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THE POPLAR

COPPER - MOLYBDENUM - GOLD PORPHYRY DEPOSIT,

CENTRAL BRITISH COLUMBIA

by

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Abstract

The Poplar porphyry copper-molybdenum-gold deposit is hosted by a calc-alkaline intrusive belonging to the Bulkley Intrusive Suite of Late Cretaceous age. The deposit is located within the Intermontane Belt in west-central British Columbia and lies in the Interior Plateau physiographic region west of Prince George, British Columbia.

The Poplar stock intrudes Jurassic Hazelton Group volcanic and volcaniclastic rocks which include a significant clastic sedimentary component. The stock appears to be the exposed part of a larger intrusive batholith, broken by post mineralization, north-northwest trending normal faults downthrown to the west.

The deposit was discovered by classical prospecting in the early 1970s and extensively explored by Utah Mines Ltd. during the period 1974 to 1981 . Geological mapping, geophysical surveying and diamond drilling served to delineate a copper-molybdenum resource of 236 million tonnes grading 0.37% Cu equivalent.

The Poplar porphyry deposit is hosted by a biotite feldspar monzonite porphyry. Copper and molybdenum mineralization is associated with significant potassic and propylitic alteration, sulfide minerals consist of pyrite, chalcopyrite and molybdenite. The chalcopyrite is commonly disseminated and associated with sericitized biotite while molybdenite occurs predominantly in veins associated with gypsum and quartz.

Diamond drilling on the Poplar porphyry stock in 1991 expanded reserves in the higher grade core of the deposit. In the northeast area of the claim block a soil geochemical survey has delineated a strong copper anomaly which overlies a zone of propylitic alteration in a porphyritic biotite feldspar monzodiorite. This stock was drill tested in the 1991 program, and returned significantly anomalous values in copper, molybdenum and gold.

Introduction

The Poplar copper-molybdenum-gold porphyry deposit was discovered in 1971 by classical prospecting techniques, and staked on behalf of El Paso Mining & Milling Company. Preliminary geochemical soil sampling, geological mapping and bulldozer trenching did not provide sufficient encouragement and the property was quit-claimed to the original stakers. Utah Mines Ltd., now BHP Minerals Canada Ltd., optioned the claims in 1972. Extensive exploration and preliminary development work was completed on the property from 1974 through 1982. Subsequent to Utah's option the claims were examined by many companies but no work was carried out. In 1991 the property was optioned by Metamin Enterprises Inc. and the option was transferred to New Canamin Resources Ltd. who completed a diamond drilling program in the fall of 1991.

The Poplar deposit occurs along the Skeena Arch in the Intermontane Belt, and is within one of the many calc-alkaline intrusions collectively known as the Bulkley Intrusive Suite. The porphyry has intruded Hazelton Group volcanic and sedimentary rocks of Jurassic age. The deposit occurs in a feldspar biotite monzonite porphyry which grades into a hornblende monzonite border phase.

The Poplar stock appears to be part of a larger buried intrusive of batholithic dimensions. Widespread phyllic alteration is imposed on the country rock and the intrusive. Mineralization in the porphyry occurs in a zone of potassic alteration within a surrounding halo of propylitic alteration, consisting of disseminated chalcopyrite and a stockwork of quartz veins with included molybdenite.

There are several intrusive stocks exposed on the property, all apparently part of the batholith. One such stock outcrops in the northeast part of the property east of China Creek. A

large copper soil geochemical anomaly is associated with this stock, this anomaly was first drilled in the 1991 program. Disseminated chalcopyrite and pyrite is hosted in a biotite feldspar monzodiorite porphyry within a zone of propylitic alteration. Samples from the China Creek porphyry are strongly anomalous in copper and molybdenum. Further work is required to evaluate this target.

Location

The Poplar deposit is located in west central British Columbia, 260 kilometers west of Prince George and 75 road kilometers south of Houston, B.C. The property is centred at Latitude 54° 1' North and Longitude 126° 58' West and is within N.T.S map sheets 93E/15W,93L/02W and 93L/03E.

