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SML 341

OOLOO MINE PROSPECT

PROGRESS REPORTS TO LICENCE EXPIRY FOR THE PERIOD 23/10/1969 TO 22/10/1970

Submitted by
Mid-East Minerals NL
1970

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Government of South Australia
Primary Industries and Resources SA

I·-003

McPHAR GEOPHYSICS

NOTES ON THE THEORY, METHOD OF FIELD OPERATION AND PRESENTATION OF DATA FOR THE INDUCED POLARIZATION METHOD

Induced Polarization as a geophysical measurement refers to the blocking action or polarization of metallic or electronic conductors in a medium of ionic solution conduction.

This electro-chemical phenomenon occurs wherever electrical current is passed through an area which contains metallic minerals such as base metal sulphides. Normally, when current is passed through the ground, as in resistivity measurements, all of the conduction takes place through ions present in the water content of the rock, or soil, i.e. by ionic conduction. This is because almost all minerals have a much higher specific resistivity than ground water. The group of minerals commonly described as "metallic", however, have specific resistivities much lower than ground waters. The induced polarization effect takes place at those interfaces where the mode of conduction changes from ionic in the solutions filling the interstices of the rock to electronic in the metallic minerals present in the rock.

The blocking action or induced polarization mentioned above, which depends upon the chemical energies necessary to allow the ions to give up or receive electrons from the metallic surface, increases with the time that a d. c. current is allowed to flow through the rock; i. e. as ions pile up against the metallic interface the resistance to current flow increases. Eventually, there is enough polarization in the form of excess ions at the interfaces, to appreciably reduce the amount of current flow through the metallic particle. This polarization takes place at each of the infinite number of solution-metal interfaces in a mineralized rock.

When the d. c. voltage used to create this d. c. current flow is cut off, the Coulomb forces between the charged ions forming the polarization cause them to return to their normal position. This movement of charge creates a small current flow which can be measured on the surface of the ground as a decaying potential difference.

From an alternate viewpoint it can be seen that if the direction of the current through the system is reversed repeatedly before the polarization occurs, the effective resistivity of the system as a whole will change as the frequency of the switching is changed. This is a consequence of the fact that the amount of current flowing through each metallic interface depends upon the length of time that current has been passing through it in one direction.

The values of the per cent frequency effect or F. E. are a measurement of the polarization in the rock mass. However, since the measurement of the degree of polarization is related to the apparent resistivity of the rock mass it is found that the metal factor values or M.F. are the most useful values in determining the amount of polarization present in the rock mass. The MF values are obtained by normalizing the F. E. values for varying resistivities.

The induced polarization measurement is perhaps the most powerful geophysical method for the direct detection of metallic sulphide mineralization, even when this mineralization is of very low concentration. The lower limit of volume per cent sulphide necessary to produce a recognizable IP anomaly will vary with the geometry and geologic environment of the source, and the method of executing the survey. However, sulphide mineralization of less than one per cent by volume has been detected by the IP method under proper geological conditions.

The greatest application of the IP method has been in the search for disseminated metallic sulphides of less than 20% by volume. However, it has also been used successfully in the search for massive sulphides in situations where, due to source geometry, depth of source, or low resistivity of surface layer, the EM method can not be successfully applied. The ability to differentiate ionic conductors, such as water filled shear zones, makes the IP method a useful tool in checking EM anomalies which are suspected of being due to these causes.

In normal field applications the IP method does not differentiate between the economically important metallic minerals such as chalcopyrite, chalcocite, molybdenite, galena, etc., and the other metallic minerals such as pyrite. The induced polarization effect is due to the total of all electronic conducting minerals in the rock mass. Other electronic conducting materials which can produce an IP response are magnetite, pyrolusite, graphite, and some forms of hematite.

In the field procedure, measurements on the surface are made in a way that allows the effects of lateral changes in the properties of the ground to be separated from the effects of vertical changes in the properties. Current is applied to the ground at two points in distance (X) apart. The potentials are measured at two other points (X) feet apart, in line with the current electrodes is an integer number (n) times the basic distance (X).

The measurements are made along a surveyed line, with a constant distance (nX) between the nearest current and potential electrodes. In most surveys, several traverses are made with various values of (n); i.e. (n) = 1, 2, 3, 4, etc. The kind of survey required (detailed or reconnaissance) decides the number of values of (n) used.

In plotting the results, the values of the apparent resistivity, apparent per cent frequency effect, and the apparent metal factor measured for each set of electrode positions are plotted at the intersection of grid lines, one from the center point of the current electrodes and the other from the center point of the potential electrodes. (See Figure A.) The resistivity values are plotted above the line as a mirror image of the metal factor values below. On a second line, below the metal factor values, are plotted the values of the per cent frequency effect. In some cases the values of per cent frequency effect are plotted as superscripts of the metal factor value. In this second case the frequency effect values are not contoured. The lateral displacement of a given value is determined by the location along the survey line of the center point between the current and potential electrodes. The distance of the value from the line is determined by the distance (nX) between the current and potential electrodes when the measurement was made.

The separation between sender and receiver electrodes is only one factor which determines the depth to which the ground is being sampled in any particular measurement. The plots then, when contoured, are not section maps of the electrical properties of the ground under the survey line. The interpretation of the results from any given survey must be carried out using the combined experience gained from field results, model study results and theoretical investigations. The position of the electrodes when anomalous values are measured is important in the interpretation.

In the field procedure, the interval over which the potential differences are measured is the same as the interval over which the electrodes are moved after a series of potential readings has been made. One of the advantages of the induced polarization method is that the same equipment can be used for both detailed and reconnaissance surveys merely by changing the distance (X) over which the electrodes are moved each time. In the past, intervals have been used ranging from 25 feet to 2000 feet for (X). In each case, the decision as to the distance (X) and the values of (n) to be used is largely determined by the expected size of the mineral deposit being sought, the size of the expected anomaly and the speed with which it is desired to progress.

The diagram in Figure A demonstrates the method used in plotting the results. Each value of the apparent resistivity, apparent metal factor, and apparent per cent frequency effect is plotted and identified by the position of the four electrodes when the measurement was made. It can be seen that the values measured for the larger values of (n) are plotted farther from the line indicating that the thickness of the layer of the earth that is being tested is greater than for the smaller values of (n); i. e. the depth of the measurement is increased. When the F. E. values are plotted as superscripts to the MF values the third section of data values is not presented and the F. E. values are not contoured.

The actual data plots included with the report are prepared utilizing an IBM 360/75 Computer and a Calcomp 770/763 Incremental Plotting System. The data values are calculated, plotted, and contoured according to a programme developed by McPhar Geophysics. Certain symbols have been incorporated into the programme to explain various situations in recording the data in the field.

The IP measurement is basically obtained by measuring the difference in potential or voltage (ΔV) obtained at two operating frequencies. The voltage is the product of the current through the ground and the apparent resistivity of the ground. Therefore in field situations where the current is very low due to poor electrode contact, or the apparent resistivity is very low, or a combination of the two effects; the value of (ΔV) the change in potential will be too small to be measurable. The symbol "TL" on the data plots indicates this situation.

In some situations spurious noise, either man made or natural, will render it impossible to obtain a reading. The symbol "N" on the data plots indicates a station at which it is too noisy to record a reading. If a reading can be obtained, but for reasons of noise there is some doubt as to its accuracy, the reading is bracketed in the data plot ( ).

