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REPORT ON THE SELF-POTENTIAL SURVEY OF

MARSHALL RED LAKE MINES LIMITED

QUEENS COUNTY, NOVA SCOTIA

MINING GEOPHYSICS CORPORATION LTD.

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Map placed on file
for Brookfield Gold District.
M.B.A.

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SUMMARY

A self-potential survey of a portion of the Brookfield Gold District has indicated sixteen anomalies, of which fourteen are considered favourable, but not necessarily of economic value. It is recommended that these fourteen anomalies be investigated by trenching or diamond drilling, or by both methods.

INTRODUCTION

A self-potential survey was made of a block in the Brookfield Gold District, in the vicinity of "Libbey", "King", and "East Mine" fissure veins, during the months of July, August, and September, 1948.

The self-potential method was used in preference to a magnetic survey, as a reconnaissance traverse with the magnetometer indicated little magnetic variation of the rock types. Also, in examining the rock dump at the King Fissure, it was noted that the ore-bearing quartz vein contained approximately 5% sulphide mineralization. This fact has also been noted in old reports.

The ore mined from the property of the Brookfield Gold Mining Company came from the intersection of the Libbey cross fissure vein with three interbedded or strike veins. The purpose of the survey was to try and locate other similar structures in the district.

LOCATION AND ACCESS

The Brookfield Gold District lies in the western-central part of Nova Scotia, in Queens County. The Canadian National Railway crosses the mining district, and an old station "Brookfield Mines" is located on the old Brookfield Gold property. The property is most readily reached from Halifax by going to Liverpool, by train or bus, or to Annapolis Royal by bus, hence to Caledonia or South Brookfield by bus, then by taxi through North Brookfield to Brookfield Mines. Hotel accommodations are available in Caledonia. However, lodging near the old Brookfield property can be obtained in near by farm houses. Excellent accommodations were obtained at the farm of Mr. Hudson Mason, within walking distance of the area surveyed.

CHARACTER OF THE REGION

The general topography is hilly, with intervening swamps, a result of glacial activity, during which many drumlins were left. The surveyed area, however, lies in a wide flat valley striking generally east-west. Low flat outcrops of rocks are quite numerous, also much swampy ground. A second growth of birch, cedar, alders, and apple trees is quite thick in the valley area surveyed. The higher ground is cleared for farming purposes.

PREVIOUS WORK

The earlier geological work in the Brookfield District was by E. R. Faribault[1] . His map, published in 1908, showed the rock structure and position of known veins, and their attitude in the underground workings of the Brookfield Gold Mine (Libbey fissure). W. Malcolm gives a detail description of geology in Geological Survey of Canada Memoir 20.

Several private reports have been written, all in reference to some specific gold deposit. The most recent geological map was published in 1938 by the Geological Survey of Canada, the "Malaga Lake Sheet", Map No. 436A.

Bibliography:

Armstrong, P. (1938) and Wilson, J.T.(1936) Geological Survey of Canada, Map 436A, Malaga Lake Sheet, 1" - 1 mi.

Bancroft, M. F., Private Report "Brookfield Gold District, Queens Co., N. S. ".

Brigstocke, R. W., Private Report, King Fissure Mine, Brookfield Mines, Queens Co., N.S.

Dept. Mines, Ottawa, Investigation No. 944 "Report on the Ore Dressing and Metallurgical Laboratories" on Gold Ore from the Brookfield Gold District of Nova Scotia.

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1. Faribault, E. R., Geol. Surv. Can., Map No. 1012, 1908, Brookfield Gold District, Queens Co., N.S.

Faribault, E.R., Geol. Surv. Can., Map No. 1012, 1908, Brookfield Gold District, 1" - 1320'.

Malcolm, W., Geol. Surv. Can., Memoir 20, Geol. Series 41, "Gold Fields of Nova Scotia".

GENERAL GEOLOGY

The general geology of the district surrounding Malaga Lake is quite simple, being composed of the Meguma (Gold-Bearing) series and granite. The Meguma Series (quartzite and slate) is gently folded without known overturning. The quartzites are smoothly folded and are disturbed only by a few cross fractures. The slates exhibit many minor folds and fractures.

Table of Formations:

Palaeozoic

Devonian - granite

Precambrian (?)

