

GM 41581

REPORT ON INDUCED POLARIZATION AND MAGNETOMETER SURVEYS ON LAC SCOTT PROJECT

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REPORT
on
INDUCED POLARIZATION AND MAGNETOMETER SURVEYS
on
LAC SCOTT PROJECT
CHAPAIS, QUEBEC
for
CORPORATION FALCONBRIDGE COPPER

Ministère de l'Énergie et des Ressources

Service de la Géoinformation

23 JAN. 1985

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July, 1984
Toronto, Ontario

S.J. Bate, M.Sc.
MPH Consulting Limited

SUMMARY

During the period January 17 to February 28, 1984, MPH Consulting Limited of Toronto, Ontario conducted a program of geophysical surveying on behalf of Corporation Falconbridge Copper on the latter's Lac Scott property in Scott Township, northwestern Quebec.

The geophysical program consisted of Induced Polarization surveying with a dipole-dipole array and is designed to map the distribution of polarizable material on the property. It is anticipated that the apparent resistivity data would provide lithologic and structural information. Survey parameters were specified by Corporation Falconbridge Copper are identical to those used during previous Induced Polarization surveying on the property.

A program of total field magnetics surveying of the whole property was undertaken by Corporation Falconbridge Copper in the course of the 1983 and 1984 winter field season.

The work was carried out under the field direction of S.J. Bate, M.Sc. with D. Jones, P.Geoph. providing overall responsibility for the project. Liason with Corporation Falconbridge Copper was provided by Michel Drouin, Senior Exploration Geologist, Chapais, who also provided geological input during interpretation of the geophysical data.

The basic geological model of the area proposed by Corporation Falconbridge Copper (verbal communication, Michel Drouin, Senior Exploration Geologist) is understood as follows:

The property is assumed to be underlain for the most part by early to middle Precambrian "Granitic Assemblage" intrusive rocks of the

Chibougamau pluton. A major fault/shear zone trending northeast is inferred to transect the plutonic rocks in the region of Lac Scott (the Lac Scott Fault). Mineralized zones which strike at an angle to this major shear zone are considered to be of primary importance.

Interpretation of the magnetic data indicates that the majority of the property is underlain by a homogeneous rock type which is assumed to be early to middle Precambrian "Granitic Assemblage" rocks of the Chibougamau pluton.

Phases within the granitoid rocks are evidenced by low amplitude local fluctuations within the magnetic data.

The change in background values in the northeastern corner of the property outlines either a different phase of the granitoid rocks or early Precambrian rocks enclosing the pluton. Due to the limited geologic knowledge of the area, it is not possible to determine which is the case at this time.

The resistivity survey outlined a major en echelon fault system, the Lac Scott Fault, trending northeast. A number of west to west-northwest striking fault/shear zones have been interpreted.

The frequency effect survey conducted on the property outlined thirty-seven (37) polarizable zones of which eleven (11), labelled 'A', 'B', 'C', 'H', 'I', 'J', 'K', 'L', 'M', 'N', '7', and '11', are considered significant.

Anomalies 'A' and 'C' are considered to be priority targets due both to amplitude and line to line coherency.

In the context of the geological model, anomaly 'A' is the prime target and at this time is open to the south. Its location on

line 0+00 is reportedly in the vicinity of a grab sample assaying up to 1,200 ppb Au/ton (verbal communication from Michel Drouin, Senior Exploration Geologist, Corporation Falconbridge Copper).

Anomalies 'A' and 'C' are recommended for diamond drilling.

Collar coordinates required to adequately drill test these zones are:

<u>Anomaly</u>	<u>Collar Coordinate</u>	<u>Azimuth</u>	<u>Dip</u>	<u>Length</u>
'A'	3+75W	grid E	50°	100 m
	1+00S			
'C'	23+00W	grid E	50°	100 m
	14+00S			
or	22+00W	grid E	50°	150 m
	13+00S			

The first two drill locations are on Lac Scott. The alternative collar coordinates for anomaly 'C' are located on land.

Integration of future geological data with the geophysical results is recommended as is further surveying of anomaly 'A' to the south to determine its strike extent.

Appendix I contains a critique and interpretation of a portion of the Induced Polarization survey results obtained by George F. Beier of Don Mills, Ontario during the periods of January/February and August, 1983 on behalf of Corporation Falconbridge Copper on the latter's Lac Scott property.

Sections of lines 2+00N to 4+00S and line 7+00S were surveyed both by George F. Beier and MPH Consulting Limited. On comparing the two data sets, four main differences are noted.

- (1) The resistivity sections, while generally comparable over the lake (Lac Scott), differ increasingly as the survey line progresses from the lake onto the land. Electromagnetic coupling effects are cited as a possible major cause of this.
- (2) No texture is observed in the 1983 frequency effect sections making it difficult, if not impossible, to determine an anomalous zone's parameters.
- (3) Anomaly 'A', as outlined during the 1984 survey, is recorded by George F. Beier only as a very weak, poorly defined anomalous zone, anomaly A1, extending from line 1+00N to line 2+00S. Anomaly A1 does not display the variation in frequency response amplitudes observed in Anomaly A.
- (4) A number of near vertical anomalous responses are noted in the 1983 surveys. No geological scenario is known to the author that would result in such a response.

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1.0 INTRODUCTION

During the period of January 17 to February 28, 1984, MPH Consulting Limited of Toronto, Ontario carried out a programme of geophysical surveying on behalf of Corporation Falconbridge Copper on the latter's Lac Scott property in northwestern Quebec.

The geophysical surveying consisted of frequency domain Induced Polarization using a McPhar P660, five frequency, 2.5 kw system with transmitting frequencies of were 0.3125 Hz and 5.0 Hz. The surveying was conducted using a dipole-dipole array with a dipole spacing (a) of 50 m.

Readings at each station were recorded with five dipole separations.

The survey parameters were specified by Corporation Falconbridge Copper and are identical to those used during previous Induced Polarization surveys on the property.

The purpose of the Induced Polarization surveying was to map the distribution of polarizable material on the property with the apparent resistivity data providing lithologic and structural information.

The basic geological model of the area proposed by Corporation Falconbridge Copper is understood as follows.

The property is assumed to be underlain for the most part by early to middle Precambrian "Granitic Assemblage" intrusive rocks of the Chibougamau pluton. A major fault/shear zone trending northeast is inferred to transect the plutonic rocks in the region of Lac Scott (The Lac Scott Fault). Mineralized zones which strike at an

angle to this major shear zone are considered to be of primary importance.

The work was carried out on two separate grids for a total of approximately 42 kilometers of Induced Polarization surveying. The grids are labelled "west" and "northeast" in the report and bound the previous survey area to the west and north respectively (see section 4.2 for detailed location of grids).

The programme was conducted under the direct field supervision of Mr. S.J. Bate M.Sc. Overall supervision was provided by Mr. D. Jones, P.Geoph.

Liason with Corporation Falconbridge Copper was through Michel Drouin, the Senior Exploration Geologist in Chapais.

A magnetic survey of the entire property was performed by Corporation Falconbridge Copper during the 1983 and 1984 winter field seasons. A Geometrics G-816 unit was used to measure the total field magnetic intensity.

The report outlines the geophysical techniques employed and the instrumentation and field procedures used. The results and interpretation of the field work are discussed and conclusions are presented. Recommendations for further exploration are outlined to assess the economic potential of the property.

An interpretation of survey results from 1983 and a comparison with the 1984 data are presented in Appendix I.

2.0 LOCATION AND ACCESS

The property is located in the northwest corner of Scott township which lies within the Chibougamau mining district of northwestern Quebec. The majority of the property is covered by Lac Scott.

The area is approximately 18 km northeast of the town of Chapais and 19 km southwest of Chibougamau (Figure 1).

The property consists of 27 contiguous unpatented mining claims partly covering Lots 14 to 29 of Range 8 and Lots 23 to 28 of Range 9 in Scott township.

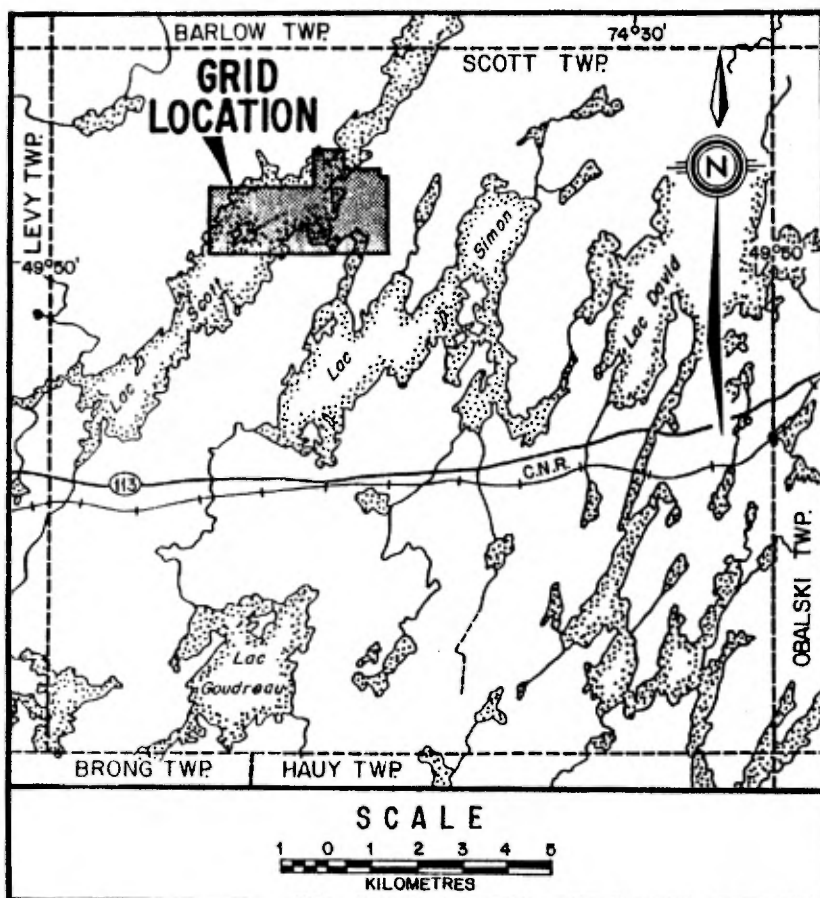
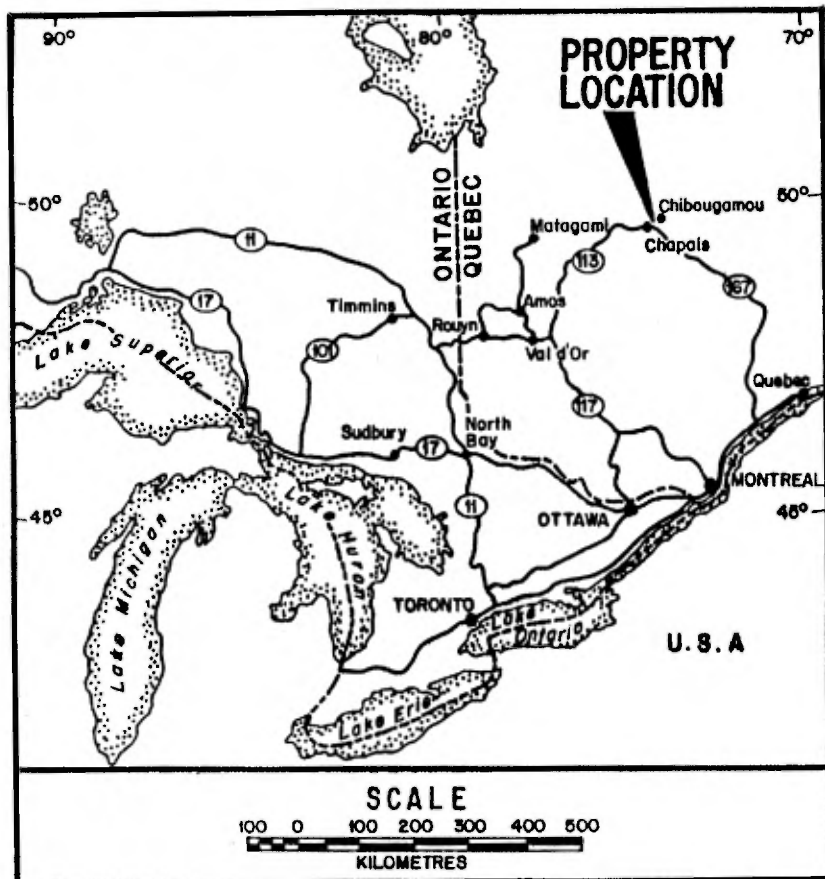
The claim numbers pertaining to Lots 14 to 29 in Range 8 are:

383998 (2)	401403 (1)
384000 (1,2)	406394 (1,2)
384001 (1)	406399 (1,2,3)
401400 (1,2)	406400 (1,2)
401401 (1,2)	406405 (1,2,3)
401402 (1,2)	

and those pertaining to Lots 23 to 28 in Range 9 are:

406401 (1,2,3,4)
406402 (1,2)

Access to the property is by skidoo or boat across Lac Scott. Access to Lac Scott is via a 500 m trail northwards from Highway 113 which connects Chapais and Chibougamau.



**CORPORATION FALCONBRIDGE
COPPER EXPLORATION**

LAC SCOTT PROJECT

LOCATION MAP

Project No: C-646	By: S. Bate
Scale:	Drawn: G.C.S. Limited
Drawing No: Fig. 1	Date: May, 1984



MPH Consulting Limited

3.0 GENERAL GEOLOGY

The property is located in the northeastern portion of the Abitibi Orogenic Belt of the Archean Superior Structural Province and is situated approximately 20 km southwest and 20 km northeast of the Chibougamau and Chapais precious and base metal mining camps respectively. The Lac Shortt gold deposit is located approximately 90 km to the southwest.

The property is, for the most part, underlain by early to middle Precambrian granodiorite-monzonite intrusive rocks of the Chibougamau pluton. The pluton is bound to the north and northeast by anorthositic rocks of the Lac Doré Complex.

Essentially east-west trending, isoclinally-folded, early Precambrian supracrustal rocks (metavolcanics, metasediments, pyroclastics) enclose the granitoid rocks.

Late Precambrian, north to northeast-trending diabase dykes are numerous and measure 0.3 to 10 m in width.

Several fault systems have been identified in the Chapais/Chibougamau area.

The oldest faults generally strike east-west to west-northwest and are characterized by steeply dipping, closely spaced zones of intense shearing, carbonitization and silicification. Sulphide mineralization is common.

The main fault system trends northeast-southwest. Three fault sets in the system have been identified (Feuerbach, 1972):

(i) 10-15° east of north

These features tend to be very narrow, only a few feet wide, with occasional slight shearing.

(ii) 20-35° east of north

The most important tectonic element in the area. Included are the Lac Scott Fault, some faults between Lac Scott and Lac Simon and some zones in the Lac Simon region. Dislocations, in a horizontal sense, are usually never greater than 100 m.

(iii) 45-60° east of north

The Lac Guillam Fault is a vertically dipping shear zone with local thickness up to 100 m that transects both the supracrustal and the intrusive granitic rocks.

Locally compositional phases have been identified within the Chibougamau pluton (Feuerbach, 1972). There is a general gradational change, south to north, from mafic to more acidic, granitic rocks.

The pluton is bisected by the Lac Scott Fault which continues northeast through the metavolcanic rocks to the north (Feuerbach, 1972). The granitic rocks are truncated 4 km to the west by the Lac Guillam Fault. The latter intersects the Lac Scott Fault north of the property.

The main mineral of economic interest on the property is gold which is reported to be hosted by quartz veining in shear zones in the vicinity of 2+00W on line 12+00S (Norman's occurrence, 1941) (QDNR, Special Paper 2, 1967).

The gold is generally accompanied by pyrite, occasionally pyrrhotite and chalcopyrite and, rarely, sphalerite.

Gold occurrences in Scott Township are also reported within sheared metavolcanics and granitic-anorthositic complexes. Gold values range from 0.04 oz Au/ton to a surface sample of 1.905 oz Au/ton (QDNR, Special Paper 2, 1967).

Widths of shears vary from 1 to 8 m. The associated quartz veins are generally stringers of 1 to 100 cm widths (Feuerbach, 1972).

4.0 SURVEY PARAMETERS

4.1 Linecutting

The linecutting on this property was contracted by Corporation Falconbridge Copper and was carried out during the 1983 and 1984 winter field seasons.

The survey grid was orientated with the baseline trending directly north-south. Limits for the baseline were 8+00N to 16+00S. Crosslines were established at 100 m intervals and cut driven both east and west. Line 0+00 is coincident with the boundary between Ranges 8 and 9.

In 1983 the baseline and lines 3+00N to 16+00S inclusive were cut. Line limits were as follows:

Lines 3+00N to 1+00N	:	8+00W to 7+80E
Lines 0+00 to 7+00S	:	11+00W to 10+80E
Lines 8+00S to 16+00S	:	14+50W to 10+80E

In 1984 the grid was extended to include:

Lines 8+00N to 4+00N	:	8+00W to BL
Lines 0+00 to 7+00S	:	30+75W to 11+00W
Lines 8+00S to 16+00S	:	30+75W to 14+50W

A dislocation of 40 m to the west was noted between the 1984 and 1983 sections of the grid.

4.2 Grid Locations

The Induced Polarization surveying on the property in 1984 covered two separate grid areas. These are referred to, for interpretation purposes, as the "west" and northeast" grids

and they bound the 1983 survey area to the west and north respectively.

The approximately grid limits are as follows:

- (1) West Grid: Lines 0+00 to 16+00S : 30+75W to 11+00W
- (2) Northeast Grid: Lines 8+00N to 4+00S : 8+00W to BL

The centre of the northeast grid is therefore located approximately two kilometers northeast of the center of the west grid. The closest separation between the grids is 300 meters on line 0+00.

4.3 Magnetometer Surveys

Approximately 86 km of magnetic surveying was carried out by Corporation Falconbridge Copper in the course of the winter field seasons of 1983 and 1984. Readings were taken every 25 meters along all grid and tie-lines. The station separation was reduced to 12.5 meters in areas of higher magnetic gradient.

The total field magnetic parameters in both years were as below:

	<u>1983</u>	<u>1984</u>
Ambient total field	58,725 nT	58,660 nT
Inclination of total field	76°1'N	75°56'N
Declination of total field	18°3'W	18°2'W

4.4 Induced Polarization Surveys

The Induced Polarization survey was carried out on the western and north-eastern portions of the property which were established in 1984. In addition, sections of lines 3+00N to 4+00S, as well as line 7+00S were re-surveyed both to tie in

to the previous survey and as an extension to the original 1984 contract. A dipole-dipole survey array was utilized with a dipole spacing (a) of 50 m and dipole separations (n) of n=1 to n=5. The frequency domain Induced Polarization system employed was a McPhar P660 unit. Measuring frequencies were 0.3 Hz and 5 Hz.

Note: All lines, except 1+00S (east) and 2+00S (east), were surveyed with stations tied to the 1984 grid.

On the plan maps (Maps 1 through 4), the data from lines 1+00S (east) and 2+00S (east) has been plotted so that anomaly locations are indicated at stations tied to the 1984 grid.

5.0 PERSONNEL

The following MPH Consulting Limited personnel were connected with this project at various times:

D. Jones, P.Geoph.	Consultant
S. Bate, M.Sc.	Geophysicist
D. Morrison	Senior Operator
R. Rae	Operator
W. Keeshing	Operator
J. Baxter	Operator
R. Pinette	Operator

6.0 INSTRUMENTATION AND PROCEDURE FOR THE INDUCED POLARIZATION SURVEY

6.1 Survey Parameters and Procedure

A McPhar P660 frequency domain Induced Polarization receiver was used for data gathering with a McPhar 1968 2.5 kw transmitter. A frequency pair of 0.3 and 5 Hz was employed.

A dipole-dipole array was used as a surveying technique with dipole separations (n) of 1,2,3,4 and 5 observed at each station.

The survey procedure employed a stationary transmitter location and a moving receiver. Each set-up allows the surveying of 10 successive dipoles, a distance of 500 m, with a repetition of four measurements as a quality control feature.