In certain situations negative values of Apparent Frequency Effect are recorded. This may be due to the geologic environment or spurious electrical effects. The actual negative frequency effect value recorded is indicated on the data plot, however the symbol "NEG" is indicated for the corresponding value of Apparent Metal Factor. In contouring negative values the contour lines are indicated to the nearest positive value in the immediate vicinity of the negative value.

The symbol "NR" indicates that for some reason the operator did not attempt to record a reading although normal survey procedures would suggest that one was required. This may be due to inaccessible topography or other similar reasons. Any symbol other than those discussed above is unique to a particular situation and is described within the body of the report.

METHOD USED IN PLOTTING DIPOLE-DIPOLE INDUCED POLARIZATION AND RESISTIVITY RESULTS

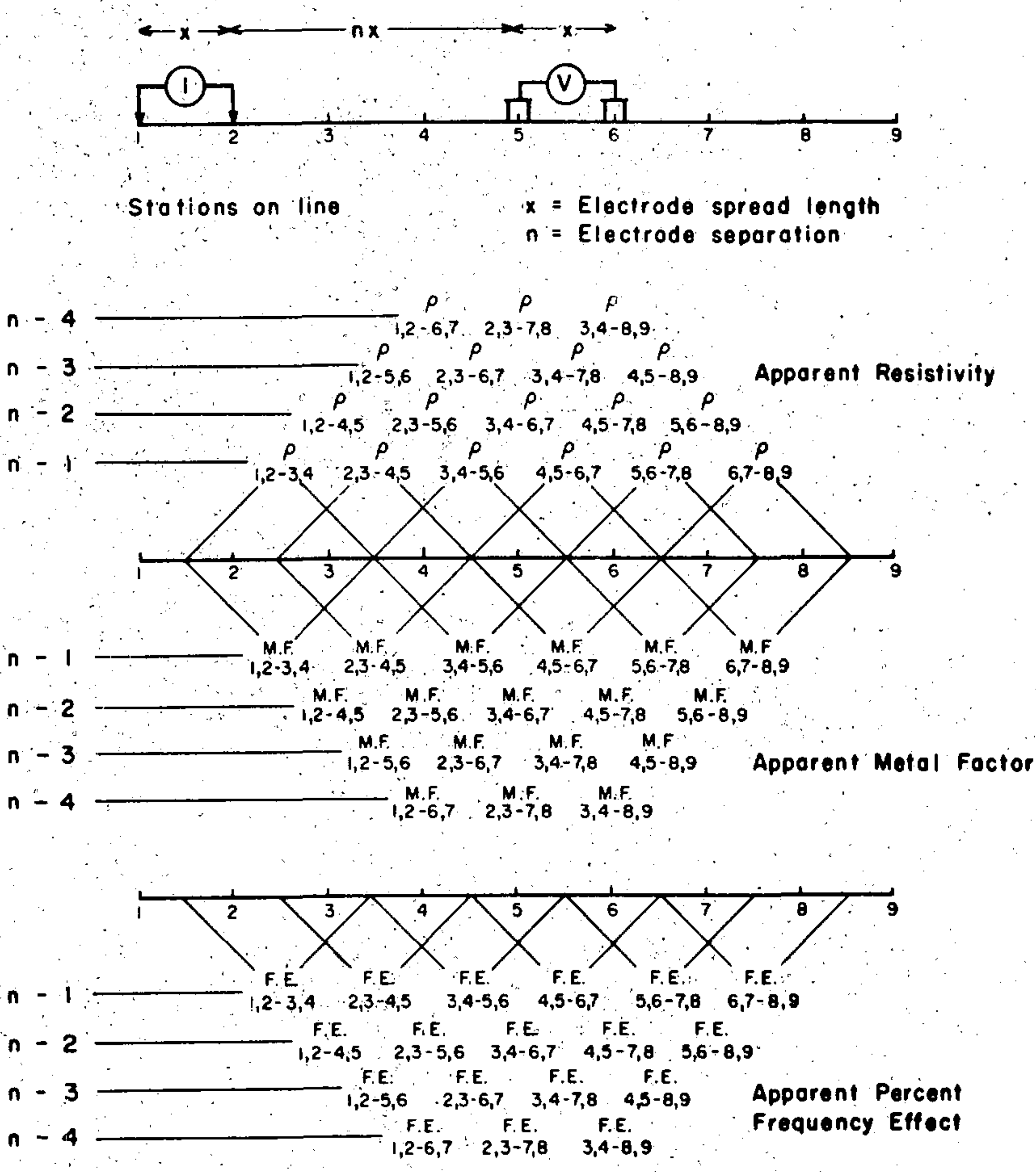

Fig. A

McPHAR GEOPHYSICS

REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY ON THE OOLOO MINE PROJECT, LYNDHURST AREA, SOUTH AUSTRALIA FOR MID-EAST MINERALS, N.L.

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1. INTRODUCTION

At the request of Mr. D.A. Huxtable, an induced polarization and resistivity survey has been completed on the Ooloo Mine project for Mid-East Minerals, N.L.

The survey area is in the Lyndhurst area of South Australia. The geological environment is the Northern Flinders sub-province of the Adelaide Geosyncline Province, part of the "copper belt" of South Australia.

The larger part of the grid area is overlain by recent alluvium, with two areas of Tertiary duricrust and outcropping green siltstone and quartz conglomerate. There are two mine shafts near the centre of the grid. The induced polarization and resistivity survey was carried out to try to trace sources of mineralization away from the mine area.

2. PRESENTATION OF RESULTS

The induced polarization and resistivity results are shown on the following data plots in the manner described in the notes preceding this report.

Line		Electrode Intervals	Dwg. No.
40+00W		300 feet	IP 5409-1
30+00W		300 feet	IP 5409-2
20+00W		300 feet	IP 5409-3
10+00W		300 feet	IP 5409-4
0+00	(North-South)	300 feet	IP 5409-5
0+00		200 feet	IP 5409-6
0+00		100 feet	IP 5409-7
10+00E		400 feet	IP 5409-8
10+00E		300 feet	IP 5409-9
20+00E		300 feet	IP 5409-10
30+00E		300 feet	IP 5409-11
25+00N		300 feet	IP 5409-12
0+00	(East-West)	300 feet	IP 5409-13
25+00S		300 feet	IP 5409-14

Enclosed with this report is Dwg. I.P.P. 4046A, a plan map of the grid at a scale of 1" = 400'. The definite and possible induced polarization anomalies are indicated by solid and broken bars respectively on this plan map as well as the data plots. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

Since the induced polarization measurement is essentially an averaging process, as are all potential methods, it is frequently difficult to exactly pinpoint the source of an anomaly. Certainly, no anomaly can be located with more accuracy than the spread length; i. e. when using 300' spreads the position of a narrow sulphide body can only be determined to lie between two stations 300' apart. In order to locate sources at some depth, larger spreads must be used, with a corresponding increase in the uncertainties of location. Therefore, while the centre of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

3. DISCUSSION OF RESULTS

One of the greatest problems in the interpretation of IP results is caused by a large area of low surface resistivities. This condition is caused by increased porosity due to weathering and also to the high salinity of the water that fills the pore spaces of the rocks. The resistivity values measured are low, variable and unpredictable.

Because of the low resistivities, the voltages created at the potential electrode are small. This means that natural electrical noises are more important and that accurate IP measurements are more difficult to make. It is necessary that current electrodes be prepared so that maximum current levels are achieved.

