I. INTRODUCTION

This report pertains to the combined airborne magnetic, electromagnetic, and gamma ray spectrometer survey flown on behalf of Northwest Explorers (1967) Limited, over a group of claims in the Shabumeni Lake Area, Ontario. The survey was conducted on October 19th and 20th, 1969 by Canadian Aero Mineral Surveys Limited, using a geophysically equipped Otter aircraft, CF-IGM, based at Red Lake.

The survey was flown at a mean terrain clearance of 150' with Northwest-Southeast trending flight lines spaced at 1/8 mile intervals. The geophysical data acquired totalled 87.5 miles.

The following Canadian Aero Mineral Surveys Limited personnel were associated with this project:

J. Broeders  
Pilot
B. Duperron  
Copilot
P. Rautenberg  
Geophysical Operator
G. Curtis  
Anomaly Compiler
W. Knappers  
Data Chief
D. Fitzsimmons  
Chief Draftsman
J. Mekarski  
Geophysicist.
An airphoto laydown provided a base for the maps presented. E.M. conductors and coincident magnetic anomalies were plotted on a plan map at a scale of 1" = ½ mile. An isomagnetic contour plan was also compiled at the same scale, and is included in this report.

II. GEOLOGY

Geology used in this report was obtained from Ontario Department of Mines - Preliminary Geological Map No. P406 (1967), Trout Lake - Birch Lake Sheet, District of Kenora, Scale 1" = 2 miles.

This claim block is underlain by northeast trending areas of mafic metavolcanics and felsic to intermediate tuff. The east side of the property is underlain by a north-south trending belt of metasediments.

III. DISCUSSION OF RESULTS

Three E.M. conductors, marked sequentially from north to south, were outlined by this airborne survey.

Conductor 1 is underlain by basic volcanic rocks. It is characterized by in-phase to quadrature ratio of two to one (good conductivity), and a high coincident magnetic peak.

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On the isomagnetic contour plan this anomaly coincides with the peak of a northeast trending ridge. This anomaly is considered to be a good follow-up target.

Conductor 2 lies outside the claim block in an area of metasediments. It is characterized by large amplitude of E.M. response, very good in-phase to quadrature ratio, and coincident E.M. and magnetic peaks. This conductor is considered to be an excellent follow-up target because of geophysical response.

Conductor 3 lies within the same belt of metasediments as Conductor 2. It is characterized by negative in-phase response, and coincident quadrature and magnetic peaks. (Negative in-phase is a magnetic permeability effect). This is considered to be a fairly good follow-up target because it lies on the same geological trend as Conductor 2.

IV. CONCLUSIONS AND RECOMMENDATIONS

An effort should be made to acquire land around Conductor 2 which exhibits good sulfide characteristics, and should be thoroughly explored.

In view of the recent Uchi Lake discovery, all anomalies should be checked out on the ground.

Respectfully submitted,

J.E. Mekarski, B.Sc.,
Geophysicist.

OTTAWA, ONTARIO,
December 23, 1969.
<table>
<thead>
<tr>
<th>Anomaly</th>
<th>Fiducials</th>
<th>In-Phase Quad</th>
<th>Altitude</th>
<th>Magnetics</th>
<th>Rate</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>147A</td>
<td>5026/8</td>
<td>80/40</td>
<td>125</td>
<td>Dir. 600g</td>
<td>3</td>
<td></td>
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<tr>
<td>147B</td>
<td>4949/2</td>
<td>-/50</td>
<td>120</td>
<td>Dir. 500g</td>
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<td>IP suppressed. Mag negative effect.</td>
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<td>4453/5</td>
<td>50/50</td>
<td>140</td>
<td>W.Side 400g</td>
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<tr>
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<td>4456/8</td>
<td>120/60</td>
<td>125</td>
<td>Dir. 400g</td>
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<td>4348/51</td>
<td>140/80</td>
<td>150</td>
<td>E.Edge 120g</td>
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<td>125</td>
<td>E.Edge 50g</td>
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APPENDIX II

A. EQUIPMENT

The electromagnetic unit and the magnetometer are the key instruments in the Canadian Aero Mineral Surveys Limited Otter survey system. The remainder of the equipment consist of a radar altimeter, a spectrometer, an accelerometer, a continuous-strip camera, three recorders and a fiducial numbering system.