It is important to note that there is a maximum inherent error of 10 percent in determining the frequency effect/current amplitudes as the read-out displays on the receiver/transmitter are in analogue form rather than digital. It follows, however, that the larger the measured amplitudes the smaller the error in the actual reading.

Electrodes on the lake were constructed by first boring a hole through the ice so that a filed six inch galvanized nail attached to blasting wire could then be embedded in the lake bottom sediments. Three foot long stainless steel rods were used for electrodes on the land. Wherever good contact with the ground was difficult to obtain, two connected steel rods and a supersaturated salt solution were employed.

The transmitter and/or connected power wires were never closer than 50 m to the receiver and its read wire. This was

to minimize spurious noise from the transmitter and to avoid electromagnetic coupling between the reading and power wires respectively.

Radio contact using walkie-talkies allowed for synchronization of current on/off times and frequency selection and also ensured personnel safety. The technical specifications of the survey equipment are presented in Appendix III.

6.2 Calculation and Significance of the Apparent Resistivity and Frequency Effect

Two values are of interest in frequency domain Induced Polarization surveying:

- a) the apparent resistivity of the ground;
- b) the frequency effect of the ground.

The apparent resistivity values of the ground are not directly measured but are obtained by calculations from observed data.

Mathematical formulae utilizing the measured secondary voltage values coupled with the current output from the transmitter at the same instant, and a geometrical constant dependent on the array type being used, yield the apparent resistivity values of the ground.

In the case of the dipole-dipole array the formula is:

$$\rho_a = \pi \cdot G \cdot \frac{V_s}{I} \quad (6-1)$$

$$\text{where } G = n(n+1)(n+2) \quad (6-2)$$

ρ_a = apparent resistivity
 V_s = secondary voltage
 I = current
 G = geometrical factor
 n = dipole separation

The geometrical factor for apparent resistivity data obtained below surface differs by two from the surface case. This is due to the fact that the electric field of an entire sphere has to be accounted for rather than a hemisphere.

However, as the depth to the lake bottom is small over the area of Lac Scott surveyed, no correction was required.

In order to calculate the frequency effect, the apparent resistivity of the ground is measured at two or more frequencies. In the same manner that it takes to charge a capacitor, it takes time to build up the polarization voltage. Therefore, the apparent resistivities of the ground (or the transfer impedance between the current and measuring circuits) increase when the frequency of the current decreases. For constant current and voltage between the potential electrodes the measured apparent resistivity increases as the frequency decreases. Figure 2 shows the frequency response of laboratory mineral samples.

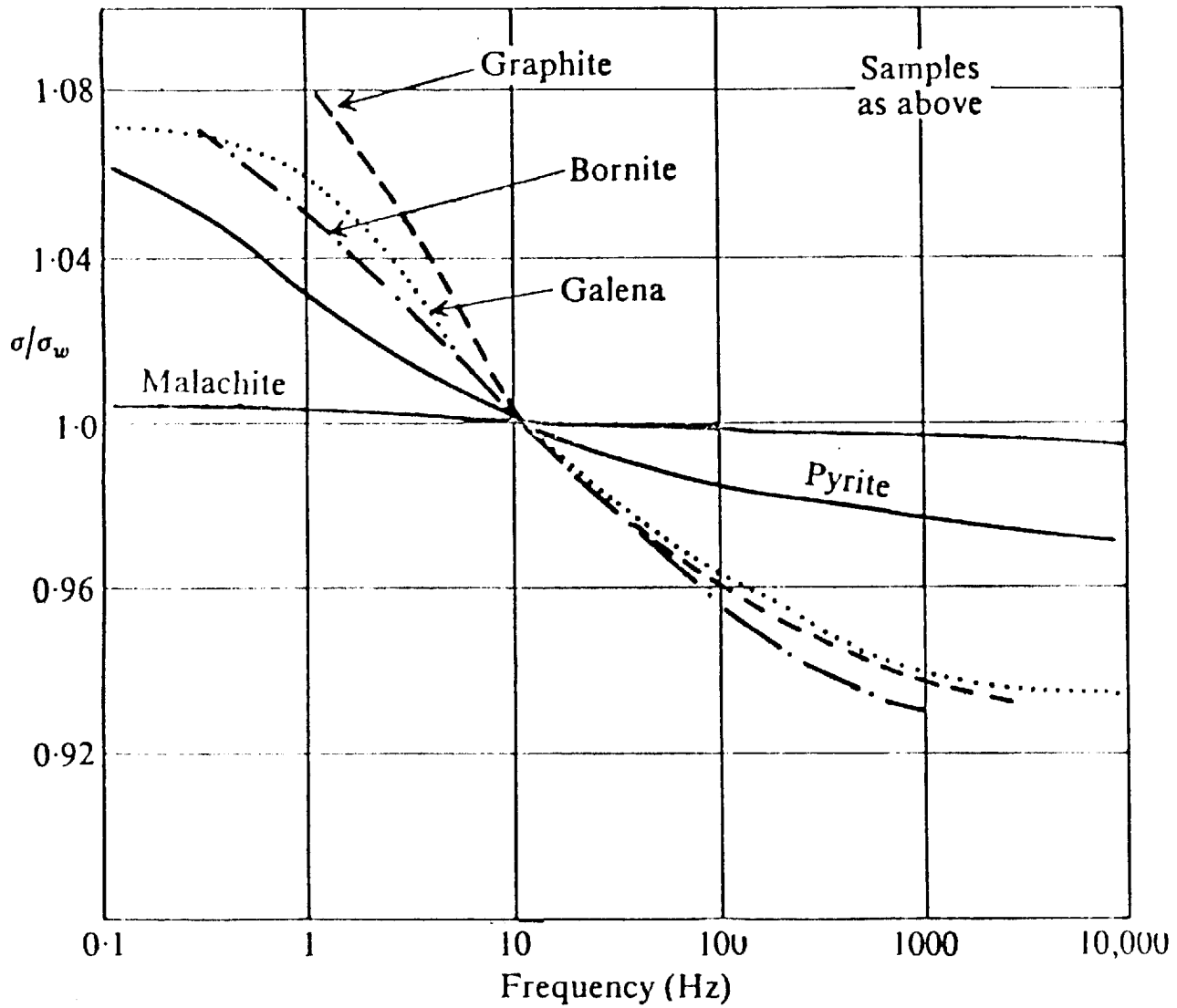
The frequency effect is obtained using the formula:

$$FE = \frac{\rho_{F1} - \rho_{Fh}}{\rho_{Fh}} \quad (6-3)$$

where ρ_{F1} and ρ_{Fh} are the low and high frequency apparent resistivities. It is an apparent value not a true value,

Decay time (sec)

(a)



(b)

Figure 2: The Frequency Response of Various Minerals

since frequency effect varies with the choice of frequencies used. The frequencies used, 0.3 Hz and 5 Hz, were widely separated to ensure a near true value measurement while close enough to suppress potential noise and coupling problems.

The plotting point for both the frequency effect and apparent resistivity values were generally taken as being at the midpoint of the surveying array.

The basic principles of the Induced Polarization array are displayed in Figure 3.

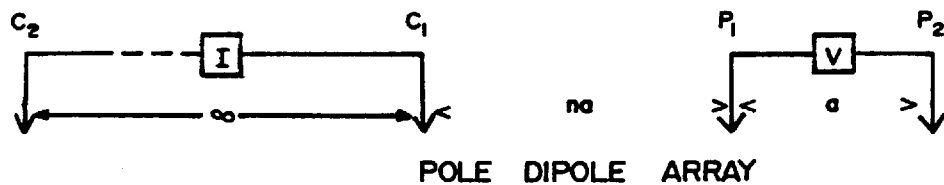
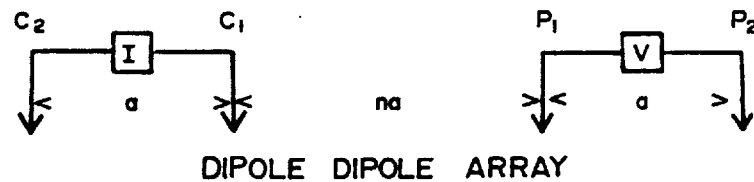
The Metal Factor (MF) is a quantity derived from the apparent resistivity and frequency effect results. It is defined as follows:

$$MF = 10^3 \cdot PFE \left(\rho_{FL}/2 \right) \quad (604)$$

where PFE = percent frequency effect.

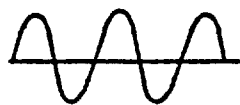
6.3 Metal Factor

The idea behind the MF is to compensate more or less for the following effect: disseminated mineralization in a high resistivity rock gives rise to a much larger PFE than the same mineralization in a lower resistivity rock because the current paths through the barren, non-polarizable rock are actually in parallel with the current paths through the conductive particles and in cases such as this, the metal factor will accentuate the size and location of the mineralized zones. However, similar anomalous zones can be manufactured from calculations when the PFE is kept constant and varying the apparent resistivity.

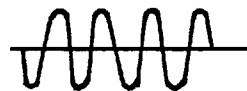


Apparent Resistivity $\rho_a = \frac{V}{I} \cdot G$
 where G is a geometric factor
 dependant on survey array.

TRANSMITTED WAVE FORMS



F_l



F_h

F_l = low frequency

F_h = high frequency

$$F_l \quad \frac{V_{F_l}}{I} \cdot G$$

$$F_h \quad \frac{V_{F_h}}{I} \cdot G$$

$$PFE = 100(\rho_{F_l} - \rho_{F_h}) / \rho_{F_h}$$

$$MF = PFE / \rho_{F_l}$$

Figure 3
 PRINCIPLE OF FREQUENCY DOMAIN I.P.

Example: Suppose $PFE = 0.1$ and the apparent resistivities varied from 4,000 ohm meters to 300 ohm meters. The metal factor would increase from .15 to 2.09, thus creating an anomalous situation.

In some areas, the metal factor is a very useful quantity. However, it should never be viewed in isolation since it is dependent upon two measured quantities.

It was decided, due to the severe masking effects of lake bottom sediments (Section 8.2) and the complexity of the resistivity sections, that it would be more profitable to view the Fraser Filtered data (Section 7.0) rather than utilize the Metal Factor.

7.0 PRESENTATION OF DATA

The data from the Induced Polarization survey is presented as detailed profiles of the lines in pseudosection form. To construct the pseudosections, data for each station are plotted on a vertical section at the point of intersection of 45° lines, drawn from the surface, starting at the midpoints of the current and potential electrode pairs. In this way the readings are plotted at points directly beneath the centre of the spread. The result is a form of two-dimensional plot in vertical section (see Figure 4). The pseudosections are contoured in logarithmic increments.

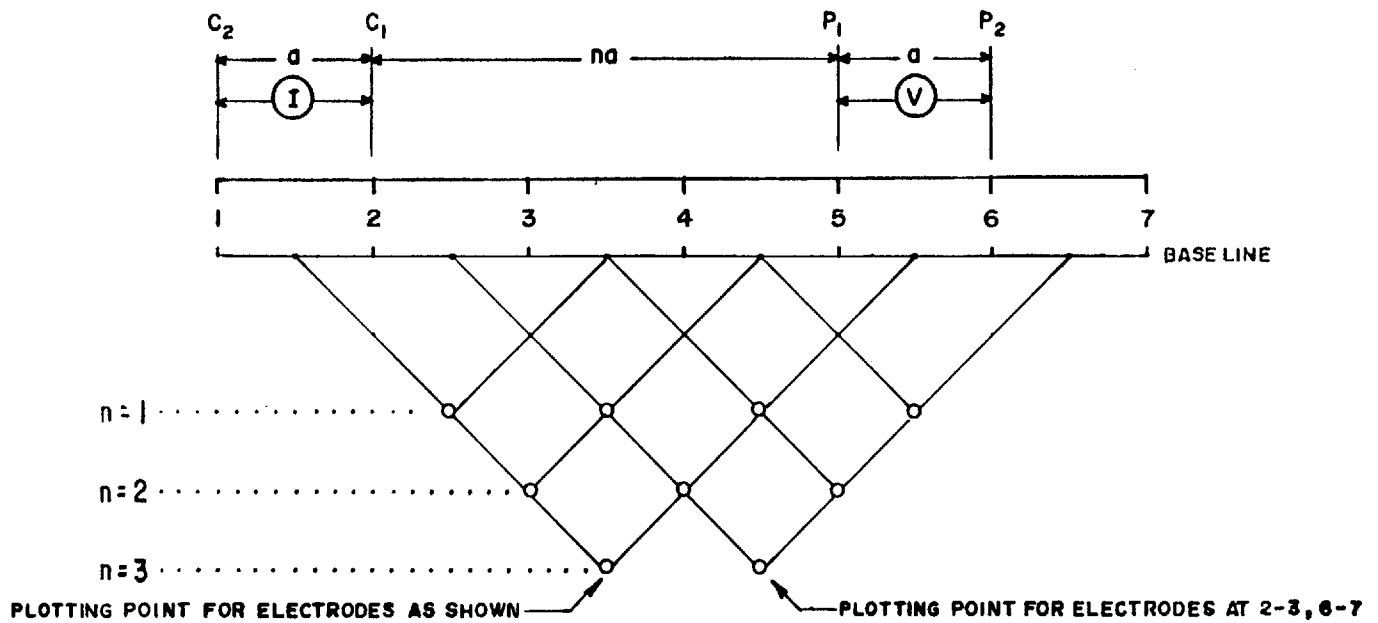
Due to the severe masking effect of the lake bottom sediments on the data, readings for each station are filtered for both frequency effect and apparent resistivity values using an averaging method developed by D.C. Fraser (19). This method clarifies the data presentation, yielding a single value station from all levels of the pseudosection. The most anomalous values overlie the polarizable body. Figure 5 describes the filtering technique.

Accompanying this report are a series of Induced Polarization pseudosections and plan maps of both the frequency effect and the apparent resistivity. These are listed below:

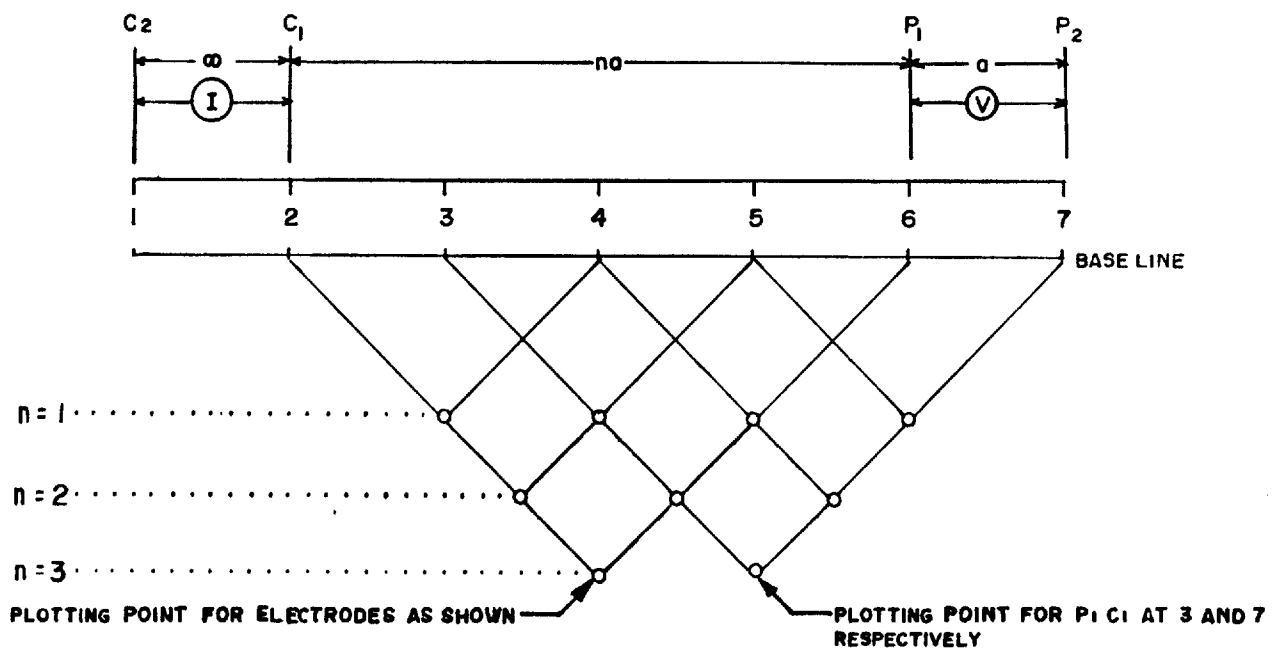
<u>Maps:</u>	1	Apparent Resistivity:	n=4
	2	Frequency Effect	: n=4
	3	Apparent Resistivity:	Fraser Filtered
	4	Frequency Effect	: Fraser Filtered

Pseudosections

P-1	Pseudosection Line	8+00N
P-2	Pseudosection Line	7+00N
P-3	Pseudosection Line	6+00N
P-4	Pseudosection Line	5+00N
P-5	Pseudosection Line	3+00N
P-6	Pseudosection Line	2+00N
P-7	Pseudosection Line	1+00N
P-8	Pseudosection Line	0+00 (east)
P-9	Pseudosection Line	0+00 (west)
P-10	Pseudosection Line	1+00S (east)
P-11	Pseudosection Line	1+00S (west)
P-12	Pseudosection Line	2+00S (east)
P-13	Pseudosection Line	2+00S (west)
P-14	Pseudosection Line	3+00S (east)
P-15	Pseudosection Line	3+00S (west)
P-16	Pseudosection Line	4+00S (east)
P-17	Pseudosection Line	4+00S (west)
P-18	Pseudosection Line	5+00S
P-19	Pseudosection Line	6+00S
P-20	Pseudosection Line	7+00S (east)
P-21	Pseudosection Line	7+00S (west)
P-22	Pseudosection Line	8+00S
P-23	Pseudosection Line	9+00S
P-24	Pseudosection Line	10+00S
P-25	Pseudosection Line	11+00S
P-26	Pseudosection Line	12+00S
P-27	Pseudosection Line	13+00S
P-28	Pseudosection Line	14+00S
P-29	Pseudosection Line	15+00S
P-30	Pseudosection Line	16+00S



DIPOLE DIPOLE ARRAY

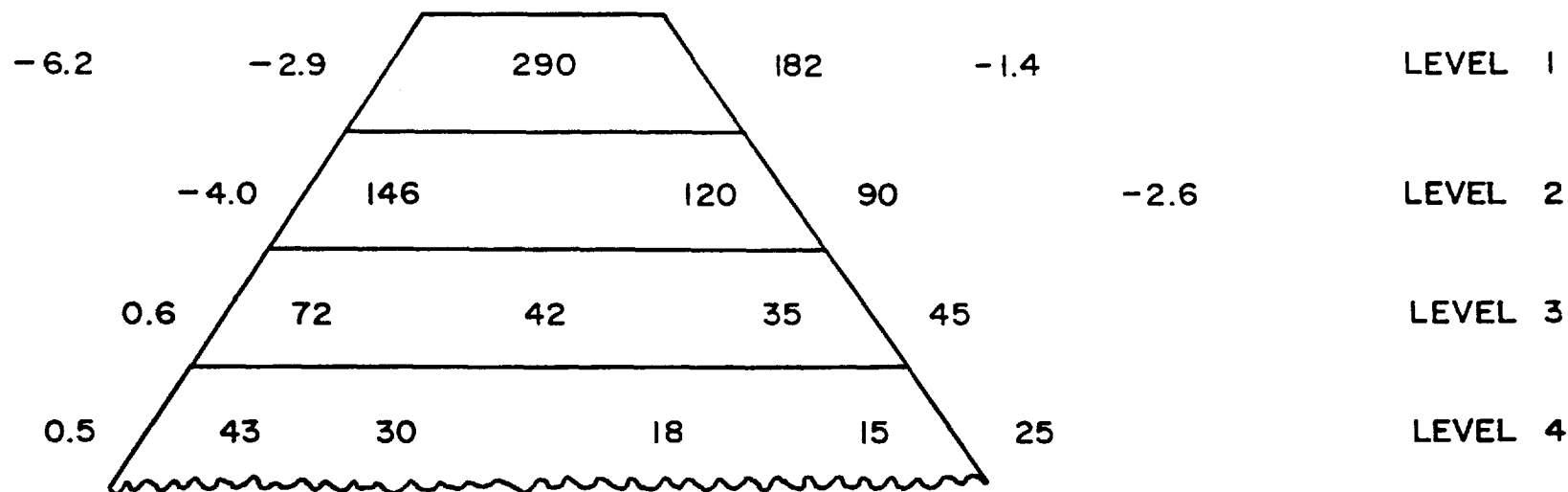


POLE DIPOLE ARRAY

Figure 4
PLOTING POINTS FOR VARIOUS ARRAYS

PSEUDO-SECTION INPUT

a)



125 — FINAL OUTPUT

OUTPUT

(b)

290	LEVEL 1
133	LEVEL 2
52	LEVEL 3
27	LEVEL 4

INTERMEDIATE OUTPUT

Figure 5: The Fraser Filtering Method
The sliding window operator is shown superimposed on the pseudo-section input. The intermediate outputs are the average values for each level, and the final output is the average value of the intermediate outputs. The window is then moved one station, and the process is repeated.

