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Update on Eskay Creek - A Review of Geology, Ore Reserves and Development Activities

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The surface diamond drilling program commenced in 1988 continued through 1990 and by year end some 650 holes totalling about 150 km. of core had been completed, since the start of the project. In September 1990, probable plus possible geological reserves in the 21B block were stated to be 2,093,000 tons grading 1.43 oz. Au and 54.01 oz. Ag per ton, using a cutoff grade of 0.25 oz. Au/ton. Corresponding figures at 0.10 oz. Au/ton cutoff were 4,364,000 tons grading 0.77 oz. Au and 29,12 oz. Ag. per ton. In July 1990, an exploration decline was commenced, directed under the thickest, highest grade parts of the 21B zone. Principal objectives are to get direct experience of rock conditions underground and to obtain samples for metallurgical test work. By the end of the year, the decline had advanced 1,130 m. and three cross-cuts had been driven through the Main Contact Ore Lens. Sampling of these cross-cuts amply confirmed the extraordinary expectations engendered by surface drilling. An underground program of in-fill drilling scheduled to end in early March 1991 is the prelude to mining a bulk sample for metallurgical testing at pilot plant scale. Meanwhile, the process of site permitting and provision of road access to the property is well underway.

The Land Between the Stinking and Dream Rivers

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The 21 Zone deposits of Eskay Creek form the second largest gold reserve and third largest silver reserve in British Columbia's history. Yet they eluded discovery for 60 years despite intense, focused exploration efforts. Equally elusive are simple explanations for their geological setting, deposit features and ore genesis.

The geological setting for the 21 Zone deposits shows elements common to the broad regional geological patterns and several features that are at variance to these regional patterns. A current challenge is to determine the origin of these local anomalies and to decide whether any of these atypical features were factors in the formation, localization or preservation of these unusual deposits.

The stratigraphic position of these stratabound ores is not yet certain. The main ore horizon may lie within any of the Salmon River, Mount Dilworth or Betty Creek formations. We can only state with certainty that the ores are hosted by strata in the upper part of the Hazelton Group. Since these strata have attracted little attention in the past 20 years, the entire interval should be regarded as highly prospective, rather than focusing on a single dacitic band within this interval.

At deposit scale, several features of the 21 Zone are characteristic of syngenetic, volcanogenic exhalative ore genesis (thinly laminated sulphides, graded beds, slump folds, synsedimentary faults, lateral zoning along strata). Other features are diagnostic of a subvolcanic or epithermal ore deposit (vugs, coarse-grained and zoned sulphides, fluid inclusions, gangue mineralology). Still other features are common to both deposit types and are therefore non-diagnostic (realgar, orpiment, chloritic and sericitic alteration zones). Of the two sets of diagnostic features, only one is consistently associated with economic concentrations of precious and base metals. Whether these sets of features represent two chronologically and genetically distinct sulphide depositing systems that have been superimposed in a very small area, or whether the ore deposits represent only one complex genetic episode remains to be determined.

Palaeozoic through Tertiary Geological Evolution of the Iskut and Stikine Rivers Area - or "How the West 'Begun"

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The area extending northwest from Stewart along the international border to the confluence of the Stikine and Iskut Rivers, and north to Bob Quinn Lake, is known as Iskut River map area (NTS 104B; 56-57½oN, 130-130°W; also known as the Bradfield Canal map area in the U.S.A.). It contains a record of a rich and varied geological history that encompasses development of the Palaeozoic Stikine assemblage, Triassic and Jurassic Stikinian arcs, and Middle to Upper Jurassic Bowser overlap assemblage rocks along the Tertiary (Eocene) plutonic eastern margin of the Coast Belt. Part of this geological history included the Middle Jurassic precious- and base-metal deposition in the Eskay Creek area.

The Palaeozoic Stikine assemblage comprises Lower Devonian, Mississippian and Lower Permian platformal limestone and subordinate pillowed basalt flows and intermediate to felsic volcaniclastic rocks that were deformed in Devono-Mississippian? and Permo-Triassic time. The Stikine assemblage forms the basement for the Mesozoic strata.

The Upper Triassic Stuhini Group, Lower and Middle Jurassic Hazelton Group volcanic and sedimentary rocks, and three plutonic suites record waxing and waning of the Stikinian Mesozoic arcs. Western and eastern facies of Stuhini Group are distinguished by bimodal vs. mafic and intermediate volcanic rocks and limestone vs. medium to fine grained siliciclastic sedimentary rocks, respectively. To the northeast, the upper Stuhini Group is dominated by sedimentary rocks which grade into a condensed sequence of distal Hazelton Group volcanic rocks. Three lower volcanogenic formations and one upper sedimentary formation make up the Hazelton Group, a precious metal metallotect. Plutons of the Late Triassic Stikine and Early Jurassic Texas Creek suites are partly cospatial along a northwest-trending belt parallel and adjacent to the international boundary. Two northwest-trending belts of Texas Creek suite plutons and hypabyssal intrusions -- calc-alkaline to the southwest and alkaline to the northeast -- are recognised. Texas Creek plutons were coeval with the volcanism and were emplaced locally cospatially with some Early Jurassic volcanic centres inferred from Lower Jurassic stratigraphy. Early Jurassic and older rocks were deformed in an event perhaps manifest in a widespread, sub-Toarcian unconformity. Development of an extension-related latest Early and Middle Jurassic basin and coeval intrusion of Middle Jurassic Three Sisters plutonic suite followed.

The distribution and metallogeny (e.g. Eskay Creek) of Lower Jurassic and Middle Jurassic facies belts of the Salmon River Formation differ from the Lower Jurassic strata described above. North-trending facies belts dominate and change in character from west to east.