The EM unit is the Canadian Aero Service Limited MARK IV low frequency (320 c.p.s.) in-phase/out-of-phase system. The transmitting and receiving coils are mounted on the wingtips of the Otter, with a vertical coplanar orientation and a separation of 61 feet. An electronic null device is adjusted so that in the absence of a conductor within the range of the system no signal is recorded. The anomalous signal is divided into two components, the "in-phase" component having the same phase as the transmitted field and the "quadrature" or "out-of-phase" component being at right angles to it. These two measurements are recorded on two channels of the six-channel rectilinear recorder.

Variations in the total magnetic field of the earth are measured by a Gulf Fluxgate magnetometer mounted in the aircraft. Anomalies as small as 10 gammas can normally be distinguished. The output of the magnetometer is presented as one channel on the six-channel recorder to facilitate correlation with the EM traces. It is also presented at a larger scale and in rectilinear form on a separate recorder, these recording being used in the preparation of isomagnetic contour maps whenever they are required.

A Bonzer radar altimeter provides a terrain clearance profile on one channel of the six-channel recorder. Because EM response decays rapidly with increasing altitude this altitude information is important in the analysis of the EM data.

A vertical accelerometer mounted in the aircraft provides a record of the air turbulence and of any drastic manoeuvres of the aircraft. The accelerometer trace on the six-channel recorder is often helpful in recognizing spurious blips on the EM traces caused by air turbulence or drastic manoeuvres.
The gamma ray spectrometer is manufactured by Hamner Electronic Products, a division of Harshaw Chemical Company, to Aero Service specifications. Three 6-inch diameter by 4-inch thickness thallium activated sodium iodide crystals are utilized. Ratemeter ranges cover count rates from 100 c.p.s. to 100,000 c.p.s. with a choice of time constants from 0.25 to 10 seconds. Upper and lower threshold settings are continuously adjustable allowing for the discrimination of potassium, uranium and thorium. Results are presented on a rectilinear recorder together with altimeter data.

The entire flight path is photographed by a vertically-mounted Aeropath 35 mm. continuous-strip camera.

Synchronization of the film strip with the three recorders is accomplished by means of an automatic fiducial numbering system which prints simultaneous time markers on all records at regular time intervals, normally every ten seconds.

Due to the time constant used in the electromagnetic unit, both the EM in-phase and quadrature recordings are delayed by approximately 1 second. This is taken into account when plotting the position of each anomaly.

B. DESCRIPTION OF RECORDS

Rectilinear Magnetic Record

With the chart oriented so that fiducial numbers increase from right to left, upward deflections on the chart indicate increases in the total magnetic field of the earth. On the 1200 scale the smallest division on the chart is approximately equivalent to 10 gammas. When the record "steps" a change of approximately 1000 gammas is indicated.

The fiducial marks are normally spaced at 10-second intervals, a spacing which is equivalent to approximately 1500 feet on the ground. The exact horizontal scale of the tape can be established by measuring the fiducial spacing on the map.
Brush Six-Channel Record

With the chart oriented so that fiducial numbers increase from right to left the tracings from the bottom to the top of the chart are as follows:

Fiducial markers - same comments as above.

Channel 1) Magnetometer - positive upward. On the 1200 scale 1 minor division is approximately equivalent to 25 gammas and a step is approximately 1000 gammas.

Channel 2) EM In-Phase - positive upward. 1 minor division represents approximately 20 parts per million, referred to the primary field at the receiving coil.

Channel 3) EM Quadrature - positive upward. Same scale as In-Phase.

Channel 4) Radar Altimeter. Altitude increases upwards. 150' centre line and 300' top line of channel.

Channel 5) Accelerometer - an acceleration of \( \frac{1}{2} \) "g" is equivalent to a 5 minor divisions deflection from the central point.

Channel 6) Spectrometer total count.

Fiducial markers - same comments as above.

When a spectrometer survey is included, the information is recorded on a Clevite 6" Rectilinear light sensitive recorder. Window settings and counts used are specified in the accompanying report.

C. SURVEY AND MAP COMPILATION PROCEDURES

Uncontrolled airphoto mosaics usually serve as base maps for flying the survey and for compilation of the geophysical data. The most common scale is 1/4 mile per inch.

