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REPORT ON MAGNETOMETER SURVEY

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VAL D'OR, Que.

REPORT ON THE MAGNETOMETER SURVEY OF THE PROPERTY OF CAMP BIRD MINES LTD. VASSAN TWSP., N-W. QUEBEC.

by T. Koulomzine, L. Sc., Ing. ENSP.

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March - May 1942.

INTRODUCTION

The property of Camp Bird Mines is located in Vassan township, North-Western Quebec, and adjoins the producing Siscoe Gold Mines, on the northwest, along the strike of the Siscoe "K.Zone" which is a strong shear structurally responsible for the ore deposition at Siscoe.

The property covers 2,081 acres, while the magnetometer survey, the results of which are presented hereby, englobed an area of 1,457 acres.

During the last five years, the property was intensively diamond drilled, a shaft was suck to a depth of 300 feet, and a considerable amount of underground work was done from that level. All this work was concentrated along one section of the property having a width of about 1500 ft. and extending for about 7,000 feet N.W.-S.E. along the strike of the probable extension of the Sicoe "K.Zone". It disclosed a considerable amount of low grade gold ore and the presence of numerous diamond drill intersections which were almost invariably below ore grade under the present economic conditions.

The object of the magnetometer survey was to cover the entire property and locate, if possible, new areas that would have reasonable geological chances of developing ore-making conditions. The immediate objective was to disclose masses of intrusive rocks which being brittle usually are more competent to ore-deposition than the ordinary soft Keewatin greenstones.

The survey started in the last days of February and lasted till May 2nd. Work on calculations, preparation of maps and reports continued till May 20th.

RESUME OF GENERAL AND ECONOMIC GEOLOGY.

The property is almost entirely covered by the waters of Lake Demontigny. A certain number of rock outcrops are known around the shores of islands numbers 5, 6 and 7; all the rest of the geological knowledge must be derived from the results of diamond drilling and underground work. As development work to date was concentrated along the northern part of the west claim group, it must be emphasized that, before the magnetometer survey was undertaken, there did not exist any positive geological knowledge concerning the rocks underlying most of the property. All the geological facts presently known are assembled on a 300 ft. to the inch map "showing geological conditions at Camp Bird Mines, Siscoe Gold Mines and neighboring properties", compiled by the writer in November-December 1931, and revised on March 7th 1942; the description of geology is given in a report that was presented on December 4th 1941. More ample details on the west end of the property are given on a map made to the scale of 100 ft. to the inch and dated March 1942.

The section of the property previously explored by diamond drilling disclosed a predominance of Keewatin lava flows, some of which were of such coarse texture as to be mistaken, by numerous geologists, for granodioritic intrusives. Whenever gold-deposition was found, it was always associated either with small porphyry dykes or shears. The main vein exposed in the west drift of the 300 ft. level is quite remarkable by its length (more than 800 ft.), its fair width going up to 10 feet, but is characterized by the presence of only low gold values. Certain sections of this vein could probably be mineable if a sufficient amount of ore to feed a large mill could be developed. Unfortunately, the drilling that was done during last winter, both from underground and from the ice of the lake, did not disclose the presence of either richer or larger ore bodies.

On the neighboring Siscoe property, where well over twenty million dollars were produced since 1929, the gold deposits are located within a medium size mass of Algoman granodiorite intruding the Keewatin volcanics. The ore is found in the form of large veins filling tension cracks of the brittle granodioritic plug. By analogy, it was supposed that, if large masses of intrusive rocks could be found on the Camp Bird property, reasonable

chances would exist that ore bodies of better dimensions and grade than those found to date may also be located.

RESULTS OF THE SURVEY.

The first attempt to explore the unknown areas of the property was done with a Berg type needle magnetometer; this attempt was unsuccessful, as it was found that practically all variations of the magnetic field in the southwest part of the property were of an amplitude too small to be measured by the Berg magnetometer. The survey, the results of which are described hereby, was made with an Askania vertical magnetometer that is nearly hundred times more precise than the Berg.

All the results of the survey are gathered on a 300 ft.-to-the-inch map. These results are plotted on a 100 ft.-to-the-inch map, covering the west end of the property.

Technical details of the magnetometer survey are to be found in the appendix. The geological interpretation of the results is described hereafter. For the convenience of description, all the magnetic anomalies having geological significance are identified on the map by letters and will be referred to as such in the report.

The property consists of two claim groups adjoining each other by their corners. The magnetic characteristics of these areas are quite different from each other, and, therefore, will be described separately.

