REPORT ON AN
INDUCED POLARIZATION SURVEY
ZAVITZ TOWNSHIP
LARDER LAKE MINING DIVISION
FOR
PAN-ORE GOLD MINES LIMITED

BY

BARRINGER RESEARCH LIMITED

304 CARLINGVIEW DRIVE

METROPOLITAN TORONTO

REXDALE, ONTARIO

FEBRUARY 1974

1. INTRODUCTION

1.1 GENERAL

During the summer of 1973 geological and geophysical surveys were carried out over a group of 24 claims in Zavitz and Hincks Townships for Pan-Ore Gold Mines Limited by Barringer Research and the results of the surveys were submitted in a geological and a geophysical report earlier.

A number of geophysical methods were employed to explore the claims. In the northwestern part of the claims where the present IP survey was performed, a horizontal loop EM survey was carried out. The conductors outlined by the EM survey have short strike length and are described as one good conductor and some of them have weak character. The good conductor was tested by surface excavations and by drilling prior to the Barringer EM survey by Silvermaque-Voyager. All the drill holes and pits encountered massive and disseminated sulphide mineralization, mainly pyrrhotite, pyrite. Copper mineralizations at a shallow depth was reported in drill holes located on the south extension of the conductor.

An induced polarization survey was recommended with two purposes in mind. Firstly, to define the extent of the disseminated mineralization and also the extent of the mineralization which was described geologically as massive. Secondly, the survey was to test the possibility of the mineralized zone joining the IP anomaly on Lines 0 and 2S, outlined by the earlier IP survey.

The present induced polarization survey took place from December 13 to 18, 1973 and from January 12 to January 17, 1974.

1.2 PROPERTY

The original property consists of 24 claims around Moray Lake in Zavitz and Hincks Townships, 31 miles west of Matachewan, Ontario, by road. The claims are in the Larder Lake Mining Division, and are numbered L344897, L353130-32, L353158-67, L353169-71, L354534-39, and L354621, all numbers are inclusive. The present I.P. survey was carried out over the following claims covering them in whole or part: L353158, L353161, L354534, L354535, L354536 and L354537. The above claims are located in Zavitz Township.

1.3 LOCATION AND ACCESS

The property is located west of Matachewan, around Moray Lake. Access is by Highway 566 west from Matachewan and then by logging and forestry access roads. Another access is provided by forestry access and logging roads going south from Pine Street in Timmins. Both sets of roads form a continuous summer road system. The distance by road from Timmins is approximately 45 miles.

Parts of the property have been logged recently. The topography is variable.

Reference: Topographic map NTS 42A/3E Peterlong Lake.

1.4 PREVIOUS WORK

Parts of the property have been previously investigated with magnetic and electromagnetic methods. Noranda Exploration Company Limited conducted a ground magnetic survey in 1964-65 over the easterly part of the present property as well as further east to and beyond Austen Lake. Five claims immediately northwest of Moray Lake were similarly investigated during the summer of 1965. The geophysical work was followed by drilling eight diamond drill holes. Some copper mineralization was encountered together with graphite, pyrrhotite, and pyrite. In 1964 Voyager Exploration Limited and Silvermaque Mining Limited conducted a vertical loop electromagnetic survey over parts of the northwestern claims of the present property. A conductor was located and explored with six drill holes. Both massive and disseminated pyrrhotite and pyrite mineralization was found, with some copper mineralization.

As it was indicated earlier geophysical and geological surveys were carried out by Pan-Ore Gold Mines Limited in 1973.

Reconnaissance, and recently in more detail, government geological mapping has been carried out. The outcrops are generally few and very small.

