Report on the
Magnetometer and Spontaneous Polarization Survey
of the property of
MARBENOR MALARTIC MINES LIMITED,
Manitouwadge Lake Area, Thunder Bay Distr., Ontario,
by
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May - July, 1954.

INTRODUCTION

The Manitouwadge Lake Area property of Marbenor consists of 36 mining claims, numbered TB-49433 to 49468 inclusive, located in the Nama Creek Area, district of Thunder Bay. The claims lie on the east side of the Pic River, approximately 4 miles south of Camp 12 of the Marathon Pulp and Paper Co. and 12 miles due west of the Geeco Mines.

The property is comparatively easy of access as a private motor road belonging to the Marathon Company joins Stevens, a whistle stop on the main C.N. Railway line, with Camp 12. Furthermore, the area has been the object of logging operations, with the result that several bush roads lead from Camp 12 to the claims.

The ground was acquired by the Marbenor because it was considered that it lies on the strike of the Manitouwadge greenstone belt with which the very important, newly discovered, Geeco ore bodies are associated. The object of the magnetometer survey was to outline the geological structure concealed by overburden, while a limited amount of spontaneous polarization measurements was performed with the aim of directly indicating the presence of sulphide mineralization.
GENERAL GEOLOGY

There are no government geological maps, either provincial or federal, covering the Marbenor claims. The property would lie just in the northwest corner of map No. 41j entitled "Heron Bay - White Lake Area" and accompanying a report by J.E. Thomson issued by the Ontario Department of Mines in 1932 as Vol. XL, part 6; this part of the map, however, is left in white indicating that it was not geologized. A small band of greenstone shown on the above map as outcropping on the east shore of the Pic River would be approximately 2½ miles south of the Marbenor claims; this greenstone could mark the western extension of the volcanic rocks in which the Geco mine occurs, but this cannot be determined with certainty until further geological information is made available as there is an unmapped stretch of about 8 miles between this outcrop and the western end of the mapped portion of the Geco greenstone belt.

A certain amount of information on the topography may be secured from aerial photographs Nos. 13390-115 and 13390-116 which can be obtained from the National Photographic Library, Ottawa, and which give a stereoscopic coverage of the ground; it is apparent from these photos that the Pic River and the creek flowing into it have eroded deep gorges in the comparatively flat sand plain which occupies the major part of the property. It is possible that these deep valleys may mark important breaks or faults; in fact it is quite clear from the air photographs that the Pic River flows in part along a clearly defined lineament and that the creek in the northeast part of the property corresponds to another fracture running obliquely between the Pic River and another parallel lineament further east.

There are no rock exposures whatsoever in the northern part of the Marbenor property, where the overburden is probably quite thick; the southern part, however, contains a number of outcrop areas, the approximate outlines of which are shown on the accompanying map. All rock visible from the picket lines were noted by the instrument crews, and, while it is considered probable that all outcrop areas have been spotted, it is possible that additional small exposures between the picket lines may have remained undetected. The outcrops were not mapped in detail, but were rapidly examined by one of the writers and can be summarily described as follows:

On line 0, in the south flank of the escarpment, both granite and recrystallized greenstone are exposed discontinuously for a distance of about 200 feet to the west
of the line and extend for an unmeasured distance toward the northeast; this particular exposure is not clear enough to be easily studied, but a good outcrop of similar material can be examined at the falls, roughly 500 feet to the east; there, the rock consists of a mixture of granite and highly metamorphosed, recrystallized greenstone, now consisting largely of amphibole and quartz; the greenstone bands are quite wide and numerous and would probably account for perhaps 50% of the whole formation.

In the lower part of the cliff on line 0, mineralization was noted in magnetic boulders which contain at least 10% sulphides, mostly pyrite and pyrrhotite with a few grains of visible chalcopyrite, and which undoubtedly lie in close proximity to their source; two pieces were assayed for zinc and returned values of .05 and .30% respectively. In the outcrop at the falls, a small zone, about 15 feet long by a maximum of about 12 inches wide, with identical mineralization, was noted in solid rock; two samples from this particular location were assayed and gave .05% and .02% in copper, and .01% and .06% in zinc respectively. While these values are not high, they are considered important as they establish the presence on the Marbenor property, not only of sulphide mineralization, but also of associated copper and zinc values in a type of formation similar to the Gecco occurrence.

Just east of station 77 on line 24, on the west shore of the creek, a small outcrop shows gneissic granite with the foliation running about N.50°E. Further south, at the south end of line 40W and neighbouring lines, there is a large outcrop of granite containing some pegmatite dykes; there is no apparent gneissic structure in this mass, but a series of joints run in the general direction of N.40°E. to N.50°E.

Near the south end of line 0, between stations S-85 and S-87, granite occurs in a flat outcrop too poorly exposed to be studied in any great detail.

