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SUMMARY REPORT ON
THE 1981 EXPLORATION PROGRAM
OF THE ANYOX PROPERTY

Observatory Inlet Area, Skeena Mining Division, B.C.

Latitude: 55° 25" N

Longitude: 125° 45" W

N.T.S.: 103P5

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1. Conclusions and Recommendations

It is concluded that the old glory-holes and the 1 km^2 area adjacent on the west to the old Hidden Creek Mine, - which includes ample undeveloped ore-bodies, remaining ore sections of underground stopes and unevaluated mineralized portions, - warrants further study as a possible site for open-pit mining.

It is strongly recommended that a systematic surface diamond drilling program (first stage) should be carried our for the evaluation of these remaining ore sections and unevaluated mineralized portions. Indirect exploration methods such as geophysical and geochemical surveys, should be skipped although insufficiently done in the 1981 exploration program.

The 1982 surface diamond drilling program will provide sufficient data for estimating reserves and grades of gold-silver bearing copper mineralized zones which maybe in the order of a few hundred million tons.

A systematic diamond drilling program will be proposed in a separate report.

2. Anyox Project

The Anyox Property consists of the first option area, centered on the old Hidden Creek Mine, and the second option area that includes the old Bonanza Mine and the undeveloped Double Ed deposit.

The main objective of the Anyox Project is to re-evaluate the ore reserve potential (both newly blocked-out and remaining ones) in the first option area, which may be mined by employing some method of open-pit mining.

In the early summer of 1981 Mitsui & Co., Ltd., Tokyo, Japan signed an option agreement with Cominco Ltd. in Canada, on the basic principle of developing any deposit(s) found by the joint venture.

The proposed work commitment was for a maximum of four years. The major aim of exploration work conducted in 1981 was to gather practical information regarding various factors which may be vital in planning the 1982 exploration program.

Hidden Creek Mines Ltd. was incorporated in B.C. as a vehicle for exploration activities and conforms with the relevant Canadian acts and regulations. The company was activated in August 1981. T. Takeda, P. Eng. was the consulting geologist on behalf of the company.

3. Selection of the most promising area

Granby Mining, Smelting & Power Co. commenced mining and smelting on its Anyox Property in 1914 shortly before the outbreak of the World War I, and ceased operation in June 1935 due to the historically low copper price of 7.4¢ per lb. Consequently, the property was purchased by Cominco in 1936.

In total, 21,725,600 tons of ore was produced from the Hidden Creek Mine. Metal content in blister copper yielded, amounted to 3,772.8 kg of gold, 206,468 kg of silver and 321,548 tons of copper, of which calculated average grades were 0.17 g/ton Au, 9.5 g/ton Ag and 1.48% Cu respectively. Immediately before the mine closure, the flotation mill had been treating at the rate of 5,000 tons of ore/day with an average grade of 1.03% Cu.

During 1980, this consultant engaged in a comprehensive compilation and detailed study of priceless Granby records and maps, which have been well preserved by Cominco. As a result, it was possible to narrow the area targeted for intensive exploration to a one square kilometer (1 km^2) zone, immediately adjacent to the old glory-holes. Underground level maps in overlays together with available records of diamond drill holes (both underground and surface) clearly indicate that most of the low grade portions, with far less than 1% Cu mineralization, had never been mined.

The promising area thus selected comprises a series of 7 Crown Granted claims. Going from north to south these claims are:

Donald (L483), Mayflower (L2219), Gamma (L480), Revenge(L482), Rudge (L481), Buffalo (L2230) and Maple Leaf (L2223) ---------- --- (see Fig. 1 Claim Map, scale 1/50,000).