1.5 GEOPHYSICAL SURVEY

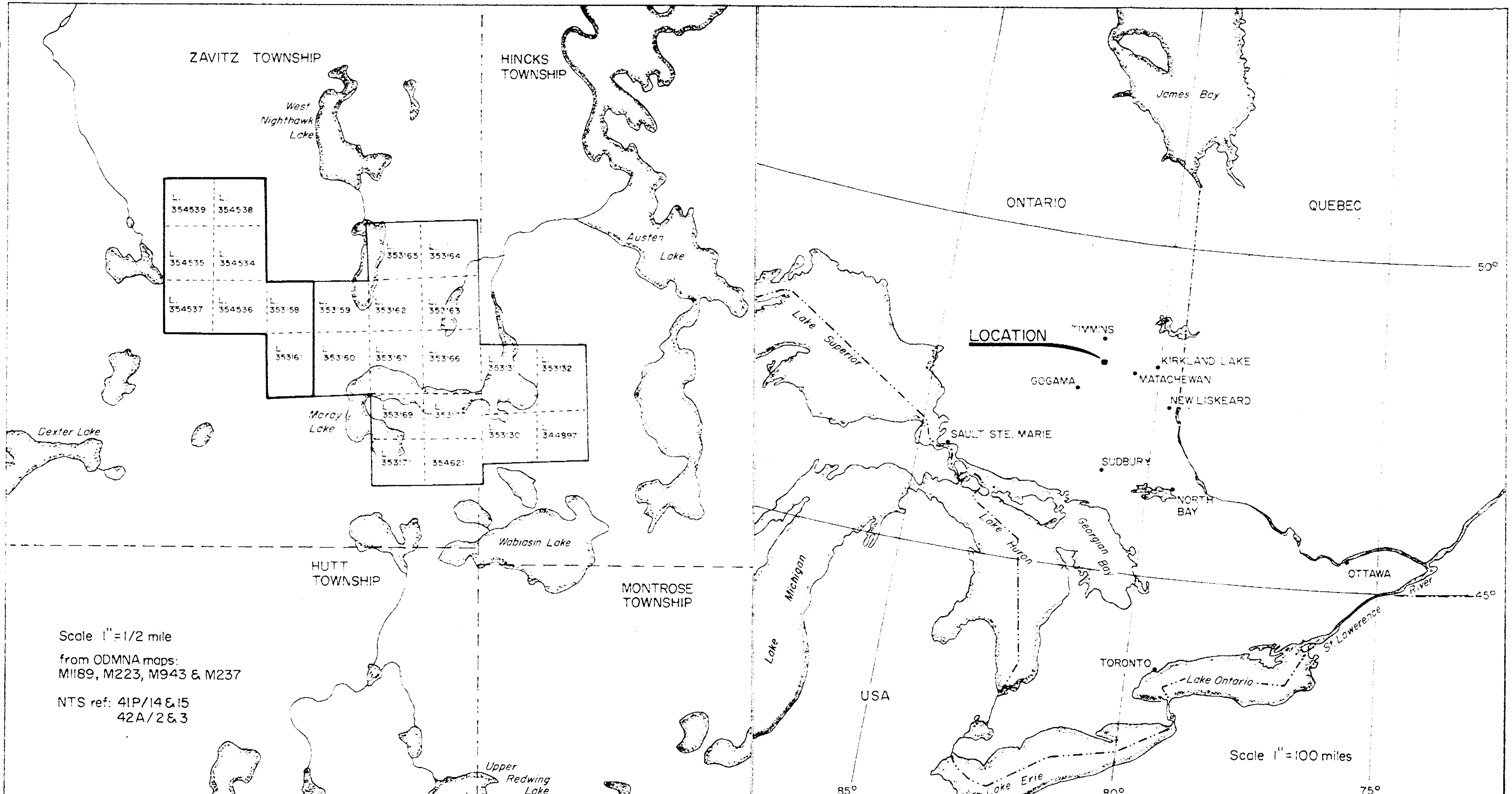
The geophysical work consisted of an induced polarization survey. The survey covered parts of Lines 2SE, from 2NW to 30NW (every second line) west of base line No. 2.

1.6 SURVEY CONTROL

The grid was cut by a crew under supervision of Mr. Ralph Allerston of Timmins, Ontario, under separate contract. The main base line was cut east-west on the north side of Moray Lake. Two auxiliary base lines were also cut at angles to the main one in order to cover the northwest and northeast parts of the property and thereby take into account changes in geological strike. The lines were cut with a nominal spacing of 200 feet and chained and picketed with a nominal 100 foot station interval.

1.7 PERSONNEL

The geophysical surveys were carried out by a crew led by Mr. George Young, Senior Geophysical Operator with Barringer Research, under supervision of Frank L. Jagodits, P. Eng., Chief Geophysicist.



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REGISTERED PROFESSIONAL ENGINEER
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Work undertaken by
BARRINGER RESEARCH LTD, Toronto, Canada.

PAN-ORE GOLD MINES LIMITED
ZAVITZ & HINCKS TOWNSHIPS, ONTARIO
LOCALITY PLAN
JAN 1974 — DWG. 5-359-1

2. SURVEY PROCEDURES

The induced polarization survey utilized a pole-dipole electrode array, the measuring, or potential dipole had a separation of 200 feet, referred to as the 'a' spacing. The current pole was situated to the south at the potential dipole throughout in order to make line to line correlation possible.

The reconnaissance IP work was done with n = 1, and 2, for a potential dipole to current pole distance of 200 and 400 feet respectively. The detail survey used n = 3, and 4, i.e. dipole to pole separations of 600 and 800 feet, respectively, for greater depth penetration. The detail work together with appropriate parts of the regular survey is shown in the form of pseudosections with all data compatible. The station interval was 200 feet.

