QUESTOR SURVEYS LIMITED

AIRBORNE ELECTROMAGNETIC AND MAGNETIC SURVEY REPORT

AREA 1970 - 43

KESAGAMI LAKE AREA

ONTARIO

PREPARED FOR

ARGOR EXPLORATION LIMITED

NOVEMBER 1970

CONTENTS

INTRODUCTION

This report contains our interpretation of the results of an airborne electromagnetic survey and magnetic survey flown in the Kesagami Lake Area, Ontario, on November 7, 1970. A brief description of the survey procedure together with recommendations for ground follow-up is included.

The survey totalled 163 line miles and was performed by Questor Surveys Limited. The survey aircraft was a Super Canso CF-JMS and the operating base was Timmins, Ontario.

MAP COMPILATION

The base maps are uncontrolled mosaics constructed from National Air Photo Library 1" = 1/4 mile photographs. These mosaics were reproduced at a scale of 1" = 1/2 mile on stable transparent film from which white prints can be made.

Flight path recovery was accomplished by comparison of the prints of the 35 mm camera film with the mosaic in order to locate the fiducial points.

SURVEY PROCEDURE

Terrain clearance was maintained as close to 400 feet as possible, with the E.M. "bird" at approximately 150 feet above the ground. A normal S-pattern flight path using approximately one mile turns was used. The equipment operator logged the flight details and monitored the instruments.

A line spacing of 1/4 mile was used.

INTERPRETATION AND RECOMMENDATIONS

This survey was flown to fill in between two flying areas which were compiled in May of 1969. An overlay with the original areas was made in an effort to confirm the conductors. There is acceptable agreement with the original flying with one exception. The conductor labelled "F" in area 1969-23A was not duplicated in the new flying and the only explanation that can be arrived at is that this conductor was caused by some feature that has since been removed (ground geophysical wires?).

A portion of area 1969-23B was reflown in the new survey, but at a different angle, and for this reason the anomaly characteristics are not the same. However, there is an indication of the original conductor. It must be kept in mind that an airborne geophysical survey cannot be exactly duplicated due to the fact that flight traverses, flight altitudes, and weather conditions will never be exactly the same.

The following discussion of conductors in area 1970-43 is offered as an evaluation of the airborne anomalies and it may be used as a guide in the ground investigation programme. The conductors are identified with a number beside the apparent axis of the conductor. It is felt that all of the conductors on the map are bedrock conductors and should be considered in a ground programme.

Conductor No. 1

The conductor displays good conductivity, but has no magnetic correlation. The strike of the conductor as indicated on the map, is questionable and it appears that the strike could be north-south because of the stronger conductivity obtained when flying in an east-west direction. Magnetic trends seem to support this. A ground reconnaissance could be made to determine this.

Conductor No. 2

Although the E.M. response is moderate, the zone has good conductivity. There is no magnetic correlation. Pyrite could be the cause of this anomaly. A vertical loop E.M. survey is recommended.

Conductor No. 3

Intercept 17B displays good conductivity along with good direct magnetic correlation. The two remaining intercepts within this trend have fair to good conductivity but have no magnetic correlation. Sulphides could be the cause of this conductor. A vertical loop E.M. and magnetometer survey is suggested.

Conductors 4 and 5

As with Zone 1, it is felt that the strike of these conductors could be north-south rather than east-west. This, however, will have to be verified from a ground survey. Intercepts 28K and 29K display good direct magnetic correlation and good conductivity. The magnetic trend is distorted in this area suggesting the presence of a source having a different magnetic susceptibility. A horizontal loop E.M. and magnetometer survey is recommended.

Conductor No. 6

This conductor displays good conductivity and has no magnetic correlation. Non-magnetic sulphides could be the cause of this zone. A horizontal loop E.M. survey is suggested.

Conductor No. 7

The conductor shows good conductivity along with weak magnetic correlation. Sulphides could be the cause.

Conductor No. 8

While the rest of the trend displays fair conductivity, intercept 9A shows good conductivity. There is no magnetic correlation associated with the conductivity. A vertical loop E.M. survey is recommended.

Conductors 9 and 10

The zones show good conductivity, but only fair magnetic correlation. A ground survey is suggested to determine the source.

Conductor No. 11

Although the conductivity is considered poor, the zone was considered for its magnetic trend. It is suggested that a ground reconnaissance be made to determine the source.

Conductor No. 12

The zone displays good conductivity and flanks a fair magnetic high. It is recommended that a vertical loop E.M. survey be carried out.

Conductor No. 13

There are very high magnetic intensities in this area giving good magnetic correlation with the conductivity. A vertical loop E.M. and magnetometer survey is recommended.