8.0 RESULTS AND INTERPRETATION

8.1 Introduction

The section is divided into five subsections. First a number of points are discussed about the effects of conductive lake bottom sediments or overburden on the resistivity and polarization pseudosections. Next, the labelling classification of all polarizable anomalies, a broad overview of the interpreted structure of the survey areas and the location of significant anomalous zones is presented. A discussion of the total field magnetic survey is followed by a detailed line by line interpretation of the Induced Polarization results. An overall interpretation concludes this section.

8.2 General Notes on the Effect of Conductive Overburden

As the majority of the survey was carried out in a conductive overburden environment (Lac Scott), a number of points should be raised about the effects of the lake bottom sediments on the results to avoid undue repetition and confusion in the following sections.

- i) A surficial layer of conductive lake bottom sediments or conductive overburden will appear in the apparent resistivity pseudosection as a layering effect over two or more dipole separations depending on the lateral extent of the medium.

In this survey, the effect initially appears in the first dipole separation ($n=1$) data as low apparent resistivity values of between 100 ohm m and 400 ohm m. The conductive medium is then characterized by a gradual increase in resistivity with increasing dipole separation.

The explanation for this phenomenon is that the majority of the current seeks to remain within the surface layer rather than be channeled through into the more resistive bedrock. The result is that penetration, in other words, depth of exploration, is increasingly reduced for thicker conductive surficial mediums.

As the effect is normally relatively uniform along the length of the surficial unit, a layering effect becomes evident in the data.

- ii) If there is a sharp increase in the apparent resistivity values at the larger separations such as $n=3$, $n=4$ and $n=5$ then bedrock responses are being recorded and penetration through the conductive surficial layer is achieved.
- iii) The layer of lake sediments or conductive overburden will probably mask, through dilution, the Induced Polarization effects to some degree. Typically, this leads to a narrower, weaker response than would be expected from the body's actual characteristics. Also, the thicker the surficial layer, the smaller the measured percentage of the intrinsic frequency effect of the bedrock. This leads to the possibility of no identifiable response from narrow zones of low sulphide content.

8.3 General Induced Polarization Interpretation

8.3.1 Labelling Classification of polarizable zones

The Induced Polarization survey outlined a total of 37 polarizable zones, 24 in the western grid, 12 in the north-eastern grid and one on the test line, line 7+00S (east). All have been interpreted from the

pseudosections where they are identified and labelled (pseudosections P1 to P30). They are also transcribed onto both the n=4 and Fraser Filtered plan maps (Maps 2 and 4).

The polarizable zones vary in importance and have been divided into two broad groups with strike extent being the primary factor. Fifteen (15) of the zones have been traced over two or more survey lines and have been labelled A through O. The remaining 22 zones are one-line anomalies and have been labelled 1 through 22.

Anomalies A, B, D, E and 1 through 8 are located on the northeastern grid. Anomaly 17 occurs on the test line, line 7+00S. The remainder are situated in the western grid.

A number of polarizable zones have been identified but not completely surveyed, mainly due to the proximity of the property boundary. All have been identified, but not labelled, on the pseudosections (P1 to P30) and plan maps (Maps 2 and 4).

8.3.2 Background Values in the Frequency Effect Data

The background response, as measured in the frequency effect sections, is seen to vary from an average amplitude of 0.5 when surveying over the lake to an average amplitude of 1.0 when those parts of the property that are on land are covered. The difference in amplitude can be mainly explained as a larger percentage of measured intrinsic bedrock frequency effect when surveying on land as opposed to the lake (Section 8.2 (iii)). The surficial medium in the lake

is seen from the pseudosections to be more conductive than that on the land.

Throughout the remainder of the report, unless the polarizable response is contained within a variable background, all anomalous frequency effect amplitudes are referred to as being so much over background.

8.3.3 West Grid

The apparent resistivity survey outlined a number of resistivity high/low bands trending northeast with apparent resistivities ranging from 300 ohm m to 15,000 ohm m. The bands are interpreted to have widths ranging from approximately 200 meters to more than 500 meters. A number (6) of east-west striking structural features (i.e. contacts/dislocations/faults) have been interpreted from the resistivity data. All of these features have been outlined on the pseudosections (P9 to P30) and the plan maps (Maps 1 through 4) and are discussed as follows.

A high resistivity band is located in the centre of Lac Scott as covered by the grid and has been outlined from station 13+00W on line 0+00 to station 26+00W on line 16+00S. Apparent resistivity values range from 2,000 ohm m to 15,000 ohm m. The unit is coincident with the large island, centered at station 23+00W on line 10+00S, over which the highest apparent resistivities of 15,000 ohm m were observed (Map 1). A dislocation in the band between lines 6+00S and 7+00S is interpreted to reflect a major east-west trending fault/shear zone which extends the length of the grid. The northern unit of the band is displaced approximately 150 meters east, relative to the south unit.

The resistivity high is flanked on either side by low resistivity bands. Both units are displaced by the inferred east-west fault between lines 6+00S and 7+00S in a manner similar to the high resistivity unit.

The low resistivity unit to the east has not been fully surveyed due to the limited grid extent, but is interpreted as being located between station 13+00W on line 6+00S and station 20+00W on line 16+00S. Apparent resistivity values range from 400 ohm m to 800 ohm m (Map 3).

The low resistivity unit to the west extends from station 18+00W on line 0+00 to station 29+00W on line 13+00S. Apparent resistivity values range from 300 ohm m to 700 ohm m (Map 3).

This central system is in turn flanked by higher resistivity regions with apparent resistivities of approximately 3,000 ohm m.

Five east-west faults/dislocations of limited strike extent across the boundaries between resistivity bands are interpreted on the grid from the frequency effect and apparent resistivity plan maps (Maps 3 and 4).

The width and continuity of the central system is interpreted as representing a major en echelon fault system trending northeast (i.e. the Lac Scott Fault) through the underlying "Granitic Assembly" rocks. Very distinct, near-vertical contacts between the high resistivity and flanking low resistivity units are interpreted in the majority of the pseudosections

south of line 6+00S (pseudosection P21 to P30). These sharp contacts and the location of the islands within the central resistivity high indicate a different lithologic unit has been intruded within the fault system. The apparent resistivity results are not as clear north of line 6+00S as the area of interest is overlain by conductive lake bottom sediments which effectively mask the bedrock response (Section 8.2).

The majority of the polarizable zones are parallel to and on the flanks of the interpreted contacts separating the various resistivity bands. Eight anomalous zones are considered significant.

At the present time, anomaly 'C' is considered the most significant on this grid. The anomaly has been traced for nearly 600 meters from station 19+25W on line 11+00S to station 22+75W on line 15+00S.

Observed frequency effect amplitudes range from 1.5 to 3 times background. The zone is situated in the eastern low resistivity unit and is associated with the contact between the central resistivity high and the low resistivity unit.

Other significant polarizable zones, anomalies 'H', 'I', 'J', 'L', 'M', 'N' and '11', fall into two distinct groups. The maximum interpreted strike extent is approximately 200 meters. Anomalous trends are north to north-northeast.

Anomalies 'L', 'M' and 'N' are located within the central high resistivity unit. Frequency effect amplitudes of up to 3 times the background are

observed. Anomalies 'L' and 'M', at 19+75W on line 9+00S and 27+25W on line 14+00S respectively are associated with contacts separating two resistivity units. Anomaly 'N' at 16+50W on line 5+00S is associated with a fracture/shear zone within the high resistivity unit.

Anomalies 'H', 'I', 'J' and '11' are located in the outlying higher resistivity region in the northwestern corner of the grid. Anomalies 'H' and 'J' at 28+75W on line 5+00S and 28+75W on line 8+00S respectively, are associated with contacts and/or discrete narrow higher resistivity units within the region. Frequency effect amplitudes of up to 3 times background are present. Anomaly 'I' is associated with a contact/fault between the western low resistivity band and the outlying more resistive region. It is located at 25+25W on line 5+00S within the higher resistivity unit. Frequency effect amplitudes of up to 3 times background are recorded. Anomaly '11' is located in the extreme northwest corner of the grid at 28+75W on line 0+00. Due to the proximity of the property boundary, it was not completely surveyed, but frequency effect amplitudes of up to 2.5 times background and a well defined response are considered significant.

8.3.4 Northeast Grid

Due to the small size of the grid (800 meters by 800 meters), only a limited interpretation can be made from the apparent resistivity survey.

The previous sequence of northeast trending high/low resistivity units is not evident on this grid. The

relative location of the two grids places the northeast grid on the eastern flank of the interpreted Lac Scott Fault when the latter is extended to the northeast.

Two structural features are interpreted from the resistivity and frequency effect plan maps (Maps 1 to 4).

An east-west striking contact/fault is interpreted between lines 7+00N and 6+00N. The feature separates a high resistivity region of approximate apparent resistivity 15,000 ohm m to the north and a region of apparent resistivity 2,000 ohm m to the south.

The second contact/fault is interpreted from information from both the resistivity and frequency effect data. A contact/fault is inferred trending slightly north of west between lines 1+00N and 1+00S. It is interpreted to intersect line 0+00 in the region of station 6+00W. North of the feature, polarizable zones 'A' and 'B' display approximately 50 meters displacement to the east.

Three polarizable zones are considered significant: anomalies 'A', 'B' and '7'.

The most significant zone recorded in 1984 in view of the proposed geological model is anomaly 'A', located at station 3+25W on line 1+00N. The zone has been traced due south over 500 meters to line 4+00S and is open to the south. Anomaly 'A' displays classic "pant-leg" polarization responses which vary in amplitude from 4 to 16 times background.

Anomaly 'B' at 1+75W on line 0+00 is parallel to anomaly 'A' but is of limited strike extent of between 200 m and 300 m. Frequency effect amplitudes are up to 4 times background.

Anomaly '7' is a one line anomaly at 5+50W on line 1+00N. Frequency effect amplitudes up to 6 times background are noted.

8.4 Magnetic Interpretation

The total field magnetics plan map used for this interpretation was supplied by Corporation Falconbridge Copper, Chapais, and is retained in their files.

The property is, for the most part, underlain by early to middle Precambrian intrusive "Granitic Assemblage" rocks of the Chibougamau Pluton. A general gradational change, south to north, from mafic to more acidic, granitic rocks has been identified within the pluton (Feuerbach, 1972). The pluton is bound to the north and northeast by anorthositic rocks of the Lac Doré Complex.

Inspection of provincial government maps indicates that the property is located at the northern extremity of the Chibougamau pluton on Lac Scott.

The Lac Scott Fault bisects the pluton and continues through the metavolcanic rocks to the north (Feuerbach, 1972). The resistivity survey outlined this feature between 26+00W on line 16+00S and 13+00W on line 0+00 on the property (Section 8.3.3).

The total field magnetic survey of the entire property shows a generally quiet background of about 550 nT. A northeast

trending regional gradient is evident in the data as background values increase from an average value of 450 nT in the southwest to values of 600 nT to 700 nT in the northeast.

It should be noted that the Lac Scott Fault has no magnetic signature. This fact, together with the quiet, level background response observed over most of the survey area indicates that a uniform rock type underlies the majority of the property.

The local fluctuations within the background values over the property are on the order of 100 nT and are interpreted as responses from different phases of the "Granitic Assemblage" rocks. None of the magnetic responses are coincident with polarizable responses as interpreted from the pseudosections (Section 8.5).

Four zones of significant magnetic relief and similar width are identified on the property. All are of a distinctive podiform nature indicating variable magnetic mineral content and/or discrete lithologic bodies such as metavolcanic/metasedimentary units of the enclosing early Precambrian rocks. These zones have total field magnetic response amplitudes ranging from 1,300 nT to 1,800 nT. Depths to all zones are estimated at 40 to 50 m.

Two directional trends are noted: east-west and northwest-southeast.

The single east-west trending zone is located between lines 4+00S and 6+00S from stations 11+50W to 18+50W. It is a near vertical zone with a strike length of 700 m and is interpreted as the response from an inclusion of metavolcanic/

metasedimentary pendant within the granodiorite-monzonite pluton which is assumed to underlie the majority of the survey area.

Two zones with a northwest-southeast trend occur 2,500 m apart on the property.

The first, from station 23+00W on line 11+00S to 20+00W on line 16+00S, is interpreted as a combination of responses. The major contribution to the zone, a rectangular prismatic body, dipping steeply to the southwest at a depth of 60 m, is centered at the land/lake boundary of the island at station 21+00W on line 11+00S. The continuing response to the southeast, indicates a narrow, vertically dipping unit extending from the prism. Polarizable anomaly 'C' (Section 8.3.3) transects this unit. Another narrower, 10 m to 20 m wide, vertically dipping zone strikes southwards from the western extent prismatic body at station 24+00W on line 13+00S.

The second zone transects the survey area from station 4+00W on line 8+00N to station 10+50E on line 9+00S. This zone displays a variable character and signature which may be ascribed to a number of features. An east-west fault across this zone is inferred at line 2+50S.

A relatively sharp rise in the background is seen in the vicinity and to the east of the zone compared to the observed gradient over the rest of the property. This suggests that a rock unit of higher magnetic mineral content underlies the north-eastern corner of the survey area. Determination of whether this unit belongs to the Lac Doré complex or represents a more magnetic phase of the granitoid rocks requires some geological input.

The fourth zone of high magnetic relief, located on Lac Simon, is only partially surveyed and extends from line 14+00S to line 16+00S east of the baseline. Depth to the zone is estimated to be approximately 50 m. No further conclusions can be drawn due to the limited survey area.

8.5 Pseudosection Interpretations

Line 8+00N

Two anomalous frequency effect zones are recorded on line 8+00N and are labelled '1' and 'D' (P1). Neither has been completely surveyed due to the extent of the grid and the proximity of the property boundary respectively.

Four contacts/faults are outlined in the apparent resistivity pseudosection, three of them separating four distinct lithologic units. A low resistivity unit of apparent resistivity 6,000 ohm m is located between contacts at 5+75W and 7+00W. It is flanked east and west by higher apparent resistivity units of 15,000 ohm m.

The eastern high resistivity unit contains a low resistivity zone, interpreted to be a fault/shear zone, at 2+75W. The unit is coincident with a magnetic high interpreted from the total field magnetic data.

A contact/fault at 1+00W delineates this high resistivity unit from a unit of lower apparent resistivity of 3,000 ohm m which displays negligible magnetic response above background.

The more distinct of the polarizable anomalies, anomaly '1' is located at 6+75W and is beneath Lac Scott. Frequency effect amplitudes of up to 0.8 above background are observed. Only the eastern response of the anomaly is fully outlined,

but the shape of the anomaly indicates a narrow body at a depth of 10 to 20 m. The definitive "pant-leg" response outlined, albeit only at its eastern extent, suggests a near vertical dip. The increase in frequency effect values with larger 'n' separations show that the polarizable properties of the body continue to depth. The zone is situated on the eastern flank of the contact/fault at 7+00W.

A low magnitude polarizable zone located at 0+75W, anomaly 'D', was only partially surveyed and is much less distinct than anomaly '1' located at 0+75W. Frequency effect amplitudes are up to 0.4 above background. It is interpreted as a narrow zone on the eastern flank of the inferred contact/fault at 1+00W.

Frequency effect values of 1.8 at 3+50W for separations of $n=4$ and $n=5$ are interpreted as being due solely to a sympathetic response to the increased bedrock resistivity values.

Line 7+00N

The results gathered on this line are highly complex. Three frequency effect anomalies which mutually interfere are identified and labelled '2', '3' and 'D' (P2).

Three lithologic units are observed in the apparent resistivity pseudosection. A higher resistivity unit of apparent resistivity 10,000 ohm m is contained within contacts/faults at 1+00W and 4+25W. Two fault/shear zones at 5+75W and 6+75W are interpreted in the zone of lower apparent resistivity of 4,000 ohm m to the west.

Anomaly '2' at 4+75W has frequency effect amplitudes up to 1.0 above background. The zone is near surface and extends

to depth. No further interpretation can be made due to distortion of the polarization response from that of anomaly '3'.

Anomaly '3' is interpreted as being either a broad anomalous zone from 3+50W to 3+00W or two separate, narrow responses which cannot be resolved with the dipole separation used. The frequency effect amplitudes are generally 0.5 to 1.0 above background. The amplitudes at the larger dipole separations ($n=3, 4, 5$) are possibly a reflection of mutual interference with a polarizable anomaly at 0+75W and/or the increased background effect of a high intrinsic resistivity unit. The zone is near surface. No further interpretation can be made.

Anomaly 'D' at 0+75W is not fully defined by the survey due to the limited extent of the grid. The zone is more distinct than the observed response on line 8+00N (P1) with frequency effect amplitudes approximately 0.5 above background. At dipole separations of $n=4$ and $n=5$, the observed anomalous response is enhanced due to coupling with anomaly '3'. Zone 'D' is a near surface body situated in a low resistivity unit and is associated with a contact/fault at 1+00W as on line 8+00N (P1).

Line 6+00N

Two polarizable responses are outlined on line 6+00N and are designated 'E' and '4' (P3).

The apparent resistivity section observed from line 6+00N is of a completely different nature to that viewed on line 7+00N (P2). A background apparent resistivity of 3,000 ohm m is observed over the line.

The zone of low resistivity on the first and second separations centered at about 5+50W probably reflects an increase in thickness of conductive sediments at the bottom of Lac Scott with the rapid increase of $n=3$ and $n=4$ data reflecting the penetration of current into bedrock and the influence of a larger bedrock response.

The most significant resistivity feature in the section appears to be reflecting a bedrock ridge between 4+00W and 3+50W. The asymmetry of the bedrock ridge response is due to the decreased thickness of sediments at 3+00W as the line approaches within 15 m of the land.

The line appears to have been surveyed along a homogeneous rock unit separated from the lithologic units to the north by an east-west trending fault/shear zone between lines 7+00N and 6+00N as interpreted from the plan maps (Maps 1 and 3).

Anomaly 'E' is located at 4+00W and has polarization amplitudes up to 0.5 above background. The response is interpreted as due to a narrow, near-vertical zone at a depth of less than 25 m below surface.

Anomaly '4' at 2+50W has an anomalous response of 0.7 over background. The zone is interpreted as a narrow, near-vertical body at up to 25 m below surface.

The possibility of a third anomalous zone arises at the western extremity of the line with anomalous frequency effect amplitudes of about 0.3 above background. The increased amplitudes may be a reflection of the larger measured percentage of intrinsic polarization as the survey progresses onto the land from the lake (see Section 8.2). The zone was

not completely surveyed due to the proximity of the property boundary.

Line 5+00N

One frequency effect response, denoted 'E', was recorded on line 5+00N (P4).

The apparent resistivity response observed on line 5+00N is similar to that on line 6+00N (P3). The bedrock ridge is located between 3+25W and 3+75W. The more symmetrical response on this line is interpreted as due to a uniform depth to the lake bottom and thickness of overlying sediments.