In the low resistivity areas, the measurements for the larger values of (X) and (n) can be distorted by inductive coupling effects. The inductive effects between the wires used for the measurements are in the opposite sense from the resistive coupling; the voltage measured decreases with increased frequency. These extraneous frequency effects can be confused with polarisation.

The magnitude of these effects increases with distance (X or n) and frequency; they also increase as the resistivity of the earth decreases. Some typical examples for a uniform earth and 300 foot electrode intervals are tabulated below.

X = 300 feet; 0.3 - 2.5 cps

$\rho/2\pi$ = 10

n = 1	Less than 0.1%
n = 2	0.1%
n = 3	0.3%
n = 4	0.7%

X = 300 feet; 0.1 - 1.25 cps

$\rho/2\pi$ = 10

n = 1	Less than 0.1%
n = 2	Less than 0.1%
n = 3	Less than 0.1%
n = 4	Less than 0.1%

X = 300 feet; 0.3 - 2.5 cps

$\rho/2\pi$ = 1.0

n = 1	0.7%
n = 2	2.5%
n = 3	5.4%
n = 4	9.1%

X = 300 feet; 0.1 - 1.25 cps

$\rho/2\pi$ = 1.0

n = 1	0.2%
n = 2	1.0%
n = 3	2.2%
n = 4	4.1%

X = 300 feet; 0.3 - 2.5 cps

$\rho/2\pi$ = 0.5

n = 1	2.9%
n = 2	8.1%
n = 3	approx. 16%
n = 4	greater than 25%

X = 300 feet; 0.1 - 1.25 cps

$\rho/2\pi$ = 0.5

n = 1	1.1%
n = 2	3.7%
n = 3	7.4%
n = 4	approx. 13.5%

In the case of a non-uniform earth, the exact magnitude of the inductive coupling effects can not be calculated. However, it is obvious that in low resistivity areas the frequencies used should be as low as 0.125 - 1.25 cps. Even with these frequencies there are regions in which the inductive coupling effects will be large enough to make IP data non-interpretable.

Until recently, it has not been possible to make measurements at 0.125 - 1.25 cps on a production basis. The natural noise variations are large, and signal voltages are small. However, we have recently completed field tests for a new filter-amplifier that operates at 0.125 - 1.25 cps. This system operates in our standard receiver, and it has functioned very well in the southwestern U.S. We have made satisfactory measurements at 0.125 - 1.25 cps in noisy areas in which this has not previously been possible.

These new filter-amplifiers are now available in Australia, and they can be used to make 0.125 - 1.25 cps measurements.

The northeastern and eastern sections of the Ooloo Mine grid should be surveyed with these low frequencies to try to determine how much, if not all, of the anomalous effects is due to coupling. In the following discussion, only these anomalies which are not suspected as resulting from coupling effects alone will be discussed.

<u>Line 40W</u>

The anomaly from 9S to 15S lies across the contact between green siltstone and the recent alluvium. The source lies at some depth relative to the electrode interval. The change in rock type at approximately 4W to 15W is apparent in the resistivity increase in that section.

 017

Line 30W

A probable anomaly at some depth extends from 24S to 28S at the siltstone contact. A second probable anomaly from 0 to 6S is associated with the northern contact of the siltstone. This second anomaly is shallow and should be checked with shorter electrode intervals.

A probable anomaly from 4N to 8N is in the alluvium but does not seem to be wholly due to coupling. This anomaly should be checked with lower frequencies and shorter intervals. This is also true of a shallow, possible anomaly from 18N to 21N.

Line 20W

A possible anomaly in the siltstone extends from 18S to 30S. The top of the source is less than 300' deep. There are two possible anomalies from 1N to 5N and from 13N to 21N, both relatively shallow. All three anomalies should be checked with shorter electrode intervals.

Line 10W

There is an incomplete possible anomaly in quartz conglomerate from 37S to the south. A second possible anomaly in the siltstone extends from 15S to 20S, with the source at some depth.

Line 0 (N-S)

This line was surveyed with 300' intervals, then checked with 200' and 100' electrode intervals.

There is a deep possible anomaly from 19S to 25S. A second anomaly of varying magnitude and depth extends from 3S to 17S. The strongest part of this anomaly, from 10S to 11S, is shallow and should be detailed with shorter spreads.

A weak anomaly was located at the mine shaft near the edge of the siltstone from 8N to 15N. This anomaly was checked with 200' intervals and a shallow, weak anomaly from 1S to 1N was located, as well as a weak incomplete anomaly from 7N past 14N. The 100' survey located an incomplete anomaly from 2S to the south, strengthening with depth. There was also an anomaly from 1S to 2N varying in magnitude but strongest at some depth relative to the electrode interval.

Line 10E

The 300' survey located two probable anomalies on this line. There is an incomplete anomaly on the western end of the line from 25S. This anomaly should be detailed with shorter electrode intervals. The second anomaly extends from 300N to 900N and is strongest at depth. It was detailed with 400' electrode intervals and was confirmed.

Line 20E, Line 30E

Coupling is suspected throughout these lines, so they should be surveyed at lower frequencies.

Line 25N

Coupling is also suspected on this line from 900E to the east. A shallow, weak anomaly was located from 15W to 21W. This anomaly crosses a similar anomaly on Line 20W, for which detail with shorter electrode intervals has been recommended.

Line 0 (W-E)

A weak anomaly, increasing in magnitude with depth, extends from 7W to 11W. There is no corresponding anomaly on Line 10W, which the anomaly crosses at 0.

Line 25S

A weak, shallow anomaly extends from 33W to 36W. A second similar anomaly was located from 15W to 18W. Both anomalies should be checked with shorter electrode intervals.

4. CONCLUSIONS

Most of the anomalies are associated with the green siltstone. The reconnaissance survey interval is 400 feet, which is too wide to locate the narrow, vein type of deposit which has been found both at Ediacara and the Blinman Dome. The anomalies here suggest a disseminated type of mineralization. Detail work with shorter electrode intervals has been recommended for several of the shallow anomalies and the results, after evaluation, may suggest further work.

The anomalies in the north and east of the grid area are in recent alluvium. This would explain the very low resistivities, but not the high frequency effects. Coupling is suspected and this part of the grid should be surveyed with lower frequencies to decrease the possibility of coupling.

McPHAR GEOPHYSICS PTY. LTD.

Marion A. Goudie
Geologist.

Philip G. Hallof,
Geophysicist.

Dated: March 25, 1970

McPHAR GEOPHYSICS

APPENDIX

EXPECTED IP ANOMALIES FROM "PORPHYRY COPPER" TYPE ZONES OF DISSEMINATED SULPHIDE MINERALIZATION

Our experience in other areas has shown that the induced polarization method can be successfully used to locate, and outline, zones of disseminated sulphide mineralization of the "porphyry copper" type. In most cases the interpretation of the IP results is simple and straightforward. The results shown in Figure 1 and Figure 2 are typical.