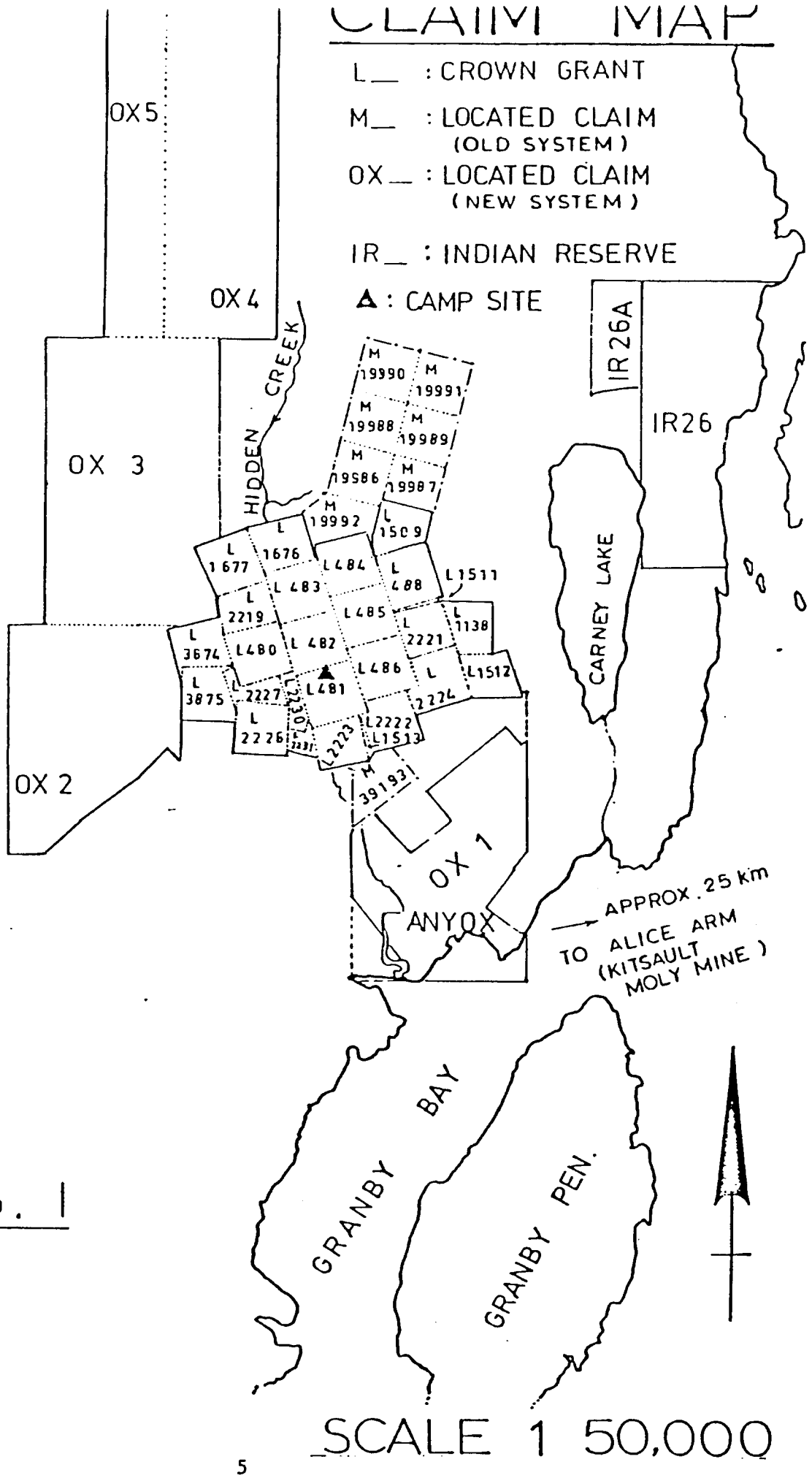
CLAIM MAP
L__ : CROWN GRANT
M__ : LOCATED CLAIM (OLD SYSTEM)
OX__ : LOCATED CLAIM (NEW SYSTEM)
IR__ : INDIAN RESERVE
▲ : CAMP SITE
OX5
OX4
OX 3
OX 2
OX 1
ANYOX
HIDDEN CREEK
IR26A
IR26
CARNEY LAKE
M 19990
M 19991
M 19988
M 19989
M 19586
M 19987
M 19992
L 1509
L 1676
L 1677
L 484
L 488
L 1511
L 483
L 2219
L 485
L 1138
L 2221
L 3674
L 480
L 482
L 486
L 1512
L 3875
2227
L 481
2224
L 2226
L 2223
L 2222
L 1513
M 39193
APPROX. 25 km TO ALICE ARM (KITSAULT MOLY MINE)
GRANBY BAY
GRANBY PEN.
SCALE 1 50,000

FIG. 1

4. Work done during 1981

The government form titled "Notice of work on a mineral property" dated 20 October 1981 is the summary of field work carried out during the 1981 field season (Table 1). The field work was restricted to the aforementioned 1 km^2 area and includes the following surveys:

i. Geochemical sampling - - - (Assessment report of soil and rock geochemistry on the Anyox Property, prepared by M. J. Osatenko of Cominco Ltd.)