South-West part of the property.

This section comprises claims number:

A-32210; A-33388 to A-33390 incl.
A-43272 to A-43279 incl.

and covers an area of 608 acres. It includes Island No. 7 and portions of islands No. 5 and 6. The north part of this section was intensively diamond drilled, and partly developed underground.

Magnetically, the south-west part of the property may be divided in three sections:

1.) A series of strong magnetic anomalies exists in the north-east, north of line m.n., as well as in the north parts of islands 5 and 6, and it is known from diamond drilling that these anomalies are due to a complex of talcosic greenstone rocks of no economic interest. Line m.n. should pass through the north part of island No. 6, but it was not traced on the map because the magnetic measurements made around the mine buildings could not be relied upon.

2.) The area between line m.n. and zones T.U. and V. described hereafter is underlain mainly by none magnetic greenstones. Several small magnetic anomalies encountered in this area are described further on.

3.) Zone T. is apparently underlain by a rather large intrusive mass, while the origin of rocks underlying zones U. and V. is somewhat uncertain.

2.) The middle section of the south west group of claims includes numerous anomalies of small amplitude. The variations along individual profiles repeat themselves on neighboring lines and show the existence of a strike in the formation which is parallel to the known strike of the Keewatin volcanics.

Some of the anomalies that are more consistent and stronger are probably due to shears or porphyry dykes which are interbedded in the greenstone mass.

Anomaly K is apparently due to the extension of the Siscoe K. Zone shear into Camp Bird ground. This fact was proved by diamond drilling. Two experiemental profiles done on Siscoe ground, between Powder Island and Siscoe Island, prove that the "K" Zone proper has a magnetic reaction absolutely similar to the one found on anomaly K. The location of the anomaly about hundred feet south from the position of the "K. Zone", as plotted from diamond drilling results, is probably due to the dip of the shear which, in fact, is known to be towards the North-East.

Anomaly F corresponds fairly well to the diamond drill intersections carrying low values in sheared and altered rock that were cut by diamond drill holes Nos. 57 and 60.

Anomaly G is quite consistent and also parallel to the general strike of the greenstone bed. It is probably due to the strong shear that was located in diamond drill holes nos. 24,20,26 and 55, but its location, south of the shear as picked up by diamond drilling, indicates a north dip of the shear instead of the south dip that was adopted from purely geological evidence on the two maps presented in March.

Anomaly J is probably the continuation of anomaly G, although the continuity cannot be proven without additional measurements.

Anomaly L is probably due to a shear that cuts at a small angle the strike of the greenstone formation.

Anomaly H is most interesting, not only because it apparently lies along the contact of the intrusive Zone T, but also because a very strong magnetic reaction was found near Station 12 South, on Line 30 West.

Detail measurements made at 50 ft. intervals and plotted on the 100 ft.-to-the-inch maps show the existence, within the anomaly H, of a lenticular mass of strongly magnetic rocks or minerals. This strong Anomaly H_1 is most likely due to a mass of pyrrhotite or magnetite-bearing sulphides and should be investigated as a possible source of gold and base metals ore.

There are several magnetic anomalies of small amplitude in the neighborhood of the west end of the main drift of the Camp Bird underground workings. We did not attempt to correlate the magnetic variations in this zone with the geology known from underground workings and the diamond drilling. As it may be seen on the map of 100 ft.-to-the-inch scale, the information gathered from underground drilling is much more detailed than the results of the survey represented by measurement stations located at 100 ft. intervals along lines spaced 300 ft. apart. No definite correlation could be made between the magnetic measurements and the underground geology unless the number of measurements in this part of the property would be substantially increased.

3.) Zone T. The southwest corner of the property has never been subjected to diamond drilling. Therefore, there are no sure ways of interpreting the magnetometer results in this part of the property. Nevertheless, due to a number of characteristics disclosed by the survey, we consider it almost certain that zone T is underlain by a large mass of intrusive rocks probably of granodioritic composition. First of all, the magnetic results of this zone show a remarkably regular negative value that corresponds fairly well to the magnetic values found over the Siscoe granodiorite in the two experimental profiles made between Powder and Siscoe Islands. Furthermore, our experience covering 8 properties and many miles of contacts of the Bourlamaque granodiorite batholith indicates that magnetic anomalies along the contacts of the Bourlamaque batholith invariably show the granodiorite to be less magnetic than the surrounding greenstones, even when the greenstones are of the so-called non-magnetic variety. Magnetometer results over the Snowshoe property adjoining Camp Bird indicate that the T zone is almost circular, which would certainly be unusual for a mass of any kind of non-magnetic greenstone rocks. Rather strong magnetic anomalies due to greenstone bands stop abruptly against the zone T; this would also suggest the intrusive character of the rocks underlying this zone.