The potential dipole and the current pole move in unison along the survey lines, while the second or "infinity" current pole is fixed at a distance which is sufficiently large so as not to affect significantly the current distribution of the moving current pole. Commonly this distance is at least 10 times the 'na' spacing from the nearest survey point on the grid.

A 2.5 kW transmitter-generator unit was employed for this survey.

3. DESCRIPTION OF THE INSTRUMENTATION

3.1 INDUCED POLARIZATION SYSTEM

The induced polarization system used is the time-domain system. The DC-pulse or time-domain approach to the induced polarization method comprises the passing of direct current through the ground which builds up charges on the interfaces between metallic minerals and electrolytes. The current is switched off and the redistribution of these charges is measured as a voltage decay (referred to as "overvoltage" of I.P. effect) at the ground surface. Comparison of this secondary voltage (V_s) with the primary voltage (V_p) when the current is on provides a measure of the chargeability of the sub-surface.

The system consists of a generator set, a transmitter and receiver. The generator set, consisting of an engine driven alternator and voltage regulator, provides the primary power at 120V AC - 400 Hz tò the transmitter. The transmitter contains the circuitry and front panel controls to step up and convert the primary AC voltage to a rectangular low frequency waveform, the amplitude of which can be selected by the operator for application to the ground. The transmitter also contains switching circuitry for the current. The current is applied to the ground for 2.0 seconds and it is switched off for 2.0 seconds. The polarity of current is reversed after each pulse.

The generator set and the transmitter are manufactured by Huntec Limited of Toronto, and are available as 2.5 or 7.5 kW units. The receiver is the Newmont designed N IV manufactured by Crone Geophysics Limited, Mississauga, Ontario. The receiver contains its own power supply and has an SP buckout, manual and automatic. After the primary voltage between the potential electrodes has been determined, the receiver automatically integrates the secondary voltage between 0.45 and 0.90 seconds (M) as well as between 0.90 - 1.35 seconds (N) after the termination of each primary current pulse for six consecutive pulses (3 complete cycles), compares the sum to the primary voltage measurement and displays a readout directly in milliseconds on a meter.

The applied current is measured on the transmitter and the apparent resistivity or the given electrode array calculated from the current (Ig) and primary voltage (V_p) and factor applicable to the electrode array employed.

In most environments the measurement of the chargeability can be repeated to an accuracy of 5 - 10% or better, depending on the power rating and ground resistivity.

4. DATA REDUCTION AND PRESENTATION OF THE RESULTS

The induced polarization and resistivity data is presented in the form of profiles, one set for each separation in the reconnaissance survey, while the detail work and corresponding reconnaissance work is shown in the form of pseudosections. The horizontal scale for the profiles is 1 inch = 200 feet, and the vertical scales 1 inch = 20 milliseconds for the chargeability and 1 inch = 5000 ohm-meters for the apparent resistivity. The pseudosections are presented at a horizontal scale of 1 inch = 400 feet.

In order to compensate for the effect of increasing resistivity on the chargeability, normalized chargeabilities were also calculated. These are only shown on the sections. The normalized chargeability is equal to the chargeability divided by the resistivity multiplied by 1000 and has a dimension of farads/meter.

5. KNOWN GEOLOGY

Most of the area is underlain by Precambrian metavolcanics, with some acidic rocks mainly as dykes and small stocks. Serpentinized peridotites occur south of Moray Lake.

Sulphide mineralization, both massive and disseminated, has been found in several places on the property, as well as graphite. Although copper has been encountered in previous drill cores, most sulphides have been barren pyrrhotite and pyrite. The copper in one drill hole in the northwest part was in disseminated form near a small massive pyrrhotite occurrence. Gold mineralization has also been reported from this property.

In conjunction with the earlier geophysical survey a geological investigation was also conducted and was reported on separately.

