at depth. The reason for this remains unresolved, but it may be significant that the host lithologies were also absent from the projected intersection interval.

Yorke-Hardy (1986) described the showing as " "altered looking" metavolcanic material containing iron carbonates, iron oxides, masses of quartz/calcite with disseminated to semi-massive sulphides and minor feldspars; along with pebbles and fragments of argillite", and interpreted it as a "somewhat contorted bedded or stratabound system."

The sulphides are fine-grained, disseminated to semi-massive pyrite, pyrrhotite, arsenopyrite, variable amounts of sphalerite, and minor chalcopyrite and galena. The sulphide content in the zone is up to 60 percent, but is generally of the order of 15 percent. Gold is associated with the sulphides and is well distributed throughout the breccia zone. Vein(s) within the zone comprise quartz with lesser calcite, and are quite shattered. Surface exposures of the mineralised breccia zone are gossanous.

Gutrath (1976) tabulates the assay data for the East Showing. Channel samples across strike have yielded gold values ranging from 1.0 to 19.2g/t with a weighted average of 11.3g/t. Silver values range from trace to 51.4g/t, but average only 12.1g/t. Zinc is reported up to 0.4 percent in channel samples and 3.5 percent in grabs.

Alteration at the East Showing is largely restricted to the breccia zone where chloritisation is pervasive though not intense. Silicification and carbonate alteration is more localised within the breccia zone, but extends into the adjacent host rock as minor quartz and calcite veining.

The West Showing is described by Dawson (1973) as a zone that "contains a 2 - 3' (0.6 to 0.9m) wide quartz vein only sparsely mineralised with pyrite and ~~and~~ surrounded by moderately to slightly sheared greenstone(?) which contains minor pyrite and (?)arsenopyrite".

The showing, like that to the east, is hosted in sheared andesitic tuff and hornblende porphyry. The shear strikes about 330° and dips to the west at 54°. The vein and adjacent volcanics are limonite stained, and fine-grained, disseminated pyrite, arsenopyrite, and chalcopyrite are present in both (Gruenwald, 1976). Kerr (1983) reports the vein to be 1 to 2m wide and to trend east. ^{T. Hubner} ~~W. Taylor~~ (pers. comm.) measured the strike of the vein at 080°.

Assay results are sketchy, at best. A 1.5m channel sample of vein footwall material yielded 16.1g/t gold, although grab samples of vein material carried only 0.7 to 1.0g/t gold. A recent 1.5m channel sample across a "system of quartz-ankerite veining" near the West Showing was reported to have yielded 20.8g/t gold (George Cross News Letter, June 24, 1988). Carbonate alteration at the West Showing was also noted by ^{T. Hubner} ~~W. Taylor~~ (pers. comm.).

Iron staining, silicification, and quartz and calcite veining is evident over part of the width of a 300°-trending intensely sheared zone in a trench exposure near the West Showing.

Between the two main showings only one outcrop penetrates the deep drift cover; minor slickensiding is evident, but no sulphide mineralisation was observed. (Gruenwald, 1976).

The Quartz Showing is poorly documented, and its location is uncertain. Gold values are reported as greater than 1.7g/t over 12.2m, including an average of 4.6g/t over 2.0m (George Cross News Letter, June 24, 1988).

This showing may lie in the same area as that inspected by W. Taylor and T. Hubner (pers. comm.) about 300m west of the West Showing. It is described as a 3m wide zone of quartz veining, including a 1m wide, highly fractured vein, striking about 140° and dipping about 80° east. It lies within a 15m wide zone of ankeritic, carbonate-altered volcanics. Sulphide mineralisation is (?) sparse or absent.

Two other sites on the property have shown physical evidence of mineralisation. About 100m south (uphill) of the main zone trend, quartz float carrying disseminated galena and sphalerite has been found (Gutrath, 1976). The quartz float occurrence coincides with a prominent, elongate, zinc geochemical anomaly. Gruenwald (1976) reported minor magnetite and chalcopyrite in lithic tuffs about 1300m west-northwest of the West Showing.

EXPLORATION POTENTIAL

Despite a long history of exploration on the Black Hawk property that work has, literally, "barely scratched the surface". Sparse outcrop and areas of deep drift cover have hampered investigations. The probable connection between the East and West Showings remains unproven and, although the geochemical signature fades to the west of the West Showing, the zone of mineralisation is open to the east of the East Showing. The nature of the main trend at depth also requires further investigation.

The restriction of the known mineralisation to the volcanics in the sequence gives some credence to a stratabound mineralisation model (Yorke-Hardy, 1986). However, this apparent association may be purely coincidental and a function of a greater propensity for outcropping by the volcanics. It could also be due to the more competent volcanics, only, providing adequate porosity, after shearing, for the deposition of potentially economic mineralisation.

One major and several minor soil geochemical anomalies are yet to be fully tested. The major anomaly is a 1.4km linear zinc anomaly located about 100m south of, and subparallel to, the main trend of mineralisation.

The Quartz Showing apparently also has exploration potential.

The consistently high gold values recorded for samples from showings on the Black Hawk property have provided, and should continue to provide, encouragement for exploration of the property.

ACKNOWLEDGEMENTS

Access to the library and facilities of Discovery Consultants, Vernon, B.C. was greatly appreciated. I wish to thank Richard Meyers and Todd Hubner of the Kamloops District Office of the Ministry of Energy, Mines and Petroleum Resources for their unstinting advice and assistance. I particularly wish to thank Richard for his time spent reviewing and editing this report. The project was funded by the British Columbia Geoscience Research Grant Program.

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