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W. J. McMillan

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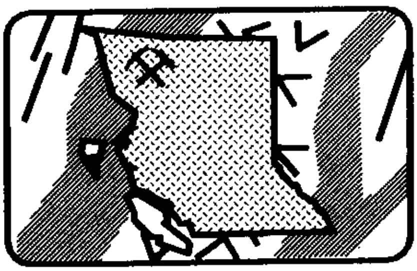

British Columbia's Golden Triangle: Report on Iskut Field Conference

W.J. McMillan
Geological Survey Branch
Ministry of Energy, Mines and Petroleum Resources
300 - 756 Fort Street
Victoria, British Columbia V8V 1X4

The spirited conference held in the Bronson Creek-Iskut "Golden Triangle" area in northwestern British Columbia, on 12-13 August 1989, highlights the co-operation between industry and government that typifies this area. Smithers Exploration Group and British Columbia Geological Survey (BCGS) Branch geologists, Dave Lefebure, Jim Logan and Mary Lou Mallot, organized the talks; co-sponsors Pamicon Developments Limited, Cominco Ltd. and Skyline Gold Corporation arranged logistics and field trips. Kevin Millidge of Pamicon co-ordinated accommodation for many participants and a delicious barbecued steak dinner for all 120 people who came for the "party". Some did just party, but 90 hardy types hiked three kilometres up the airstrip to Cominco's Snip camp where four talks by government geologists set the regional framework and three talks by industry geologists — about Snip, Johnny Mountain and the first public talk ever on the Eskay Creek gold property — provided details on mineral properties. An underground tour at Snip and surface and underground tours at the Johnny Mountain Mine were held the next day.

The meeting more than met its objective — to bring industry and government geologists together *during* the field season to discuss mutual problems and progress. The organizers and sponsors are congratulated for a superb show.

Bob Anderson of the Cordilleran Division, Geological Survey of Canada, opened the talks with a regional overview. He translated the Indian word Iskut as "stinking", which aptly describes the bush in the valley bottoms, but not the fascinating geology or the mineral and other potential of this area — entrepreneurs have even tried to export ice cubes from glaciers in the Iskut to the Japanese and Californian markets.

Rocks in the area (Table 1) range in age from Devonian to just a century ago when lavas poured out onto the ice and built "The Volcano". The Paleozoic Stikine assemblage basement, which consists in part of roof pendants in the Coast Plutonic Complex (CPC), forms a northwest-trending belt that is overlain by Triassic to Jurassic island arc rocks of the Stuhini and Hazelton Groups, and Middle to Late Jurassic Bowser Group overlap sediments; these are cut by Tertiary batholiths of the CPC. The Stikine assemblage consists of three volcanic-carbonate packages: Early Devonian limestone and intermediate to felsic volcanic rocks; Mississippian thick-bedded, bioclastic limestone with large crinoid columnals; and Permian fragmental volcanics with associated thin-bedded coralline limestone units. Stuhini island arc rocks vary in character from west to east. In the west, the Stuhini is composed of thick sections of Late Triassic limestone and bimodal volcanic rocks which are cut by Jurassic (177 Ma, R.G. Anderson, personal communication, 1989) gabbroic to felsic plutons and mafic to felsic dykes. In the east, mafic volcanics are associated with Alaskan ultramafic intrusions and cut by intermediate to felsic intrusions. Jurassic volcanic rocks correlate with Hazelton Group rocks to the east and south. Dykes that texturally resemble the K-feldspar megacrystic Premier porphyry fed the volcanic pile.

Locally, these early Jurassic rocks are highly strained. Co-magmatic intrusions, notably the Texas Creek granodiorite, also show areas of ductile deformation. Deformation and resultant erosion of the Early Jurassic volcanics reflect an Early Jurassic, but pre-Toarcian, compressional event.