This report indicated overall highly anomalous values with some significant anomalies, mainly in the soils. All the geochemical analyses (gold, silver and copper) were done by Cominco's laboratory.

ii. Geophysical surveys - - - - (Geophysical report on induced polarization and magnetometer surveys on behalf of the Mitsui/Cominco joint venture Anyox Property, prepared by Alan R. Scott of Cominco Ltd.)

This work provided the major information source regarding local characteristics and degree of mineralization for areas with no bedrock exposures. It indicated the whole surveyed area was highly anomalous.

iii. Mineralized bedrock sampling - - - - (Fig. 2 compiled by T. Takeda after Dr. K. Suzuki's original sketch. Scale 1/1,200)

More or less 3m long sampling revealed an extensive mineralized area of pockety to irregular stockwork sulfides with low chalcopyrite content in between the Gamma deposit and the No. 3 glory-hole.

Also located a new "Slide ore" area in the vicinity of No. 6 glory-hole, through surficial distribution but with limited tonnage.

Some selective grab samples were collected for determining oxidized zone and secondary supergene sulfide enrichment.

All three kinds of samples were assayed for gold, silver and copper as a rule.

iv. General aspects of field and compilation work

Delays in drafting and signing the Cominco/Mitsui joint venture agreement resulted in a drastic curtailment of field work from the four months proposed originally to only 50 days. Judging from general circumstances in the Anyox area, this consultant found it advisable not to continue surficial work after early September due to the following unfavorable factors: start of sleety conditions with poor visbility, relative difficulties in maintaining sea or air support, shorter daylight time due to the considerably high latitude and inadequate preparation for operating the camp through the winter.

Cominco's generous co-operation in providing well trained field teams for geochemical and geophysical surveys, unexpectedly stable dry weather for this rainy Anyox area, and direct supervision by Messrs. Seki and Suzuki at the field camp all contributed to the successful execution of the revised 1981 exploration program.

Generally speaking, initial camp set-up and subsequent operation with helicopter support went very smoothly, considering this was the first year. An exception was the communication problem with the VHF radiotelephone

caused by the steep topography and meandering nature of Observatory Inlet. This problem was quickly solved by replacing VHF with a conventional side-band unit with the proper antenna set-up. The side-band unit was usually capable of direct communication with the key station in Vancouver.

Despite the limited number of working days, above-mentioned field surveys provided very useful information but the surveys by themselves could not be the definitive factor in deciding what would be the most suitable exploration methods for the 1982 exploration program.

The compilation work on available data was carried out during the period starting mid-September and ended in late-November of 1981, and involved preparation of a detailed surface geology map and "composite geology & assay map of surface drill holes" which provided substantial information in correlating data obtained from the geochemical and geophysical surveys.

Release of detailed logging data of diamond drill holes done by Cominco, furnished very valuable information regarding the occurrences of lower grade copper mineralization in the so-called greenstone host.

5. General Geology

The Anyox Property is underlain by a greenstone complex belt and argillitic meta-sediment belt; the latter laying immediately east of the former. Regionally, a transitional contact zone of two belts is regarded as the most favorable horizon for the occurrence of ore deposits. Apparantly, however, there are more than one horizon in detail as alternate layers of greenstone and argillite exist in repetition at least in the vicinity of the Hidden Creek Mine.

Pillow lavas with well preserved original texture, meta-sediments of volcanic origin and intercalated porphyritic tholeiitic basalt lavas are noted locally. In the vicinity of major mineralized zones, greenstone is mostly composed of massive, fine-grained textureless rocks with a distinct greenish tint, suggesting a possible dark-coloured tuff origin. Small lenses of impure limestone are often enclosed in dark-coloured argillite with occasional banded texture. Stratigraphically, all of these rocks are believed to be of the Jurassic age.

Overlapping the original rock types are the local development of the following features:

i. patchy thermal metamorphism in greenschist facies

ii. poorly foliated, phyllitic texture and

iii. mylonitization to intense shearing structures.

Chlorite - sericite - actinolite - irregular quartz veinlet bearing greenstone is the most common host for lower grade copper mineralization, and is often associated with some foliation.