Anomaly 'E' is located at 4+00W and displays a frequency effect amplitude of 0.2 above background. The anomalous frequency response is enhanced at $n=5$ at 3+25W by high frequency amplitudes reflecting increased bedrock response. The inherent 10 percent error in reading the frequency effect amplitudes makes the interpreted extension of anomaly 'E' from line 6+00N tentative (P3).

Line 4+00N

Line 4+00N was not surveyed.

Line 3+00N

One anomaly is recorded on line 3+00N. Due to the proximity of the property boundary, anomaly '5' was not completely surveyed (P5).

At the eastern extent of the survey line, the apparent resistivity section is dominated at 2+25W by a well defined high apparent resistivity response of 6,000 ohm m to 10,000 ohm m. The causative source is interpreted as a near surface

dyke-like feature up to 50 m wide. Attitude of the unit is difficult to determine as the eastern "pant-leg" of the response was not completely defined.

The resistivity pattern to the west is indicative of a bedrock ridge between 5+25W and 5+75W.

Anomaly '5' at 6+50W displays a low frequency effect amplitude of 0.2 above background. The zone is not completely surveyed due to the proximity of the property boundary. Due to the indistinct nature of the response, the parameters of the source cannot be determined.

Line 2+00N

Two anomalous zones are indicated on line 2+00N. One zone is labelled '6' (P6).

Interpretation of the apparent resistivity response indicates a high resistivity feature at 0+75W possibly rock outcropping on the lake bottom.

A bedrock resistivity low of apparent resistivity 2,000 ohm m is located between 6+00W and 5+00W.

Anomaly '6' is located at 5+50W. The anomaly displays frequency effects of 0.5 above background. These are prominent at separations $n=4$ and $n=5$ indicating that the bulk of the anomalous response is at depth.

The edge of a second anomalous zone was detected at 7+50W but not investigated further due to the proximity of the property boundary. Frequency effect amplitudes of up to 2.2 above background were recorded close to surface. This fact and the negative frequency effect values at $n=1$ and $n=2$ on the

eastern flank of the anomaly strongly suggest a well defined anomalous response such as anomaly 'A' on line 1+00S (east) (P10).

Line 1+00N

Three frequency effect anomalies labelled '7', 'A' and 'B' are evident on line 1+00N (P7).

The apparent resistivity section displays three mutually interfering resistivity highs located at 5+25W, 3+25W and 1+25W in a fairly homogeneous background resistivity of 2,000 to 3,000 ohm m. A number of contact/fault zones located at 2+75W and 6+50W are interpreted.

Anomaly '7', centered at 5+50W, is outlined by a classic "pant-leg" anomaly with polarization amplitudes up to 5.8 above background. It is interpreted as a less than 50 m wide, shallow, east dipping body with limited depth extent.

Anomaly 'A' is located at 3+50W. Frequency effect amplitudes of up to 0.7 above background are observed. The polarization amplitude of 6.3 recorded at n=5 at 3+75W within anomaly '6' is interpreted to reflect anomaly 'A' at depth. Zone 'A' is estimated to be up to 50 m below surface.

Anomaly 'B' is tentatively located at 1+75W at the eastern extent of line 1+00N. The anomaly is described as a 1.6 frequency effect zone in a background ranging from 0.5 to 0.9. The zone was not completely mapped due to the extent of the grid.

Line 0+00 (east)

Three polarizable anomalies, designated 'A', 'B' and '8', were detected on line 0+00 (east) (P8).

8+00W and 12+25W. The relatively homogeneous background The apparent resistivity section is greatly simplified in comparison to line 1+00N (P7). Five contacts/faults have been interpreted and are located at 0+25W, 3+00W, 6+25W, apparent resistivity of 2,000 ohm m is disrupted by two features. A high resistivity, near surface dyke-like unit of apparent resistivity 7,500 ohm m to 10,000 ohm m is located between 1+50W and 1+00W. A low resistivity unit of 1,000 ohm m is constrained by the contacts/faults at 8+00W and 12+25W. The effect of thickening lake sediments is evident in the n=1 through n=3 apparent resistivity data between lines 12+50W and 8+00W (see Section 8.2).

Anomaly 'A' is located at 3+25W and is defined as a sharp response with frequency effect values of up to 5.8 in contrast to background values of 0.5 to the west and 1.0 to the east. The difference in background response is explained by the increased percentage of measured intrinsic bedrock frequency effect as the survey line progresses eastward from the lake onto the land.

Zone 'A' is interpreted as a narrow, shallow body with good depth extent. The dip of the body cannot be determined as only one "pant-leg" is fully defined due to mutual interference between the anomalous responses of 'A' and 'B'.

Anomaly 'A' is reported to be located in the vicinity of a grab rock sample which assayed up to 1,200 ppb Au/ton (verbal communication, Michel Drouin, Senior Exploration Geologist, Corporation Falconbridge Copper).

Frequency effect amplitudes of approximately 2.0 with dipole separations of n=4 and n=5 between 2+00W and 1+00W may indicate a second zone located at a depth of 25 m to 75 m at

station 1+75W. It is interpreted as an extension of anomaly 'B' from line 1+00N (P7).

Anomaly '8' is a broad zone with frequency effect of up 0.6 above background located at 7+75W. It is interpreted to be located at a depth of 25 m to 75 m beneath the lake bottom. Causative sources could either be a single 100 m wide zone or the combined response of two narrow zones at 8+00W and 7+00W. It is associated with the contact/fault at 8+00W.

A possible fourth anomalous zone is located at the extreme eastern extent of line 0+00 at 2+50E. Frequency effect values of up to 1.7 in contrast to a background of 1.0 are noted in the last diagonal dipole measurements. This response may be a reflection of increased bedrock response and further coverage of the zone is necessary prior to any definite interpretation.

Anomalously high frequency values of 1.8 at separations of $n=1$ through $n=3$ at 1+00E are considered to be a surficial response within the overburden.

Line 0+00 (west)

Three frequency effect anomalies, labelled '9', '10' and '11', are evident on line 0+00 (west) (P9).

The apparent resistivity section displays a number of features. A bedrock high, evident between stations 14+50W and 13+50W, represents the surveyed northern extent of the interpreted intrusive within the Lac Scott Fault system (see Section 8.3.3). The unit is flanked to the west by a low resistivity zone contained within contacts/faults at 15+25W and 20+25W. A higher resistivity region predominates

westwards. Two other contacts/faults are interpreted at 17+00W and 22+25W.

Anomaly '9' is indicated by a fairly indefinite response located at 16+75W. Frequency effects are 0.2 above background. The zone is associated with a contact/fault at 17+00W and occurs within a section of thickening lake sediments as reflected by the gradational shift to lower apparent resistivities from 22+00W and 15+00W towards 18+00W. It is therefore possibly that anomaly '9', rather than truly being a filtered measured percentage of an anomalous bedrock response, is merely due to the larger volume of sediments containing a greater amount of polarizable material than the surrounding area.

Anomaly '10' occurs at 26+00W within a similar "masking" situation, caused by a swamp extending from 27+50W to 25+00W. However, the persistence of the lower resistivity values to depth ($n=4$, $n=5$ data) at 26+50W precludes attributing all of the decrease in resistivity to the swamp. Frequency effect amplitudes of up to 0.7 above background are recorded. The indeterminate nature of the response, only the eastern "pant-leg" is defined, precludes any interpretation of the parameters of the body.

Anomaly '11' is a well defined zone located at 28+75W. It is described by frequency effect values of up to 2.8 in contrast to a background of 1.3. The response is of a similar nature to anomaly 'A' on line 4+00S (east) though it is better defined. It is interpreted as a narrow, less than 25 m wide, body situated at a depth of up to 25 m. The symmetry of the response and the continuity of the frequency effect values with increasing 'n' factor indicate a vertical body and good depth extent respectively.

Anomalous frequency effect amplitudes at dipole separation of $n=1$ and $n=2$ between 28+00W and 26+50W are attributed to a surficial response within the overburden.

Line 1+00S (east)

Two zones of interest are recorded on line 1+00S (east) and are labelled 'A' and 'B' (P10). Line 1+00S (east) was extended from the 1983 grid (see Section 4.4).

The apparent resistivity section observed on line 1+00S (east) is similar to that seen on line 0+00 (east) (P8). Two contacts/faults are interpreted at 4+00W and 0+25E. Conductive lake sediment effects are increasingly evident in the western half of the survey line.

A displacement in the strike of contacts/faults and polarization zones on the plan maps (Maps 1 through 4) lead to the interpretation of a fault/shear zone, trending slightly north of west between lines 1+00N and 1+00S (east).

Anomaly 'A', located at 3+75W displays a much stronger response than on the previous line with frequency effect amplitudes up to 9.8 in contrast to a background of 0.6. The zone is interpreted as a narrow, up to 25 m wide, body dipping steeply to the west at a depth of less than 25 m below the lake bottom. The increasing frequency effect values with the larger separation 'n' factor indicate continuation of the body to depth. The zone is associated with a low resistivity zone, indicative of a contact/fault at 4+00W.

The eastern diagonal defining anomaly 'A' displays a wider signature in the $n=4$ and $n=5$ data similar to that observed

on line 0+00 (east) (P8). As per line 0+00 (east), this signature is interpreted to reflect a second anomalous zone 'B' located at depth at station 2+25W.

Line 1+00S (west)

Two anomalous zones labelled '12' and '13' are recorded on line 1+00S (west) (P11).

The resistivity section is comprised of three main lithologic units.

The gradual increase in resistivity values in the pseudosection with increasing dipole separation demonstrates the effect of thickening sediments between 22+00W and 16+00W. However, the persistence of the lower resistivity values to depth (n=4, n=5 data) indicates a portion of the response is due to a low resistivity bedrock unit between 17+50W and 18+50W. The whole lower resistivity zone is contained by contacts/faults at 16+00W and 21+50W.

Higher apparent resistivity zones flank this low resistivity bedrock unit both to the east and west. Eastwards, the resistivity pattern indicates a gentle bedrock high located at 14+00W. In sharp contrast at 23+75W, a narrow high resistivity feature is located at surface, coincident with a peninsular land mass. The unit has an apparent resistivity of 5,000 ohm m in contrast to a background of 2,000 ohm m. It is interpreted as a feature wholly created by the higher impedance between the electrodes of the dipoles located on the peninsula.

A narrow, low resistivity zone indicative of a contact/fault is located at 28+75W.

Anomaly '12' is a broad polarizable zone located between 27+25W and 26+00W with frequency effect values up to 2.2 in contrast to a background of 1.3. It is probable that there are two zones contributing to the anomalous response in which case the eastern zone could be interpreted as a continuation of anomaly '9' on line 0+00 (west) (P9) and anomaly 'G' on line 2+00S (P13). Both zones have good depth extent and are near surface. No further interpretation is attempted.

Anomaly '13', located at 18+50W, is observed as a low amplitude frequency effect high approximately 0.3 above background. There is no clear definition to the zone. It is interpreted to be between 25 m and 50 m below surface. The zone is associated with the low resistivity feature. No further interpretation is made.

Line 2+00S (east)

The results of the survey on line 2+00S (east) are almost identical to the results obtained from line 1+00S (east). Line 2+00S (east) is extended from the 1983 grid (see Section 4.4).

The anomalous zones are labelled 'A' and 'B' (P12).

The apparent resistivity section on line 2+00S (east) displays a similar character to that on line 1+00S (east) (P10). Three contacts/faults are indicated at 3+75W, 0+25W and 1+75E.

Anomaly 'A', located at 3+50W, is not as strong a response as on line 1+00S (east) (P10) but still displays a well defined anomalous response with frequency effect amplitudes up to 2.0

above a background of 0.6. The decreased polarizability indicates a lower sulphide content. This zone is interpreted as a narrow, up to 25 m wide, body which occurs near the lake bottom. The anomaly is interpreted as a near vertical zone with a steep westerly dip. The continuity of the frequency effect amplitudes with increasing separation 'n' factor indicates the zone has good depth extent. Zone 'A' is associated with a contact/fault at 3+75W.

Anomaly 'B', situated at 1+50W, displays frequency effect amplitudes up to 0.4 above background. The signature of the eastern diagonal defining anomaly 'A' does not display a greater width in the n=4 and n=5 data as it did on line 1+00S (east (P10)). Also, the polarization response can now be ascribed to a reflection of increased bedrock response. Anomaly 'B' is therefore only tentatively extended from line 1+00S (east).

An anomalous zone located at approximately 7+50W is indicated by the texture of the frequency effect response. Because of a lack of response definition, and as the zone was not completely surveyed, no further interpretation can be made.

The increase in the background polarization response east of 1+50W is due to the larger measured percentage of bedrock response as discussed in Section 8.3.2.

Line 2+00S (west)

Two anomalous frequency effect zones, designated 'F' and 'G', are recorded on line 2+00S (west) (P13).

The resistivity section displays three distinct lithologic units. A low apparent resistivity zone of 400 ohm m is con-

tained by contacts/faults at 22+75W and 16+50W. The central feature is a classic response obtained from a valley in the bedrock which has been filled with a lower resistivity material such as the lake bottom sediments. The apparent resistivity values at a separation factor of $n=5$, however, are approximately 800 ohm m which are very much less than the bedrock response of 2,000 to 3,000 ohm m on the remainder of line 2+00S (west). This indicates that a lithologic unit less resistive than the surrounding bedrock is contained within the valley. Higher apparent resistivity units of 2,000 to 3,000 ohm m flank this low resistivity feature to the east and west.

Two contacts/faults are interpreted at 28+50W and 13+00W.

Anomaly 'F' is located at 28+50W. The frequency effect amplitudes of 0.3 above background are first seen at a separation factor of $n=5$ so that no inferences can be drawn about the attitude or depth extent of the body. Depth to the zone is greater than 100 m. Anomaly 'F' is associated with the contact/fault at 28+50W.

The main anomalous zone 'G' is centered at 26+25W with frequency effect amplitudes up to 0.8 above background. It is interpreted as being caused by a narrow, near-vertical body at a depth of 50 m to 100 m. There is no distinct resistivity variation coincident with this body.

Line 3+00S (east)

Only one anomaly, labelled 'A', was recorded on line 3+00S (east) (P14).

The apparent resistivity section mainly reflects the increasing masking effect of the deepening lake sediments as the survey line progresses westward over Lac Scott from the land/lake contact at 0+60W.

Anomaly 'A', located at 2+75W, displays a slightly stronger frequency effect response than that recorded on line 2+00S (east) (P12) with values of up to 3.8 in contrast to a background of 0.6. It is interpreted as a narrow, up to 25 m wide body, which occurs at the surface and has a near vertical attitude. The continuation of frequency effect values with increasing 'n' separation indicates good depth extent. The zone is not associated with any resistivity feature.

Line 3+00S (west)

Three polarizable zones, denoted 'F', 'G' and 'O', are indicated on line 3+00S (west) (P15).

The resistivity section outlines the same lithologic units of similar apparent resistivity magnitudes on line 3+00S (west) as on line 2+00S (east) (P13). The interpreted contacts/faults between units are all displaced to the west in accord with the northeast-southwest geological trend observed on the west grid (Lac Scott Fault system, Section 8.3.3). The locations of the contacts/faults are 23+00W, 17+50W and 13+25W.

Anomaly 'F' is situated at 29+00W and is not completely surveyed due to the proximity of the property boundary. The zone is only anomalous at separations of $n=3$ and greater, with polarization amplitudes up to 0.8 above background, indicating a depth to the polarizable source of 50 m within

the rock unit, assumed to be of the "Granitic Assemblage", underlying the majority of the survey area.

Anomaly 'G' is located at 26+00W close to the edge of Lac Scott with frequency effect amplitudes of up to 0.5 above background observed at the larger 'n' separations.

The zone is interpreted as a narrow zone occurring at a depth of 50 m to 100 m. The attitude of the zone cannot be determined due to the depth of occurrence. The anomaly is situated within the low resistivity unit.

Anomaly 'O' is centered at 13+75W on Lac Scott with frequency effect amplitudes of up to 1.1 in contrast to a background of 0.5. While the amplitudes do not directly reflect increased bedrock response at depth, the indeterminate character of the response precludes detailed interpretation. The zone is interpreted to be approximately 25 m below surface. It is associated with a resistivity low at 13+25W which is caused either by a discrete unit or a contact/fault.

Frequency effect amplitudes of up to 0.4 above background at dipole separations of $n=3$ and greater at station 16+00W are interpreted to reflect the increased bedrock response.

Line 4+00S (east)

Anomaly 'A' is the only polarizable zone indicated on line 4+00S (east) (P16).

The resistivity section on line 4+00S (east) is similar to that seen on line 3+00S (east) (P14).

Anomaly 'A' is located at 2+50W. Frequency effect amplitudes of up to 2.6, in contrast to a variable background response of 0.7 to the west and 1.0 to the east were observed.

The anomaly is interpreted to be caused by a 25 m wide body located at 2+50W. The zone is interpreted to occur at about 25 m below the bottom of the lake although the unknown depth and conductivity of the lake sediments lead this to be a somewhat approximate determination. The symmetry of the measured response indicates a vertical body and the consistency of the response with increasing separation indicates extension of the body to depth.

Slightly anomalous frequency effect values of up to 0.8 are observed in coincidence with a mild resistivity low at 6+00W. This is possibly the edge of a response from an anomalous zone located near 7+00W.

Line 4+00S (west)

Four polarizable zones, labelled 'H', 'I', 'N' and 'O', are indicated on line 4+00S (west) (P17).

The apparent resistivity section displays five distinct lithologic units. The high resistivity unit of apparent resistivity 2,000 ohm m, which was interpreted in Section 8.3.3 as a possible intrusive within the Lac Scott Fault system, is contained by contacts/faults at 18+00W and 14+00W. These features are displaced 50 m to 75 m west of their relative locations on line 3+00S (west) (P15).

Low resistivity units flank the high resistivity unit to the east and west. The western unit extends to 24+50W where a contact/fault separates it and a higher resistivity region.

This feature was also interpreted on line 3+00S (west) (P15) but shows a westward displacement of 150 m.

The fifth lithologic unit is located at 28+25W and is observed as a narrow, high resistivity unit of 5,000 to 7,500 ohm m compared to a background of 2,000 ohm m. The unit occurs on the land and is not completely surveyed due to the proximity of the property boundary.

Inspection of the plan maps (Maps 1 through 4) leads to an interpreted east-west trending fault/shear zone between lines 3+00S (west) and 4+00S (west) which extends from the western end of the grid to approximately 24+00W. A fourth contact/fault is identified at 26+25W.

Anomaly 'H', at 28+25W, displays polarization amplitudes up to 1.1 above background. The zone is not completely surveyed to the west due to the proximity of the property boundary. Anomaly 'H' is coincident with the narrow high resistivity unit. The frequency effect amplitudes of the eastern "pant-leg" of zone 'H' appear to be partially reflecting increased apparent resistivity values making it difficult to determine the attitude of the body. The zone is interpreted as a near surface, narrow body which extends to depth.

Anomaly 'I', located at 24+75W, is coincident with an island. The polarization amplitudes are approximately 0.7 above a variable background. Only the western "pant-leg" of the response has been defined as the anomaly is located on the western flank of the contact/fault at 24+50W. Zone 'I' is interpreted as being narrow, near surface and extending to depth. No dip estimated can be made.

Anomaly 'N' is an ill-defined anomalous zone located at 17+00W with frequency effect values of 0.8 compared to a background of 0.7. Depth to the zone is estimated at 25 m. No further interpretation can be made.

Anomaly 'O', at 13+75W, is a tentative extension of anomaly 'O' from line 3+00S (west) (P15) and displays frequency effect amplitudes up to 0.5 above background. The response here appears to be at least partly reflecting increased bedrock resistivity. The zone does not show any near surface response and is interpreted to be at a depth of 25 to 50 m. It is associated with a low resistivity zone which is interpreted to be a shear zone or a contact/fault at 14+00W.