If it be proven by subsequent diamond drilling that the Zone T which straddles the Snowshoe - Camp Bird boundary is actually underlain by an intrusive mass, the discovery would be of major geological importance, as this mass is of a size larger than the Siscoe granodiorite plug and is located in an area known to be, in a general way, favorable to gold deposition.

Anomalies M and N are quite remarkable as they have a strike more or less perpendicular to that of the greenstone formation. These anomalies are not long enough to be due to younger diabase dykes. It must, therefore, be concluded that they are due either to basic dykes of the end of the Algoman intrusive cycle, apparently related to the intrusive of zone T; or to greenstone inclusions at the contact, between zones T and U. In any case, it will be interesting to explore by diamond drilling not only zone T but also anomalies M and N.

Zones U and V present certain magnetic characteristics that would class them as areas possibly underlain by intrusive rocks. On the other hand, the existence of anomalies P, Q, and R, which are parallel to the strike of the greenstone, would tend to prove that at least zone V, and probably zone U, may be underlain by non-magnetic greenstones. Actual diamond drilling will have to decide whether zone U is underlain by intrusives. If such is the case, the zone will be of particular interest as it is known that apexes of intrusive bodies often include ore deposits.

Northeast part of the property.

This section comprises claims:

Nos. A-38656 - A-38659 incl.
A-42364 - A-42368 "
A-45041 - A-45050 "
A-54912 - A-54916 "

and some additional claims on the main land which are not covered by our survey or the map.

All this part of the property was surveyed by a Berg type needle magnetometer before the start of our survey. It was decided to cover claims Nos. 45045, 45047, 54912, 54914, at the end of the survey, as the Berg magnetometer showed high readings over this ground and therefore indicated the presence of magnetic greenstone. Unfortunately, the break-up came about a week earlier than expected, and the work over the above portion of the ice could not be performed. The main land claims were not surveyed because lines in the bush were still uncut at the time when the writer had to take up work with another company.

In a general way, it must be stated that the survey of the northeast part of the property indicates that the rocks underlying the lake and the overburden are mainly magnetic greenstones.

We have delimited on the map a series of positive magnetic anomalies marked A, B, C, D and E which have all the characteristics of being due to magnetic lava flows. South of the line marked on the map f.g.h. lies a zone of very magnetic rocks which we presume to be mainly talcosic greenstones. All these anomalies have no economic interest in themselves, but they are helpful for the study of the structure of the greenstones. The only interesting spot indicated is the probably cross-faulting shown by the distortion of anomaly E on claims 54915 and 54916, but even this cross-faulting does not appear to be very important.

Between the positive anomalies, there exists a certain number of zones magnetically neutral which are probably underlain by non-magnetic greenstones, and may be some small masses of intrusive rocks. The zone which has the most probability of being due to an intrusive mass is Zone "X" located east of Island No. 8. This zone has a slightly elongated form and seems to push away the positive magnetic anomaly known just south of it.

There is but a remote possibility that zone "Y" may be underlain partly by intrusive rocks, but, if this is so, this zone may be specially interesting around lines 39 and 42 where the anomaly "E" shows the presence of transversal faulting or folding.

RECOMMENDATIONS.

If Camp Bird Mines wish to reduce the acreage held under development licenses we would recommend the dropping of claims Nos. A-54913 - A-54915 incl. and A-45051 - A-45049. These claims, as can be seen from the map, cover the northwest and north parts of the northeast section of the property. Due to the fact that we did not do any magnetometer on the mainland claims, east of claim A-39273, we cannot definitely recommend the abandoning of these claims, but just off-hand, only for geological reasons, we do not think that these claims are of any particular value.

A definite diamond drilling programme cannot be proposed unless the amount of money available for development work is known. Under normal conditions, we would recommend the drilling of about 5,000 ft. to test the main discoveries made by the magnetometer survey. This proposed drilling would consist of:

1.) Two holes to explore the possible deposits of sulphides under anomaly H-1;

2.) A complete section of probably four holes of 500 ft. each, set along line 21 west, in order to cross-section the east part of zone "T", which we interpret as being inderlain by a granodiorite intrusive mass. If the fact of the presence of a mass of intrusive rocks is proven, this cross-section would have to be supplemented by vertical drilling and perhaps some additional detail magnetometer work.