Intrusion of dyke swarms occurred along the fracture system roughly in the N-S and NEE-SWW direction, possibly right after the last copper mineralization of the fracture -filling type. Some dykes are over 10 m wide. Composition of the dykes varies from lamprophyre to monzonite porphyry through feldspar porphyry, quartz porphyry and felsite. These dykes probably represent the product of co-magmatic activities in early Tertiary time.

Last ice age in Pleistocene formed the glaciated togography as currently seen over the Anyox Property. Numerous glacial lakes in various sizes were formed at the waning period of glaciers, and later filled with lake sediments such as peat, bog iron, glacial clay and fluviatile sand-gravels. Deeply incised riverbeds are the sign of active fluvial erosion now in progress. Local canyons and waterfalls are ubiquitous in this region.

6. Ore deposits

The ore deposits in the old Hidden Creek Mine area are of two major types: one is a sufide-rich bedded deposit of stratabound type, and the other is a stockwork type deposit consisting of irregular quartz veinlets with intermittent druses in the swollen parts. Erratic concentration of cupriferous sulfides occur in these druses. In addition, there is also a so-called "Slide-Ore" type deposit accumulated on the southern slope of No. 2 and No. 3 glory-holes as talus from the original bluff of mineralized outcrops.

During the 1981 field season, a new deposit of this type was located by this consultant in the vicinity of No.6 glory-hole (see Fig. 4). Another new deposit lies on both banks of the Hidden Creek to the south of the "Silica" glory-hole and possibly the No. 8 orebody zone. Here, the poorly sorted floats of cupriferous ore are cemented in limonite-rich matrix to give a pseudo-conglomerate-like appearance. These "Slide Ore" deposits of secondary accumulation origin lie on the surface and may be recoverable in a small scale surficial operation as had been done in the past on the southern slope of No. 2 and No. 3 glory-holes.

Stratabound type deposits were the major objectives for selective underground mining by Granby, due to the advantages of higher copper grade, clearer outline of orebodies for stoping, and larger tonnage for less costly mining. They occur as sulfide-rich to massive sulfide bodies enclosed in

siliceous or intensely silicified host within the argillite zone. Most of the best grade portion of No. 1, No. 5 and No. 6 of this type have been mined by both glory-hole and underground mining methods on a large scale. The No. 5 orebody was mined in a small scale by underground stoping. No. 7 and No. 8 orebodies have not been developed nor well evaluated, due to lower grades and less attractive apparant size of the massive sulfide layers.

Judging from the available records and ore floats, the No. 2 and No. 3 orebodies should be grouped into the stratabound type deposits. Cupriferous sulfides are aligned to form closely spaced, thin layers in parallel banding with siliceous porus layers in a foliated greenschist-like host. Apparantly some disseminated sulfides are associated.

Irregular stockwork type deposit is well represented by the Gamma deposit (see Fig. 3). It was explored by diamond drilling by both Granby and Cominco. However, little evaluation work has been carried out due to its known average grade which is usually less than 1% Cu and the irregular nature of the quartz veins containing the erratic copper mineralization.

During the 1981 field season, over 500 chip samples, each representing more or less 3 m section, were collected from extensive exposure of mineralized bedrock (see Fig. 2).

Detailed core-logging records for some surface drill-holes clearly describes the presence of this type of irregular mineralization.

Unfortunately, however, no systematic assay has been done for the evaluation of the average grade of the mineralized sections (see Fig. 3).

7. Mineralization

Two major types of deposits already mentioned, represent different environments for mineralization, although both comprise primary cupriferous sulfide mineralization with minor gold and silver content.

It is believed that bedded deposits of stratabound type in the Hidden Creek Mine were formed on the ancient sea-floor at the end of a period of submarine mafic volcanism. Reportedly, stratabound deposits enclosed in siliceous host within argillite belt are pyritic, while banded sulfide deposit, adjacent to greenschist carries more pyrrhotite than pyrite. For both types chalcopyrite is the major primary copper mineral. Local occurrences of minor magnetite are known.

In spite of its occurrence in greenstone host, chalcopyrite is most prevalent in the irregular stockwork type of mineralization. Some pyrite and rare sphalerite were also observed in the mineralized outcrops. Pyrrhotite occurs as disseminations in greenstone host, but not in quartz veins. Minute grains of sparsely distributed pyrrhotite are present in dark-coloured, tuffaceous argillite near the northwestern corner of Fig. 4. Probably pyrrhotite was formed simultaneously with the host rock, but it definitely was not formed by hypogene hydrothermal mineralization process.