The western pant-leg of a polarizable zone is observed at the eastern extent of the line at 12+50W. Frequency effect amplitudes up to 0.5 above background are recorded. The n=4 and n=5 data at 14+00W possibly reflects increased bedrock response. However, the extremely low amplitudes at separations of n=1 and n=2 at the same station on the flank of the anomaly are indicative of a bona fide polarizable response. Further surveying is necessary for any detailed interpretation to be made.

Line 5+00S

Four polarizable zones, labelled 'H', 'I', 'N' and '14', are outlined on line 5+00S (P18).

The resistivity response seen on line 5+00S is similar to that on line 4+00S (west) (P17). Contacts/faults are interpreted at 25+00W, 16+75W and 13+00W.

Anomaly 'H' extended from line 4+00W (west) at 28+75W displays anomalous polarization amplitudes to 0.7 above background. The zone is at surface and is interpreted as a narrow, subvertical zone with limited depth extent. The anomaly is not completely surveyed to the west such that interpretation of steep dip is only partially supported. The zone is associated, as on line 4+00S (west), with a narrow dyke-like feature located at 28+50W with an apparent resistivity signature of 3 to 5 times above background (1,500 ohm m). The resistive unit is situated near surface.

Anomaly 'I', located at 25+25W, appears as a low amplitude indeterminate response with frequency effect amplitudes up to 0.4 above a background of 0.7. It is associated with a contact/fault at 25+00W. N=4 and n=5 data of amplitudes up to 2.0 at station 27+00W are enhanced due to a reflection of increased bedrock resistivities and/or mutual interference between the anomalous responses of zones 'H' and 'I'.

Anomaly 'N' at 16+25W displays polarization amplitudes up to 0.6 above background. Due to the indeterminate nature of the response with only the western "pant-leg" outlined no parameters, apart from the zone being narrow, can be determined.

Anomaly '14' is situated at 13+25W. Frequency effect amplitudes of up to 0.5 above background are recorded. The response is first outlined in the n=4 data. The zone is interpreted as occurring at a depth of 25 m to 75 m below surface. No further interpretation can be made.

Line 6+00S

Three anomalous zones, designated 'H', 'I' and '15', are detected on line 6+00S (P19).

The resistivity section on line 6+00S displays a similar format to that on line 5+00S (P18). Three contacts/faults are interpreted at 12+00W, 15+25W and 20+75W. A vertical contact at 25+50W can be compared to a computer generated model in Figure 6. The contacts/faults delineate the alternate resistivity high/low zones observed across the Lac Scott Fault system.

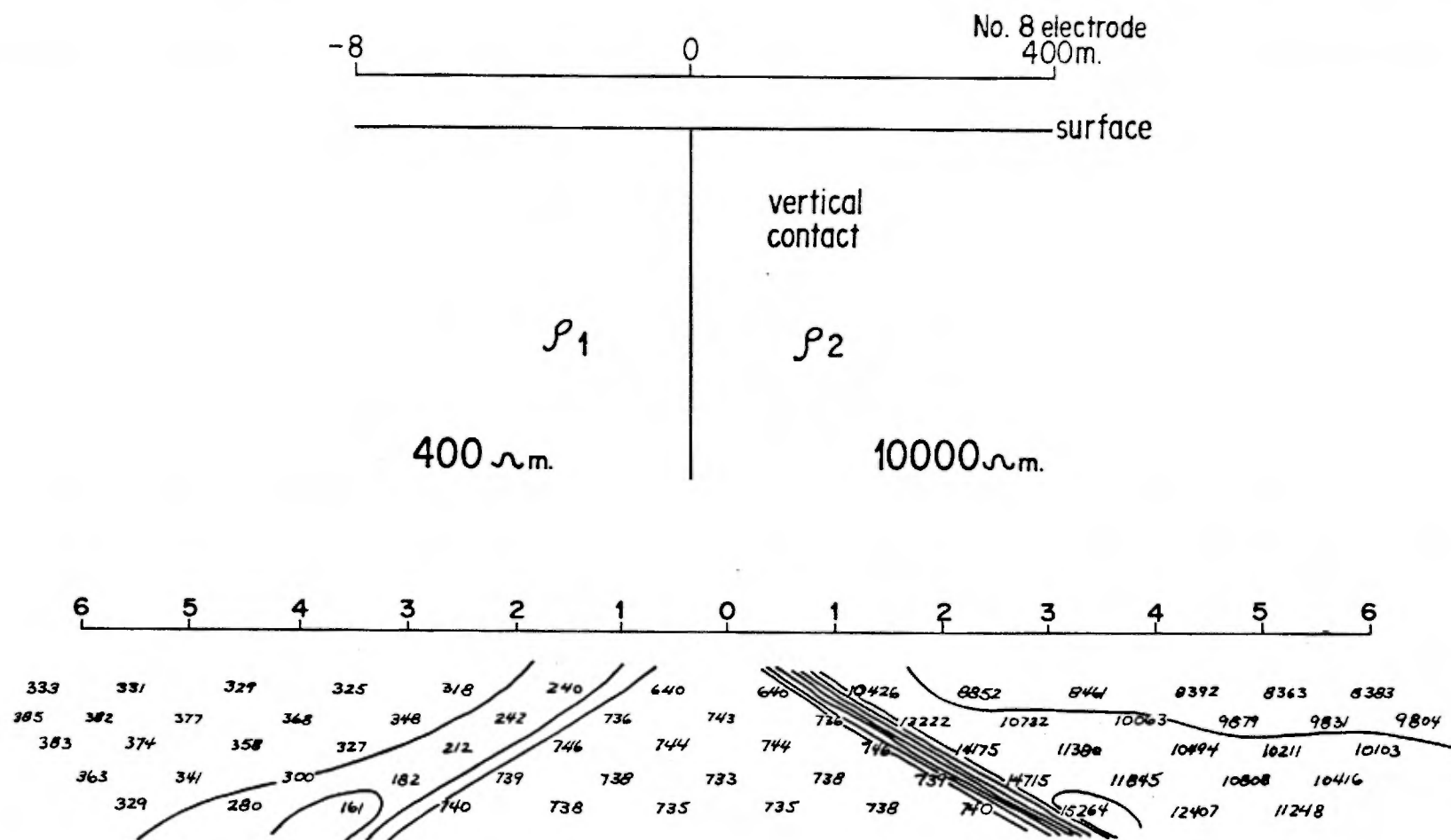
Anomaly 'H', located at 29+00W, is an extension of anomaly 'H' from line 5+00S (P18). The frequency effect amplitudes of up to 0.5 above background partially reflect increased apparent resistivity values. Interpretation, other than the zone is near surface, is not possible as the zone is only partially surveyed due to the proximity of the property boundary.

Anomaly 'I' at 25+50W, again extended from line 5+00S, displays polarization amplitudes of 0.8 above a variable background. The zone is interpreted as being near surface, narrow and extending to depth. It is associated with a contact/fault at 25+50W between 5,000 ohm m resistivity rocks to the west and a unit of lower resistivity to the east.

Anomaly '15' is a one line anomaly at 14+75W. The zone shows an indistinct response with frequency effect amplitudes up to 0.3 above background. No further interpretation is possible.

Line 7+00S (east)

This line was originally surveyed as a test line to tie in with the previous survey carried out in 1983.



The Computer Modelled Response of a Vertical Contact Between
Two Lithologic Units of Different Resistivity

**CORPORATION FALCONBRIDGE
COPPER EXPLORATION**
LAC SCOTT PROJECT

Project No: C-646	By: S. Bate
Scale: 1:625	Drawn: GCS Limited
Drawing No: Fig 6	Date: July, 1984



MPH Consulting Limited

The apparent resistivity section response is interpreted as a valley in the bedrock between 8+25W and 9+00W filled with conductive lake sediments (P20).

Anomaly '17' is at station 8+50W with frequency effect amplitudes up to 0.5 above background. The response is only observed at the larger dipole separations of $n=3$, 4 and 5. An interpreted depth to the source of 25 m to 50 m is deduced.

In comparing this line with the corresponding portion of line 7+00S surveyed in 1983, it was noted that while the apparent resistivity sections are similar, the frequency effect responses were markedly different. Two polarizable zones of almost identical frequency effect amplitude content are located at 7+50W and 8+50W respectively. Both can be interpreted as narrow, near surface bodies with good depth extent. However, as only a single "pant-leg" is recorded in each case, dips cannot be deduced. The response patterns cannot be interpreted as arising from a single anomalous zone at 8+00W.

The reader is referred to Appendix I for further data comparisons between the two surveys and possible explanations for any discrepancies.

Line 7+00S (west)

Two polarizable zones, labelled 'J' and '15', are indicated on line 7+00S (west) (P21).

Five lithologic units, delineated by contacts/faults at 24+50W, 23+00W, 16+00W and 12+50W, are identified in the resistivity section.

The pattern of alternate high/low resistivity zones is in accord with the resistivity interpretation from the plan maps (Maps 1 and 3). In addition, an east-west displacement of individual lithologic units is noted from the plan maps between lines 6+00S (P19) and line 7+00S (west) (P21). An east-west trending fault/shear zone has been inferred between these lines (Section 8.3.3).

Three other contacts/faults are indicated on line 7+00S (west) (P21) at 27+75W, 21+25W and 17+75W.

Anomaly 'J' is a single "pant-leg" response located at 28+00W displaying frequency effect amplitudes up to 2.1 in contrast to a background of 1.3. The zone is interpreted to be near surface, narrow, near vertical with substantial depth extent. It appears to be associated with a resistivity low at 27+75W interpreted as a contact/fault.

Anomaly '15', at 24+75W, displays a poorly formed anomalous response. The eastern "pant-leg" of the anomaly shows polarization amplitudes up to 1.0 in contrast to a background of 0.6. The less well-formed western "pant-leg" shows polarization amplitudes up to 1.6 with a background of 1.2. The enhanced response is a reflection of higher resistivity values. Anomaly '15' is associated with a contact/fault at 24+50W between different lithologic units, the western unit being of higher resistivity. Zone '15' is interpreted as a narrow, near vertical body which extends to depth. Depth to the body is approximately 25 m.

Line 8+00S

Four anomalies, labelled 'J', 'K', '18' and '19', are interpreted from line 8+00S (P22).

Six contacts/faults, located at 28+00W, 25+25W, 23+50W, 21+75W, 18+00W and 15+75W, are interpreted from the resistivity section.

The resistivity section observed on line 8+00S is of a similar nature to that seen on line 7+00S (west) (P21). The high resistivity feature at 23+00W of apparent resistivity 7,500 ohm m is coincident with the northern peninsula of the largest island in the west grid. The response is interpreted to be mainly reflecting the higher dipole impedance encountered at that location.

Anomaly 'J', extending from line 7+00S (west), is located at 28+75W. The zone has frequency effect amplitudes up to 1.6 in contrast to a background of 0.6. However, the poor definition and open-ended nature of the anomaly does not provide any definitive interpretation of anomaly parameters. The response of the zone defined in the $n=1$ data indicates a near-surface source. The anomaly appears to be associated with a contact/fault at 28+00W.

Anomaly 'K', at 23+25W, displays polarization amplitudes up to 1.0 above background. The frequency effect response appears to be reflecting the complex resistivity section to a certain degree and the $n=4$ and $n=5$ data at 22+00W is possibly enhanced due to coupling between zones 'K' and '18'. However, the general texture of the response and the extension of anomaly 'K' to line 9+00S (P23) leads to an interpretation of the zone as a near surface, narrow, vertical body. The anomaly is associated with a contact/fault at 23+50W.

Anomaly '18' is located at 20+75W. Frequency effect amplitudes of up to 1.2 above background are recorded. Mutual

interference between the anomalous responses of anomalies '18' and '19' has resulted in high response amplitudes in the n=4 and n=5 data at 19+00W. Due to the distortion in the response, anomaly '18' can only be interpreted as a narrow, near surface body.

Anomaly '19' is located at 17+75W and displays an indeterminate response with frequency effect amplitudes up to 1.2 above background. The source is interpreted as a narrow, near surface body.

Line 9+00S

Three polarizable zones, labelled 'J', 'K', and 'L', are indicated on line 9+00S (P23).

The resistivity section outlines four lithologic units. The high apparent resistivity unit of 2,000 ohm m at the western extent of line 9+00S is delineated from an adjoining lower resistivity zone by a contact/fault at 27+75W. This latter unit displays a width more than twice that seen on line 8+00S (P22).

The central high resistivity unit is associated with the island at 22+50W. The apparent resistivity values of up to 13,000 ohm m partially reflect the increased dipole impedance encountered on the island. A lower resistivity unit extends to the east.

Inspection of the plan maps (Maps 1 and 3) leads to the interpretation of an east-west fault/shear zone of limited extent between lines 8+00S and 9+00S and stations 28+00W and 25+00W.

A similar fault/shear zone of limited extent is inferred at station 18+00W from the plan maps (Maps 1 to 4) and the observed change in character in the eastern halves of lines 8+00S (P22) and 9+00S (P23).

Two other contacts/faults are interpreted at 24+00W and 21+50W.

Anomaly 'J', extended from line 3+00S (P22), located at 29+25W, is only partially surveyed due to the proximity of the property boundary. Frequency effect amplitudes up to 2.1 in contrast to a background of one are observed. No further interpretation can be made.

Anomaly 'K' is a continuation on strike from line 8+00S. The zone is located at 23+50W. Frequency effect values of up to 0.7 above background are recorded. It is interpreted as being 50 m wide, vertical and near surface with good depth extent. The zone may be associated with a vertical contact at 24+00W between a high resistivity unit to the east and a lower resistivity unit to the west (Figure 6 displays a computer modelled response to this interpretation).

Anomaly 'L', at 19+75W, is a well defined response first outlined at a dipole separation of $n=1$. Polarization amplitudes of up to 1.2 above background are observed. The zone is interpreted as a narrow, near surface, sub-vertical body which extends to depth.

Line 10+00S

Two anomalous zones, designated 'L' and '20', are interpreted on line 10+00S (P24).

The resistivity section observed on line 10+00S is similar to that on line 9+00S (cp P23).

The central high resistivity unit is coincident with the island and is bounded by near-vertical contacts/faults at 24+50W and 19+50W. A contact/fault is interpreted within the unit at 21+75W.

A contact/fault is observed at 27+50W between a high resistivity unit of 1,100 ohm m to the west and a lower resistivity unit of 400 ohm m to the east.

Anomaly 'L' at 20+00W is an extension of anomaly 'L' from line 9+00S (P23). Frequency effect amplitudes of up to 1.9 in contrast to a variable background of between 1.0 and 0.5 are observed. The anomalous response is poorly defined with the highest polarization amplitudes recorded at a dipole separation of $n=1$. The zone is interpreted as being up to 100 m wide and at surface and is associated with the contact/fault at 19+50W. No further interpretation can be made.

Anomaly '20', a one line anomaly at 25+50W, displays polarization amplitudes up to 0.6 above background. The anomalous response is first detected at larger 'n' separations ($n=4$ and $n=5$). The zone is interpreted as a narrow body at a depth of 50 to 100 m.

A possible polarizable zone at 29+50W at the western extent of the line is only partially surveyed due to the proximity of the property boundary. Frequency effect amplitudes of up to 0.5 above background are observed. No further interpretation can be made.

The anomalous values at 22+50W are interpreted as a sympathetic background increase which reflects the higher bedrock resistivities measured.

Line 11+00S

One anomalous zone, labelled 'C', is observed on line 11+00S (P25).

The resistivity section is dominated by a broad higher resistivity unit bounded by a contact/fault at 20+00W and a vertical contact/fault at 25+00W.

A narrow lower resistivity response within the unit is interpreted to be due to a contact/fault at 21+50W. The higher apparent resistivities of up to 17,000 ohm m within the broad high resistivity unit, west of this feature, reflect the higher dipole impedance encountered when surveying on the island. Lower resistivity zones flank this central unit to the east and west.

Inspection of the plan maps (Maps 1 through 4) and the resistivity sections on pseudosection P24 and P25 leads to the interpretation of a contact/fault of limited east-west extent between lines 10+00S and 11+00S in the vicinity of station 27+50W.

Anomaly 'C' is situated at 19+25W. Frequency effect amplitudes of up to 1.9 in contrast to a variable background of 0.5 to 0.9 are observed. The anomalous response displays an asymmetry which is attributed mainly to a reflection of the observed variation of the apparent resistivity values. The western "pant-leg" is the more sharply defined with high polarization amplitudes extending to the n=4 and n=5 data. Interpretation of the zone indicates a 25 m wide, near

surface body with good depth extent. The zone is possibly associated with the contact/fault at 20+00W.

An anomalous zone at the western extent of line 11+00S at 30+00W is only partially surveyed due to the proximity of the property boundary. Frequency effect amplitudes of up to 0.5 above background are recorded. No further interpretation is possible.

High frequency effect values at a separation of $n=3$ and greater located at 21+75W are attributed to a sympathetic increase in background due to high apparent resistivities.

Line 12+00S

Two anomalous zones, labelled 'C' and '21', are observed on line 12+00S (P26).

The resistivity section recorded on line 12+00S is similar to that seen on line 11+00S (P25). Contacts/faults are identified at 25+25W, 22+50W and 20+50W.

The response of the low resistivity unit east of the contact/fault at 20+50W leads to two possible interpretations.

Inspection of the pseudosection can attribute the observed data to be reflecting a bedrock high centered at 17+25W. A second hypothesis is of a narrow, lower resistivity zone at 17+25W contained within the unit. The latter is considered the more consistent with the overall interpretation from the apparent resistivity plan maps (Maps 1 and 3) of a northeast trending low resistivity band (Sections 8.3.3 and 8.6). The asymmetry of the response is due to a decrease of conductive sediments as the survey line approaches the land/lake contact at approximately 14+00W.

Anomaly 'C', at 20+25W, is an extension of Anomaly 'C' from line 11+00S (P25). The anomalous response is well defined with frequency effect amplitudes up to 0.8 above background. The response is asymmetric as per the response on line 11+00S (P25). Zone 'C' is interpreted as a 25 m wide, near surface body which extends to depth.

Anomaly '21' is located at 25+50W. Frequency effect amplitudes of up to 1.0 above background are recorded. High polarization amplitudes at separations of $n=4$ and $n=5$ at stations 26+75W and 24+00W partly reflect a sympathetic increased apparent resistivity values. This produces a distortion of the true anomalous response. The zone is interpreted as a narrow, near surface body. The anomalous response indicates that the depth extent of the body is restricted. Anomaly '21' is associated with a vertical contact/fault at 25+25W.

The edge of an anomalous zone at the western extent of the line is only partially surveyed due to the proximity of the property boundary. Frequency effect amplitudes up to 0.5 above background are observed. No further interpretation can be made.

High polarization amplitudes recorded at all dipole separations at station 22+50W are interpreted as a reflection of the higher apparent resistivities.

Line 13+00S

Two anomalous zones, designated 'C' and 'M', are recorded on line 13+00S (P27).

The resistivity section observed on the eastern two-thirds of line 13+00S is similar to that seen on line 12+00S (P26).

Contacts/faults are interpreted at 24+00W and 22+00W. The near vertical contact/fault recorded at 25+25W on line 12+00S (P26) between a high resistivity unit to the east and a lower resistivity to the west, is observed at station 27+50W on line 13+00S (P27). Inspection of the plan maps (Maps 1 and 3) indicates an east-west fault/shear zone between lines 12+00S and 13+00S from stations 28+00W to 23+50W. The higher apparent resistivities of up to 15,000 ohm m between 24+00W and 22+00W reflect the higher dipole impedance encountered when surveying over the island.

Anomaly 'C' at 21+25W, is an extension of Anomaly 'C' from line 12+00S (P26). The anomaly is not as well defined as on the previous line. Frequency effect amplitudes of up to 0.6 above a variable background are noted with higher polarization amplitudes in the western half of the anomalous response reflecting higher apparent resistivity values. The zone is interpreted as a narrow, near surface body which is associated with a contact/fault at 21+75W.

Anomaly 'M', at station 27+00W, displays polarization amplitudes up to 0.7 above background. Interpretation of the anomalous response indicates that the zone is a narrow, near surface body. The anomaly is situated on the eastern flank of a near vertical contact/fault at 27+50W.