6. INTERPRETATION

6.1 GENERAL

The induced polarization technique is unique among geophysical methods in that it is able to detect both massive and disseminated sulphide mineralization. It does not depend entirely on the contrast in conductivity between the mineralized zone and the host rock, as the electromagnetic induction methods do. The induced polarization effect comes from the physical phenomenon of build-up of electrical charges at the interfaces between metallic sulphides and fluids in pore-spaces in the rock under the influence of a current applied to the ground. When this primary current is interrupted the accumulated charges dissipate and in the process set up secondary currents which can be measured. The ratio between the secondary and primary currents is the chargeability measure. In the practical case the voltages are measured rather than the currents themselves, but the chargeability remains the same. Although initially the induced polarization method was devised to detect low grade dissemination of copper sulphides it has been found that some metallic oxides, such as magnetite, metals in the native state, and graphite also give IP effects. Due to the nature of crystal arrangement in a massive sulphide body this also gives a measurable chargeability. The amplitude and type of IP anomaly is dependent upon the average mineral content in a volume of rock as well as the size of the mineral grains. Very fine grain mineralization usually gives a higher chargeability value than a coarse grained deposit of the same average grade. Concentration of the mineralization within a small volume, such as occurs in a massively mineralized zone lowers the resistivity to an appreciable degree. The resistivity measurements are obtained at the same time as the chargeabilities (Section 3.1, above). Sulphide concentrations as low as one percent or less can be successfully mapped with IP provided that this mineral content occurs over a volume of rock which is comparable in size with the volume measured. The volume of the subsurface which is used for each reading depends upon the separation between the electrodes, and can therefore be adjusted to fit the exploration problem at hand.

The IP anomalies are classified as excellent, good and fair to poor. The classification is based upon the same criteria as was used when classifying the anomalies of the previous survey. The present survey outlined only "good" and "fair to poor" anomalies, while the previous survey produced a large number of "excellent" anomalies. But the "excellent" anomalies occurred over a different geological setting.

6.2 DETAILED INTERPRETATION

The IP survey outlined an anomalous zone, which extends from Line 2SW to Line 30NW and is open to the north. On the south the anomalous zone joins the IP anomaly trend outlined by the previous IP survey. The IP zone outlined by the present survey appears to be the northerly extension of the zone located earlier, however the zone seems to be broken between Lines 2NW and 14NW. The data is essentially non-anomalous along Lines 6NW and 10NW although there is a rise in chargeability towards the southwest on both lines at both separations.

This apparent break may indicate that the two IP zones are not related, however the available data is insufficient to substantiate this theory.

Although IP data are not available over the drill holes and pits, the results seem to indicate that the mineralized zone may continue into the north and south from the known occurrence.

In general terms the IP anomalous trend is closely related to magnetic anomaly trends in the north. In the south this relationship is not clearly identifiable. Basic to ultrabasic rocks encountered in the drill holes can account for the magnetic responses.

In the following the IP results will be discussed on a line to line basis.

Line 30NW

The anomalous zone is sharply limited by a large increase in resistivity on the northeast which may represent change in rock type. The response is strongest at the shallowest separation. The detail surveying suggest a narrow mineralized band, the strongest normalized chargeability response occurring at Station 8+00SW. The mineralized zone may widen at depth as indicated by the detail survey. The detail survey also suggests that the chargeable body extends towards the southwest but with limited depth extent. (IP responses at n = 3 and 4 are essentially non-anomalous in the southwest.) The previous horizontal loop EM survey outlined a conductor centred around Station 6+00SW. The conductor has limited depth extent and/or diminishing sulphide content with depth since only a very weak anomaly was observed at 300 foot coil spacing. The IP anomaly is situated over three parallel, short strike length magnetic anomalies. All three are narrow, especially the middle one. (Ref. 1.) Basic rocks are known to occur in the vicinity (D.D.H. 1 and D.D.H. 4, Ref. 2) and it may be reasoned that the magnetic anomalies may indicate narrow bands of basic rocks.

Line 26NW

Three drill holes and two pits are located between Lines 26NW and 28NW. These were to explore the conductor found by surveys conducted prior to the Pan-Ore surveys. The Pan-Ore horizontal loop survey outlined a conductor on Line 28NW registering at both the 100 foot and 300 foot coil separations. 100 foot coil separation survey on Line 26NW outlined a narrow anomaly which lies outside of the interpreted IP anomaly.

The basic rocks encountered in the drill holes can account for the magnetic anomaly which occurs on Line 26NW extending to the north to Line 28NW.

The IP response itself is interesting inasmuch that the n = 1 data indicates a chargeability high coinciding with a definite resistivity low in the centre of the chargeability anomaly, but at separation n = 2 the chargeability low occurs with a resistivity low over the anomaly observed at n = 1. This may indicate that the chargeable zone is limited in depth extent but more than likely the electrode array is much wider at n = 2 than the chargeable source and double peak effect is developing. Unfortunately, there is insufficient data along the line to confirm this interpretation.

Line 22NW

The shallower penetrating (n = 1) electrode array indicates two chargeable zones. The first one is centred around Station 5+00SW and the second is centred about Station 10+00SW. It is significant to note that the chargeability zone centred around Station 5+00SW is about 150 feet south of Holes numbered 2, 3 and 4. All three holes intersected sulphides, massive as well as disseminated, 0.46% copper over 4 feet in Hole No. 2, 0.91% copper over 4.8 feet in Hole No. 4. It is believed that the IP anomaly may indicate a southerly extension of the mineralized zone outlined by the drill holes.

