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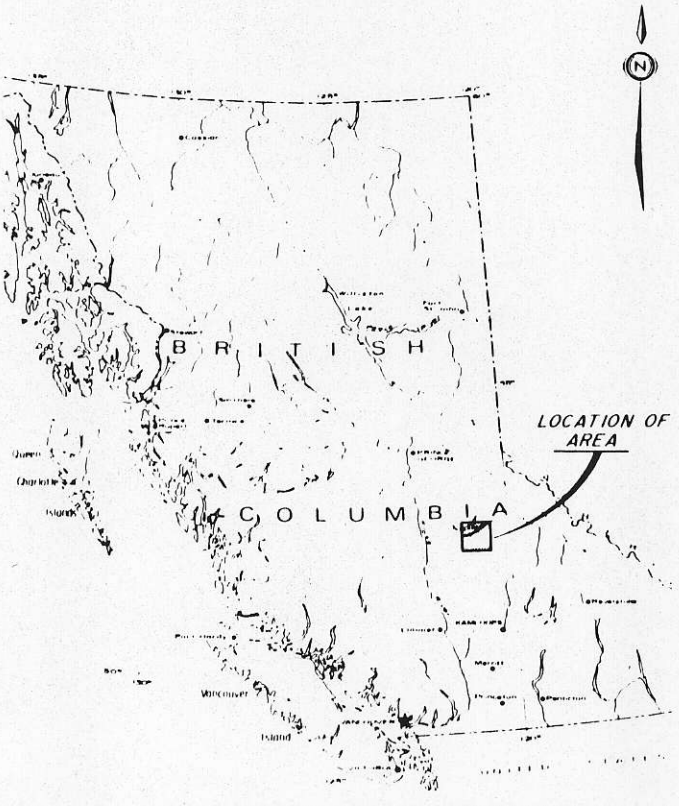
CARIBOO-QUESNEL GOLD BELT: a geological overview

SUMMARY. In the Cariboo-Quesnel Gold Belt section of the Quesnel Trough, gold deposition has occurred in a wide variety of geological settings and over a broad vertical stratigraphic range. Most deposits are related to early Mesozoic volcanism and comagmatic alkalic stocks.

Currently, the primary target in the Belt is semi-conformable stratabound gold mineralization. Exploration for these deposits requires an integrated approach utilizing conceptual models and applying several geological, geochemical and geophysical techniques. Cost savings in target evaluation can be achieved by using rotary-percussion, down-hole hammer, reverse-circulation drilling technology.

INTRODUCTION. The area referred to as the Cariboo-Quesnel Gold Belt (Fig 1) lies within the Quesnel Trough and extends from Canim Lake northwest to the town of Quesnel. Although it includes the historic placer gold camps of Likely (Quesnel Forks) and Horsefly, no significant lode gold production has been recorded from this area. Lode gold has been mined in the wells area (Cariboo Gold Quartz) and in the Yanks Peak vicinity but both of these areas lie in rocks of the Omineca Crystalline Belt to the east of the Quesnel Trough.



News of the discovery of the QR gold deposit (Orbex/Dome Mines) coupled with the release of regional geochemical data gathered by the Provincial Minister of Energy, Mines and Petroleum Resources, sparking a staking rush in the area in 1981. During the 1981 and 1982 field seasons, extensive geochemical and geophysical surveys were carried out in the Likely-Horsefly area and additional claims staked. In 1983, drilling programs were conducted on several properties including Frasergold (Eureka Resources/AMOCO), Megabuck (Placer Development) and Jamboree (Monte Christo Resources/E & B Inc). The interest generated by these programs is reflected by the considerable amount of staking activity within the last six months (to March 1984). Greater exploration activity is forecast for the upcoming field season as more properties reach the drilling stage.