The high ground between lines 4W and 8E in the vicinity of the cross-line at station 8-64 is largely occupied by two large granite outcrops which are separated by lower ground near line 0; the granite contains some pegmatite and as a rule is quite homogeneous without apparent gneissic structure, but patches of ferromagnesian minerals can be seen near the south end, not far from station S-72 on line 4W, suggesting that the southern part, which is not so well exposed, may be of the same gneissic type as the outcrop near line 24W.
MAGNETOMETER SURVEY RESULTS

All the results of the magnetometer survey are presented on a 300-foot-to-the-inch map attached herewith. The geological interpretation is discussed hereafter, while the technical details concerning the establishment of the network of picket lines and the performance of the measurements are described in the Appendix.

From the magnetic point of view, the property can be divided into three well-defined zones. In the north, zone A shows low and comparatively uniform magnetic readings. Further south lies zone C, which is underlain by more strongly magnetic rocks. Finally, in the southern section of the property, zone B presents magnetic values which, on the average, are lower than in zone C and much more irregular.

Zone A.

There being no rock outcrops either within the limits of this zone or along its extensions in the vicinity of the property, the nature of the rocks underlying it cannot be determined by any positive clues. Purely magnetic indications are contradictory: the low readings would suggest granitic rocks, but, on the other hand, the profiles show a few magnetic maxima roughly aligned in the direction of the regional strike as is commonly the case in volcanic formations. The most probable interpretation is that zone A is underlain by strongly granitized paragneisses.

Zone C.

Zone C is about three-quarters of a mile in width and is in all likelihood underlain by a mixture of metamorphosed and recrystallized greenstones and granites, with the volcanic rocks probably predominating. This interpretation is based both on geological and geophysical evidence: such formations are exposed in an outcrop on line 0, station 8-5, as well as in a much larger exposure further east on the neighbouring property and, as a matter of fact, the magnetic profiles obtained over zone C are quite typical of greenstones both in shape and in intensity.

Anomaly I lying near the northern contact of zone C shows readings of up to 1,200 gammas and undoubtedly indicates the presence of material more highly magnetic than the average metamorphosed greenstones underlying the zone. Blocks of mineralized material carrying about 10% sulphides with low values in copper and zinc have been found at the foot of a cliff-like outcrop at station 8-5 on line 0 and
similar material was observed in place a few hundred feet further east on the neighbouring property. Testing of rock samples with the magnetometer established that the mineralization is strongly magnetic, but also revealed that equally high reactions can be obtained on some of the coarser-grained amphibolitized greenstones. It would seem, therefore, that anomaly I is caused by the presence of both amphibolites and mineralization.

As mentioned in the chapter on geology, aerial photographs of the Manitouwadge area show the existence of prominent lineaments which have been assumed by geologists to represent strong faults. One such fracture has apparently played a significant part in the localization of the Geoc orebodies and the importance of similar structures on the Marbenor ground is therefore evident.

One such lineament roughly coincides with the north-south course of the Pic River, which flows immediately west of the boundary of the property, and another, marked F\textsubscript{1}F\textsubscript{1} on our map, more or less follows a creek which crosses the northeastern part of the claims. The important fact to note is that anomaly I lies near the northern contact of zone C very close to the assumed cross-fault marked by F\textsubscript{1}F\textsubscript{1}, so that its location bears a strong analogy to that of the Geoc orebodies which occur near the northern contact of the greenstone belt at the intersection with the cross-fault. There is no doubt in our opinion that anomaly I warrants a thorough investigation by diamond-drilling.

Changes in strike along the northern contact a,b,c,d of zone C constitute other favorable locations; such bends occur near the points marked "b" and "c" and these particular areas should be investigated, in spite of the absence of magnetic anomalies, in view of the possibility of encountering non-magnetic sulphides.

Zone B.

This zone lies in the southern part of the property and is characterized magnetically by readings lower and also more irregular than in zone C. All outcrops found within its limits consist of granites and gneisses. Several magnetic maxima can be traced from line to line and their axes fall into a definite pattern; they do not, however, correspond to the strike of either the gneisses or the formations in zone D and this remarkable condition seems to confirm the intrusive character of the underlying rocks.
The nature of the material responsible for the maxima themselves is unknown. We presume that certain phases of the granite are more highly magnetic than the rest of the mass and occur in bands or dykes affecting a structural pattern. Nevertheless, the possibility of some of the maxima being due to magnetic sulphide mineralization is not excluded and some study of the area is recommended, particularly anomaly II, which shows the highest readings.

SPONTANEOUS POLARIZATION SURVEY

The results of this survey are gathered on a separate 300-foot-to-the-inch map attached herewith.

The survey failed to indicate any anomalies that could be attributed to masses of sulphides, but the overburden on the sections covered with electrical measurements is probably around 200 feet in thickness and, in our opinion, such a heavy blanket of drift would effectively blot out anomalies caused by sulphide bodies.