High frequency amplitudes observed in the $n=4$ and $n=5$ data at 24+00W reflect the higher apparent resistivities measured.

Line 14+00S

Three frequency effect anomalies, labelled 'C', 'M' and '22', are indicated on line 14+00S (P28).

Four lithologic units are observed in the resistivity section on line 14+00S. The central high resistivity unit, of apparent resistivity up to 8,000 ohm m, is bounded by near vertical contacts/faults at 27+75W and 22+50W (see Figure 6 for a computer modelled representation). A low resistivity zone, interpreted as a contact/fault, is located within the unit at 23+75W. Low resistivity zones flank this central high resistivity unit to the east and west. A contact/fault inferred at 15+25W separates a higher resistivity region to the east from a lower resistivity zone to the west.

Anomaly 'C', at 22+25W is a well defined anomalous zone with frequency effect amplitudes up to 1.6 in contrast to a background of 0.7. The anomaly is an extension of anomaly 'C' from line 13+00S (P27). The zone is interpreted as a 25 m wide, near surface body with good depth extent. It is associated with a contact/fault at 22+50W.

Anomaly 'M' at 27+75W is an extension of anomaly 'M' from line 13+00S (P27). The anomalous response displays low amplitude frequency effects of up to 0.4 above background. The zone is interpreted as a narrow body, 25 m below surface with good depth extent. Anomaly 'M' is associated with a near vertical contact/fault at 27+75W.

Anomaly '22' is a one line anomaly located at 25+25W. Frequency effect amplitudes of 0.6 above background are observed. The polarization amplitude of 1.7 at $n=5$ at 24+25W is enhanced due to mutual coupling between the anomalous responses of anomalies 'C' and '22'. Depth to the source is estimated at 25 m to 75 m. With the lack of definition in the anomaly response and due to the body's depth it is difficult to deduce any definitive quantitative anomaly parameters.

Line 15+00S

Two anomalous responses, labelled 'C' and 'M', are recorded on line 15+00S (P29).

Three contacts/faults, located at 28+00W, 23+00W and 16+00W, are interpreted in the resistivity section. They delineate four lithologic units similar in character to those observed on line 14+00S (P28).

Anomaly 'C', at 25+00W, is an extension of anomaly 'C' from line 14+00S (P28). Frequency effect amplitudes of up to 0.6 above background are noted. The anomalous response is poorly defined but the continuation of polarization amplitudes to the deeper $n=5$ data indicate a narrow, near surface body which extends to depth. The zone is associated with a contact/ fault at 23+00W.

Anomaly 'M', located at 27+50W, is an extension of anomaly 'M' from line 14+00S (P28). Polarization amplitudes of up to 0.6 above background are recorded. The zone is interpreted as a narrow, near surface body which extends to depth. Anomaly 'M' is probably associated with a contact/fault at 28+00W.

The edge of a low amplitude anomalous zone at the eastern extent of the line at 15+00W is only partially surveyed. The polarization amplitude of 10.0 at a separation of $n=5$ at station 16+25W is unconfirmed by adjacent anomalous amplitudes and at this time must be considered suspect. No further interpretation can be made.

Anomalous polarization amplitudes in the n=4 and n=5 data at 24+75W are considered to be reflecting increased apparent resistivity values.

Line 16+00S

The apparent resistivity section on line 16+00S (P30) displays a continuation of the lithologic units observed on line 15+00S (P29). The high resistivity unit interpreted to be within the Lac Scott Fault system (Section 8.3.3) is centered at 25+50W. The location of contact/faults between this unit and flanking low resistivity units to the east and west can only be inferred from the apparent resistivity plan maps (Maps 1 and 3) due to the lack of definition between the individual units in the pseudosection.

A near vertical contact/fault at 17+00W is interpreted between a unit of apparent resistivity of up to 20,000 ohm m to the east and a lower resistivity unit displaying apparent resistivities of 700 ohm m to the west.

One possible anomalous zone is recorded at the eastern extent of line 16+00S (P30). The anomaly is only partially surveyed due to the limited eastern extent of the western grid. Frequency effect amplitudes of up to 1.0 above background are observed. No further interpretation can be made.

8.6 Summary of Overall Geophysical Interpretation

8.6.1 Introduction

When referring to the plan maps (Maps 1 to 4) it should be noted that there is an east-west discrepancy between the underlying topographic maps and the plotted anomaly/resistivity feature locations. The grid overlaid on the topography of the property on the plan maps (Maps 1 to 4) is referenced to the linecutting

from 1983. However, as the grid lines cut in 1984 are displaced 40 m west of those cut in 1983 (see Section 4.1), all plotted points from the 1984 Induced Polarization survey are situated 40 m east of their true locations relative to the underlying topographic map.

Lines 1+00S (east) and 2+00S (east) were surveyed over the 1983 grid. Anomaly and resistivity feature locations for these lines have been plotted relative to the 1984 grid so that a coherent reference grid is used.

The Induced Polarization survey outlined a total of 37 polarizable zones labelled as per section 8.3.1 while the apparent resistivity data provided significant structural information. The results are discussed below first for the West grid then the Northeast grid.

8.6.2 West Grid

The resistivity survey outlined a system of alternate high/low resistivity bands with widths of 200 to 500 meters trending north-east. East-west faults/shear zones, accompanied by displacement by up to 150 m of the resistivity bands are inferred from the plan maps (Maps 1 and 3). In addition, no related magnetic expression to these features is noted in the total field magnetics data (Section 8.4). The local fluctuations of the order of 100 nT within the magnetic background values are interpreted as responses from different phases of the underlying "Granitic Assemblage" rocks of the Chibougamau Pluton. It is therefore concluded that the geophysical surveys outlined a

major en echelon fault system (the Lac Scott Fault) occurring within a homogeneous rock type.

The fault system is coincident with Lac Scott. The high resistivity band in the center of this system is bounded east and west by near-vertical contacts between itself and lower resistivity units. The clearly defined nature of these contacts and the coincidence of the islands on Lac Scott (which obviously weather high) with the high resistivity band indicate a different lithologic unit has been intruded within the fault system.

Inspection of the total field magnetics revealed two areas of high magnetic relief which display a podiform nature. Neither is associated with a polarizable zone and both are interpreted as inclusions of metavolcanic/metasedimentary debris within the plutonic rocks (Section 8.4).

Twenty-four polarizable zones were interpreted on this grid, none of which displayed any coincident magnetic expression. Eight of these zones, anomalies 'C', 'H', 'I', 'J', 'L', 'M', 'N' and '11', are considered significant at this time.

Anomaly 'C' is considered the priority target on this grid. The zone is narrow and near vertical and has been traced for approximately 600 meters from station 19+25W on line 11+00S to station 22+75W on line 15+00S. Polarization amplitudes of up to 3 times background are noted with the zone extending to depth.

The zone is associated with the near vertical contact/fault between the central high resistivity band and the eastern low resistivity band and is contained within the lower resistivity unit.

The seven other anomalous zones of significance have interpreted strike extents of up to 200 meters, similar polarization amplitudes and trend north to northeast.

Anomalies 'L', 'M' and 'N' are located within the central high resistivity band. Anomalies 'L' and 'M' are associated with contacts/faults delineating the high resistivity band and the western flanking lower resistivity band while anomaly 'N' is associated with a fracture/shear zone within the high resistivity unit.

Anomalies 'H', 'I', 'J' and '11' are located in the high resistivity region in the northwestern corner of the grid. Anomaly 'I' is associated with a contact/fault between two resistivity units, the eastern unit displaying lower apparent resistivity values.

Anomalies 'H', 'J' and '11' are associated with contacts/faults and/or discrete narrow higher resistivity units within the region (see Section 8.3.3 and plan maps [Maps 2 and 4] for locations).

8.6.3 Northeast Grid

Inspection of the apparent resistivity data indicates that the northeast grid is located to the east of the major fault system observed on the west grid.

Two west to west-northwest trending fault/shear zones were inferred from the data: the first between lines

7+00N and 6+00N and the second between 1+00N and 1+00S.

The total field magnetics data displays a sharp rise in background relative to the gradient observed over the rest of the property. This suggests that a rock unit of higher magnetic mineral content underlies the northeast corner of the grid. Whether this unit belongs to the Lac Doré complex or represents a more magnetic phase of the granitoid rocks cannot be ascertained at this time.

Twelve polarizable zones are interpreted, none of which displays any coincident magnetic expression. Three zones are considered significant: anomalies 'A', 'B' and '7'.

The most significant zone recorded in 1984, in view of the proposed geological model (Section 1.0), is anomaly 'A', initially recorded at 3+25W on line 1+00N. The zone has been traced due south for a distance of 500 meters to line 4+00S (east) and is open to the south. Anomaly 'A' displays classic "pant-leg" polarization responses which vary in amplitude from 4 to 16 times background indicating variable sulphide content. The highest measured polarization response is observed on line 1+00S (east).

The anomalous response is interpreted as being due to a narrow body extending to depth with an attitude varying from a steep westerly to vertical. The character of the response of zone 'A' on line 4+00S (east) leads to two possible interpretations. The

anomaly is either the lateral response from the anomalous zone 'A' which may have terminated north of line 4+00S (east) or is the response from a body at depth which indicates that anomaly 'A' may be plunging to the south. In order to determine which is the case, further surveying to the south would be necessary.

The occurrence of anomaly 'A' on line 0+00 is reportedly in the vicinity of the location of a grab sample that assayed up to 1,200 ppb Au/ton (verbal communication, Michel Drouin, Senior Exploration Geologist, Corporation Falconbridge Copper).

Anomaly 'B' is located some 200 meters east of and parallel to anomaly 'A' on line 0+00 and is of limited strike extent between 200 and 300 m. Polarization amplitudes up to 4 times background were observed in the n=4 and n=5 data. The zone occurs at depth.

Anomaly '7' is a well defined one-line anomaly with frequency effect amplitudes up to 6 times background.

9.0 CONCLUSIONS AND RECOMMENDATIONS

The Induced Polarization survey successfully outlined what is interpreted to be the Lac Scott Fault transecting the property with a northeast strike.

A total of 37 polarizable zones were identified, of which only 11 are considered significant. These anomalies are labelled 'A', 'B', 'C', 'H', 'I', 'J', 'L', 'M', 'N', '7' and '11'. The remainder are considered to be secondary priority targets due to either lack of strike extent and/or indeterminate responses.

Of the zones of interest two, anomalies 'A' and 'C', are recommended as priority targets for immediate continued investigation.

The basic geological model of the area proposed by Corporation Falconbridge Copper (verbal communication, Michel Drouin, Senior Exploration Geologist) is as follows.

The property is assumed to be underlain for the most part by early to middle Precambrian "Granitic Assemblage" intrusive rocks of the Chibougamau pluton. A major fault/shear zone trending northeast is inferred to transect the plutonic rocks in the region of Lac Scott (the Lac Scott Fault). Mineralized zones which strike at an angle to this major shear zone are considered to be of primary importance.

Anomaly 'A' is considered the prime target in this geological context. The zone strikes southwards from station 3+50W on line 1+00N (P7) to station 2+50W on line 4+00S (east) (P16) where it is open to the south. Anomaly 'A' is situated at station 3+00W on line 0+00 (P8) in the vicinity of which a grab sample is reported to have assayed up to 1,200 ppb Au/ton (verbal communication from

Michel Drouin, Senior Exploration Geologist, Corporation Falconbridge Copper).

Anomaly 'C', while not of primary importance in the context of the proposed geological model (Section 1.0), nevertheless displays continuity of response along a strike extent of 550 meters and is located within and parallel to the interpreted Lac Scott fault system.

Recommendations to further explore the economic potential of the property include:

- 1) Geological mapping of the property.
- 2) Integration of all geological and geophysical data either to confirm or reinterpret the conclusions reached in this report.
- 3) Continued surveying of anomaly 'A' to the south to determine its strike extent.
- 4) A program of diamond drilling to further evaluate anomalies 'A' and 'C'.

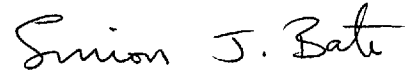
Collar coordinates to adequately test these zones are:

<u>Anomaly</u>	<u>Collar Coordinates</u>	<u>Azimuth</u>	<u>Dip</u>	<u>Length</u>
'A'	3+75W	grid east	50°	100 m
	1+00S			
'C'	23+00W	grid east	50°	100 m
	14+00S			
or	22+10W	grid east	50°	150 m
	13+00S			

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The first two drill locations are on Lac Scott. The alternative collar coordinates for anomaly 'C' are located on land.

Respectfully submitted,



July, 1984
Toronto, Ontario

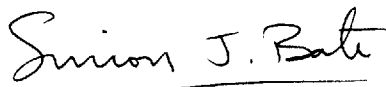
Simon J. Bate, M.Sc.
MPH Consulting Limited

CERTIFICATE

I, Simon J. Bate of Toronto, Ontario, hereby certify that:

1. I hold a Bachelor of Science degree in Physics from the University of Bristol, England and a Master of Science degree in Applied Geophysics and a Diploma of Imperial College from Imperial College, London, England.
2. I have practiced my profession continuously since graduation.
3. I have based my conclusions contained in this report on my previous experience and knowledge of geophysical interpretation techniques.
4. I hold no interest, directly or indirectly in the property other than professional fees, nor do I expect to receive any interest in the property or in Corporation Falconbridge Copper or any of its subsidiary companies.

Toronto, Ontario
July, 1984


Simon J. Bate, M.Sc.
MPH Consulting Limited

Appendix I

APPENDIX I

Report on Previous Surveys

AI.1 Introduction

During the periods of January/February and August, 1983, George F. Beier of Don Mills, Ontario conducted Induced Polarization surveys on behalf of Corporation Falconbridge Copper on the latter's Lac Scott property. A portion of this work is interpreted in this appendix. The data, in pseudosection form, is contained in a 1983 Corporation Falconbridge Copper report, NTS 32 G15, by Boily, B.

The line limits of the grid surveyed in 1983 are recorded in section 4.1. Similar instrumentation and identical survey parameters to the 1984 survey were used (see Section 6.1).

MPH Consulting Ltd. re-surveyed sections of lines 2+00N through 4+00S originally surveyed by George Beier. This was principally undertaken to tie in the two surveys and ensure survey repetition. While comparing the two data sets, a number of significant differences in the 1983 data became evident and are as follows:

- P1. The apparent resistivity sections, while displaying a constant factor difference for data gathered on the lake (Lac Scott), vary markedly as the survey line progresses from the lake onto the land.
- P2. No texture is evident in the frequency effect data.
- P3. Anomaly 'A', as surveyed in 1984, is not observed as a similarly significant response.

In addition, two telephone conversations with George F. Beier brought forth the following five (5) points with regard to the procedural methods used:

- P4. Electrodes were constructed in the same manner for both surveys during the winter seasons(Section 6.1). Beier used tinfoil for electrodes when surveying in August, 1983.
- P5. A different surveying procedure was employed.
- P6. The receiver was never calibrated at a given dipole location so as to supply a correction factor, as was the case in the 1984 survey, but is rather set to zero so that a correction factor is not needed.
- P7. No damping was ever employed on the receiver as was the case in the 1984 survey.
- P8. If difficulty is experienced in obtaining measurements in low resistivity areas, then the higher transmitting frequency would be decreased to allow for greater ease of measurement. No record is made on the field notes. (In the case of noise from operations on a mine site, the same procedure would be used to reduce noise from harmonics of the transmitted noise.)

While presenting possible explanations for the observed differences in the data sets and commenting on the two survey procedures, extensive reference is made to Appendix II.

AI.2 Procedural Differences Described Verbally by George F. Beier

AI.2.1 The Survey Procedures

The procedure used by MPH Consulting Limited in 1984 is illustrated in Figure AI.1(a) and is designed to minimize noise and electromagnetic coupling (EMC) effects. The receiver is never closer than 50 meters to the transmitter. The receiver wire is 50 meters long, is moved with the receiver and is never in parallel with connected transmitter wires (see Section 6.1). Four repeat measurements are made during each set up, providing quality control. Four men are required for a high productivity return on the operation.

George F. Beier uses a three man crew, operating the transmitter and receiver himself at the same location. The survey procedure is illustrated in Figure AI.1(b) and is an in-line method. Repeat measurements to determine data quality require a deliberate repetition of a given set of measurements. The connected transmitter and receiver wires will be in parallel for some measurements introducing possible electromagnetic coupling errors in the data (see Appendix II, section AII.5). These effects are sometimes difficult to recognize in the field and are often extremely subtle.

Table AI.1 illustrates the calculated EMC effects in the $n=1$ data for uniform environments with resistivities of 50 ohm m and 5,000 ohm m for a dipole length of 50 m. These effects will increase rapidly with increasing dipole 'n' separation.

Survey Layout: Electrodes labelled A, B, etc.
 Electrode interval, 50 m
 Transmitter fixed at electrode G
 Receiver moves

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
 A B C D E F G H I J

Survey Procedure:

Dipole Separation	Rx	AB	BC	CD	DE	EF	HI	IJ	
n=1	Tx	CD	DE	EF	FG	GH	FG	GH	
n=2	Tx	DE	EF	FG	GH	HI	EF	FG	etc.
n=3	Tx	EF	FG	GH	HI	IJ	DE	EF	
n=4	Tx	FG	GH	HI	IJ			DE	
n=5	Tx	GH	HI	IJ					

Figure AI.1(a): Survey procedure with fixed transmitter, roving receiver.

Survey Layout: Electrodes labelled A, B, etc.
Electrode interval, 50 m
Transmitter and receiver fixed at electrode D

↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
A B C D E F G H I J

Survey Procedure:

Dipole Separation	Tx	AB	BC	CD	DE
n=1	Rx	CD	DE	EF	FG
n=2	Rx	DE	EF	FG	GH
n=3	Rx	EF	FG	GH	HI etc.
n=4	Rx	FG	GH	HI	IJ
n=5	Rx	GH	HI	IJ	

Dipoles DE, EF, etc. are generally used for transmitting only when the end of the line is being surveyed.

Figure AI.1(b): Survey procedure with fixed transmitter and receiver.

Table AI.1
Calculated EMC Effects

Frequency (Hz)	0.3		2.5		5	
Resistivity (ohm m)	50	5,000	50	5,000	50	5,000
δ	6486	64,860	2,247	22,468	1,589	15,887
a/δ	.008	.0008	.02	.002	.03	.003

The additional coupling effect due to interference between the transmitter and receiver is difficult to determine and is dependent on both the orientation of the generator, transmitter and receiver and the transmitting/receiving parameters.

In instances where EM coupling effects are evident, Beier turns to the moving receiver method (verbal communication, George F. Beier).

Areas where EM coupling is perhaps distorting the data are indicated in Section AI.3.1.

AI.2.2 Transmitting Frequencies

The Frequency Effect is, by nature, a fairly coarse measurement of a medium's polarizability. On the McPhar P660 receiver there is an inherent 10 percent error in taking measurements, the error decreasing as the frequency effect magnitude increases.

However, the frequency effect is a measure of the polarizability of a medium over a given frequency band: in this case 0.3 Hz to 5 Hz. It is proportional to the difference in apparent resistivities measured at the extreme frequencies (equation 6-3).

When Beier reduces the higher transmitting frequency to 2.5 Hz then both the apparent resistivity and frequency effect amplitudes are affected (Appendix II, sections AII.2 and AII.3). The apparent resistivity will be higher than that measured at 5 Hz and consequently the frequency effect amplitude will be reduced.

Theoretically, the magnitude of the apparent resistivity measured could be increased by up to 20 percent and the frequency effect amplitude decreased by up to 20 percent.

The degree to which Beier's data is affected is difficult to determine as all frequency effect amplitudes are very low, less than 2.0, and no comparisons of measurements at the two higher frequencies are recorded.