REGIONAL GEOLOGY

The Quesnel Trough is a linear belt of early Mesozoic volcanic and sedimentary rocks lying along the western margin of the Omineca Crystalline Belt. It is fault bounded on the west by Paleozoic rocks of the Cache Creek Group and on the east by older Paleozoic and Pre-Cambrian strata. The trough is believed to be an island arc assemblage formed at a consuming plate margin above an easterly-dipping subduction zone which existed from late Triassic to early Jurassic time. Under the recently evolved concept of 'terrane tectonics', (Monger et al 1972) the Quesnel trough, along with flakes of the older, oceanic Slide Mountain Group, formed a composite terrain which was obducted eastward onto the continental Kootenay-Barkerville terrane (Omineca Belt) in the middle Jurassic. Metamorphism of the Omineca Belt and bordering Slide Mountain and Quesnel terrains occurred during this accretionary event.

The Quesnel Trough in the Likely-Horsefly area is composed of alkalic volcanic, volcaniclastic and sedimentary rocks intruded by comagmatic stocks and dyke complexes. The basal unit of the Quesnel Trough is of Upper Triassic age and is composed mainly of black argillites. This sequence is located along the eastern boundary of the Trough and represents a back-arc basinal facies. A succession of augite porphyry breccias and flows with minor interbedded argillite overlies the basinal series to the west and is in turn overlain by volcaniclastics and argillites of Upper Triassic and Lower Jurassic age.

Several volcanic centres became emergent in the Lower Jurassic as evidenced by subaerial volcanic flows and the presence of coarser clastic deposits. These clastic sequences normally occur as localized composite lenses of sandstone, grit and conglomerate, and may include wedges of massive limestone.

Early, northwest trending, primary fault structures may have controlled the location of mid-Jurassic plutons which were emplaced at volcanic centres. Such faults were active into the late Mesozoic when widespread block faulting tilted and displaced the strata of the Quesnel Trough.

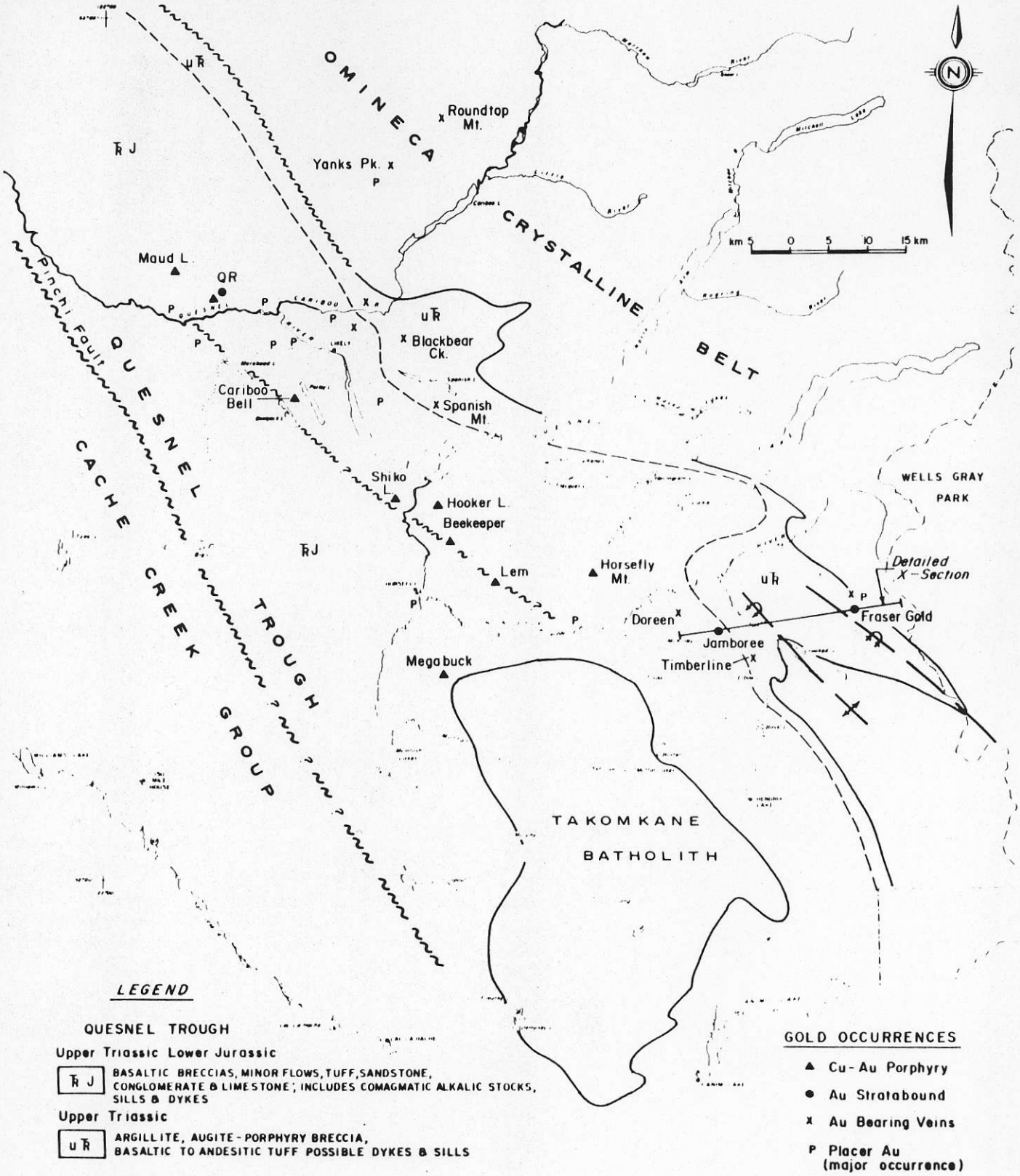
Folding, related to uplift and deformation of the Omineca