Buff carbonates of Toarcian age with Weyla and other fossils unconformably overlie the older rocks and are useful stratigraphic markers. Post-Toarcian Bowser Basin overlap sediments are not well mineralized; exploration efforts should be concentrated in rocks that underlie the distinctive Bajocian black shale and white flint "pyjama beds" of the upper Hazelton Group. As Bob mentioned in Spokane, at the Northwest Mining Association meeting in December, exploration is warranted where the pyjama beds change facies to pillowed lava and dirty argillites, such as at the Eskay Creek property described following. Within the Bowser Group, Bathonian shales are overlain by a monotonous sequence of Oxfordian and Kimmeridgian greywackes and shales. Folding and development of cleavage in the shales took place during Middle Cretaceous and younger contraction. Intrusions of the CPC are largely Eocene in age and their post-tectonic contacts are intrusive.

Jim Logan of the BCGS Branch shifted the focus to a more detailed scale. He described the stratigraphy of the area south of the Scud River, which is along the boundary between the Intermontane Belt and the Coast Plutonic Complex.

Mapping showed two distinctive Mississippian limestone units in the area. The lower unit has characteristic coarse crinoids and tuff layers; the upper is medium-bedded bioclastic limestone overlain by calcareous green tuff. There are unconformities between the Mississippian and Permian sections and at the base of the Mesozoic package. The generalized stratigraphy is given in Table 1.

The plutonic history of the area is long. The earliest intrusions are the pre-Middle Triassic Hickman Alaskan-type ultramafics. Middle to Late Triassic quartz monzonite to granodiorite of the Hickman batholith followed. Early Jurassic intrusions are syenite to quartz monzonite that are characterized by K-feldspar megacrysts. Middle Jurassic intrusions range from diorite and granodiorite to biotite granite. Tertiary dykes cut all the older rocks.

Mineralization is largely structurally controlled and frequently intrusion-related. Mesozoic porphyry copper mineralization of both the alkalic (Galore) and calc-alkalic (Schaft Creek) type occurs. Gold is an important commodity in these copper and copper-molybdenum systems. Skarn deposits of similar age developed in calcareous hosts. In his talk, Dave Lefebure described Mesozoic Stuhini-hosted mesothermal and Hazelton-hosted transitional to epithermal veins. Structurally controlled Tertiary precious metal vein deposits lie within north-, northwest- and east-trending faults. They have carbonate and silica alteration and associated base metals. Volcanogenic massive sulphide deposits like those in Paleozoic(?) host rocks near Tulsequah are possible targets.

Dani Alldrick of the BCGS Branch stressed the importance of Premier porphyry and equivalent subvolcanic intrusions in determining stratigraphic position and locating mineralization in the Iskut. The characteristic texture consists of 1-2 cm megacrysts of potassic feldspar, generally 15-25% plagioclase phenocrysts and small amounts of amphibole needles in an aphanitic, generally chloritized, matrix. These rocks occur as stocks, sills, uncommon dykes, flows, and air fall and ash flow tuffs. These porphyries characterize the top of the Unuk River Formation of the Hazelton Group and are prominent at many of the area's mineral deposits — like Premier, Sulphurets and Kerr.

Dave Lefebure and Mike Gunning presented a geological map of the Bronson Creek area (BCGS Branch Open File 1989-28) that was released at the conference. Dave noted that much of the $43 million spent on exploration in northwestern B.C. in 1988 was in the "Golden Triangle", albeit he prefers the term "Golden Horseshoe" since interesting areas of mineralization in Hazelton rocks rim the northern Bowser Basin.

Snip Property

Al Samis of Comino Ltd. stated that early exploration on the Snip property (Figure 1) focussed on porphyry copper potential. Red Bluff, a prominent cliff underlain by a Premier porphyry stock, is silicified, pyritized and anomalous in copper and gold. Emphasis in the modern program has been on gold. The Twin Zone occupies a shear zone that trends 120° and dips 45°-65°SW. It is presently being evaluated by means of adits at the 180 and 300 metre levels and connecting spiral ramps that continue up to the 420 metre level. Fill-in drilling to the original 25 metre program is at 12.5 metre spacing. Undiluted reserves, reported in George Cross Newsletter 214, 1989, are 936,000 tonnes at 30 grams/tonne gold.