Meguma (Gold-bearing) Series

Halifax formation - black, grey and green slate and argillite.

Goldenville Formation - quartzite (whin) and slate.

Goldenville Formation:

The gold deposits of the Brookfield District are all found in the Goldenville formation. The formation consists of grey and blue-grey quartzite (whin) that weathers light grey. Narrow beds of blue-grey to green-grey slates are found, but they form only a small part of the formation.

Halifax Formation:

The Halifax formation consists of green-grey and grey slates and argillites, grading upwards into purple, blue-grey, green-grey, grey and black slates. The upper slates are softer and cleave more readily

than those of the lower part of the formation.

Devonian:

The Devonian granite to the northwest of the Brookfield district intrudes the Meguma series. This body is part of a tongue-like projection from the granite mass that extends from Halifax to Digby County. The rock is a coarse, biotite granite tending to be porphyritic. Numerous masses of sediments lie in the marginal part of the granite body and the sediments near the granite have been altered. The ore solutions may well have been derived from the granite magma.

Glacial and Recent:

The topography in the Brookfield district is hummocky, owing to the occurrence of many drumlins. Swampy ground is prevalent in the low ground, separating the drumlins.

It is on the drumlins that farming is carried on. The glacial striae indicates the ice movement to have been southeast.

GEOPHYSICAL SURVEY

After some preliminary research a self-potential survey was made of the Brookfield gold district in preference to a geomagnetic survey. A reconnaissance traverse with the magnetometer showed that the readings were all of equal value, thus little structural data could be obtained from interpretation. The self-potential method was then recommended, as old reports stated the quartz veins, previously mined contained auriferous pyrite. Also the examination of the old rock dump at the King Fissure Mine indicated the vein material to carry approximately 5% pyrite. The sulphide was sufficient that a pyrite concentrate was made during operation of the mine. Some of this concentrate is to be found in the old mill building.

The survey lines consist of the main base line and four

subsidiary base lines, A, B, C and D. These lines strike approximately 65° magnetic, or about 43° astronomic. Traverse lines were run at intervals of 300 feet, at 155° magnetic, approximately, and self-potential readings were taken every 50 feet.

GENERAL INTERPRETATION

The most important anomalies are those numbered 1 to 14 on the accompanying map. Anomalies 15 and 16 are not considered important at this time as they appear to be caused by some condition other than sulphides, such as a thick mantle of gravel overburden. However, anomalies 15 and 16 can be examined later, if favourable results are obtained from investigation of anomalies 1 to 14.

Anomalies 1, 2, 3, and 4 appear to have particular promise, as they occur on known strike veins, and appear to lie near intersections of these veins with fissure veins. Anomaly 2 and 3, for example, lie adjacent to the Libbey Fissure vein, and are rated as favourable locations. Anomaly "L" immediately west of anomaly 2 occurs over the mined out section of the Libbey Fissure structure. Anomalies 5, 6, 7, and 8 all lie adjacent to an anticlinal axis, and also appear adjacent to transcurrent structures or fissure veins.

Anomaly 9 appears to lie on a fissure type structure, which is parallel and south of the King Fissure, and which strikes toward anomaly 8.

Anomalies 10, 11, 12, and 13 can all be attributed to intersecting structures of strike veins and transcurrent features, and may be of importance. Anomaly 14, immediately west of the Dunbrack vein is the largest and strongest anomaly indicated, and is considered worthy of careful investigation.

Nothing of importance was indicated in the vicinity of the"East Mine Fissure" or in connection with the "King Fissure". However, not all deposits of economic importance may be indicated; if the anomalies outlined give economic results, other geological possibilities can be investigated later.

Discussion:

The self-potential survey is an excellent method of detecting the sulphide minerals such as pyrite, pyrrhotite, and arsenopyrite under a limited depth of overburden. The allowable overburden depth depends upon concentrations and size of body. Anomalies of appreciable size may be caused by graphic material, and changes in the character of the surface also cause minor variations. A considerable potential, sometimes 40 millivolts, may be registered in passing from swamp to bare rock, and gravelled road beds may show a drop in potential. The grounding of the "pots" may also give high or low readings if necessary precautions are not taken. These features, however, are negligible when a survey is run over high concentrations of sulphide of considerable size.

