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REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY ON THE MIX CLAIM GROUP MESS CREEK AREA FOR PHELPS DODGE CORPORATION OF CANADA LTD.

BY

DAVID K. FOUNTAIN, P.ENG.

AND

D. J. MISENER, Ph.D.

NAME AND LOCATION OF PROPERTY

MIX CLAIM GROUP, MESS CREEK AREA, B.C.

LIARD MINING DIVISION, B.C. 57°18'40"N, 130°54'W

DATE STARTED: JULY 12, 1973

DATE FINISHED: AUGUST 7, 1973

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McPHAR GEOPHYSICS

REPORT ON THE

INDUCED POLARIZATION AND RESISTIVITY SURVEY

MIX CLAIM GROUP

MESS CREEK AREA

LIARD MINING DIVISION, BRITISH COLUMBIA

FOR

PHELPS DODGE CORPORATION OF CANADA LIMITED

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1. INTRODUCTION

At the request of Phelps Dodge Corporation of Canada Limited, McPhar Geophysics Company have completed an Induced Polarization and Resistivity Survey on the Mix Claim Group. The survey grid lies at 57°18'40"N Latitude and 130°54' W Longitude in the Mess Creek area, approximately 40 miles south of Telegraph Creek, British Columbia. The work was carried out during July and August of 1973.

Access to the claim group is by helicopter from the Schaft Creek air strip.

The purpose of the survey was to detect and outline any zones of sulphide mineralization which may be of economic significance in the area surveyed.

The area is believed to be underlain by Upper Triassic volcanic rocks which strike predominately north-south parallel to the Mess Creek fault zone. Of interest within the claim block is a lengthy north-trending alteration zone which appears to be fault influenced. Weakly disseminated hematite, magnetite, pyrite and chalcopyrite occur within the alteration zone. Local concentration of the sulphide minerals may occur.

Previous work includes geophysical, geochemical and IP surveys as well as diamond drilling. The previous IP survey report was available to the author at the time of writing this report.

A McPhar P660 frequency IP unit was used for the survey, operating at 0.3 Hz and 5.0 Hz. Measurements were recorded on four dipole separations, (n = 1, 2, 3, and 4) using 200' dipoles.

In some cases, measurements were also recorded at 100' dipole separations (n = 1, 2, 3 and 4) in order to obtain a more detailed representation over anomalous zones.

The survey was conducted over the following claims, believed to be owned or held under option by Phelps Dodge Corporation of Canada Limited.

Mix - 13, 14, 15, 16, 17, 18, 19, 20,
23, 24, 25, 26, 27, 28, 29,
34, 35, 36, 37, 38, 39,
42, 43, 44, 45, 46, 47, 48,
51, 52, 53, 54, 55, 56, 57, 58,
61, 62, 63, 64, 65, 66.

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.
2400E	200 feet	IP 6097-1
2400S	200 feet	IP 6097-2
800N	200 feet	IP 6097-3
1200N	200 feet	IP 6097-4
2800N	100 feet	IP 6097-5
3200N	100 feet	IP 6097-6
3600N	200 feet	IP 6097-7
4000N	200 feet	IP 6097-8
	100 feet	IP 6097-9
4400N	200 feet	IP 6097-10
4800N	200 feet	IP 6097-11
5200N	200 feet	IP 6097-12
5600N	200 feet	IP 6097-13
6000N	200 feet	IP 6097-14
6400N	200 feet	IP 6097-15
7200N	200 feet	IP 6097-16
8000N	200 feet	IP 6097-17
8800N	200 feet	IP 6097-18
9600N	200 feet	IP 6097-19
Base line	200 feet	IP 6097-20

Also enclosed with this report is Dwg. I.P.P. 4915, a plan map of the Mix Claim Group Grid at a scale of 1" = 400'. The definite, probable and possible Induced Polarization anomalies are indicated by bars, in the manner shown on the legend, on this plan map as well as on 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 electrode interval length; i.e. when using 200' electrode intervals the position of a narrow sulphide body can only be determined to lie between two stations 200' apart. In order to definitely locate, and fully evaluate, a narrow, shallow source it is necessary to use shorter electrode intervals. In order to locate sources at some depth, larger electrode intervals 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.

The claim boundary information shown on Dwg. I.P.P. 4915 has been taken from maps made available by the staff of Phelps Dodge Corporation of Canada Limited.

3. DISCUSSION OF RESULTS

The anomalous responses detected in this survey fall into three categories. A number of moderate-to-good anomalies from discrete sources; broader and weaker zones which are usually associated with the stronger anomalies as well as broad weakly anomalous zones which are not connected with a strong response.

Data recorded on each line will be discussed separately.