A thin, belemnoid-rich, sandy limestone to calcareous or siliceous shale member of Toarcian (late Early Jurassic) to Bajocian (early Middle Jurassic) age commonly occurs at the base of the Salmon River Formation. The overlying, lower Middle Jurassic member has three facies that define the north-trending belts. Andesitic hornblende - and plagioclase -

rich volcaniclastic rocks near Snippaker Mountain (**Snippaker Mountain facies**) may represent vestiges of an arc. West of Snippaker Mountain and east of the Stikine River, Middle Jurassic, northerly or easterly elongate, quartz monzodiorite to quartz monzonite plutons are part of the widespread Middle Jurassic Three Sisters plutonic suite. In Iskut River map area, the plutons may indicate the roots of the Middle Jurassic arc preserved in the Snippaker Mountain facies rocks to the east. A medial facies belt east of Snippaker Mountain, the Eskay Creek facies, comprises distinctive basal siliceous and limy, radiolaria-bearing shale and argillite that is intercalated with and overlain by pillowed andesite flows that are locally intensely silicified. The sedimentary rocks are part of the "contact zone" that hosts the stratabound Eskay Creek deposit. Eskay Creek facies strata can be traced 50 - 70 km. north and south from Eskay Creek thickening abruptly from about 60 metres at the deposit to 1,500 metres farther north. Rare but distinctive rhyolite flows occur within the facies to the north. Just north of the Iskut River map area, molluscs indicate a Toarcian and Bajocian age for the basal sedimentary member of the Eskay Creek facies rocks. The Eskay Creek facies may have accumulated in a back-arc basin.

East of Eskay Creek, starved basin-type, radiolarian-bearing, black siliceous shale and white, flinty (air fall?) ash (the **Troy Ridge facies**) are correlative with the Snippaker and Eskay Creek facies. These rocks are also likely correlative with the better dated Bajocian age Quock Formation of the Spatsizi Group found about 100 km. to the northeast in the Spatsizi map area. In the Spatsizi area, the alternation of black and white weathering beds of this facies reminded geologists of striped pyjamas and hence their nickname "the pyjama beds."

The final stage of Mesozoic sedimentary basin development is recorded in the fine - to coarse-grained siliciclastic rocks of the Middle and Upper Jurassic Bowser Lake Group which grade up from or unconformably overlie Stikinian arc rocks. Orthogonal north- and east-trending cross folds and eastwardly-directed transpressive faults of the Jurassic to Tertiary Skeena Fold Belt involve the Bowser Lake Group rocks.

Lithology and Alteration in the Eskay Creek 21A Zone

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The Eskay Creek massive sulphide deposit contains an estimated geologic resource of 3.95 million tonnes grading 26.40 grams (0.77 oz.) gold and 998.4 grams (29.12 oz.) silver (N. Miner 1/28/91) for a total of 104 tonnes (3.36 million ounces) of gold. This resource is divided between the 21A and 21B ore zones which contain similar host lithologies, but distinctly differing ore minerologies, gold grades and trace element contents. The bulk of the resource is contained within the 21B zone which is the site of the current surface and underground exploration.

The 21A zone is hosted by bimodal volcanic and sedimentary rocks of the Lower Jurassic Hazelton Group. Lithologic units within the deposit may be grouped into the following sequences: a hanging wall sequence, correlative with the Salmon River Formation, consists of intercalated andesitic to basaltic massive and pillowed flows, hyaloclastite breccia and argillite. A massive to thinly bedded argillite sequence, informally referred to as the contact argillite, and a footwall sequence of felsic tuff, agglomerate and flow banded rock (Mt. Dilworth Formation), underlain by amygdaloidal dacitic flows and agglomerate (Betty Creek Formation). Semi-massive sulphide mineralization and the bulk of the gold are located at the same stratigraphic level as the contact argillite, and with limited disseminated and stringer sulphide ore occurring in the felsic footwall unit (Britton et al., 1991).

Alteration in the 21A zone is least intense within the hanging wall; primary volcanic textures and plagioclase phenocrysts are commonly observed. Chlorite and rare sericite replace the glassy matrix and plagioclase phenocrysts, respectively. The argillites contain abundant carbonaceous material and the sedimentary fabric is often overprinted by stratiform accumulations of euhedral mineral, whose origin and original composition is currently uncertain. They now consist variably of prehnite, calcite, sericite and quartz. Barite or anhydrite may also have originally been present. Footwall alteration is intense and consists primarily of quartz and sericite (illite + Muscovite) + Mg-chlorite (clinochlore) + pyrite. Remnant volcanic textures such as flow banding, lithophysae, and devitrification cracks are often visible, but no original mineralogy is identified in this unit.

Sulphides in the 21A zone exhibit a vertical zonation: within, and immediately below the contact argillite, stibnite, realgar and orpiment are most common. Continuing with depth in the footwall the following assemblages are observed: stibnite (realgar+orpiment absent), pyrite + sphalerite + galena, sphalerite + tetrahedrite + pyrite, and pyrite.

Hydrocarbons occur frequently both in hanging wall and footwall units. In the hanging wall, pyrobitumen occurs most often in interflow argillites and in the matrix to volcanic flow breccia. In the footwall felsic unit, pyrobitumen occurs in the matrix to quartz and pyrite grains. The timing of pyrobitumen alteration is uncertain; however, it appears to be later than the formation of prehnite in the hanging wall argillites.

The Eskay Creek deposit represents one of the most significant recent mineral discoveries in British Columbia. The origin and paragenesis of this fascinating deposit is controversial. Current reseasch is focusing on footwall lithology and alteration, recognition and description of sulphide feeder zones, the timing and significance of pyrobitumen alteration, and the origin and composition of late mineral phases in the hanging wall argillites.