Crystalline Belt, has affected the strata near the eastern edge of the Quesnel Trough. Elsewhere only minor folding related to fault movement has occurred.

GOLD MINERALIZATION AND ASSOCIATED DEPOSIT

Lode gold mineralization was reported from the area as early as 1902, when placer miners drove tunnels on pyrite bearing quartz veins near Frasergold and Eureka creeks (BC MMAR 1902). During the early 1930s this area was re-examined, but the gold content of the veins was found to be inadequate to justify mining. At about the same time, gold and galena bearing quartz veins were discovered on Spanish Mountain, southeast of Likely, and at McKee Lake, 5km west of Crooked Lake. Considerable work has been carried out on the Spanish Mountain prospects but actual production is insignificant. Most

Figure 1. Location map showing major tectonic features and gold occurrences



of the gold-bearing quartz veins cut argillites and tuffs near the eastern boundary of the Quesnel Trough. The host rocks are of Upper Triassic age but the veins were probably formed during metamorphism and deformation in the Middle Jurassic. Recent isotope studies (Andrew et al 1983) have shown that the gold mineralization at Mosquito Creek and in other epigenetic, vein-hosted deposits of the Omineca Belt, though of Mesozoic age, is not derived from rocks of the Quesnel Belt.

In 1964, the Cariboo-Bell deposit was discovered 9km southwest of Likely. Current drill indicated mineable reserves are 117-million tons grading 0.31% Cu and 0.012 oz/ton Au (including a higher grade zone totalling 30-million tons grading 0.38% Cu and 0.018 oz/ton Au). Mineralization is mainly confined to high level, intrusive breccia zones within an alkalic laccolith of early Jurassic age emplaced at the site of an Upper Triassic eruptive center.

During the early 1970s most of the known Jurassic alkalic plutons in the Likely-Horsefly area were staked and explored for similar copper-gold mineralization. Though most were found to contain some auriferous chalcopyrite mineralization in stockwork or disseminated deposits, none proved to be significant in size or grade. It was during the investigation of one of these comagmatic stocks that the QR deposit was discovered in the late 1970s. Gold mineralization was found associated with a pyrite-epidote zone in basaltic breccia flanking a zoned alkalic stock. The mineralized horizon occurs immediately below a sedimentary contact and above a strongly carbonatized zone (Fox 1983). Drill indicated reserves have been reported as 950,000 tons grading 0.21 oz/ton Au (CMH 1982-83).