Both IP responses occur over magnetic anomalies. The zone between the magnetic highs correlates with a chargeability low and resistivity high at n = 1. The deeper penetrating electrode array (n = 2) gives a set of data which indicate that the chargeability may be continuous at depth between the magnetic highs. The IP anomaly observed at n = 2 is less significant than the one observed at n = 1 because of the chargeability anomaly corresponds to an increase in resistivity.

Line 18NW

The survey line was selected for detail surveying and readings at n = 3 and 4 were also obtained. The calculated normalized chargeabilities suggest that the northeasterly chargeable zone may be of limited depth extent, on the southwest the chargeable zone occurs at some depth as indicated by the n = 3 and 4 data; the two zones may be connected but the normalized chargeabilities are less anomalous between the two zones. It is interesting to note that the strongest normalized chargeability (Station 4+00SW, n = 1) occurs over a distinct magnetic anomaly. Similarly, a magnetic anomaly striking in a north-northwest direction crosses the line, at Station 8+00SW.

Line 14NW

The IP anomaly covers a narrower zone along this line. Normalized chargeabilities indicate that the response is stronger to the northeast and is anomalous at both separations.

Lines 6NW and 10NW

The IP data are essentially non-anomalous along these lines. There is a general increase towards the northwest, which probably indicates change in rock type. A small zone, which could be anomalous, is indicated by normalized chargeabilities on Line 10NW.

Line 2NW

An anomalous zone is indicated on the northeast, but the extent of this is not defined because of the negative chargeabilities observed on both ends of the anomaly. It is believed that the negative chargeabilities may be due to conductive overburden and/or unusual channelling of current paths.

Line 2SE

The response is more anomalous than on Line 2NW and is a continuation of the IP anomaly observed earlier on Lines 00 and 2E. The normalized chargeability increases with depth on the northwest end of the line.

7. CONCLUSIONS AND RECOMMENDATIONS

The induced polarization survey outlined a northwest striking anomalous zone. Previous drilling and pitting, testing electromagnetic conductors, encountered massive and disseminated sulphide mineralization. The mineralization is described as pyrite, pyrrhotite and some chalcopyrite. Assays at two locations indicates 0.91% and 0.46% copper over a width of 4.8 feet and 4.0 feet respectively. Although there are no IP data available over the drill holes containing the copper, it is apparent from the IP data that the chargeable material extends to the north as well as to the south from the known occurrence.

The anomalous zone extends to the southeast where it joins the IP zone outlined by an earlier survey on Lines 00 and 4E.

There is an apparent break in the anomalous zone between Lines 2NW and 14NW, which may indicate that two zones are not related intimately. However, the available data is not conclusive and one continuous zone with a less or non-anomalous portion is also a possibility.

In the north, the zone correlates with a magnetically anomalous area which includes several short strike length anomalies. In a number of cases the anomalies directly correlate with IP anomalies. However, it should be noted that magnetic anomalies are not the same character and amplitude as found on Sheet 4 of the earlier survey.

In order to test the IP anomalies, the following drill holes are recommended in order of priority:

1. Collar: Line 22NW/3+50SW, azimuth grid south, dip -45°, depth 350 feet.

2. Collar: Line 26NW/4+50SW, azimuth grid south, dip -45°, depth 300 feet.

3. Collar: Line 30NW/10+50SW, azimuth grid north, dip -45°, depth 350 feet.

4. Collar: Line 18NW/7+50SW, azimuth grid north, dip -45°, depth 350 feet.

5. Collar: Line 22NW/11+50SW, azimuth grid north, dip -45°, depth 350 feet.

6. Collar: Line 00/2+00S, azimuth grid south, dip -45°, depth 350 feet.

If encouragement develops from the above, the following hole is recommended:

Collar: Line 2SE/7+00SW, azimuth grid north, dip -45°, depth 350 feet.

The location of these holes should be reviewed during the drilling programme and the locations should be altered if warranted, based on the results.

Respectfully submitted

BARRINGER RESEARCH LIMITED

Frank L. Jagodits, P. Eng.,
Chief Geophysicist.