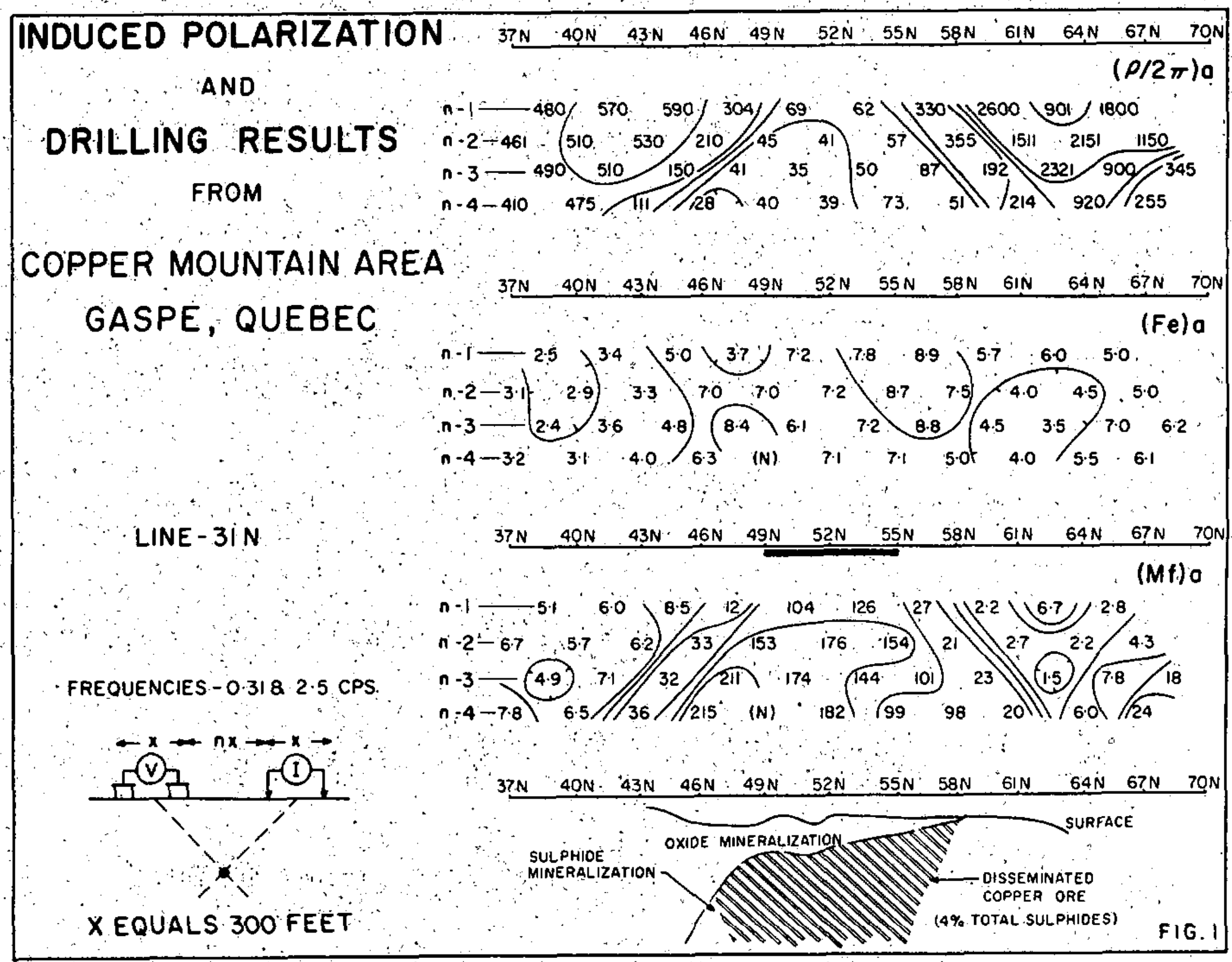

FIG. 1

The source of the moderate magnitude IP anomaly shown in Figure 1 contains approximately 4% metallic mineralization. The zone is of limited lateral extent and enough copper is present to make the mineralization "ore grade". The presence of the surface oxidation can be seen in the fact that the apparent IP effects increase for n = 2.

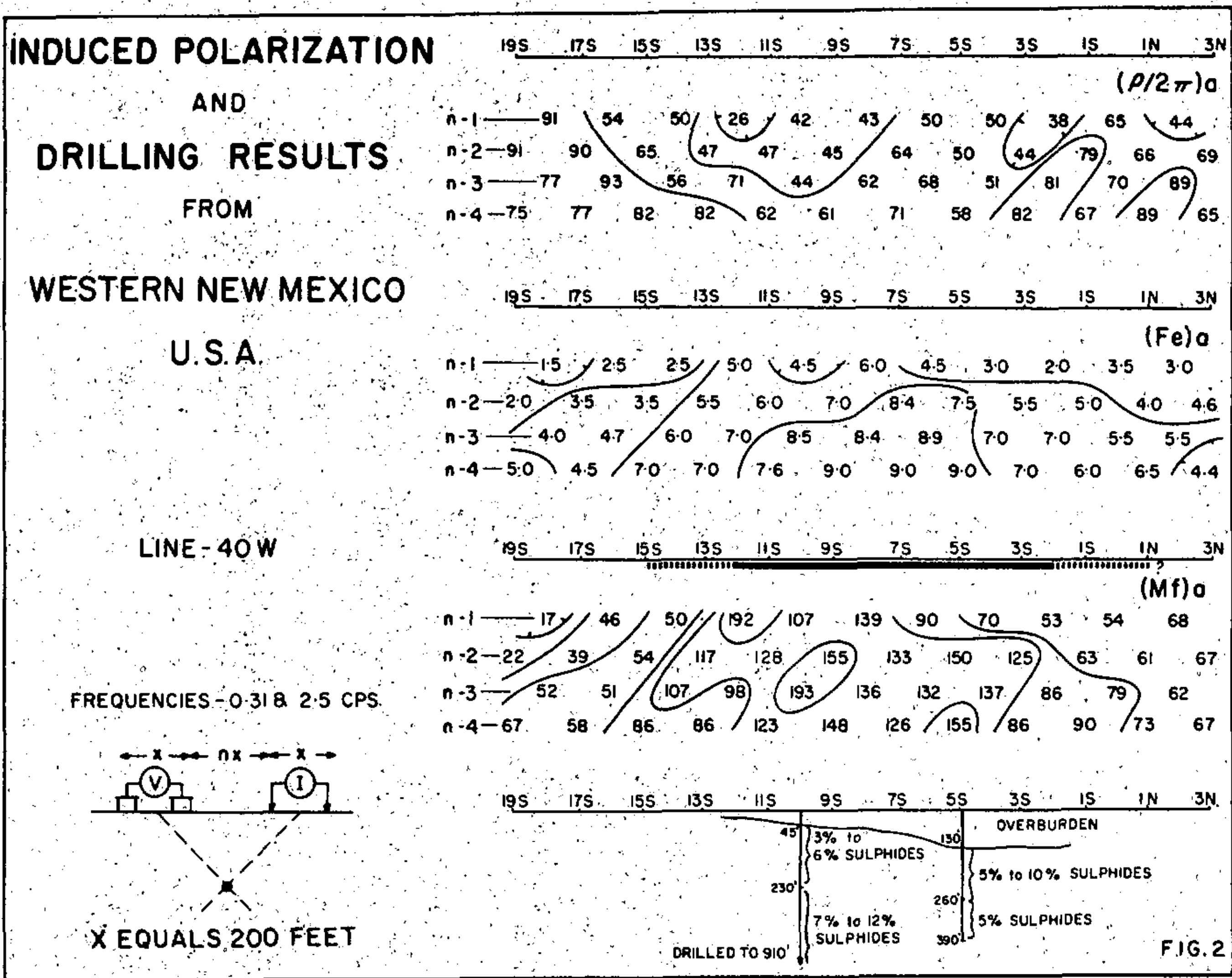

FIG. 2

The IP anomaly shown in Figure 2 has about the same magnitude as that described above. It should be noted that appreciably greater concentrations of metallic mineralization are present; further, there is little or no copper present. These results illustrate the fact that IP results can not be used to determine the exact amount of metallic mineralization present or to determine the economic importance of a mineralized zone. In some geologic situations zoning is present; the zones of mineralization of greatest economic value may contain less total metallic mineralization than other zones in the same general area.