Field observation suggests that the irregular stockwork type

mineralization fills small fractures formed after the deformation, mylonitization and weak thermal metamorphism of greenstone host. Accordingly, it is concluded that irregular stockwork type mineral deposits were formed later than the metallogenic period of stratabound type deposits in the Hidden Creek Mine area.

Dyke swarms clearly intersect bedded stratabound deposits, but often occur along some of the common fracture systems with irregular stockwork type mineralization. Without doubt, dykes are post-mineralization intrusions although a very intimate relationship is demonstrated.

As far as was observed in the field, none of the argillic products of typical hydrothermal alteration such as kaolinite or other clay minerals are associated with the two types of deposits in the Hidden Creek Mine area. Generally speaking, stratabound type deposits have characteristics more typical of the Besshi-type deposits, while irregular stockwork type deposits seemingly show more similarity to porphyry copper deposits of the alkalic suite type which carry significant amounts of gold and silver as byproducts instead of molybdenite.

8. Secondary supergene enrichment

Extreme care is required in evaluating lower grade deposits in the Hidden Creek Mine area, because secondary supergene enrichment of copper sulfides of economic importance occurs near the ground surface but very often in a hardly recognizable sooty form which may be easily overlooked in the field. Surface weathering caused some secondary change to the primary copper deposits with minor gold and silver content. However, most of the oxidized zone has been removed by glaciation.

Weathering in post-ice age is estimated up to 10m thick as shown on the walls of glory-holes across steep-sloped spurs. Apparantly, development of the oxidized zone is so restricted that malachite, chrysocolla, cuprite, tenorite and azurite - - - - such minerals typical of oxidized enrichment product are seen in almost negligible amounts.

As for gold and silver, however, selective grab sampling (see Fig. 2) and geochemical soil sampling by Cominco indicated secondary enrichment by oxidization in porus limonitic gossan formed from sulfide - rich mineralized material (cf. on the western slope of No. 1 glory-hole and near the eastern rim of No. 6 glory-hole). At present, such limonitic gossan does not exist in quantities to be feasible..

It is assumed that secondary supergene sulfide enrichment of copper had

a considerable influence over the operating grade of old Hidden Creek Mine. Some of the old assays near the mined-out capping of a glory-hole shows that a high grade copper zone of about 20% Cu once existed as sporadical patches.

During the 1981 field season, frequent occurrence of secondary enriched copper minerals such as sooty chalcocite and irridescent bornite coating on other sulfide minerals were noted in the mineralized bedrock exposures of the irregular stockwork type within the Gamma deposit.

In the lake sediment zone to the west of No. 1 glory-hole, sooty chalcocite coating as thick as 2mm was formed on banded porous aggregate of massive pyrite in a greenschist boulder float, which was enclosed in very permeable peat layers. Selective grab sample of peat itself also indicated considerably high copper value, probably due to adsorption by its activated carbon.

Large amount of oozy limonite precipitate is seen flowing into the Hidden Creek from the iron-rich glory-holes. This phenomenon may be regarded as a sign that secondary supergene enrichment of copper continues to take place in this area.

9. New concept on the structural control of ore deposits

It is my strong view that this new concept is required to explain the occurrence of ore deposits in much more detail and to develop a more reasonable criterion in re-evaluating this area.

Stratabound type deposits such as No. 6, "Silica", No. 1 and No. 5 are in alignment in the southwesterly to north-northeasterly direction. From thence, No. 4 and No. 7 orebodies are distributed intermittently in a northwesterly trend.

The approximate contact between argillite and greenstone belts has been drawn by connecting the Gamma zone of irregular stockwork type deposit to the stratabound type No. 7 orebody. On the basis of this apparant horse-shoe - shaped greenstone belt with convex side pointing to the north, many geologists have supported Granby's concept that ore deposits in the old Hidden Creek Mine are distributed on the same horizon and controlled by a complex tight drag folding structure with both limbs steeply dipping to northwest as well as the gentle northerly pitch to the northeast.