AI.3 Observed Differences in the Two Data Sets

AI.3.1 The Resistivity Section

The apparent resistivity data for 1983 is calculated as $\rho_a/2\pi$ in ohm feet:

$$\rho_a/2\pi = K \cdot a \cdot n(n+1)(n+2) \cdot \frac{\Delta V}{I} \quad (\text{AI-1})$$

where $K = 1.64$, a constant including conversion factor to feet

a = dipole spacing in meters

n = dipole separation factor

ΔV = measured off-time voltage as a percentage of the primary voltage

I = current transmitted

While this is a correct form of presentation, it is contrary to current practice in the industry where apparent resistivity, ρ_a , is presented in ohm meters:

$$\rho_a = \pi \cdot a \cdot n(n+1)(n+2) \cdot \frac{\Delta V}{I} \quad (\text{AI-2})$$

An approximate factor difference of two (2), the ratio of equations (A-2) and (A-1), is therefore expected when comparing the resistivity sections from the two surveys.

Sections of eight lines were resurveyed during the 1984 winter, specifically lines 2+00N to 4+00S (east) and line 7+00S (east). The data is contained in pseudosections P6 to P8, P10, P12, P14, P16 and P20 respectively.

The resistivity sections are found to be in general agreement when the data has been gathered over Lac Scott. However, as the survey line progresses onto the land increasing differences in the apparent resistivity data are noted. Tables AI.2 and AI.3 are used to illustrate this phenomenon. The values in the tables are approximate ratios of the 1984 data to the 1983 data. Each column of ratios is of $n=1$ to $n=5$ data along a 45 degree plotting diagonal to the west from the $n=1$ plotting point.

On line 3+00S (east) (Table AI.2) the agreement between the two data sets is seen to be relatively good though small differences start to occur as the survey progresses onto the land.

Line 1+00N (Table AI.3) is used as the worst case example. The ratios calculated show a marked variable difference between the two data sets gathered on the land. During the 1984 survey, four measurements were repeated. In each case, the transmitting dipole was first located on the lake

n=1 plotting point

	3+25W	2+75W	2+25W	1+75W	1+25W	0+75W
n=1	2	1½	1½	1½	3	1
n=2	1½	2	1½	1½	2	2½
n=3	2	1½	1½	1	1	2
n=4	2	2	1½	1½	1	1½
n=5	1½	2	2	1½	2	2

Table AI.2: Contrast between resistivity surveys: minimal deviation, line 3+00S. (The mainland extends from 1+10W to the east)

n=1 plotting point

	6+25W	6+75W	5+25W	4+75W	4+25W	3+75W	3+25W	2+75W	2+25W
n=1	2	2	6½	3	3	2	12	7½	6
n=2	2	2	4½	2	3	5	2	2	10
n=3	2	2	2	2	2	8	4½	½	3
n=4		2	2	1	1	3½	6½	1½	1
n=5			2	1½	1½	1	2½	½	2

Table AI.3: Contrast between resistivity surveys: extreme case line 1+00N (An island is situated between 5+25W and 4+50W. The mainland extends from 4+00W to the east).

and then on the land. The transmitting currents ranged from 0.6 amps to 0.078 amps. Repetition of the apparent resistivity data was within 1.5 percent or less of the total value.

Apparent resistivity data from the 1983 survey on lines 2+00N and 1+00N displays a decrease in $n=1$ and $n=2$ data values as the survey progresses onto the land. It is at these dipole separations that the largest differences are observed between the two data sets. In view of the fact that the ground, which is mainly sand and gravel overburden, was frozen during the survey period one would expect high apparent resistivity values in the $n=1$ and $n=2$ data.

One possible explanation of the observed decrease in apparent resistivity values is that EM coupling effects, from the transmitter/receiver orientation and/or wire layout, are large.

Another is that when repeating a resistivity survey exact repetition of data is not to be expected as survey conditions, electrodes used, electrode locations and the time for electrodes to stabilize may be different.

The latter two factors may be of importance. First, all repeated lines, except lines 1+00S, 2+00S and 7+00S, are tied into the 1984 survey so that there is an effective 40 m displacement of electrode location. However, differences are also observed on lines 1+00S and 2+00S. As regards the electrodes,

these consisted of two connected rods that were well salted and allowed to stabilize for three days as problems were encountered on the previous line due to equipment breakdowns.

Good survey repetition was possible on three lines: Lines 3+00S and 4+00S where the section reflect a gradational east-west change in resistivities and line 7+00S which was surveyed wholly on Lac Scott.

AI.3.2 Frequency Effect Data

Frequency effect amplitudes are a coarse measurement of the polarizable nature of a medium. When measuring with the McPhar P660 receiver there is an inherent 10% error in the measured amplitude (see Section 6.1).

As the polarizability of any given geological medium will vary laterally and to depth, so a corresponding variance in frequency effect amplitudes is expected in the survey data. The amplitudes measured can vary from negative values to highly anomalous positive values. This variance in the data is the "texture" of the polarizable response and is a crucial factor in assigning priorities and significance to subtle anomalous responses and determining anomaly parameters. No such texture is observed in George Beier's data which limits the interpretability of the results.

The frequency effect sections from the 1983 and 1984 surveys therefore bear very little resemblance. Even in the broadest sense of a marker horizon

outlining a polarizable zone the two sets of survey results are not consistent.

The most significant difference between the two surveys is anomaly 'A', outlined in 1984 from line 1+00N to line 4+00S. The zone is characterized by classic "pant-leg" anomalous responses of varying strength. The response on line 0+00 was measured three times on various days, and with two different setups, by MPH Consulting Limited, with consistently repeatable results. Beier outlined the anomaly, as anomaly A1, from line 1+00N to line 2+00S (see Section AI.4). No "pant-leg" responses are recorded. The maximum observed polarization amplitudes of 1.3 are between 15 and 50 percent less, in magnitude, of the amplitudes measured in 1984.

AI.4 Brief Interpretation of 1983 Survey Results

Ten (10) anomalous zones, labelled A1 to A10, have been indicated on the pseudosections contained in the logistical report on the 1983 survey (Boily, B., 1983, Corporation Falconbridge Copper Report NTS 32 G15).

No attempt was made to interpret the resistivity sections, for reasons outlined in the previous sections, other than to indicate possible contacts/faults.

None of the polarizable zones displays any coincident magnetic signature (see Section 8.4).

Anomaly A1

Anomaly A1 is indicated as extending from 3+50W on line 1+00N to 3+75W on 2+00S. Frequency effect amplitudes of up to 1.3 in contrast to a background of 1.0 are consistently recorded except on line 0+00 where the polarization amplitudes of 1.1 and 1.2 appear to be a sympathetic reflection of increased apparent resistivity values. The response is first seen in the n=2 and n=3 data. Anomaly A1 is interpreted as being a narrow body at a depth of 25 to 50 meters below surface and extending to depth.

The variations in response amplitude observed from line to line for anomaly 'A' are not seen in the 1983 survey.

Anomaly A2

Anomaly A2 extends from 5+50W on line 1+00N to 6+00W on line 2+00S. The frequency effect amplitudes recorded are generally up to 1.3 in contrast to a background of 1.0. Polarization amplitudes of 1.5 indicating increased sulphide content are observed on line 1+00S. The zone is interpreted as a narrow body at depth on line 1+00N but near surface from line 0+00 to line 2+00S. The body extends to depth.

Anomaly A1 is associated with a narrow low resistivity zone which is interpreted to be a contact/fault within a uniform rock unit.

Anomaly A3

Anomaly A3 is a one-line anomaly at 7+50W on line 0+00. Frequency effect amplitudes of up to 1.7 in contrast to a background of 1.0 are observed. The anomaly is interpreted as a narrow, near surface body which extends to depth.

Anomaly A4

Anomaly A4 extends from 10+00W on line 2+00S to 11+25W on line 5+00S. The anomalous responses are not completely surveyed due to the proximity of the western extent of the grid. Frequency effect amplitudes of up to 1.7 are observed. The response is interpreted as being due to a narrow, near surface body with good depth extent.

Anomaly A5

Anomaly A5 is tentatively interpreted to extend from 8+25W on line 3+00S to 6+75W on line 9+00S. Polarization amplitudes of up to 1.4 in contrast to a background of 1.0 are recorded on all lines except 7+00S where polarization amplitudes of 1.6 are observed. Anomaly A5 is interpreted as a narrow body which extends to depth. Depth to the body varies from near surface, on lines 4+00S and 6+00S to 9+00S, to a depth of up to 25 m on lines 3+00S and 5+00S.

Anomaly A6

Anomaly A6 is tentatively interpreted to extend from 8+00W on line 5+00S to 9+75W on line 12+00S. Frequency effect amplitudes of up to 1.4 in contrast to a background of 1.0 are observed on all lines except lines 6+00S to 8+00S where amplitudes of 1.6 are recorded.

The anomaly is interpreted as a narrow body which extends to depth. Depth to the source varies from near surface on lines 5+00S to 7+00S, and line 11+00S; 25 to 50 meters below surface on line 8+00S; and 50 to 100 meters below surface on lines 9+00S, 10+00S and 12+00S.

Anomaly A6 is associated with an apparent resistivity low of approximately 1,500 ohm m in a higher resistivity unit of 3,000 to 4,000 ohm m.

Anomaly A7

Anomaly A7 extends from 3+25W on line 7+00S to 3+25W on line 8+00S. Frequency effect amplitudes of up to 1.4 in contrast to a background of 1.0 are recorded. The anomalous response on line 8+00S is narrow and ill-formed whereas that on line 7+00S is a narrow "pant-leg" response to the west. The anomaly is interpreted as a narrow, near surface zone with good depth extent.

Anomaly A7 is probably associated with a low resistivity feature interpreted to be a contact/fault.

Anomaly A8

Anomaly A8 is an ill-formed one-line anomalous response at 13+25W on line 8+00S. Polarization amplitudes of up to 1.4 in contrast to a background of 1.0 are noted. The anomaly is interpreted as a narrow, near surface zone which extends to depth. It is probably associated with a contact/fault at 12+75W.

Anomaly A9

Anomaly A9 extends from 0+75W on line 9+00S to 0+75W on line 10+00W. Polarization amplitudes of up to 1.3 on line 9+00S and 1.7 on line 10+00S are recorded in contrast to a background of 1.0. The anomaly is interpreted as a narrow, near surface body which extends to depth. The zone is probably associated with a contact/fault at 0+50W.

Anomaly A10

Anomaly 10 is located at 5+75W on line 10+00S and at 5+25W on line 11+00S. Frequency effect amplitudes of up to 1.4 in contrast to a background of 1.0 are recorded. The anomaly is interpreted as a narrow body which extends to depth.

Depth to the body is estimated to between 25 and 50 meters on line 11+00S and near surface on line 10+00S.

The anomaly is associated with a narrow, low resistivity zone of apparent resistivity 1,400 ohm m.

AI.5 Conclusions

All the polarizable zones outlined display similar frequency effect response amplitudes. In general, the anomalous responses are narrow and poorly defined.

Only the location of polarizable horizons are indicated (see Section AI.3.2). Parameters of the zones, such as width, depth to the body and depth extent can only be very broadly interpreted. The general shape and dip of the zones cannot be estimated with any degree of certainty.

A number of anomalies are outlined as near vertical anomalous responses. Examples are anomalies A5 and A6 on line 5+00S, anomaly A5 on line 9+00S and anomaly A10 on line 10+00S. At this time, there is no geological sceanrio known to the interpreter that would result in such a response. If one considers how the plotting procedure is defined (Section 7.0) and the geometry of the surveying array then at least one diagonal "pant-leg" response should be outlined if the zone is truly polarizable.

Appendix II

APPENDIX II

The Frequency Domain Induced Polarization Method

AII.2 Principles of the Induced Polarization Method: Conduction Phenomenon

Induced Polarization is a current-stimulated electrical phenomenon observed as a delayed voltage response in earth materials. It has important applications in exploration for buried metallic mineral deposits. The complex electrochemical reactions related to Induced Polarization give rise to a variety of measurable parameters which are reflective of subsurface mineralization.

In an Induced Polarization survey, the basic measurement taken is the apparent resistivity of the ground. This is accomplished using one of several electrode combinations, consisting of two current electrodes and two potential electrodes. The current electrodes are charged with a known amperage and a voltage is measured between the potential electrodes.

The apparent resistivity, ρ_a , is calculated using the general formula

$$\rho_a = \frac{V}{I} \cdot G \quad (\text{A.II-1})$$

where v = the potential difference across the current electrodes

I = the transmitted current

G = a geometric factor dependant on the surveying array

When the current electrodes are charged, a current flow is induced in the ground. At some point, energization of

earth materials takes place. Laboratory analysis has proven that the major mechanism observed during the Induced Polarization phenomenon is of a chemical nature.

This chemical energy storage is the result of:

- (a) variations in the mobility of ions in fluids throughout the rock structure, known as membrane or electrolytic polarization, and
- (b) variations between ionic and electronic conductivity where metallic minerals are present, known as electrode polarization or overvoltage. These two effects are the result of different mechanisms but they cannot be separated by IP measurement.

Membrane Polarization may occur in non-mineralized rocks and normally constitutes the background IP effect. It results from the accumulation of ions around unpaired charges which occur in clays or on cleavage faces or edges of layered and fibrous materials. The accumulated ions form a cloud which obstructs current flow when an external emf is introduced (see Figure AII.1). A change in ion mobility is created which results in the accumulation of ions at one point and a deficiency at another. The ion concentration gradients thus formed oppose current flow and cause polarization.

Electrode Polarization, similar in principle to membrane polarization, exists when metallic material is present within the rock matrix. The current flow is thus partly electronic and partly ionic. Since the velocity of current flow is much faster through the mineral than in the

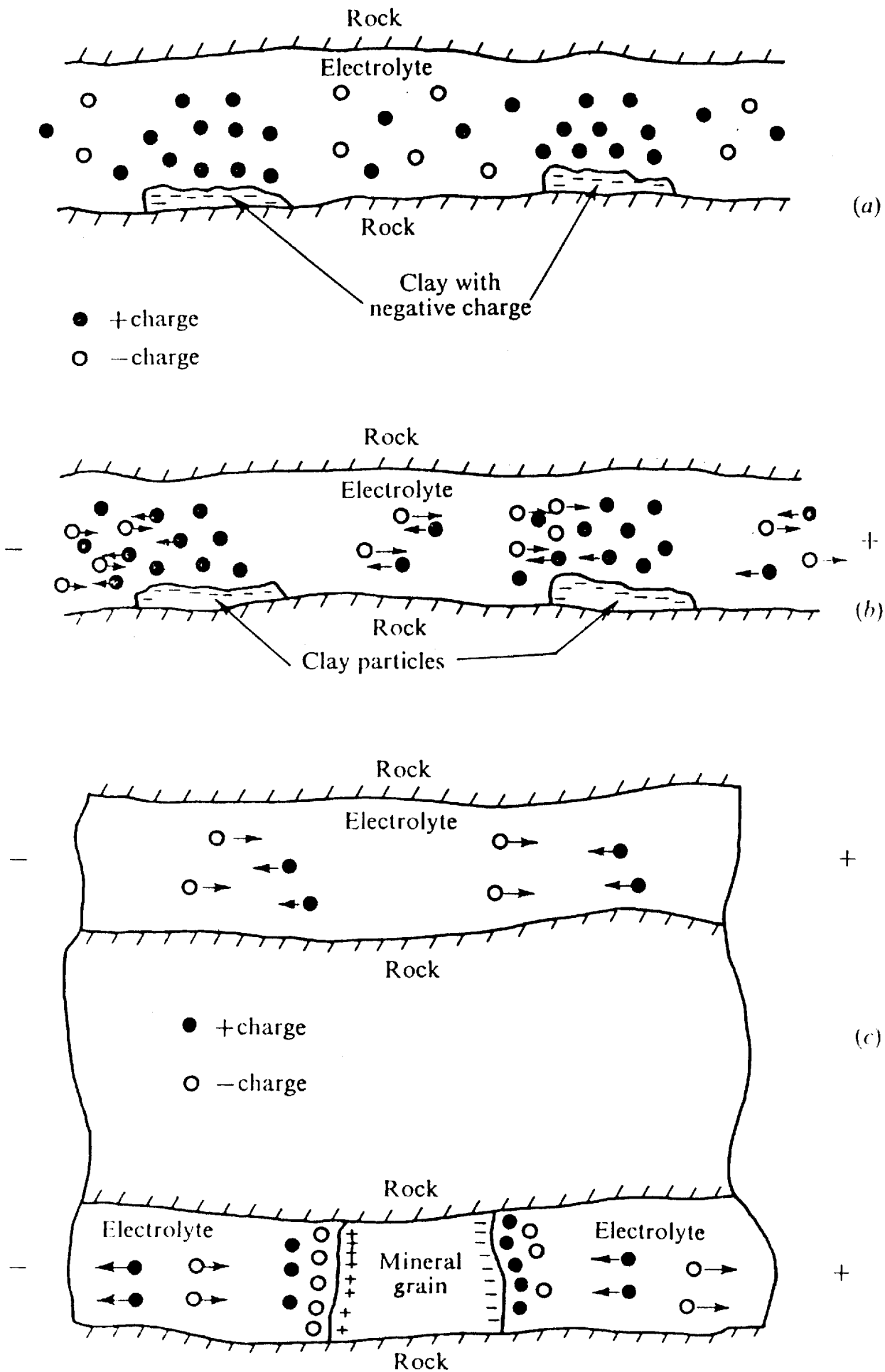


Figure AII.1

Membrane and electrode polarization effects. (a) Normal distribution of ions in a porous sandstone; (b) membrane polarization in a porous sandstone due to an applied d.c. voltage; (c) electrolytic flow in upper pore, electrode polarization in lower pore.

electrolyte, an accumulation of ions at the mineral electrolyte interface develops, leaving net surface charges of opposite sign on either face. This "pile up" of ions is maintained by the external voltage, thus creating a polarization effect.

As mentioned previously, membrane and electrode polarization cannot be separated by IP measurement. However, in general, electrode polarization is of greater magnitude than membrane (electrolytic) polarization.

AII.2 Frequency Dependence of the Apparent Resistivity Measurement

The impedance due to the diffusion of ions in the electrode polarization phenomenon is referred to as the Warburg impedance, W , the magnitude of which is dependant on the transmitting frequency. Quotes below, from Sumner 1976, p. 54-56 and 93, illustrate this phenomenon:

"From the standpoint of circuit analysis, the Warburg impedance (W) has the characteristics of a distributed electrical circuit. Its magnitude varies inversely with the square root of the frequency (f) according to $W=K(1 + J)/\text{square root } f$.

At low frequencies, it carries much of the current (J) across the interface, and it becomes very large as f approaches zero."

"Using the Warburg impedance relationship, it is possible to hypothesize the resistivity-against-frequency variation of an idealized circuit that behaves in a manner analogous to the IP characteristics of a rock. This resistivity spectrum (or conductivity spectrum) of the response behaviour of a circuit is shown as Fig. AII.2."