REGISTERED PROFESSIONAL ENGINEER
F. L. JAGODITS
PROVINCE OF ONTARIO

Qualifications 2.55

8. REFERENCES

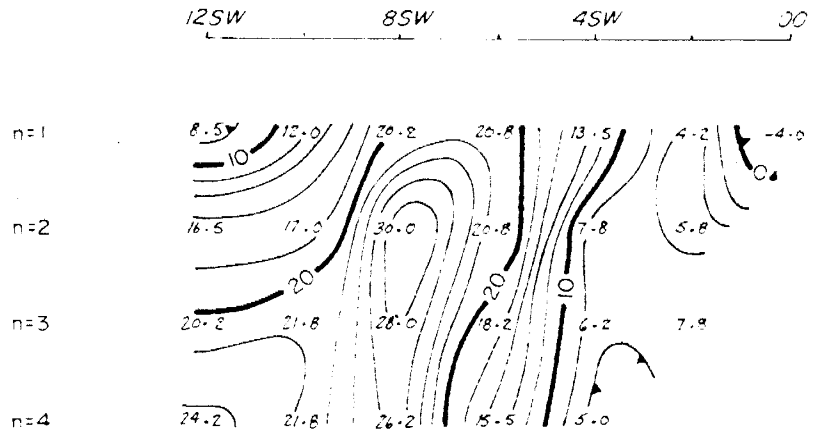
1. Report on Ground Geophysical Survey, Zavitz and Hincks Townships, Larder Lake Mining Division, for Pan-Ore Gold Mines Limited, by Barringer Research Limited, September 1973.

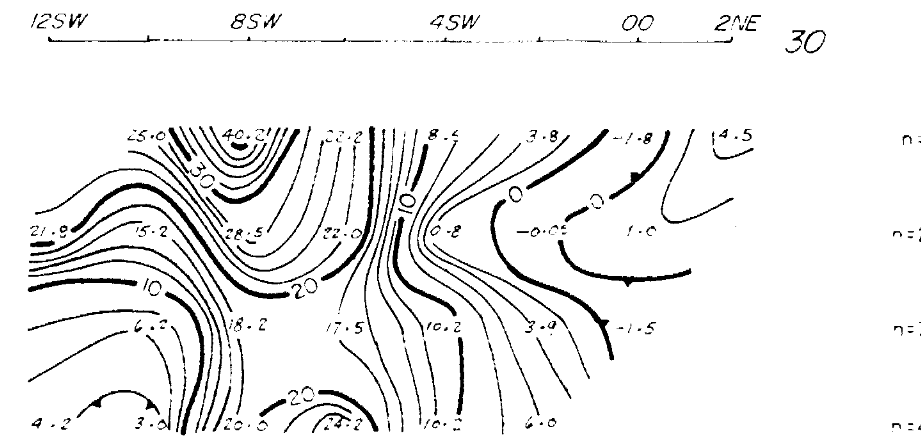
2. Report on the Geological Survey, Zavitz and Hincks Townships, Larder Lake Mining Division, Ontario, for Pan-Ore Gold Mines Limited by Barringer Research Limited, November 1973.

18NW | 30NW

CHARGEABILITY
MILLISECS

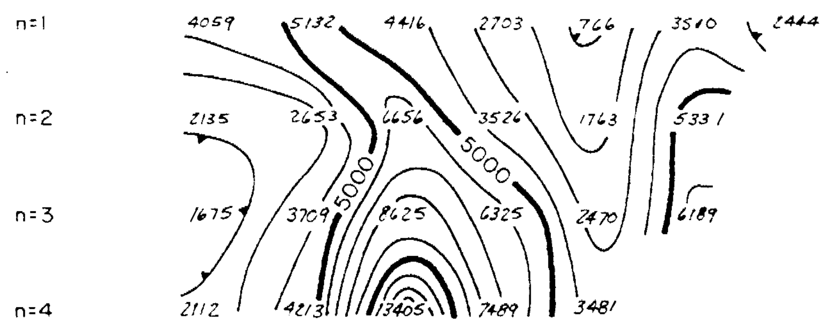
Contour interval – 2 millisecs
- 10 millisec contour
- 2 millisec contour
- Depression