In the proper geologic environment, the method will detect even very low concentrations of metallic mineralization. The IP results shown in Figure 3 located the ore zone at the Brenda Property near Peachland, B.C. The zone contains 1.0 to 1.5 per cent metallic mineralization; however, the mineralization is "ore grade" because only molybdenite and chalcopyrite are present.

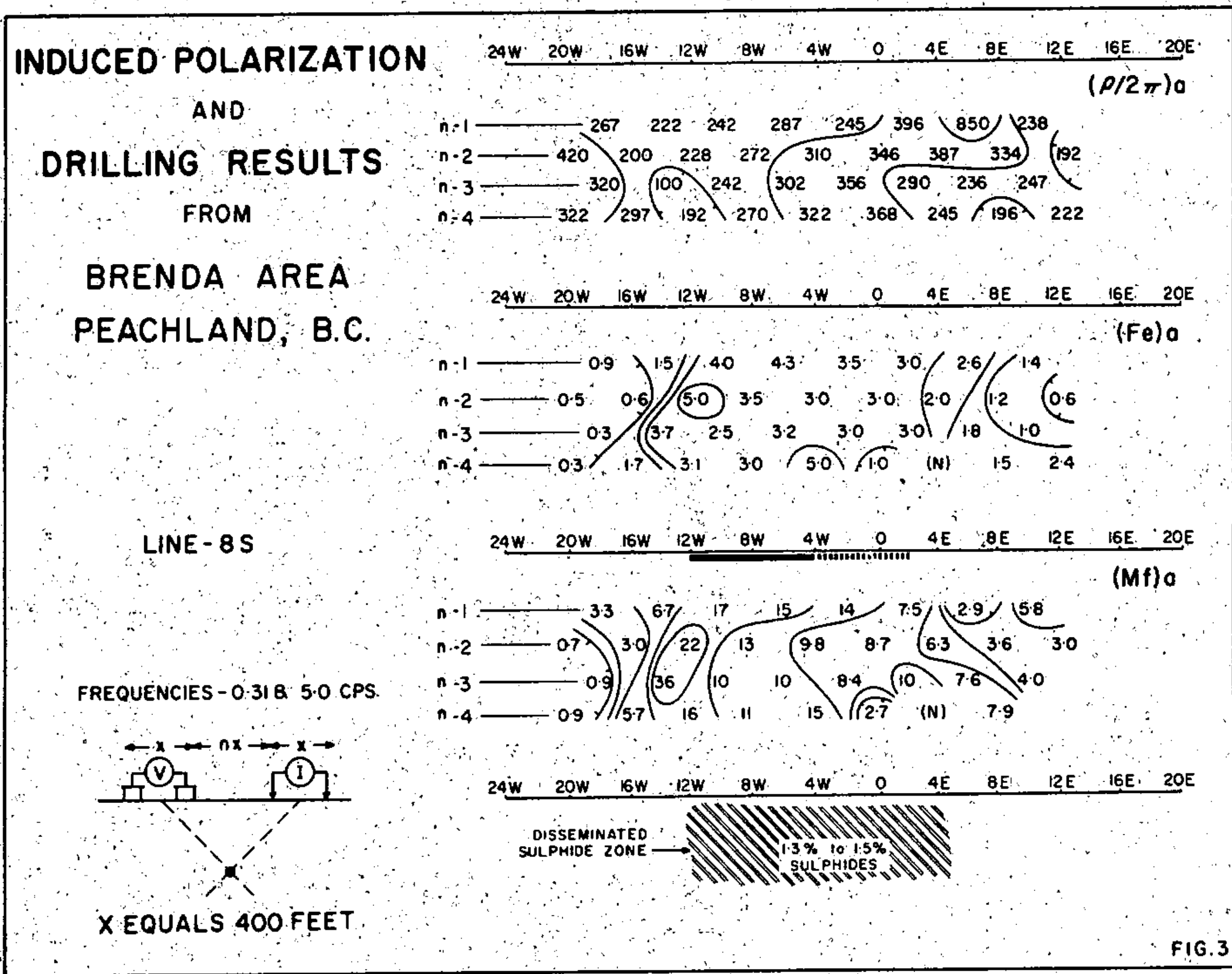

FIG. 3

1325-1.

ENV 1325

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INDUCED POLARIZATION AND RESISTIVITY SURVEY

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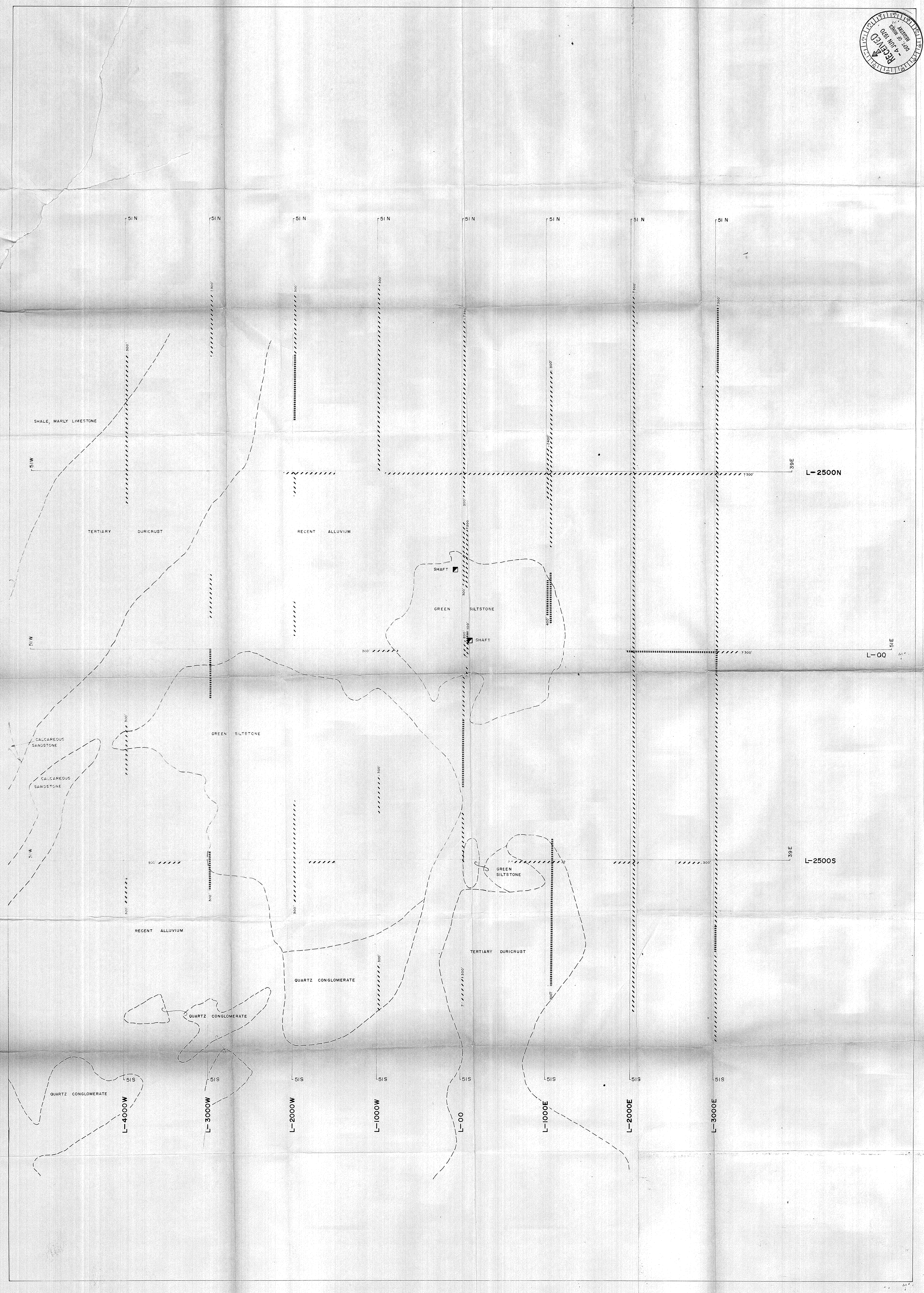


SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

NUMBER AT THE END OF ANOMALY INDICATES SPREAD USED.

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT – STH. AUST.

SCALE: 1 INCH = 400 FEET

DRAWN: C.C.C.
DATE: 14.5.70
APPROVED: E.B.

DATE: 14.5.70

DWG. NO.- I.P.-5409-1

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 4000W

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT X = 300'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

1325-2

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

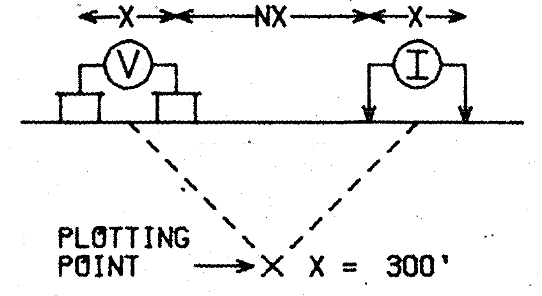
NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

DWG. NO.- I.P.-5409-2

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 3000W



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

DATE: 23 Mar 70

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

1325-3

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

DWG. NO.- I.P.-5409-3

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 2000H

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT X = 300'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

1325-4

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

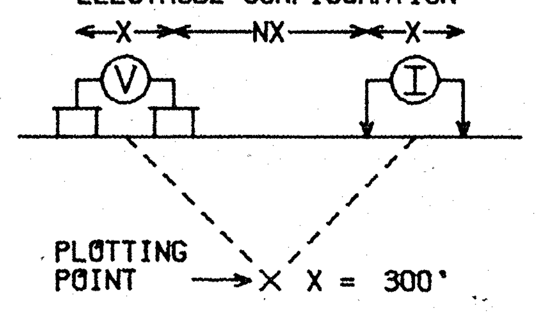
DWG. NO.- I.P.-5409-4

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 1000N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

1325-5

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

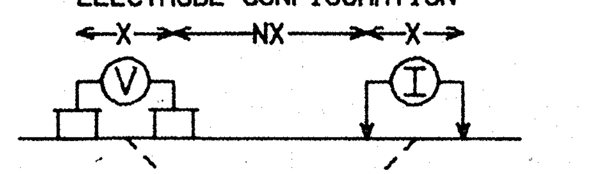
DWG. NO.- I.P.-5409-5

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 0

ELECTRODE CONFIGURATION



PLOTTING POINT → X X = 300'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

DATE:

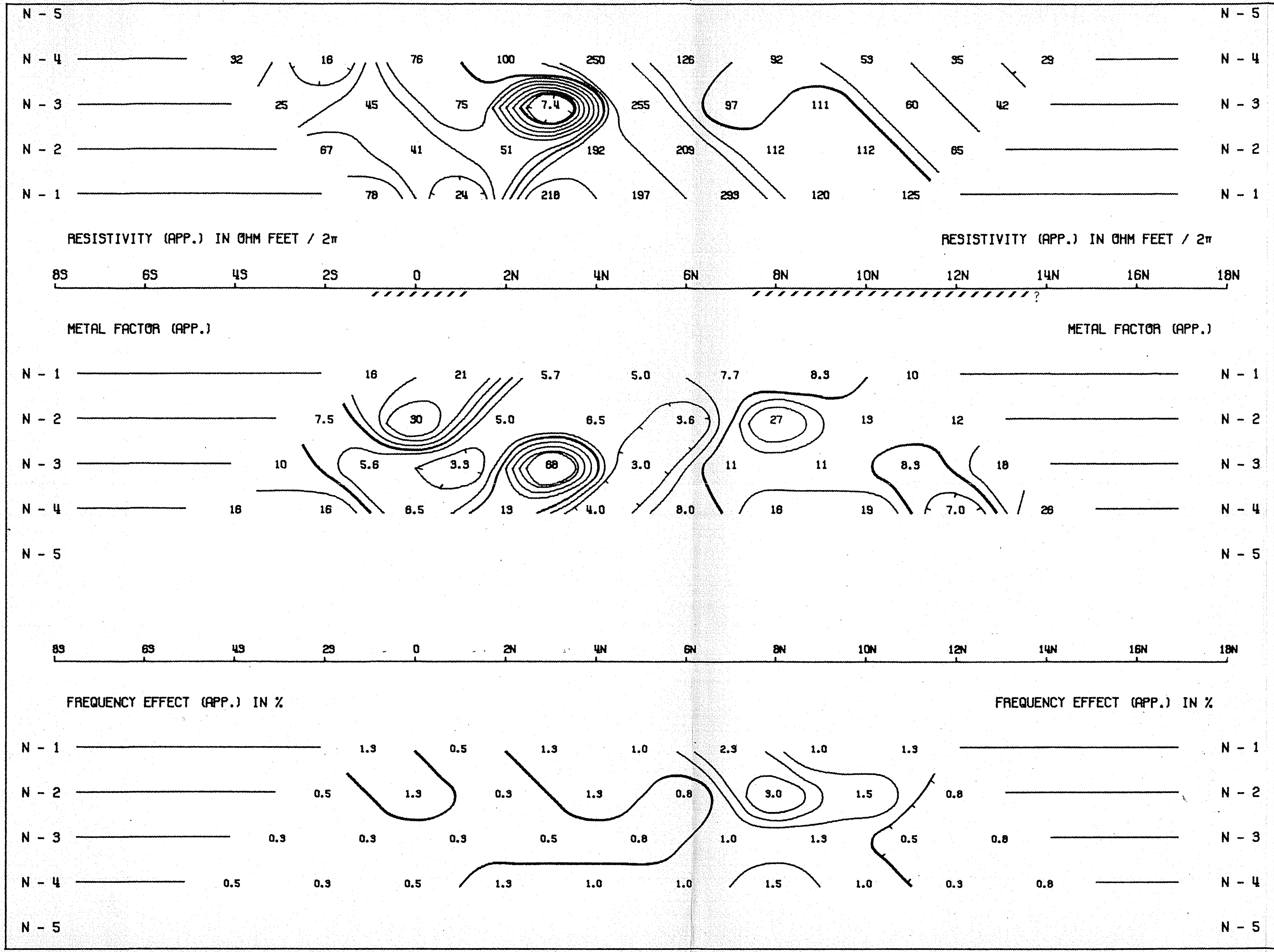
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