Thus in locating low concentrated bodies, as the sulphide veins in the Brookfield district, very careful consideration must be given the interpretation.

Several methods such as contouring, analysis of profiles, corrections for background effects, and tracing known geological structures were used. Thus, from the elimination procedures used, the locations which persisted to show as possible pyrite concentrations were considered as important and are shown on the map accompanying this report.

STRUCTURE

The structure as known, was not augmented, except for possible additional structures parallel to those already known.

Folding:

The major folding in the Brookfield Gold District is an anticline; the north limb dips approximately 60° to the northwest and the south limb 45° southeast, the nose plunges about 10° northwest. The general trend of the anticline is N 30° E.

Faulting:

Faulting is not conspicuous, however, one known local fault has an east-west trend.

Interbedded or strike veins are found on the limbs of the anticline, these, no doubt, occupy strike faults. This is more or less confirmed by the fact that the veins usually are found in slate beds, which were the weaker beds, and adjustment took place along them during the period of folding. Quartz veins, known as fissure veins, are found along east-west trending structures, which cross the strike veins at low angles. These may occupy former faults or shears. Other quartz filled fractures, known as angulars were found in the Brookfield mines, these appear to be tension fractures.

ECONOMIC GEOLOGY

Although not a large amount of gold is reported to have been mined, the Brookfield Gold District was active over a long period. The Libbey vein has produced the greatest amount of gold, and was mined to a vertical depth of 1000 feet. Other producers in the vicinity of the Libbey were the "East Mine" and the "King Fissure Mine".

A description of the ore from the King Fissure is given by Brigstocke[1]:

"The ore consists of quartz containing auriferous pyrite and probably metallic gold, although none was seen. The quartz has a banded

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1. Brigstocke, R. W., Private Report on the "King Fissure Mine"

appearance due to black lines which at one time was supposed to have some significance as far as gold is concerned. This, however, after sampling and assaying proved to be erroneous. The importance of the presence of pyrite is important for it seems to depend almost entirely on the amount of pyrite present, what the gold content will be.

There are of course some samples that assayed well, that did not have much pyrite, but on the other hand, when plenty of pyrite is present an interesting assay result can be safely expected".

Structural Control of Ore Bodies:

The structural control of the most important ore body known to date in the Brookfield district, is that of the intersection of the Libbey Fissure vein with three strike veins known as the Mill Lead. Stockman Lead and the Jim Lead. Since the three leads are parallel and spaced 50 to 75 feet apart, a plunging ore body of good size was formed.

CONCLUSIONS

The self-potential survey has indicated fourteen anomalies, any one of which may indicate pyrite mineralization, and hence, also gold. Only anomaly 14 appears to be of any size, the rest appearing quite small. This may be due to two factors:

(1) The lines along which readings are taken are 300 feet apart, and the readings are spaced at 50 foot interbals. Thus much detail is lacking, however, the indications appear to be real.

(2) Since the ore is most likely to occur at the intrusion of two veins, the ore structure is apt to occur as a pipe or chimney-like structure. Thus its aerial extent is limited.

Exploration for such chimney-like structures may also prove difficult, as it depends on the dip of the two intersecting structures, as

to which direction it will plunge or pitch. The chimneys in the vicinity of the Libbey Fissure, are expected to plunge off at 265° magnetic, approximately, thus a diamond drill hole should be placed west of the anomaly and drilled on a bearing of approximately 85° magnetic. It may be necessary to prove the dip of some veins before accurate drilling to intersect the structure causing the anomaly is possible. However, careful study of the rock structures in the vicinity of each anomaly may give the required data.

RECOMMENDATIONS

The anomalies 1 to 14 are considered worthy of investigation by either trenching or diamond drilling, or by both methods. The order of investigation is a matter of choice of the principals. However, the following order is suggested:

1. Libbey Fissure vein area, anomalies 1, 2, 3, 4, and 5.
2. Dunbrack area, anomaly 14. This anomaly area is considered to have three distinct anomalies within it, and will require extensive exploration.
3. Anomalies 6, 7, 8 and 9 adjacent to anticlinal axis.
4. Anomalies 10, 11, 12 and 13.
5. Anomalies 15 and 16 are not considered important at this time.

Respectfully submitted,

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