During the renewed exploration activity in the 1980s other, seemingly stratabound, gold occurrences have been discovered in the eastern Quesnel Trough (Fig 2). Near Frasergold Creek, Eureka Resources has reported drill indicated reserves of 11-million tons grading between 0.04 and 0.05 oz/ton Au (NAGMIN January 15, 1984). Here, gold-pyrite mineralization occurs along an iron-carbonate rich horizon within the Upper Triassic argillite sequence which has been highly deformed and metamorphosed to phyllite (Belik 1982). The Jamboree property, northwest of Crooked Lake, hosts a stratabound, anomalous gold horizon in tuffaceous phyllite immediately above a contact with the augite porphyry breccia unit.

The relative stratigraphic positions of gold occurrences in the Quesnel Trough are illustrated in cartoon form in Fig 3.

EXPLORATION TARGETS

The primary exploration target in the Cariboo-Quesnel Gold Belt is semi-conformable, stratabound gold mineralization hosted by permeable volcaniclastic or sedimentary rocks of the Quesnel Trough. These deposits (eg, QR and Frasergold) are believed to be products of marine exhalative or fumarolic activity which resulted in gold deposition along with pyrite in permeable horizons on, or slightly below, the sea floor. Associated alteration minerals include quartz, ankerite and epidote. A strong carbonate alteration zone may be present directly below mineralized horizons.

The Cariboo-Bell and Megabuck porphyry copper-gold deposits are representative of the larger copper-gold porphyries target. They occur within magnetite-rich, alkalic stocks and dyke complexes which host these chalcopyrite-bearing brecciated/stockwork zones. Occurrences of this type currently being re-examined are located near Lemon Lake (Lem), Kwun Lake (Beekeeper) and Shiko Lake.

The vein-hosted gold deposits of the Quesnel Belt have been explored since the turn of the century with discouraging results and, consequently, a low priority is placed on this type of occurrence. The only exception would be in areas near stratabound deposits where gold may have been remobilized