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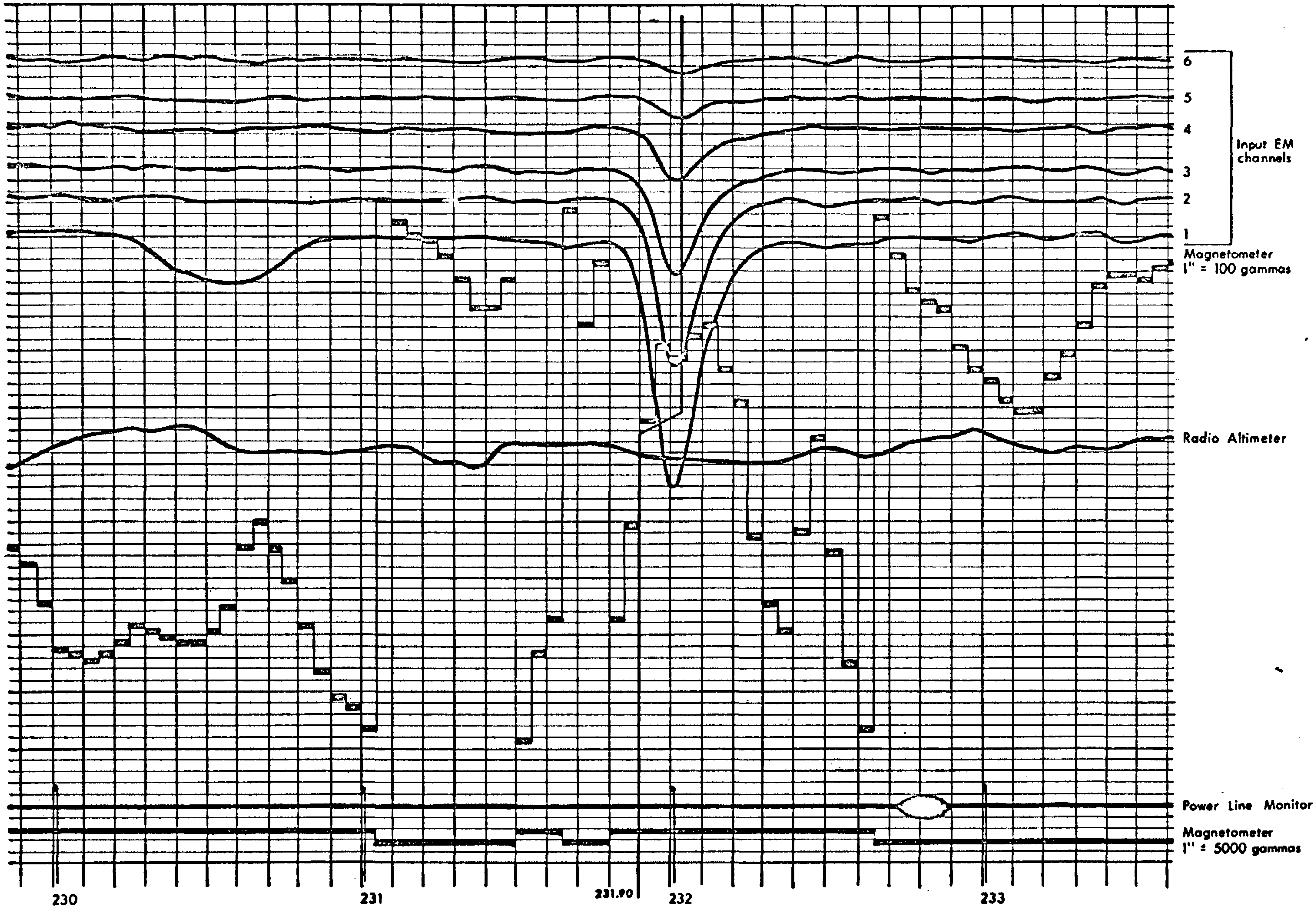
6
5
4
3
2
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Input EM channels
Magnetometer
1" = 100 gammas