In reviewing both the detailed distribution of No. 5, No. 4 and No. 7 orebodies of stratabound type at depth and composite geology and assay map of surface diamond drill-holes (Fig. 3), however, it was revealed that each stratabound deposit represents a different ore emplacement horizon and is

controlled by overall monoclinic structure of such piles with approximately 60^{o} dipping to the west and with conjugated lateral folding in both southwesterly and northwesterly trends to form an arcuate curve. It is more important that No. 7 and No. 8 deposits appear to be open at the north and south ends, respectively.

No. 2 and No. 3 orebodies in greenstone host are banded parallel deposits with a north-northwesterly trend in detail. However, the overall outline of the composite glory-hole for both orebodies has an elongated axis in a northwest to southeast direction, so as to give the misleading impression that they were the "roots" for other bedded stratabound deposits in siliceous hosts.

The new concept of parallel ore horizons within the greenstone belt of apparent 700m thickness are shown schematically on Fig. 5.

As far as known to date, copper content tends to increase towards the contact with argillite belt to the east. However, this tendancy has not been definitely proven due to the fact that the exploration density in the western half of the greenstone belt is much less than the one in the eastern half. Also, there is no conclusive clue to determine whether the argillite lying to the east of greenstone belt would be really an overturned hanging-wall or the lower horizon.

10. Summary

(1) the field and data compilation work done in 1981 was instrumental in developing a new concept on the structural control of ore deposits. All sort of available information was utilized to prepare the schematic map of composite geology and ore deposits-mineralized zones (Fig. 5, scale 1/1,200). This will be the base map for planning future exploration programs.

(2) A few hundred million tons of mineralized material of unknown grade exist in an area measuring approximately 1 km^2 adjacent and west of the old glory-hole area in the old Hidden Creek Mine area. Accordingly, the systematic drilling program for the direct evaluation of this mineralized area may be started without completing indirect exploration methods such as geophysical and geochemical surveys.

(3) During the 1981 field season, it was noted for the very first time that the supergene sulfide enrichment of copper is extensively distributed in the form of sooty chalcocite coating on other sulfides as well as some secondary bornite.

Development of oxidized zones or overburden is limited due to glaciation in this area. Supergene enrichment zone of secondary copper is either exposed on or near the surface, or enclosed in the peat layers at shallow depth as the upper members of the lake sediments.

(4) To date, no sizeable gold and silver deposits of any economic importance have been found. Cupriferous deposits in the old Hidden Creek Mine area are grouped into two major types. Both stratabound and irregular stockwork

types carry chalcopyrite as major primary copper mineral as well as minor amounts of gold and silver as byproducts.

(5) Aside from the stratabound type deposits which were the sole producer of copper ore in the past, irregular stockwork type mineralized zones are extensively distributed in the greenstone belt. These have remained largely untested and have not been evaluated systematically. This means that the old Hidden Creek Mine which employed selective underground mining system for exploiting high grade copper ore may be a good candidate for conversion into an open-pit mine.

(6) If an open-pit mining system can be employed, there would be many advantages such as recovery of proven ore reserves at depth, safety pillars and other sorts of remnant ore.

Therefore, it is an urgent task to evaluate untested mineralized materials and re-evaluate known orebodies with insufficient exploration work, so as to estimate potential tonnages and grades feasible for open-pit mining.

(7) It is vital to lay out a systematic diamond drilling program with good lateral coverage but to a shallow depth. At present, drilling depth to 150 m below surface would be sufficient.

As a rule, systematic drilling with gentle dip to southeast and perpendicular to the general structural trend of mineralized zones as currently postulated would be most appropriate and effective.

11. List of maps and table

Table 1: Notice of work on a mineral property (for completion) dated October 2, 1981

Fig. 1 Claim map showing the first option area (scale 1/50,000)

Fig. 2 Mineralized bedrock sampling map (scale 1/1,200)
Compiled by T. Takeda after Dr. Suzuki's original sketch.

Fig. 3 Composite geology and assay map of surface diamond drill holes (scale 1/1,200)
Compiled by T. Takeda

Fig. 4 Detailed surface geology map (scale 1/1,200)
Compiled by T. Takeda

Fig. 5 Schematic map of composite geology and ore deposits-mineralized zones, showing new concept. (scale 1/1,200)
Drawn by T. Takeda.

Respectfully submitted: Tatsuya Takeda

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Approved for release by: G. Usui

Genzaburo Usui, Vice President
HIDDEN CREEK MINES LTD.