The property is accessed by logging roads from Highway 16 at Houston, British Columbia., to the south along the Morice River Forest District Road and the Morice-Tahtsa F.S.R. to the east end of Poplar Lake. The "Poplar Main" haul road accesses the north east part of the claim block, while the trail to theForest Service camp ground on the east end of Poplar Lake continues on as the access trail to the main drill area on the property.

Setting

The Poplar property lies on the north shore of Poplar Lake. The lake lies at an elevation of 2,750 feet or 825 metres above sea level. The ground on the north shore slopes up to the high hill of Poplar Mountain at 6,000 feet or 1,800 metres. The claims cover this south facing slope which is made up of several wide benches and small hills. The slopes are dissected by three or four south and south-west flowing streams which are deeply incised close to the lake.

The vegetation is typical of the Interior Plateau with thick stands of conifers such as spruce, hemlock, fir and lodge pole pine with many areas of open meadow. The meadows are covered with grasses and have a thick development of black, chernozem type soils which appear to inhibit the growth of coniferous trees. There are open stands of deciduous trees such as aspen adjacent to the meadows on the benches with cottonwoods occurring along the creek banks. The grass meadows are utilized for summer cattle range by local ranchers.

History and Previous Work

The Poplar porphyry deposit was discovered by traditional prospecting along the lake shores and surrounding creeks and hills. The discovery of malachite on outcrop at the lake shore and malachite associated with chalcopyrite mineralization outcropping in Canyon Creek led to the staking of the claims in 1971 by F.Callaghan, F.Onucki and C.Critchlow for El Paso Mining & Milling Company.

Programs of geochemical soil sampling, geological mapping and bulldozer trenching were carried out in 1971 and 1972 under the direction of Harold Jones, for El Paso Mining and Milling Company. Results were disappointing and the property was returned the original stakers.

The property was optioned by Utah Mines Ltd. in 1974, who conducted an ongoing exploration program up to 1977. Work included geological and topographic mapping, grid establishment by line-cutting and surveying, soil geochemical surveys, geophysical surveys including ground magnetometer and induced polarization surveys. Forty diamond drill holes for a total of 27,170 feet or 8,281 metres, were completed during this period. In 1978 the property was the subject of a Master's thesis by P.M. Mesard at the University of British Columbia, Dr. N.C. Carter of the B.C. Dept. of Mines collaborated with a program of Potassium/Argon age dating of the porphyry copper host rocks.

Utah Mines Ltd. renewed work on the property in 1980, by extending the diamond drilling

program. A total of 58,730 feet or 17,900 metres in 73 drill holes was completed by 1982, for an expenditure of about $2,500,00.00, (1982 Dollars). Preliminary reserve figures were published by Utah Mines Ltd., and estimated at 285 million tons (260 million tonnes) of 0.37% copper "equivalent" at a 0.25% copper "equivalent" cut-off.

In April 1982, Utah Mines Ltd. filed ten years of assessment work on the claims and returned the property to the original vendors. The property was examined by Ainsworth-Jenkins Holdings Inc. in 1991 and optioned by Metamin Enterprises Inc.. The option agreement was later acquired by New Canamin Resources Ltd.. In the fall of 1991 a diamond drilling program, totalling 1300 metres (4,267 feet), was completed on the original Poplar Porphyry and the China Creek stocks.

Applied Exploration Techniques

The Poplar porphyry deposit was discovered by classical prospecting along the rocky shores of lakes and creeks into the surrounding hills. Subsequent exploration utilised soil geochemical surveys and geophysical surveys, such as ground magnetometer and induced polarization surveying, to delimit areas of interest around the areas of mineralized outcrop.

A soil geochemical survey was completed by El Paso Mining and Milling Company in 1971 over the initial claims area. The "B" horizon was sampled on a grid system of 200 foot line intervals with 100 foot sample spacing, and a 7,400 foot baseline. The samples were analyzed for copper, molybdenum and silver. Molybdenum results were of little significance, while copper indicated a collection of 500 ppm anomalous highs within a broader anomalous area of 200 ppm located in the area west of Canyon Creek. The 500 ppm copper distribution suggests a glacial dispersion from west to east which is in agreement with Tipper (1963) who has shown west to east ice movement on the adjacent Nechako River map-area. Silver values greater than 4 ppm response were scattered, some

of which coincided with >500 ppm copper. The anomalous copper values in soil are not fully explained by known mineralization or by reported ice movement in the area.