Radio Altimeter
Power Line Monitor
Magnetometer
1" = 5000 gammas
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232
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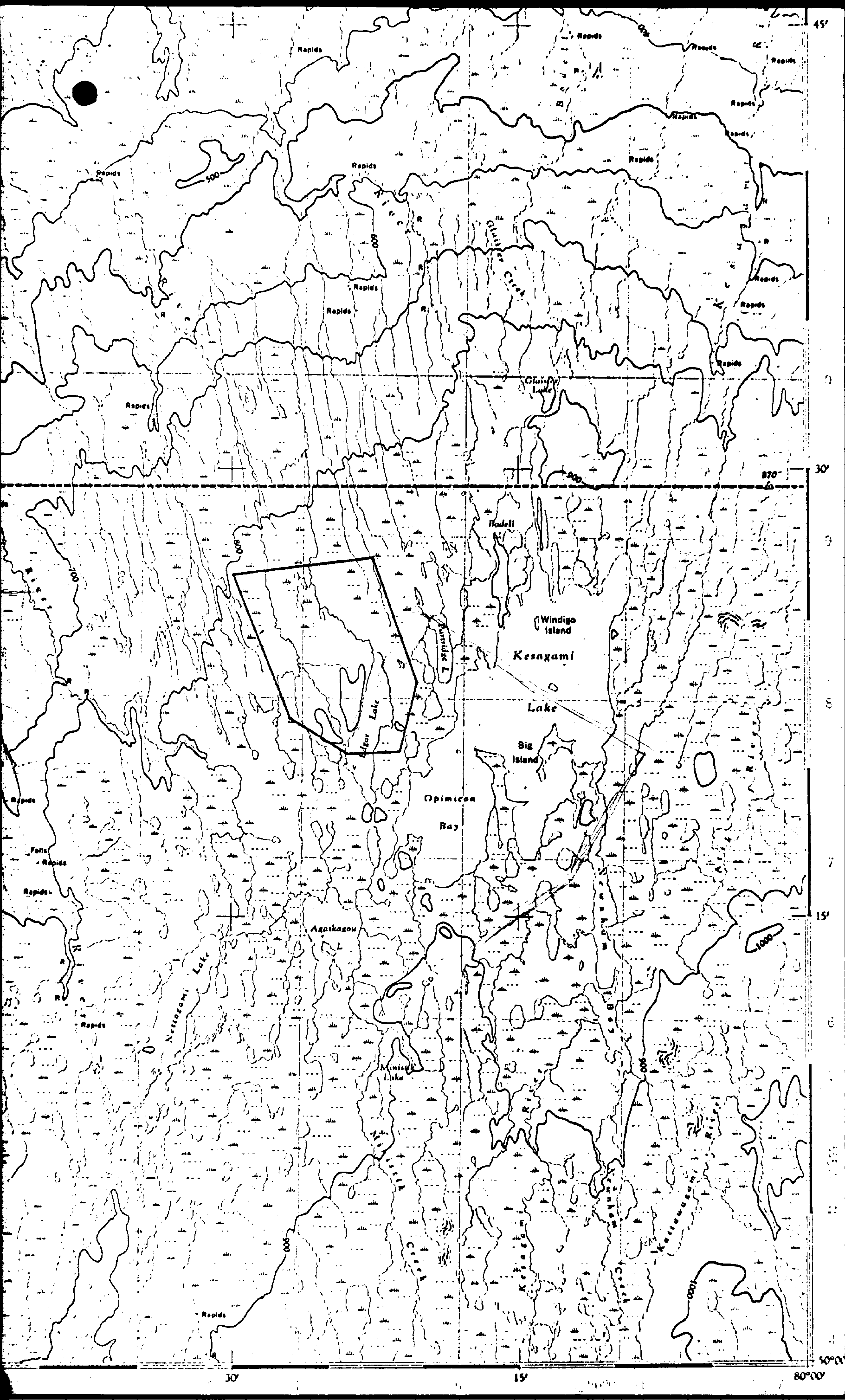