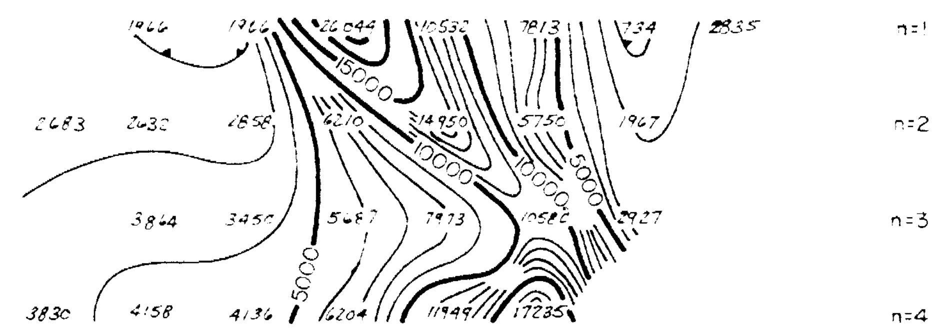




APPARENT RESISTIVITY
OHM–METERS

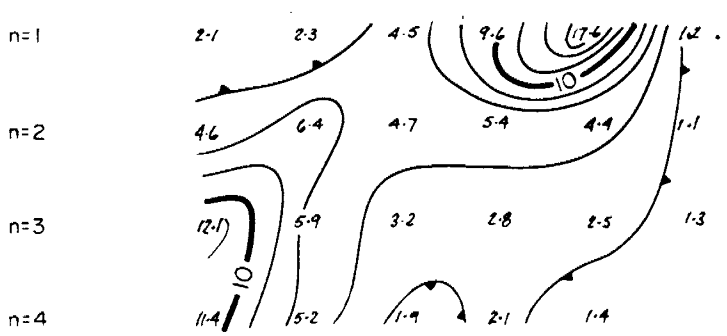
Contour interval — 1000 ohm-meters
- 5000 ohm-meter contour
- 1000 ohm-meter contour
- Depression

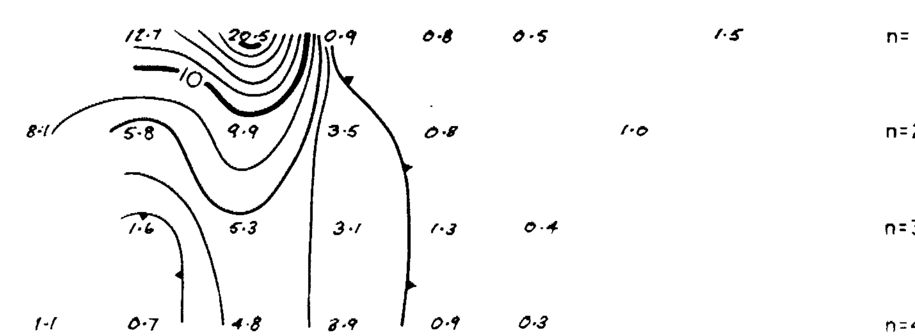




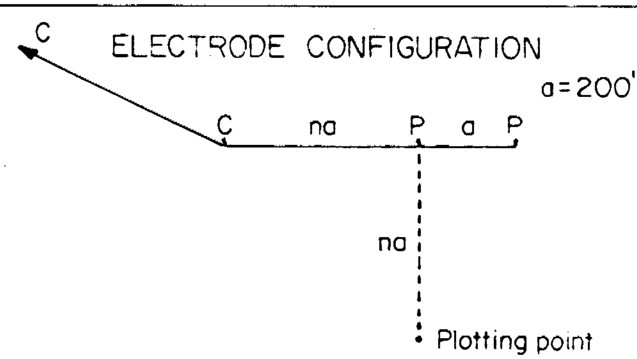
NORMALIZED CHARGEABILITY
FARAD–METERS

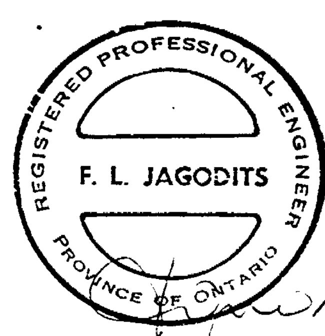
Contour interval - 2 Farad-meters
- 10 Farad-meter contour
- 2 Farad-meter contour
- Depression