The ground magnetometer survey conducted by Utah Mines Ltd. in 1976 produced a very subdued response. The main feature was a large central area of very gentle magnetic relief surrounded by areas of more magnetic activity, (Bowen, 1976). Maximum anomaly values were in the order of 1,500 gammas.

Induced Polarization surveys were conducted by Utah Mines Ltd. in 1974 and 1975. Bowen (1975) reported that n=2 and n=4 data show anomalous chargeability values from line 10,400E to 13,400E and from 5,100N to 6,750N or an anomaly length of 3.0 kms east-west and 1.6 kms north-south. The high chargeability response was attributed to widespread pyrite and possibly clay alteration. It was noted the apparent resistivity values did not show any obvious correlation with chargeability data. The apparent resistivity values varied from 50 to 2,400 ohm-metres with most of the area showing 150 to 500 ohm-metres. The copper geochemistry and mineralization lie within the induced polarization anomaly and together cover an area of 1.5 km by 1.0 km which is about twice the area tested by drilling.

Regional Geology

The Poplar porphyry deposit lies within the Intermontane Belt, east of the Coast Crystalline Belt and south of the Skeena Arch. The Intermontane Belt is underlain principally by Mesozoic volcanic and sedimentary rocks. The Skeena Arch was a prominent transverse structure during early Mesozoic time and marks the boundary between the Bowser successor basin to the north and an area to the southeast covered by Early to Late Tertiary volcanic rocks.

Tectonic deformation in Early Cretaceous time resulted in north-northeast and northwest trending block faulting of the Skeena Arch. Many of these block faults localized the intrusion of

numerous granitic stocks and plugs in Late Cretaceous and Early Tertiary time.

Age dating of the biotite monzonites of the Poplar porphyry by Mesard, Godwin & Carter (1979), returned ages correlative with the ages of the Bulkley Intrusions (Carter 1982), indicating a Late Cretaceous age. Disseminated copper-molybdenum mineralization at the Huckleberry and Ox Lake Porphyry deposits 60 kilometres or so to the south is associated with the Bulkley Intrusive Suite.

Property Geology

The Poplar copper-molybdenum-gold porphyry deposit is centered on a differentiated calc-alkaline stock of Late Cretaceous age which intruded into volcanic and sedimentary rocks of the Hazelton Group of Jurassic age.

The Hazelton Group rocks are exposed on the eastern and western parts of the claim block. Two units were differentiated by earlier workers, the lower unit is volcanic and consists of fine- to medium-grained feldspar porphyry tuffs and agglomerates with massive andesites and gabbroic rocks, interbedded with a few narrow argillite beds. The upper unit is mainly sedimentary, with up to 400m of a basal gritty argillite overlain by medium to coarse grained polymictic sandstones and conglomerates.

Several stocks of differing composition crop out within the claim block; however all the earlier drilling was carried out in the Canyon Creek area on the "Poplar stock", a feldspar biotite porphyry monzonite intruded into cherty argillites and sandstones.

The Poplar stock is zoned, with a core of biotite monzonite porphyry grading into a hornblende monzonite border phase. The stock is cut by northwest trending post-mineral felsic dikes. Mesard, Godwin & Carter (1979) carried out age determinations on biotites from a "biotite monzonite porphyry" associated with the Poplar porphyry copper deposit. The K/Ar analyses were performed at the Geochron Laboratory of the Department of Geological Sciences at The University of British Columbia. Apparent

ages of 71.9 +/- 2.5 Ma and 75.1 +/- 2.3 Ma were returned on biotites from two samples, of drill core and of outcrop, within the porphyry. This age places the intrusions in the Late Cretaceous, correlating with the age of the Bulkley Intrusions (Carter, 1982).