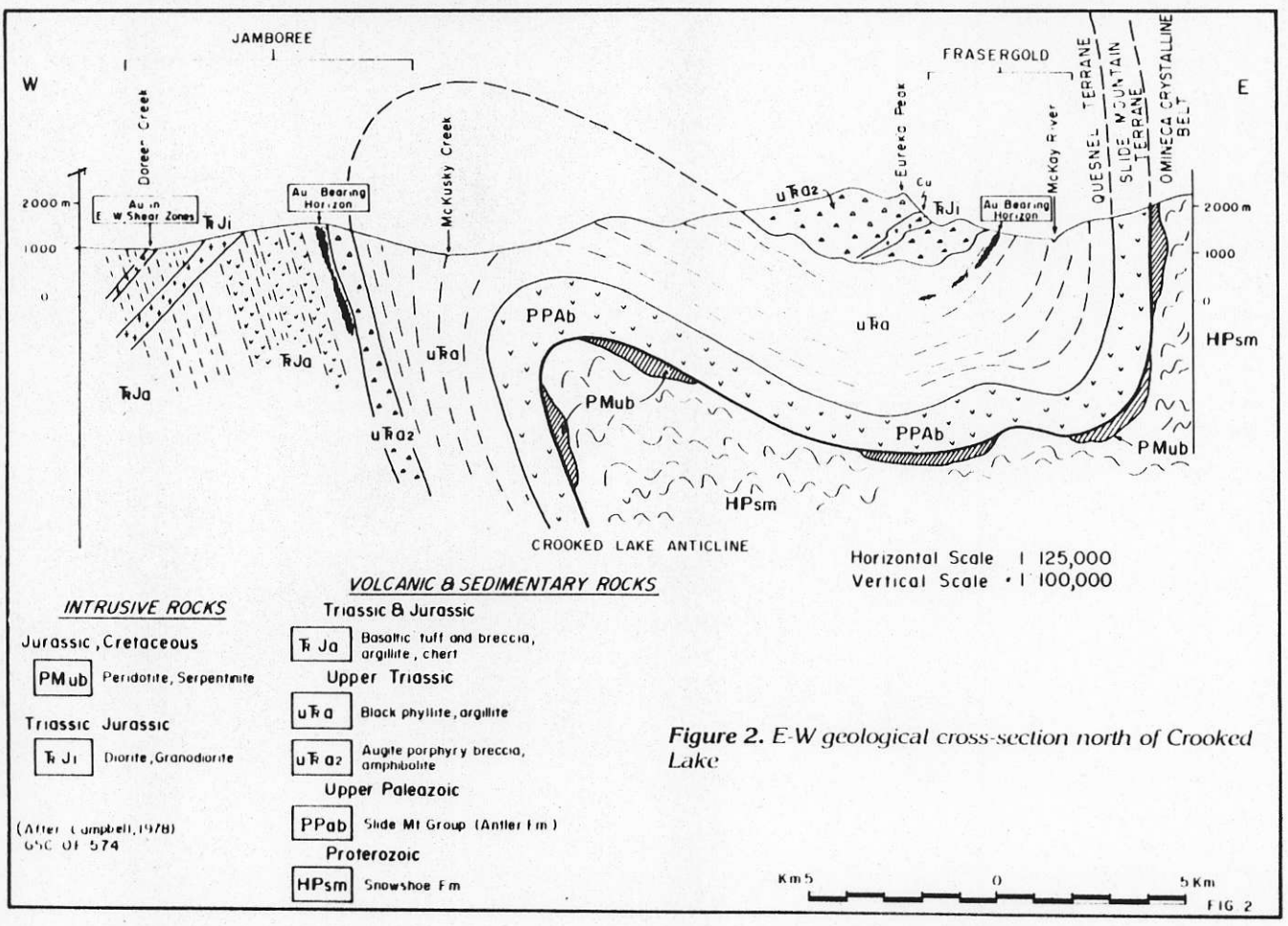


Figure 2. *E-W geological cross-section north of Crooked Lake*

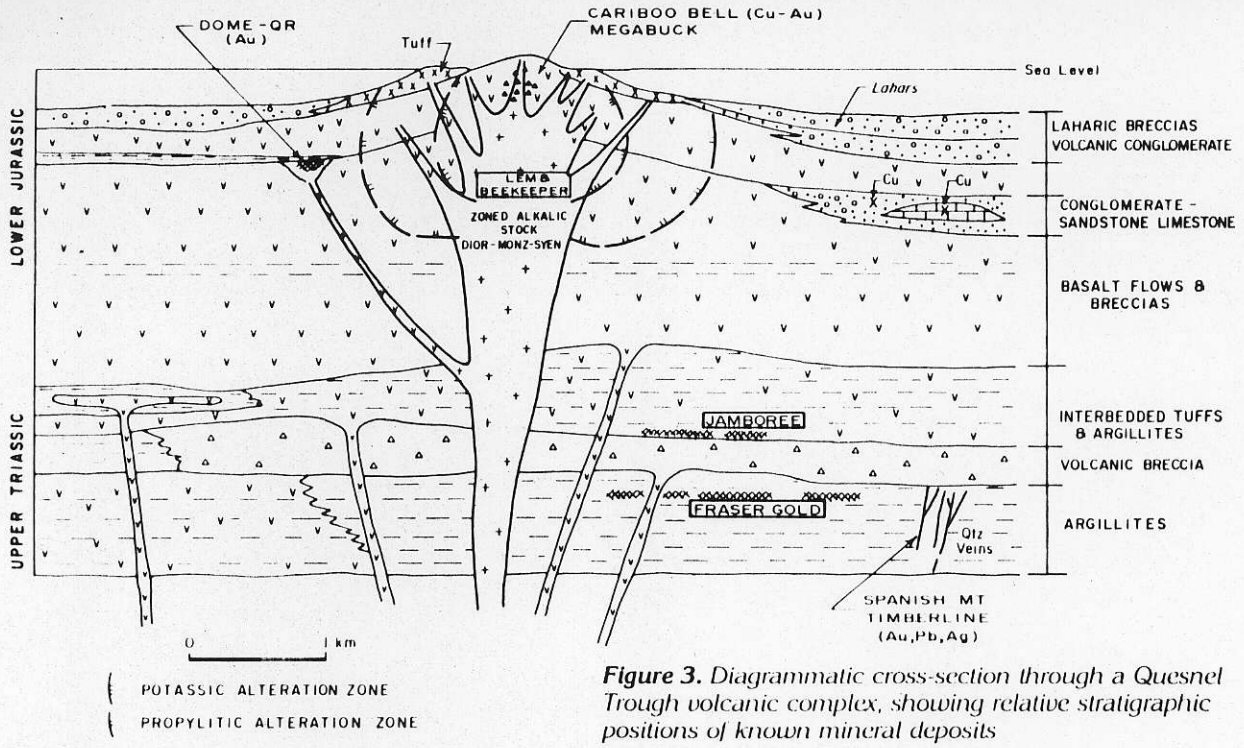


Figure 3. *Diagrammatic cross-section through a Quesnel Trough volcanic complex, showing relative stratigraphic positions of known mineral deposits*

and concentrated in quartz veins or sweats during later metamorphism.

EXPLORATION APPROACH

An integrated exploration approach is recommended starting from conceptual geologic models and testing the targets by several exploration techniques. In the Cariboo-Quesnel Gold Belt, the primary geologic target is currently a semi-conformable, stratabound gold deposit having a bulk tonnage potential containing between 200,000 and 400,000 ounces gold that can be extracted by open pit methods. The field methods that have been successful in the Belt are:

1. Reconnaissance

- Regional silt and soil sampling, 2km centres, analysis for Au, As, Cu, Pb, Zn, Mo

2. Property Exploration

- Airborne Magnetic and VLF-EM Survey: quick cost effective method to organize rock types, faults, contacts etc. over the entire property or area of interest.
- Ground Follow-up: grid prospecting, soil sampling and rock geochemistry, magnetic and VLF-EM surveying.
- Anomaly Definition: detailed geologic mapping, IP surveying, and trenching.
- Target Test: depending on access, rotary-percussion, down-hole hammer drilling or standard core drilling.