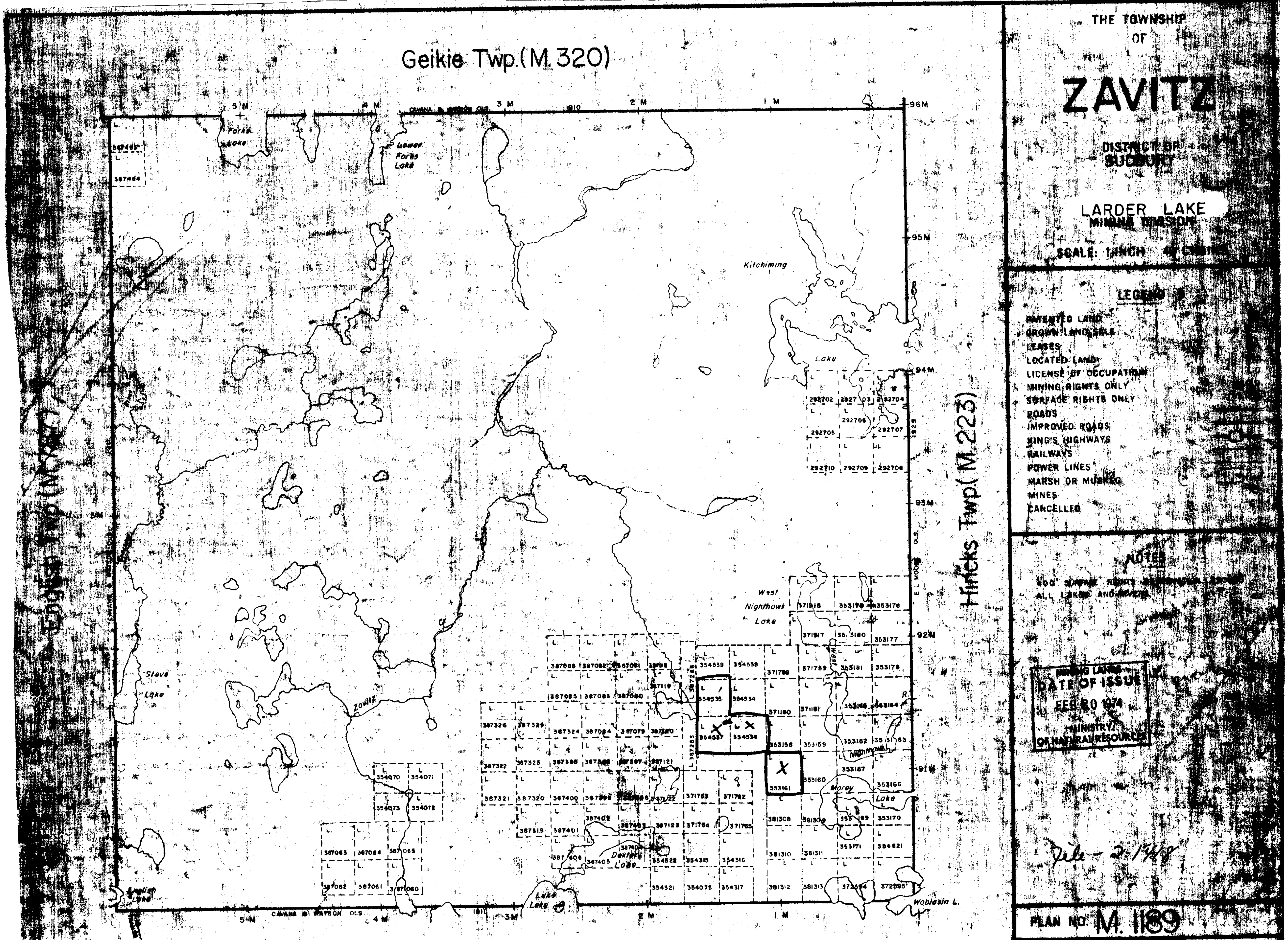
ELECTRODE CONFIGURATION





Work undertaken by
BARRINGER RESEARCH LTD, Toronto, Canada.

PAN-ORE GOLD MINES LIMITED		
ZAVITZ & HINCKS TOWNSHIPS, ONTARIO		
INDUCED POLARIZATION & RESISTIVITY SECTIONS POLE - DIPOLE ARRAY		
JAN 1974	Scale 1" = 400'	DWG. 5-359-2



42A03SE0180 2.1418 ZAVITZ

200

2.1418

LEGEND

6.6 / 1532	Station and reading CHARGEABILITY / RESISTIVITY
———	Chargeability profile scale 1" = 20 millisecs
- - - - - - -	Resistivity profile scale 1" = 5000 ohm-meters
□ ○	Claim post - located, unlocated

C — B — C, na P a P — Plotting point

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INDUCED POLARIZATION & RESISTIVITY PROFILES

n = 1. POLE-DIPOLE ARRAY a = 200'

JANUARY 1974	Scale : 1" = 200'	DWG.5-359-3

42A03SE0189 2.1418 ZAVITZ

210

2.1418

LEGEND

- Station and reading CHARGEABILITY / RESISTIVITY
- Chargeability profile scale 1" = 20 millisecs
- Resistivity profile scale 1" = 5000 ohm-meters
- Claim post – located, unlocated

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INDUCED POLARIZATION & RESISTIVITY PROFILES n=2 POLE-DIPOLE ARRAY a=200'		
JAN 1974	Scale : 1" = 200'	DWG. 5-359-4

220

2.1418

LEGEND

- Station and reading CHARGEABILITY / RESISTIVITY
- Chargeability profile scale 1" = 20 millisecs
- Resistivity profile scale 1" = 5000 ohm-meters
- Claim post - located, unlocated
- I.P. anomaly - excellent
- I.P. anomaly - good
- I.P. anomaly - fair to poor
- I.P. anomaly electrode separation
- Magnetic anomaly
- Completed drill hole

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INTERPRETATION

n = 1 a = 200'

JANUARY 1974	Scale: 1" = 200'	DWG. 5-359-5

230