1325-6

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



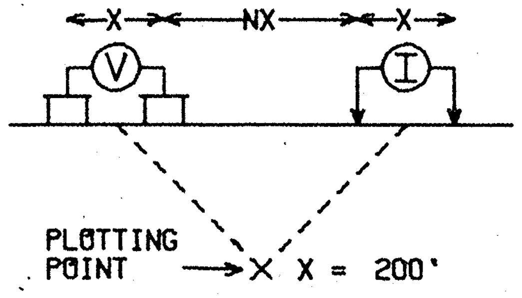
DWG. NO.- I.P.-5409-6

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 0

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

1325-7

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

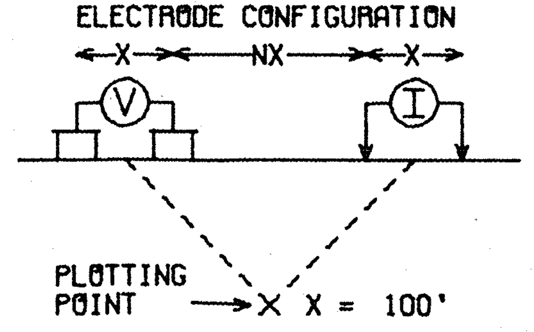
DWG. NO.- I.P.-5409-7

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 0

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

1325-8

McPHAR GEOPHYSICS

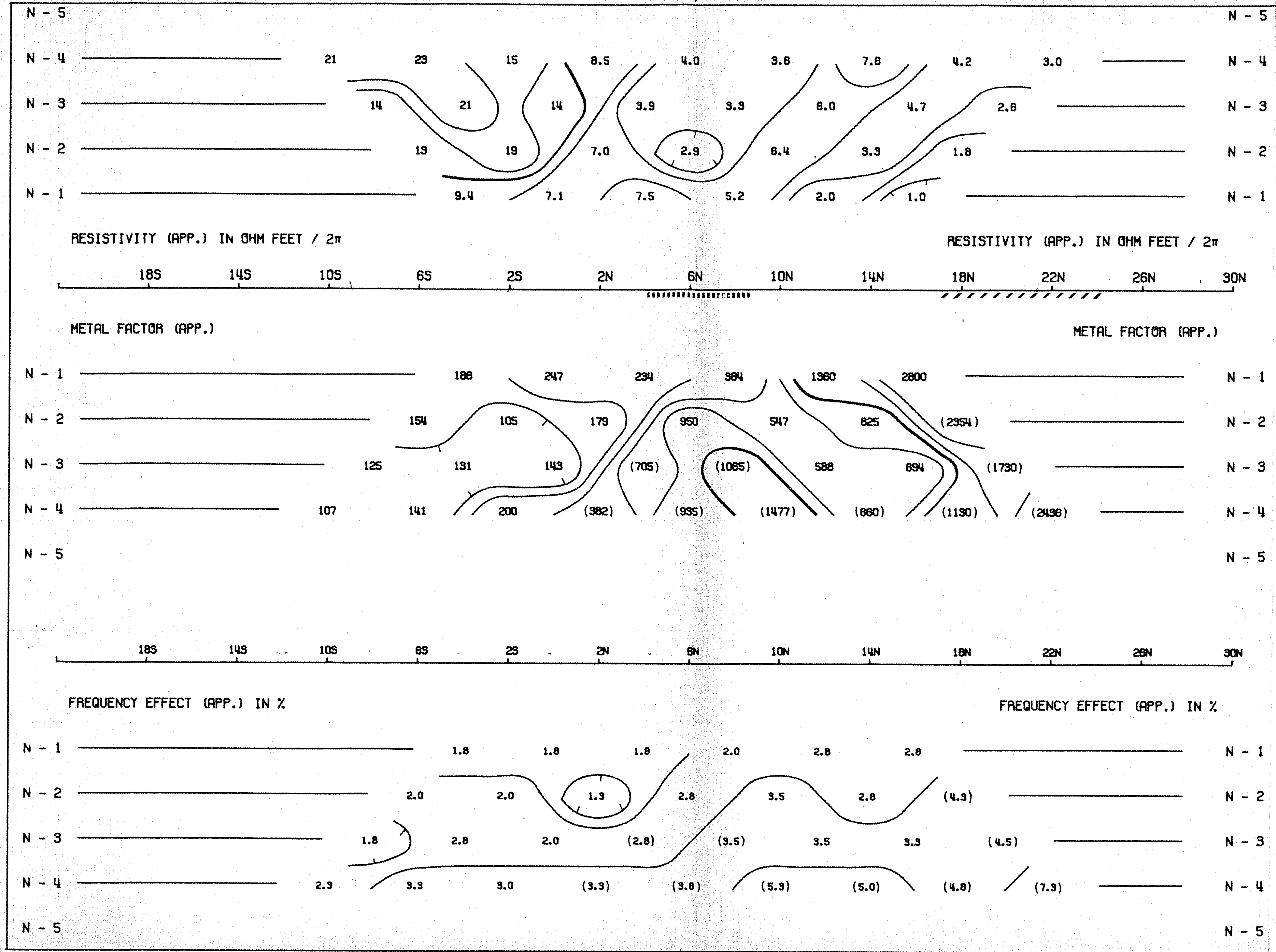
INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

DWG. NO.- I.P.-5409-8

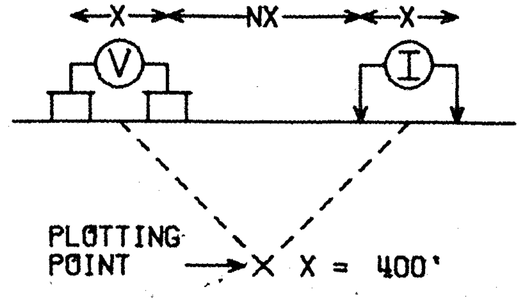
MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.



LINE NO.- 1000E

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE ▬▬▬

PROBABLE ||||||||

POSSIBLE / / / / /

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS LIMITED

E 1325-9

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

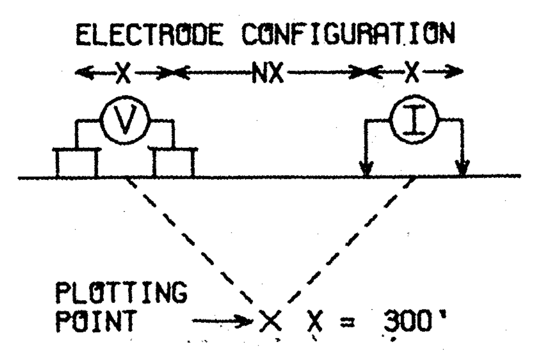
NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

DWG. NO.- I.P.-5409-9

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 1000E



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE ▬▬▬
PROBABLE ııııııııııı
POSSIBLE / / / / /

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

DATE:

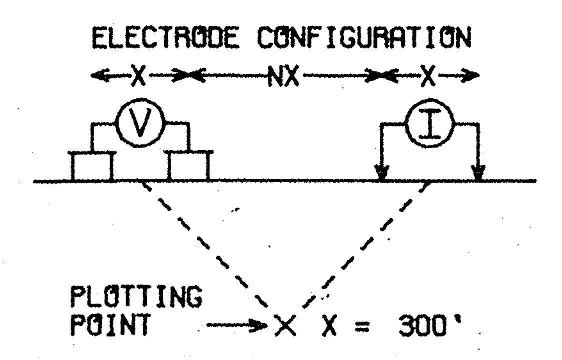
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