The stock exposed in the China Creek area is a biotite feldspar monzodiorite porphyry to diorite porphyry. This stock appears higher in the intrusive system than the Poplar porphyry, as indicated by the alteration assemblage associated with the China Creek mineralization. The China Creek stock is part of the Poplar porphyry system, separated from the main Poplar porphyry by block faulting.

Several intrusive dikes or small plugs are associated with the Poplar porphyry, the commonest is a "quartz-eye" rhyolite to rhyodacite porphyry containing characteristic rounded quartz augen up to 6mm across in a white to tan aphanitic groundmass. A pink to maroon coloured porphyritic rhyodacite with plagioclase phenocrysts and quartz augen to 5mm across intrudes the China Creek stock as dikes or late stage plugs into the main stock of monzodiorite porphyry.

The larger intrusive body which includes the Poplar and the China Creek stocks is broken by a series of parallel, post mineralization, late stage normal block faults trending north of northwest and with downthrow to the west, (Fig.2). These fault zones were more susceptible to erosion and are now occupied by Canyon Creek on the west and by China Creek on the east. The faults have dissected the two porphyry stocks to some extent and appear to have formed the loci for intrusion of the Tertiary rhyolite to rhyodacite dikes or plugs.

The fault in the Canyon Creek area, cutting the "Poplar porphyry" , may even have an element of post-glacial movement. East of Canyon Creek the glacial drift and glaciofluvial gravel are from 24 to 30 m thick while the overburden on the west of the canyon of the creek is from 1 to 3 m thick as shown by the several drill programs, (Fig.3). There is no evidence of similar post-glacial movement on the China Creek fault. (Fig.4).

All significant hydrothermal alteration and sulfide mineralization is restricted to the Poplar stock and China Creek stock and their thermal aureoles. Hornfelsing in the volcanic rocks occurs for over 300 m from the intrusive contacts. The hornfels aureole is more strongly developed around the China Creek stock than around the Poplar stock.

The major alteration assemblages reported by Mesard et al (1979) and observed in drill core are:

(1) Potassic: potassium feldspar + secondary biotite + magnetite + gypsum +/- quartz +/- hematite;

(2) Phyllic: quartz + sericite + pyrite +/- gypsum +/-clay +/- carbonate +/-/ hematite;

(3) Argillic: clay +/- sericite +/- carbonate +/- quartz;

(4) Propylitic: chlorite +/- carbonate +/- epidote +/- albite.

Phyllic alteration is widespread, enveloping the potassic and propylitic alteration associated with mineralization.

Economics

Preliminary reserves calculated by Utah Mines Ltd.in 1982, based on 17,000 metres of drilling, were estimated to be 260 million tonnes grading 0.37% Cu equivalent, using 1982 prices for copper and molybdenum. Gold was not assayed on a systematic basis. Some drill holes were composited over intervals of 30 feet (9.14 m) and assayed for gold but with limited success.

The drill core from the 1991 drill program was systematically assayed in 3 m intervals for copper, molybdenum, gold and silver. The results confirmed the earlier assay results and, because of the closer, infill nature of the spacing of the drill holes, did expand the estimated reserves of the higher grade core of the Poplar porphyry deposit. The reserves grading higher than 0.4% Cu were increased from approximately 28 million tonnes to just under 40 million tonnes.

Utah Mines Ltd. carried out metallurgical test work on several tonnnes of drill core from the earlier drill programs in 1980 or 1981. Some test work has been carried out on drill core from the 1991 drill program to determine the acid leach parameters of the mineralized rock for SX/EW recovery of copper from the higher grade core of the Poplar deposit. The results of this recent work are still pending.

The area surrounding the deposit has been logged in recent years, and while Poplar Lake does receive some recreational usage for fishing and hunting it is not a prime tourist destination. The environmental impact of a large open pit mine should not have a significant impact on the area. With proper planning the visual impact could be minimised during the mine life and reclamation of waste and tailings piles should not be onerous. There has been no acid base accounting tests done on the rocks of the porphyry deposit, however the presence of carbonate associated with the phyllic alteration assembage could be beneficial. The potential for acid rock drainage is unknown at this time.

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