The flight lines are oriented perpendicular to the assumed longest dimension of massive sulphide occurrences anticipated in the survey area. Occasionally two or more line directions have to be used to accommodate changes of geological strike within the area. Line spacings normally range between 1/8 mile and 1/4 mile.
The navigator is provided with "flight strips" of the area to be surveyed. These flight strips are a copy of the airphoto mosaic, with the intended flight lines inked and numbered. Navigation along the parallel flight lines is accomplished by visual means based on the physical detail observed on the photos. The aircraft is flown at a terrain clearance of 150 feet or, in rough terrain, at the lowest safe altitude.

Flight path is recovered in the field by comparison of the 35 mm. strip film with the airphoto mosaics. Identifiable points are marked on the mosaics and designated by numbers determined from the fiducial numbering system on the film. These recovered flight lines provide the positional basis for plotting the geophysical data. The EM anomalies are listed and graded in the field and are often plotted on the field mosaics to permit immediate acquisition of ground.

In our Ottawa office screened positives of the mosaics are prepared, upon which are drafted the recovered fiducial points, the interpolated flight lines positions and the significant geophysical data. The geophysical data are subjected to a careful analysis by a geophysicist who prepares an interpretation report including recommendations for further work.

D. DATA PRESENTATION

The data presentation procedure which we employ for the Otter geophysical system is a combination of an anomaly listing and a plan map plot of graded EM anomalies. The anomaly listing provides the significant details concerning each anomaly and the map gives a "bird's eye view" of the conductors detected.

For purposes of listing and to facilitate reference in the report each EM anomaly is assigned a "name", which is made up of the number of the line upon which the anomaly occurs plus a letter. For example, on line 257 anomalies would be named 257A, 257B, 257C, etc., from south to north or from west to east. The letter which appears beside each EM anomaly on the map is therefore part of its name. These names also appear on the Brush records and in the anomaly list.
The anomaly list contains the fiducial numbers at the edges of the EM anomaly, the in-phase and quadrature amplitudes in p.p.m., the altitude at which the anomaly was detected, the positional relationship of the EM anomaly to magnetic anomalies (if any), a rating, and comments concerning any other pertinent characteristics of the anomaly.

The nomenclature used in the "magnetics" column of the anomaly list requires some explanation. The main terms used are side, flank, edge and direct. These refer to the position of the EM peak relative to the axis of the magnetic feature. "Direct" depicts coincident peaks and similar widths; "edge" is slightly offset; "flank" is somewhere along the flank of the magnetic anomaly; "side" is down near the base. "N. Flank 800g" means that the EM anomaly occurs along the northern flank of a magnetic feature of 800 gammas total amplitude. When one peak of a multiple EM anomaly coincides with a magnetic high the specific peak may be designated. For example, if the southern peak of a double EM anomaly coincides with a 250 gamma magnetic anomaly the nomenclature would be "Dir. S. 250g".

The rating assigned to each EM anomaly in the listing determines the symbol which represents the anomaly on the map. Six categories of anomalies are defined: 1A, 1B, 2A, 2B, 3, and X. The numbers "1", "2" and "3" are primarily a measure of in-phase amplitude corrected for altitude variation: "1" is for very large anomalies, "2" for intermediate, and "3" for relatively weak response. This rating is sometimes affected by the shape, by the in-phase to quadrature ratio, or by the location of the anomaly. The letters "A" and "B" merely refer to the magnetics: "A" indicates a directly coincident magnetic anomaly, and "B" indicates the lack thereof. The "X" rating is reserved for questionable anomalies. The legend on the map shows the symbol used for each of these ratings. In general, the more the rectangle is filled in, the stronger the anomaly.

In the case of directly coincident magnetic anomalies, the amplitude of the magnetic feature is shown on the EM map. It is stencilled beneath the symbol which portrays the EM anomaly.

During the final interpretation stage, EM anomalies are correlated from line to line wherever possible and the conductive zones are outlined. All definite conductors are numbered on the map and discussed in the report.
ADDENDUM

The following changes should be noted in APPENDIX II for this survey:

1) Channel 5 on the six-channel record is blank and the accelerometer trace is recorded on channel 6.

2) Settings for the gamma ray spectrometer are indicated on the record for traverse 120E.