It was our intention to do a certain amount of spontaneous polarization measurements in the southeastern part of the property over the magnetic maxima found in zone B. Unfortunately, active lumbering with mechanical slashing is under way in this area at the present time and renders electrical measurements impossible.

CONCLUSIONS & RECOMMENDATIONS

The survey was instrumental in leading to the discovery on the Marbenor property of three related features which may be of considerable economic importance:

1. A wide magnetic zone was outlined and is interpreted as being underlain by a mixture of greenstones and granite.

2. Near the northern contact of this zone a magnetic anomaly is interpreted as being due, at least in part, to mineralization.

3. Finally, mineralized floats carrying low values in copper and zinc were found in the area of this anomaly.
We strongly recommend the investigation of anomaly I by diamond-drilling. We suggest that the first two holes be placed as indicated on our magnetic map. There is no doubt that further drilling will be necessary, but it might be advantageous to study the results of the first boring before choosing the location of the other holes. In view of very deep overburden in the area of hole D2, it is suggested that it be drilled down to a depth of at least 1,000 feet in order to cover as much ground as possible.

Electromagnetic measurements could be attempted to help to find concentrations of sulphide mineralization along the northern contact of zone G; it is our opinion, however, that the unusual thickness of overburden precludes the successful use of any electrical method in this section of the Warbenor property.
APPENDIX

TECHNICAL DETAILS OF THE SURVEY

Network of Picket Lines

The network consists of numbered pickets placed at 100-foot intervals along a series of north-south lines 400 feet apart, started from two east-west base lines; the ends of the north-south picket lines were tied in by chainages along three other auxiliary cross-lines. All chainages, with the exception of the regular 100-foot and 400-foot distances, have been plotted on the map. The position of most of the claim posts has been established in relation to the network of picket lines and, therefore, although the claims have not been officially surveyed, their outline, as shown on our map, is accurate within a few feet. Line 38, from which the base lines were started, was established on the ground, as accurately as can be done with a compass, in the direction of the astronomic north.

The work of line-cutting was started on May 12th and lasted till June 26th. A total of 2,126,880 feet of picket lines were cut.

Magnetometer Survey

Magnetometer measurements were started on June 2nd and finished on July 1st, 1954. The total area covered is of 1,636.69 acres.

The stations established and the measurements performed on the Marbenor claims can be classified as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
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<tbody>
<tr>
<td>Base stations</td>
<td>4</td>
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<tr>
<td>Ordinary stations</td>
<td>1,648</td>
</tr>
<tr>
<td>Total number of stations</td>
<td>1,652</td>
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<tr>
<td>Check measurements on bases</td>
<td>84</td>
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<tr>
<td>Total number of measurements performed</td>
<td>1,930</td>
</tr>
</tbody>
</table>

The survey was done with a Ruska magnetometer measuring the variations of the vertical component of the earth's magnetic field. The scale constant of the instrument varied in the course of the job from 23.0 to 23.4 gammas per division, while the temperature coefficient was kept at zero.
In order to minimize the errors due to the diurnal magnetic variations, check readings at the magnetic base stations were made at regular time intervals of about 3 hours, and the daily variations observed were distributed proportionally to time between the stations occupied during the day.

All values plotted on the magnetic map are expressed in gammas (1 gamma = 1/100,000 gauss, C.G.S.) and referred to an arbitrarily chosen base located at station 0 on line 13 W and considered to have a zero value. The absolute value of the vertical component of the earth's magnetic field at this base station is approximately 59,900 gammas.

The interpretation of the results of the magnetometer survey was based on the study of magnetic profiles drawn at a scale of 500 gammas to the inch.

Spontaneous Polarization Survey

A total area of 338.75 acres was covered by the spontaneous polarization survey which was performed between June 17th and July 2nd, 1954. A total of 919 stations were occupied.

The spontaneous polarization measurements were all tied in together. They were done by the standard Schlumberger method, by means of a sensitive potentiometer in series with nonpolarizing electrodes.

[Signature]
Magnetometer Survey
of the property of
MARBENOR MALARTIC MINES LIMITED.
Magnetore of Ue jtroperty of
MARBENOR MALARTIC MINES LIMITED
LaKe area, Thunder Bay district, Ontario.
KOULOMZINE, GEOFFROY & Co.
Scale: 300 ft to 1 inch
June-July 1954.

LEGEND:
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Spontaneous Polarization Survey
of part of the property of
MARBENOR MALARTIC MINES, LIMITED.
Wexford Range and area, Thunder Bay District, Ontario
by KOULOMZINE, GEOFFROY & Co.
Scale: 300 ft. to the inch
June 1954.

LEGEND.
- Measurement stations along profile line
- Reduction value of the natural electrical potential in millivolts