Rapids
R
500
600
700
800
900
1000
870
Glaisher Creek
Glaisher Lake
Bodell
Partridge L.
Edgar Lake
Windigo Island
Kesagami
Lake
Big Island
Opimicon
Bay
Agaskagou
L
Nettogami Lake
Falls
Newnham Bay
Newnham Creek
Kesagami River
Kattawagami River
Creek
45'
30'
15'
50°00'
80°00'

APPENDIX

EQUIPMENT

The aircraft are equipped with Mark V INPUT airborne E.M. systems and Barringer AM-101 proton precession magnetometers. APN-1 radio altimeters are used for vertical control. The outputs of these instruments together with fiducial timing marks are recorded by means of galvanometer type recorders using light sensitive paper. 35 mm continuous strip cameras are used to record the actual flight path.

(I) MARK V INPUT(R) SYSTEM

The Induced Pulse Transient (INPUT) system is particularly well suited to the problems of overburden penetration. Currents are induced into the ground by means of a pulsed primary electromagnetic field which is generated in a transmitting loop around the aircraft. By using half sine wave current pulses and a loop of large turns-area, the high output power needed for deep penetration is achieved.

The induced current in a conductor produces a secondary electromagnetic field which is detected and measured after the termination of each primary pulse. Detection is accomplished by means of a receiving coil towed behind the aircraft on five hundred feet of cable, and the received signal is processed and recorded by equipment in the aircraft. Since the measurements are in the time domain rather than the frequency domain common to continuous wave systems, interference effects of the primary transmitted field are eliminated. The secondary field is in the form of a decaying voltage transient originating in time at the termination of the transmitted pulse. The amplitude of the transient is, of course, proportional to the amount of current induced into the conductor and, in turn, this current is proportional to the dimensions, the conductivity and the depth beneath the aircraft.

The rate of decay of the transient is inversely proportional to conductivity. By sampling the decay curve at six different time intervals, and recording the amplitude of each sample, an estimate of the relative conductivity can be obtained. By this means, it is possible to discriminate between the effects due to conductive near-surface materials such as swamps and lake bottom silts, and those due to genuine bedrock sources. The transients due to strong conductors such as sulphides exhibit long decay curves and are therefore commonly recorded on all six channels. Sheet-like surface materials, on the other hand, have short decay curves and will normally only show a response in the first two or three channels.

The samples, or gates, are positioned at 300, 500, 700, 1100, 1500 and 1900 micro-seconds after the cessation of the pulse. The widths of the gates are 200, 300, 400, 600, 600 and 600 micro-seconds respectively.

For homogeneous conditions, the transient decay will be exponential and the time constant of decay is equal to the time difference at two successive sampling points divided by the log ratio of the amplitudes at these points.

(II) BARRINGER AM-101A PROTON PRECESSION MAGNETOMETER

The AM-101A magnetometer which measures the total magnetic field has a sensitivity of 5 gammas and a range from 20,000 gammas to 100,000 gammas.

Because of the high intensity field produced by the INPUT transmitter, the magnetometer results are recorded on a time-sharing basis. The magnetometer head is energized while the transmitter is on, but the readout is obtained during a short period when the transmitter is off. Using this technique, the head is energized for 1.15 seconds and then the transmitter is switched off for 0.15 seconds while the precession frequency is being recorded and converted to gammas. Thus a magnetic reading is taken every 1.3 seconds.

DATA PRESENTATION

The symbols used to designate the anomalies are shown in the legend on each map sheet, and the anomalies on each line are lettered in alphabetical order in the direction of flight. Their locations are plotted with reference to the fiducial numbers on the visicorder record.

A sample record is included at the end of the report identifying the method used to correct for the position of the E.M. "Bird" and identifies the parameters on each channel. Occasionally, a question mark may be shown alongside the anomaly symbol. This may occur when the response is very weak and there is some doubt as to whether or not it is caused by turbulence or compensation noise caused by large changes in the position of the "bird" relative to the aircraft.

All the anomaly locations, magnetic correlations, and the amplitudes of channel number 4 are listed on the data sheets accompanying the final maps.

GENERAL INTERPRETATION

The INPUT system will respond to conductive overburden and near-surface horizontal conducting layers, in addition to bedrock conductors. Differentiation is based on the rate of transient decay, magnetic correlation and anomaly shape together with the conductor pattern and topography.

Power lines sometimes produce spurious anomalies, but these can be identified by reference to the monitor channel.

Railroad and pipeline responses are recognized by studying the film strips.

Graphite or carbonaceous material exhibits a wide range of conductivity. When long conductors without magnetic correlation are located on or parallel to known faults or photographic linears, graphite is most likely the cause.

Contact zones can often be predicted when anomaly trends coincide with the lines of maximum gradient along a flanking magnetic anomaly. It is unfortunate that graphite can also occur as relatively short conductors, and produce attractive looking anomalies. With no other information than the airborne results these must be examined on the ground.

Serpentized peridotites often produce anomalies with a character that is fairly easy to recognize. The conductivity which is probably caused in part by magnetite, is fairly low so that the anomalies often have a fairly large response on channel number 1, they decay rapidly, and they have strong magnetic correlation. INPUT E.M. anomalies over massive magnetites show a relationship to the total Fe content. Below 25-30%, very little or no response at all is obtained, but as the percentage increases the anomalies become quite strong, with a characteristic rate of decay which is usually greater than that produced by massive sulphides.

Commercial sulphide ore bodies are rare, and those that respond to airborne survey methods usually have medium to high conductivity. Limited lateral dimensions are to be expected and many have magnetic correlation caused by magnetite or pyrrhotite. Provided that the ore bodies do not occur within formational conductive zones as mentioned above, the anomalies caused by them will usually be recognized on an E.M. map as priority targets.