3.) Two diamond drill holes should test anomalies M and N to see if they are due to late intrusives or green-stone inclusions. In both cases, the juxtaposition of rocks having different mechanical properties must be considered a favourable factor for fracturing and gold deposition.

4.) In the Northeast part of the property, we would recommend the drilling of at least two holes; a) One of them east of Island No.8, in order to test the origin of the rocks underlying Zone "X"; b) Another one between lines 39 N.E. and 42 N.E., so as to test the possible fractures of the rocks at the bend of the contact between anomaly "E" and zone "Y".

All this drilling may be done only from ice next winter.

It must be emphasized that the drilling which is hereby proposed represents but the absolute minimum necessary to prove geological conditions that were disclosed by the magnetometer survey. Additional drilling would have to be done to follow up the purely geological results and try to locate ore deposits in sections where diamond drilling will substantiate the results of the survey.

A P P E N D I X

TECHNICAL DETAILS OF THE MAGNETOMETER SURVEY.

Network of Measurement Stations.

The magnetic measurements were made along two series of picket lines. The latter were established on the ice by Mr. L. K. Smith's crew who were working directly for the Company. In what regards the network of measurement stations our work consisted mainly of surveying lines and individual stations, in order to tie in the network to the general coordinate system of the mine.

In the southwest part of the property the lines were perpendicular to a bse line passing by survey hubs nos. 3 and 4 on the tips of Islands Nos. 6 and 7. The lines were started at 300 ft. intervals on the base line, and the actual chained distances between the ends of the lines are marked on the map.

Inasmuch as nearly all the work was done from the ice, without the possibility of leaving permanent markings on the ground, we made it a point to survey as accurately as possible the location of all the magnetometer measurement stations. A number of transit traverses were run across the network of measurement stations, and the stations thus surveyed were plotted on the map from their calculated coordinates. The exact location of the other stations was interpolated on the map while their position on the ice was actually chained along the picket lines. All possible causes of error taken into consideration, the location of individual survey stations on the map of the southwest part of the property must be accurate within $\pm$ 5 feet.

In the northeast part of the property the lines were started at 300 ft. intervals, perpendicular to a bse line having a roughly east-west direction. The base line was surveyed by transit and the chained distances between the ends of the lines are marked on the map. The location of the individual stations in this part of the property should be accurate within $\pm$ 10 feet.

The magnetic measurement stations established on the Camp Bird ground can be classified as follows:

1.	Base stations	8
2.	Measurement stations at 100-ft. intervals along 300 ft. spaced lines:	
	a) Southwest part of the property	956
	b) Northeast " " " "	1332
3.	Detail measurement stations within the network	80
4.	Two experimental profiles on Siscoe property	44
	Total of measurement stations:	2420
	Check measurements on bases	286
	Check measurements on ordinary stations	44
	Total of measurements performed:	2750

Magnetic Survey.

The survey started on February 24th and was stopped on May 2nd 1942. The measurements were performed with an Askania magnetometer measuring the variations of the vertical component of the natural magnetic field. The instrument was especially set for making precise measurements, with the scale coefficient greatly reduced and the temperature coefficient practically annulled.

All measurements were referred to an arbitrary base station located at L 3 E 0 (300 feet to the east of hub No.3 on the magnetic base line on Island No.6) and considered to have a 0 value. The results plotted on the maps accompanying this report are expressed in gammas (1 gamma ( ) = 1/100,000 Gauss CGS).

The sensitivity of the Askania magnetometers is of about 3 gammas. Most of the work was favored by a quiet period of magnetic daily variations, but several days were, on the contrary, very agitated - nearly magnetic storms - and prevented regular measurements to be done. The survey can be considered to have an accuracy of ± 7.5 gammas. The sensitivity of ordinary Berg-type magnetometers varies from ± 300 to ± 1500 . The Berg magnetometer used at Camp Bird had a value of about 350 per degree. The total value of the vertical component of the natural magnetic field in the district is about 59,000 gammas, the total intensity being of 60,000 gammas and the inclination of about 78°.

The results of the magnetic measurements are concentrated on a map drawn at a 300 ft-to-the-inch scale. Graphically, the results are presented in the form of magnetic profiles projected on the map and drawn at different scales of 500 and 1000 gammas per inch, depending on the size of the anomalies encountered. The contacts of the magnetic rock belts and dykes were established by the application of the inflexion point rule and comparison with master curves computed at different scales from values obtained from theoretically established formulae for typical anomalies.