"A resistivity spectrum is the frequency-domain counterpart of the (time domain) IP decay curve. The resistivity change of the resistivity spectrum curve is a measure of the IP response. If this interval is

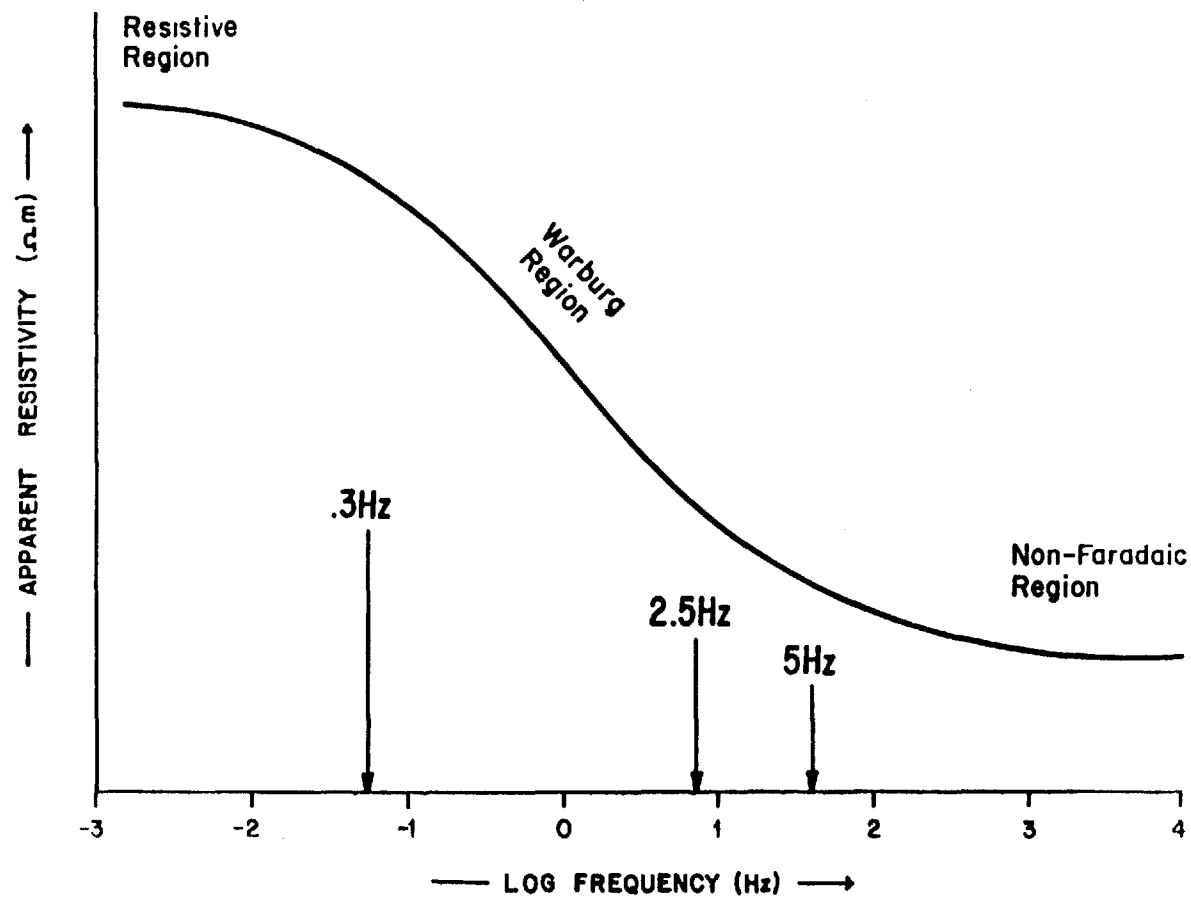


Figure AII.2: Idealized resistivity spectrum similar to the spectrum of a rock. In the central linear portion of the curve, known as the Warburg region, the slope of the curve over one decade of resistivity would be the IP effect, where resistivity can vary with an ideal maximum of $f^{-1/2}$ (Sumner, 1976, p. 55)

FREQUENCY SPECTRA FOR I.P. FIELD RESULTS

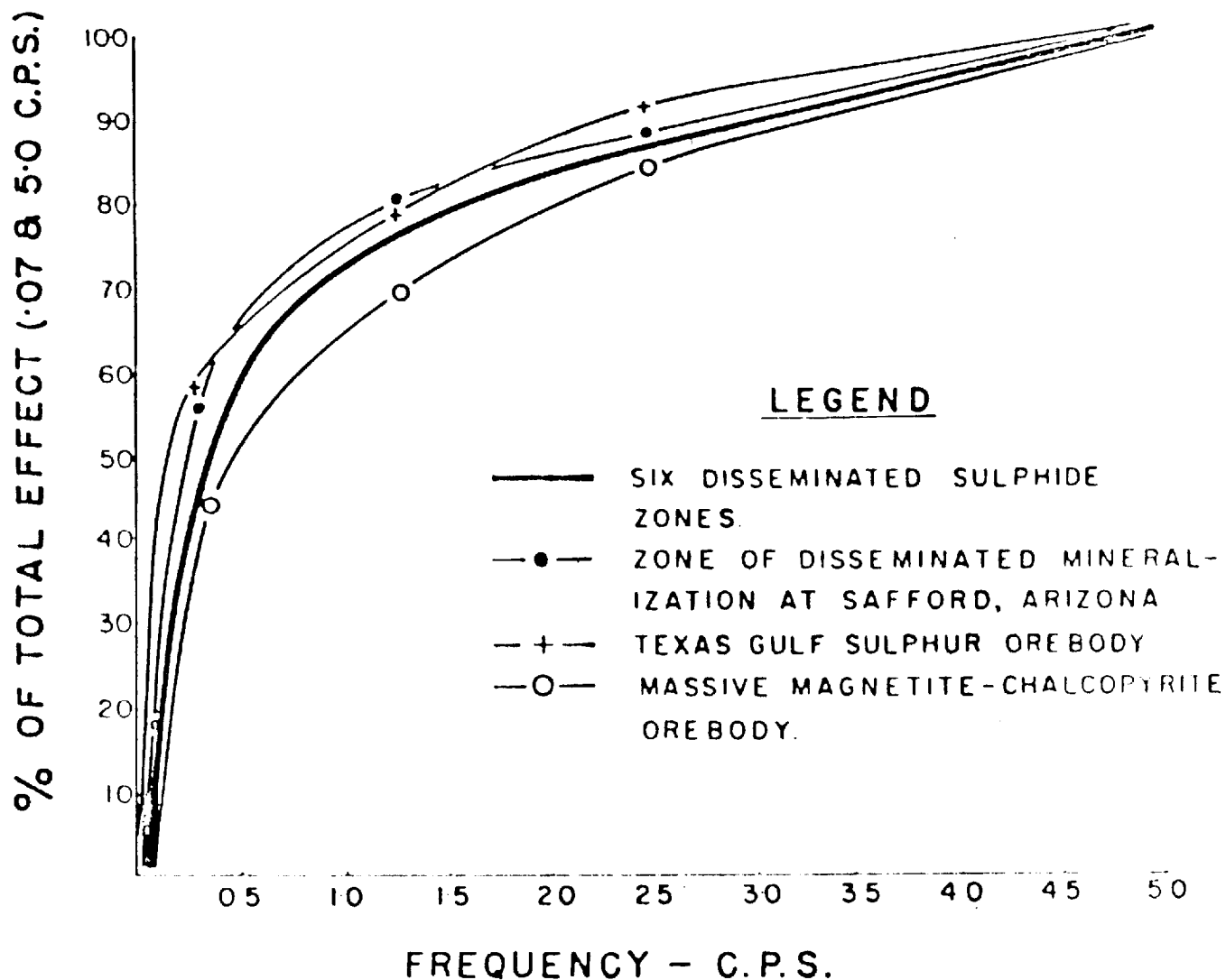


Figure AII.3: The results are based upon several hundred field measurements using the frequency range .07 cps to 5.0 cps. For each measurement made, the frequency effects measured for .07 cps and 5.0 cps were considered to be 100% of that which was available for the IP measurement. The frequency effect measured with any other two frequencies is plotted as a percentage of that value.

normalized by dividing by the resistivity, one obtains the normalized slope, which is the IP frequency effect."

AII.3 Frequency Dependence of the Frequency Effect Measurement

The frequency effect, as calculated using equation 6-3, is dependant on the transmitting frequencies used. Figure AII-3 (from Hallof, November, 1965) illustrates that most of the frequency effect is measurable if the higher transmitting frequency used is 1 Hz, with a smaller increase in amplitude occurring if using a transmitting frequency greater than 2 Hz (approximately 20% if the upper transmitting frequency is 5Hz).

It is of interest to note that, in his modelling experiments, Hallof determined that by doubling the magnitude of the true polarization effect of the target, the maximum measured magnitude of the apparent frequency effect is approximately doubled. This suggests that if the transmitting frequencies used are changed then the magnitude of the polarization effects measured within the anomaly will vary in much the same way as the true polarization effects within the source.

AII.4 Noise Factors in Induced Polarization Surveying

Man-made noise varies from 60 Hz power line noise to d.c. transients near mines using earth return d.c. haulage systems. Other cultural effects that are unavoidable are grounded fences (including grounded power lines) and pipelines.

Natural noise occurs at all frequencies but tends to decrease in magnitude with increasing frequency. It is found that the majority of natural noise occurs at

frequencies less than 0.1 Hz. For optimum speed of measurements and percentage of measured frequency effect the lower transmitting frequency is commonly chosen at 0.3 Hz.

AII.5 Electromagnetic Coupling (Sumner, 1976 pp. 149-160)

The Induced Polarization transmitter circuit will, in certain situations, include a current in the receiver circuit, where circuit is taken to mean the instrument and/or related wires. This electromagnetic coupling (EMC) causes spurious polarization effects that are not due to natural polarization causes.

When using a dipole-dipole array over an electrically homogeneous or layered earth, it is found that EMC effects are positive, i.e. in the same sense as the true polarization. The effects are also associated with anisotropic and inhomogeneous geological situations if low resistivities are involved.

A measure of the EMC effect with a given dipole-dipole array can be ascertained by using the dimensionless parameter

$$a/\delta$$

$$\text{where } \delta = 502.4 \frac{\rho_a (\text{ohm m})}{f (\text{Hz})} \text{ meters} \quad (\text{AII-2})$$

a = dipole length

δ = electromagnetic skin depth

ρ_a = resistivity of the ground

f = transmitting frequency

The EMC effect is therefore dependent on the resistivity of the ground, the transmitting frequency, the dipole length and also the dipole separation 'n' factor.

When a uniformly homogeneous, isotropic half-space is considered, it is found that EMC effects increase rapidly if a/δ is greater than 0.2 and are still significant if $a/\delta = 0.1$. For this reason, induced polarization surveys are generally carried out with a value of a/δ less than 0.1 so that EMC effects are negligible with respect to other sources of field data error.

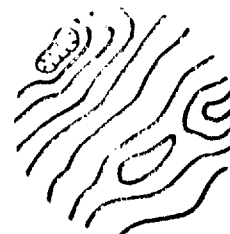
EMC effects, if less than 5%, can be subtracted linearly with an error of less than one percent frequency effect to obtain the true polarization amplitude.

However, the best way to minimize the EMC problem is to avoid it by keeping the receiver apart from the transmitter and ensuring that the survey is carried out in such a way that the attached read and power wires are never parallel.

Note: EMC can be avoided to a large degree in the time domain by using a delay time between the instant the transmitter current is turned off and the instant measurement of the decay voltage begins.

Appendix III

geoMetrics



Instrument Division

PORTABLE PROTON MAGNETOMETER MODEL G-816



- ★ 1 gamma sensitivity and repeatability
- ★ Very small size and weight: less than 12 lbs complete with batteries and sensor
- ★ Over 10,000 readings per set of alkaline "D" cell (flashlight) batteries
- ★ Provision to attach sensor to carrying harness for use without staff
- ★ Pushbutton operation—numeric display directly in gammas
- ★ Total field measurements— independent of orientation—no calibration—no leveling

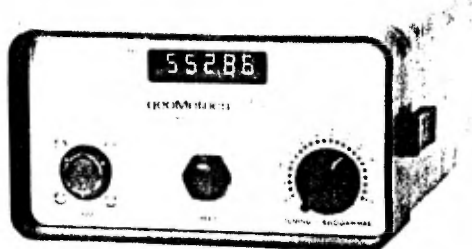
The Model G-816 is a complete portable magnetometer for all man-carry field applications. As an accurate yet simple to operate instrument, it features an outstanding combination of one gamma sensitivity and repeatability, compact size and weight, operation on standard universally available flashlight batteries, ruggedized packaging and very low price.

The G-816 magnetometer allows precise mapping of very small or large amplitude anomalies for ground geophysical surveys, or for detail follow-up to aeromagnetic reconnaissance surveys. It is a rugged, light-weight, and versatile instrument, equally well suited for field studies in geophysics, research programs or other magnetic mapping application where low cost, dependable operation and accurate measurements are required.



"Hands-free" Back Pack Sensor

Based upon the principle of nuclear precession (proton) the G-816 offers absolute drift-free measurements of the total field directly in gammas. (The proton precession method is the officially recognized standard for measurement of the earth's magnetic field.) Operation is worldwide with one gamma sensitivity and repeatability maintained throughout the range. There is no temperature drift, no set-up or leveling required, and no adjustment for orientation, field polarity, or arbitrary reference levels. Operation is very simple with no prior training required. Only 6 seconds are required to obtain a measurement which is always correct to one gamma, regardless of operator experience. Only the Proton Magnetometer offers such repeatability—an important consideration even for 10 gamma survey resolution.



Complete Field Portable System

The Model G-816 comes complete, ready for portable field operation and consists of:

1. Electronics console with internally mounted and easily replaced "D" cell battery pack.
2. Proton sensor and signal cable for attachment to carrying harness or staff.
3. Adjustable carrying harness.
4. 8 foot collapsible aluminum staff.
5. Instruction manual, complete set of spare batteries, applications manual, and rugged field suitcase.

Price and lease rates on the G-816 magnetometer are available upon request.

SPECIFICATIONS

Sensitivity:	± 1 gamma throughout range
Range:	20,000 to 100,000 gammas (worldwide)
Tuning:	Multi-position switch with signal amplitude indicator light on display
Gradient Tolerance:	Exceeds 800 gammas/ft
Sampling Rate:	Manual push-button, one reading each 6 seconds
Output:	5 digit numeric display with readout directly in gammas
Power Requirements:	Twelve self-contained 1.5 volt "D" cell, universally available flashlight-type batteries. Charge state or replacement signified by flashing indicator light on display.

Battery Type	Number of Readings
Alkaline	over 10,000
Premium Carbon Zinc	over 4,000
Standard Flashlight	over 1,500

NOTE: Battery life decreases with low temperature operation.

Temperature Range:	Console and sensor: -40° to $+85^{\circ}\text{C}$		
	Battery Pack:	0° to $+50^{\circ}\text{C}$ (limited use to -15°C ; lower temperature battery belt operation—optional)	
Accuracy (Total Field):	± 1 gamma through 0° to $+50^{\circ}\text{C}$ temperature range		
Sensor:	High signal, noise cancelling, interchangeably mounted on separate staff or attached to carrying harness		
Size:	Console: 3.5 x 7 x 10.5 inches (9 x 18 x 27 cm) Sensor: 3.5 x 5 inches (9 x 13 cm) Staff: 1 inch diameter x 8 ft length (3 cm x 2.44 m)		
Weight:		Lbs.	Kgs.
	Console (w/batteries):	5.5	2.5
	Sensor & signal cable:	4	1.8
	Aluminum staff:	2	0.9
	Total:	11.5	5.2

All magnetometers and parts are covered by a one year warranty beginning with the date of receipt but not to exceed fifteen months from the shipping date.

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AUSTRALIA
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McPIIAR

P660 Variable Frequency Induced Polarization Equipment

A 5-frequency system designed
for general purpose use

Operates on 0.125, 0.3125, 1.25
2.5 and 5 Hz

2.5 KVA solid-state transmitter

7 pair electrode selector switch

Telluric filtering on receiver

"High - Low" frequency selection
switch to reduce reading errors



Model P660 is a multi-frequency induced polarization equipment system combining high power with the ability to make precise measurements. Its rugged mechanical and electrical design plus a choice of frequencies makes it an ideal instrument for a wide variety of geological conditions and climates.

Flexibility to meet the widest range of operating conditions without sacrificing surveying efficiency has been designed into the P660. The frequency range from 0.125 to 5 Hz enables frequency pairs to

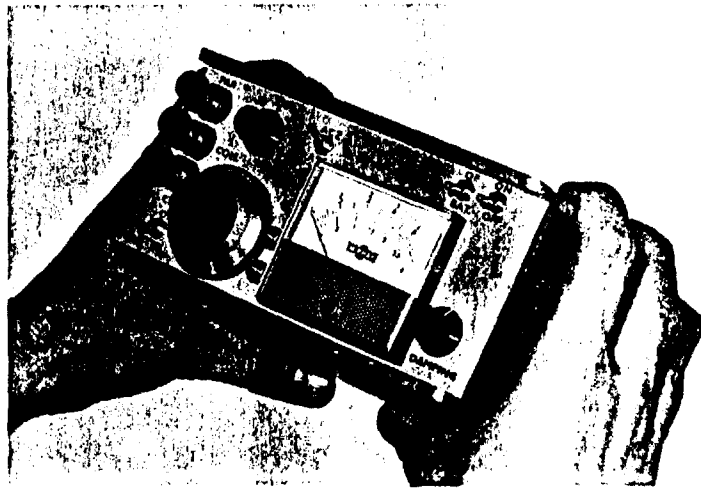
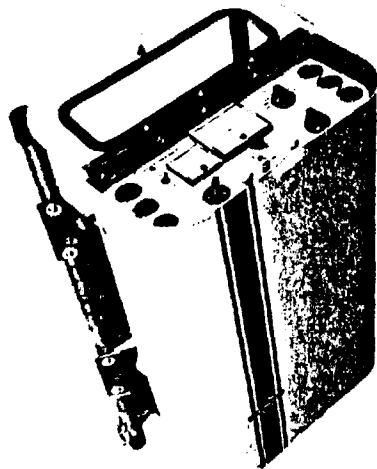
be selected to reduce the effect of inductive coupling due to large spreads or low ground resistivity. Frequency selection is made by an internal switch adjustment on the transmitter and an external adjustment on the receiver. To eliminate frequency selection error both the transmitter and receiver have a two-position switch to operate on the "high" or "low" frequency.

To obtain maximum power transfer a 10-position switch enables the operator to match the 2.5 KVA transmitter output

to the electrode load. This feature is of particular importance in low resistivity ground where power loss could significantly affect results.

The receiver has a continuously variable damping time constant, which allows the operator to adjust the instrument to the optimum degree of damping for the noise level encountered. Rather than taking readings for a pre-set time, variable damping permits minimum reading time to be achieved without reducing the accuracy of the measurement.

Transmitter and generator are packboard mounted



Transmitter:

- Completely solid state resulting in increased reliability and a weight reduction to under 35 pounds. A built-in electrode wire selector (up to 7 pairs) and its improved panel layout to reduce operator switching errors, make its operation easier. The transmitter is adaptable to a coherent filter system or

to other I.P. modes where custom designs require this.

Receiver:

The miniaturized receiver weighs 4½ pounds and latest "state of the art" integrated circuits have been effectively employed. Other features include; special telluric filtering, continuously

variable time constant to optimize reading time in high noise areas, and built-in calibration resistor. Its battery drain is low. Regular transistor radio batteries can be used to operate it. The input is fused to help prevent lightning damage.

Specifications

Frequencies: 0.125, 0.3125, 1.25, 2.5 and 5 Hz

Receiver:

Input impedance: 2 megohms.

- **Voltage ranges:** full scale 100 micro volt to 10 volts in five range positions. 10 micro volt full scale with reduced accuracy.

- **Frequency effect indicator:** —10 to +20%.

Frequency effect repeatability: to 0.1%.

- **Temperature and time drift:** negligible.

Filter characteristics: 20 db per octave below 0.1 Hz and 13 db per octave above each operating frequency.

Power line rejection (50 and 60 Hz): 70 db.

Battery Supply: 6 transistor type 9V batteries (drain 7.5 ma. at 15 to 30 volt).

Weight: 4½ pounds, less carrying case.

Transmitter:

Operating Voltage Range: 30-700V R.M.S.

Maximum current at full voltage: 5 amps.

Minimum current at full voltage: 20 ma.

Current regulation: .3% (max) output current change for 10% input voltage change; .1% is typical.

Operating temperature: —40°C to 60°C

Weight: 34 pounds packboard mounted with nylon waterproof hood.

Motor generator:

Output frequency: 400 Hz nominal

Output voltage: 125 Volts (nominal)

Output power: 2.5 KVA

Voltage regulation: —5% no load to full load

Weight: Back pack mounted:— 79 pounds.

Accessories available: Citizens band transceiver signalling set; speedwinders and spools with 1,000 feet of field wire; geo reel with 5,000 feet of field wire; porous pots; stainless steel electrodes; clip leads; multimeter; fuses; a tool kit with tape; a plastic sheet.

McPhar Geophysics

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Willowdale, Ontario, Canada M2H 2R9
Tel: (416) 497-1700 Telex: 065-25305
— Cable: McPHAR TOR

Contact McPhar Geophysics head office for the agent in your area.

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PSEUDOSECTIONS