The mineralization has three characteristic forms: (a) massive sulphide ore with pyrite > pyrrhotite, minor sphalerite and rare arsenopyrite, galena, molybdenite and chalcopyrite; (b) crackle quartz ore with shattered quartz veins infilled by green mica, chlorite and disseminated sulphides; and (c) streaky quartz-carbonate ore with quartz laminae in strongly sheared and altered country rock. The most recent program discovered both faulting, that offsets the Twin Zone as much as 20 metres, and a post-ore, but foliated, biotite-altered mafic dyke (the biotite spotted unit or BSU) that follows the mineralized zone.

Table 1 Stratigraphy of the Iskut River area. (After descriptions by R.G. Anderson and J.M. Logan).

Stratigraphy	Lithology		Comments
BOWSER GROUP			
Middle Jurassic	conglomerate, siltstone, sandstone, shale		successor basin
	gradational to unconformable contact		
HAZELTON GROUP			contractional event?
Early Jurassic	co-eval alkalic/calc-alkalic		island arc rocks
	gradational to unconformable contact		
STUHINI GROUP			
Late Triassic	intrusions; mafic volcanic rocks in the east, bimodal in the west		extensional in western area
	polymictic conglomerate; basaltic to andesitic volcanic rocks (plagioclase and hornblende phyric)		no Triassic clasts; limestone clasts common
Middle Triassic	sedimentary rocks		
	unconformable contact		contractional event
STIKINE ASSEMBLAGE			
Permian	thin-bedded coralline to crystalline limestone (over 1000 m thick), fossiliferous; intermediate flows and volcaniclastics		volcanic units resemble Hazelton Group rocks
Early Permian	rusty argillite		
	unconformable contact		
Mississippian	"siliceous" turbidite, felsic lapilli tuff		extensional event
	"basement" mafic metavolcanic rocks and metasedimentary rocks	upper coralline limestone and conglomerate	thick bedded
		lower limestone with tuff layers	limestone commonly bioclastic, coarse crinoids, corals
	unconformable contact		
Early Devonian	limestone; intermediate to felsic volcanic rocks		contractional events; rocks highly deformed

Stonehouse Gold Deposit, Johnny Mountain

Dave Yeager described exploration methods and the geological setting of various veins at the mine. The veins have been explored by adits at the 1175, 1125 and 1075 metre levels. They strike 065° and dip 70° NW to 90° and may lie at a low angle to bedding. Mineralization is mainly in quartz veins, but extends into hanging wall stringer zones, at least around the Discovery and Sixteen veins. Gold occurs as high gold electrum; associated sulphides are generally pyrite, chalcopyrite and lesser pyrrhotite as stringers and pods; galena and sphalerite occur locally. Veins pinch and swell and may splay. They are variably offset by steep, northwest-trending normal faults and local "flat faults" that complicate exploration and correlation of veins. Potassic alteration of the host feldspar porphyry extends about a metre out from the veins in the footwall and up to several metres into the hanging wall. The host rock is volcaniclastic, although minor epiclastic rocks have been seen in drill core. Production to date has been from the Sixteen and Discovery veins. In August, reserves were 50,000 tonnes of broken ore and 123,000 tonnes of proven and drill indicated ore; total estimated reserves are 623,000 tonnes at 19 grams/tonne gold.

Eskay Creek Property

The Eskay Creek property talk given by Gerry McArthur at the Bronson workshop was the first ever presented publicly. The description here is augmented by information from the company annual report and press releases. The property is east of Tom Mackay Lake (Figure 1). It is not new; the area was first worked on during the 1930s. Previously tested mineralization is associated with an extensive zone of pyritic, silicified rocks that stands out as a ridge. The new discovery is in recessive argillite that rarely crops out; there is basalt above and resistant rhyolite tuff and dacitic volcaniclastic rocks below. The company interprets mineralization to be stratabound with footwall stringer zones in Jurassic Hazelton Group host rocks. Bob Anderson calls the sediments the Eskay facies and correlates them with the "pyjama beds". BCGS Branch mapping correlates these strata with the Betty Creek and Mount Dilworth formations of the Hazelton Group.