- Deposit Development: detailed core drilling.

The cost of exploration will vary with each investigative group, the size of property and the number of gold targets to be tested.

REFERENCES

Andrew A, Godwin C I, Sinclair A J 1983. Age and genesis of Cariboo gold mineralization determined by isotope methods, BC Ministry of Mines and Pet Res, Geological Fieldwork, 1982, Paper 1983-1 p305-311.

Bailey D G 1978. The geology of the Morehead Lake area, south central British Columbia. PhD Thesis, Queens University.

Belik G D 1982. Summary Report on the Frasergold Property, in Eureka Resources Inc Prospectus dated June 1, 1983.

Campbell K V, Campbell R B 1970. Quesnel Lake map-area BC (93A), Geol Surv Can Paper 70-1, Part A, p32-35.

Campbell R B 1978. Geology of the Quesnel Lake map area, BC Geol Surv Can map OF 574.

Canadian Mines Handbook 1982-83, pub by *The Northern Miner*, Alexandra Worobec B J Ed p116.

Fox P E 1983. The QR deposit, Cariboo District, BC. Presentation to Vancouver MEG November 30, 1983.

Monger J W H, Souther J G, Gabrielse M 1972. Evolution of the Canadian Cordillera: A plate tectonic model, Am Jour Sci Vol 272 p577-602.

North American Gold Mining Industry News, Vol 2, Issue 1, Jan 15, 1984, p1.

Wheeler J O 1984. Columbian and Pacific Orogens revisited. GAC Cordilleran Section Symposium, February 1984.