1325-10

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER



DWG. NO.- I.P.-5409-10

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 2000E

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

1325-11

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

DWG. NO. - I.P. - 5409 - 11

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO. - 3000E

ELECTRODE CONFIGURATION

PLOTTING POINT → X = 300'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

1325-12

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

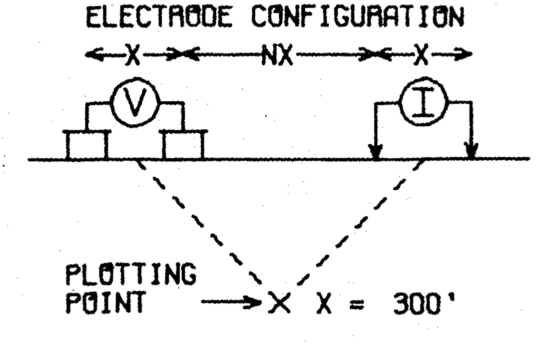
DWG. NO.- I.P.-5409-12

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 2500N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

1325-13

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

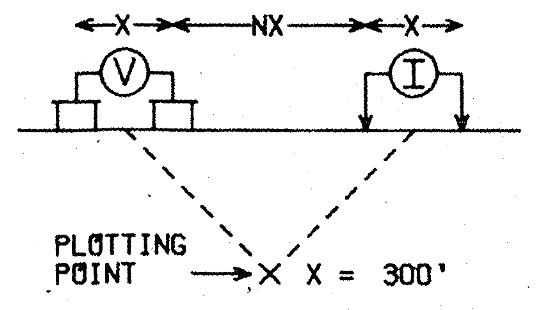
DWG. NO.- I.P.-5409-13

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 0

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE ▬▬▬
PROBABLE ||||||||||||
POSSIBLE / / / / /

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

1325-14

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

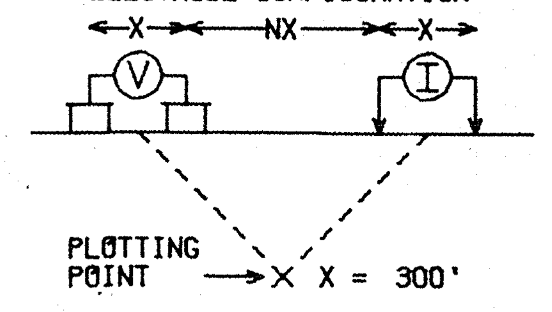
DWG. NO.- I.P.-5409-14

MID-EAST MINERALS N.L.

OOLOO MINE PROJECT, S.A.

LINE NO.- 2500S

ELECTRODE CONFIGURATION



SURFACE PROJECTION
OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: NOV 1969

APPROVED:

DATE:

NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

1325-15

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED WITH AN IBM 360/75 COMPUTER AND A CALCOMP PLOTTER

1115/69

Mid-East Minerals No Liability

REGISTERED OFFICE
SUITE 8B, 343 LITTLE COLLINS STREET
MELBOURNE, VIC.
TELEPHONES 60-1926, 60-1927
POSTAL ADDRESS
BOX 5237BB, G.P.O., 3001
TELEGRAPHIC ADDRESS
"MIDEMINER" MELBOURNE

Ref: DAH 1821

8th April, 1970

The Director of Mines,
Department of Mines,
Box 38,
Rundle Street P.O.,
ADELAIDE. 5001
South Australia

NOTED

Dear Sir,

Special Mining Lease 341

We wish to report on progress in respect to the above lease for the period ending 23rd January, 1970.

Preliminary ground reconnaissance was carried out by the Company's geological staff and consultants during the late part of October and early November, 1969. Surface samples from near the old workings were submitted for assay. An induced polarisation survey was recommended and following survey this was carried out from the 11th to 21st November, 1969.

To date the report has not been received from the contractors McPhar Geophysics, who advised us yesterday that it had been sent from their Toronto office and that we should receive it during the next few days. Until this report is received we are not in a position to advise on our future programme.

We enclose a preliminary summary report by our chief geologist, a copy of our contract with McPhar Geophysics Pty.Ltd. together with that Company's invoice and their advise regarding the report.

The terms of our S.M.L. require us to spend $1,000 in the year to the 23rd October, 1970 and to the 23rd January, 1970 our expenditure amounted to $5,042 and we enclose a schedule showing the breakdown in this expenditure.

Yours faithfully,
EASTERN PROSPECTORS PTY.LTD.

D.A. Huxtable

D.A. Huxtable
General Manager

GEOLOGY

Salaries & Wages	$1,243
Consultants Fees	400
Travel & Accommodation	278
Maps & Drafting	25
Camp Supplies	324
Vehicle Running & Maintenance	94
Vehicle Depreciation	53
Induced Polarisation Survey	2,625
	$5,042

Certified Correct.

EASTERN PROSPECTORS PTY. LTD.

[signature]

Secretary

1115/69

Mid-East Minerals No Liability

REGISTERED OFFICE
SUITE 8B, 343 LITTLE COLLINS STREET
MELBOURNE, VIC.
TELEPHONES 60-1926, 60-1927
POSTAL ADDRESS
BOX 5237BB, G.P.O., 3001
TELEGRAPHIC ADDRESS
"MIDEMINER" MELBOURNE

Ref: KMcK 2091

2nd June, 1970.

Director of Mines,
Department of Mines,
Box 38, Rundle Street P.O.,
ADELAIDE. 5001
South Australia.

Dear Sir,

Special Mining Lease No. 341

Your letter of the 29th May, 1970, reference DM.1115/69 LGL:CMH, advises that you have not received our report for the above Lease covering the period ended 23rd April, 1970.

No work has been carried out in this area since the date of our last report to the 23rd January, 1970, lodged on the 8th April, 1970.

We pointed out in that report that we were awaiting a report from McPhar Geophysics Pty. Ltd. This has now come to hand and has been forwarded on to you in response to your letter of the 27th May, 1970.

Our Site Geologist and our Consultant Geologists are now examining this report to decide a future exploration programme. As soon as we have this we will forward the information on to you.

Yours faithfully,
MID-EAST MINERALS N.L.

K.G. McKenzie
Secretary

CHIEF CLERK
4 JUN 1970
DEPT. OF MINES
ADELAIDE

Director of Mines

1115/69

Mid-East Minerals No Liability

Ref: KMcK 2672

REGISTERED OFFICE
SUITE 8B, 343 LITTLE COLLINS STREET
MELBOURNE, VIC.
TELEPHONES 60-1926, 60-1927
POSTAL ADDRESS
BOX 5237BB, G.P.O., 3001
TELEGRAPHIC ADDRESS
"MIDEMINER" MELBOURNE

5th October, 1970.

CHIEF CLERK
-9 OCT 1970
DEPT. OF MINES
ADELAIDE

Director of Mines,
Department of Mines,
Box 38, Rundle Street P.O.,
ADELAIDE. S.A. 5001

Dear Sir,

Special Mining Lease No. 341

We wish to relinquish the above Special Mining Lease as our Consultant Geologists did not consider the report from McPhar Geophysics, forwarded to you on the 2nd June, 1970, as warranting further expenditure.

No further work has been carried out on this Special Mining Lease during the quarter.

In our letter of the 8th April, 1970 we enclosed details of expenditure to the 23rd January, 1970 amounting to $5,042 and since then we have spent no further monies on exploration.

Yours faithfully,
MID-EAST MINERALS N.L.

K.G. McKenzie
Secretary

NOTED