This 50:50 joint venture between Calpine Resources Inc. and Stikine Resources Ltd. (formerly Consolidated Stikine Silver Limited) is operated by Prime Exploration Limited. As of June 1, 1989, Stikine's annual report cites drill indicated reserves of 2.5 million tonnes of 8 grams/tonne gold and 113 grams/tonne silver in the 21 South Zone. They propose to mine the deposit by open pit. These estimates are based on results from the first 71 drill holes.

Work is continuing on the 21 deposit, which now consists of South, Central and North zones. The 21 South zone consists of mineralogically complex, refractory ores. In addition to precious metals, they contain mercury, arsenic, antimony and base metal concentrations. Minerals are stibnite, realgar, orpiment, sulphosalts, galena, sphalerite and chalcopyrite. Silver to gold ratios vary from about 5:1 to 200:1 and average 10:1. The zone has a strike length of 500 metres, is 5 to 45 metres wide and has a dip length of 250 metres. Precious metals recovery from a preliminary test from the realgar-rich zone was about 85%.

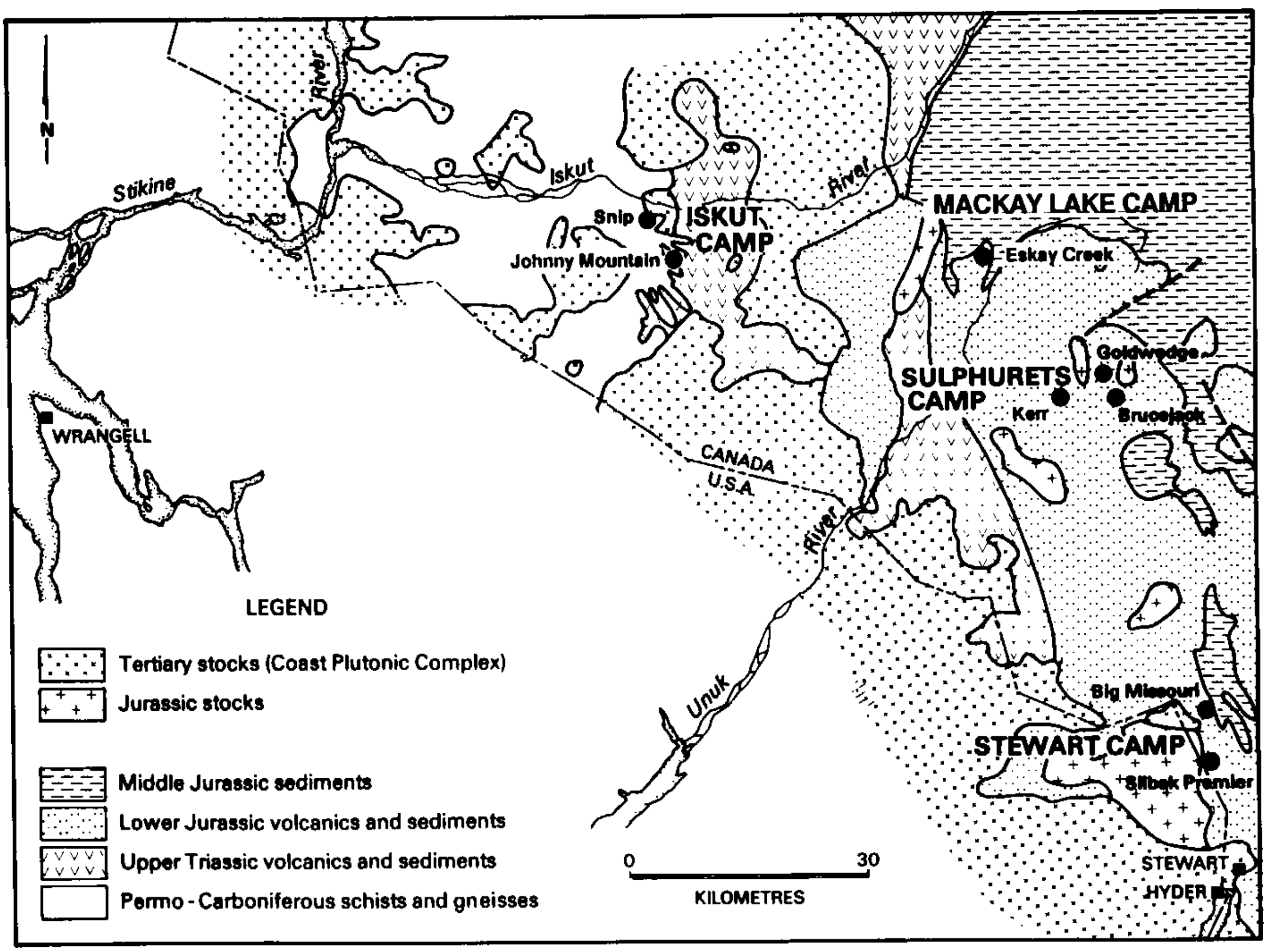

Figure 1 *Generalized geological setting of the Stewart and Iskut areas showing the major deposits.*

The refractory South zone mineralization has associated magnesian chlorite alteration and slightly younger Ba-muscovite alteration. Gold is associated with stibnite in some holes, but is not actually in the stibnite; massive stibnite veins occur in hole 88-21, which contained about 40 m of 0.44 ounces/ton gold. Footwall rhyolite is quartz-sericite altered and strongly silicified with local K-feldspar alteration. Arsenopyrite is present and mercury and silver levels are relatively high.

Central zone mineralization features higher gold grades, higher silver values, and few antimony and mercury-bearing minerals. Base metal sulphides are more abundant. This zone has 19 holes so far and 13 have relatively high grades or long mineralized sections.

In the North zone, results from hole 109, released in August, include 19 metres of 266 grams/tonne gold within a reported intercept of 208 metres of 30 grams/tonne gold. The zone has native gold and silver, sulphosalts, sphalerite, galena, chalcopyrite and tetrahedrite (or tennantite). Zinc is higher, mercury, arsenic and antimony are lower, and gold to silver ratios are higher than for the South zone. Although not yet tested, processing should be simpler than for the South zone.

In places, the fossiliferous argillites contain bedded sulphides that show slump features and debris flow textures that suggest deposition on the sea floor. In other areas, veins show classic epithermal textures such as coarse comb quartz and cockade structure.

In the February 16, 1990, Vancouver Stockwatch, preliminary reserve figures were released. At a cutoff grade of 0.25 ounces/ton, possible reserves for the Central and North zones (now 21B zone) were 1.073 million tons at 1.66 ounces/ton gold, 43.3 ounces/ton silver, 2.1% lead and 5.2% zinc; reserves for the South zone (now 21A zone) are 0.183 million tones of 0.71 ounces/ton gold, 6.8 ounces/ton silver and minor amounts of lead and zinc.

Summary

The conference was a stimulating introduction to the area for some participants, enabled others to "step back" and view their property-scale problems in a broader perspective, and presented ideas that could lead to more exploration successes in this fascinating area. The types of mineral deposits span the extremes of depth, pressure and temperature settings — porphyry, skarn, mesothermal precious metal, epithermal precious metal and perhaps even hot spring-related deposits. The country is large, the access is difficult, and the potential is largely untested.

This report benefitted greatly from reviews and comments made by Dani Alldrick, Jim Britton, Derek Brown, Jim Logan and Bob Anderson. Hopefully, all errors of fact were caught.

For further reading about the area, the following recent reports are recommended.

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