Line 2400E

A probable anomaly is outlined between 28S and 26S. The anomaly pattern suggests tabular near-surface anomaly of limited extent. The zone may possibly extend to 31S and to 23S as indicated by the anomalous P.F.E.

Line 2400S

The majority of this line exhibits anomalous M.F. and P.F.E. A definite, near-surface anomaly extends from 27E to 29E. The zone continues west to 22E. Between 20E and 22E the anomalous M.F. increase at depth. The zone possibly extends as far west as 18E. The anomalous values apparent on this line are probably due to the same feature observed just south of Line 2400S on Line 2400E.

Line 800N

A possible near-surface anomaly is located between 10W and 6W. This anomaly may extend at depth east to 2W. Another possible anomaly is located between 13E and 16E.

Line 1200N

A probable near-surface anomaly is located between 18E and 21E, extending to depth in the east. The anomaly possibly extends west to 16E and east to 22E. The creek in the vicinity of 13E may be causing the slight increase of the anomaly near surface in that region.

Line 2800N

This line was surveyed for X = 200' in a previous IP survey and the 100' separation was used in the present survey in an attempt to locate more accurately previously determined anomalies. Two definite anomalous zones have been located. The one zone appears near surface at 2W and extends west beyond the surveyed area. The second anomaly appears at depth between 3E and 4E. The zone possibly extends near surface in the vicinity of 1+50E and at depth to the east in the vicinity of 6+50E.

Line 3200N

This line was also surveyed with 100' electrode separations in order to obtain a more detailed picture of the anomalous response. A definite anomaly is indicated between 1W and 0. The zone probably extends to 3E and gradually becomes deeper. The top of the zone is apparent to 6E. The definite anomaly interpreted between 2E and 4E from the previous report, using 200' separation, is indicated in the present survey by the increasing M.F. values with depth in this region.

Line 3600N

A broad, probable anomaly is located between 0 and 6E. This zone appears to be pinching-out at depth. A possible anomaly is located at the extreme eastern end of the line, from 21E to 24E, possibly extending to the east.

Line 4000N

This line was surveyed at 200' electrode separations and re-surveyed at 100' separations, thus obtaining better anomaly definition.

The results of the 200' survey indicate a definite anomaly at the extreme western edge of the line. The zone probably extends to 6E and possibly as far as 8E.

The results of the 100' survey show more detail of the broad anomaly observed on the 200' separation. The zone extends from 3W to 7E. Two definite zones are evident within the anomaly. One extends from 2W to 0+5W; the other from 4E to 5E. The zones appear to be connected at depth.

Line 4400N

A broad anomalous zone is situated between 5E and 10E. The zone extends near surface in the region of 6E and extends to depth between 7E and 9E.

Line 4800N

A broad, near-surface feature is located between 4E and 12E. The zone has maximum M.F. between 6E and 8E, weakening to the east.

Line 5200N

A probable anomaly is located on this line between 4E and 8E.

The zone possibly extends west to 2E and east to 14E.

Line 5600N

Two anomalous zones are apparent on the line. One probable anomaly is located at depth between 15E and 17E. The second anomaly is located between 8E and 10E, possibly extending west to 0+00.

Line 6000N

One definite anomaly is located between 7E and 9E. The zone appears to be dipping to the west and extending, at depth, to 4E. The zone may possibly extend east to 14E.

Line 6400

A probable anomalous zone is located in the region 9E to 11E. The zone weakens as it extends east to 14E.

Line 7200N

A large portion of this line exhibits anomalous M.F. values. A near-surface anomaly is located on the extreme western edge of the survey line, probably extending to the west. A broad anomalous zone is located between 13E and 29E. The maximum values in this zone are recorded between 15E and 17E. Between 26E and 28E, the anomalous values increase slightly at depth.

Line 8000N

Two definitely anomalous zones are located on the line. One strong anomaly is located between 5E and 7E, extending to 3E and 8E. The high M.F. values to the west of this zone, at the edge of the line, may be "off-end" effects of an anomaly to the west. The second anomaly is located between 36E and 38E, possibly extending east to 32E.

Line 8800N

A broad anomalous zone is located on this line between 17E and 38E. Between 19E and 16E and between 30E and 36E the anomalous M.F. values are higher; probable anomalies are indicated in these regions.

Line 9600N

A large, definite anomaly, extending to depth, is located between 35E and 41E. The zone may extend east to 44E and as far as 22E to the west. A separate feature between 24E and 30E is probably causing the extension of the anomalous M.F. to the west.

A third anomaly, detected at depth, is located between 14E and 16E. The zone possibly extends west to 10E and east to 18E.

Base Line

The Base Line was surveyed from 44S to 64N. A number of anomalous zones have been located. Two possible zones are indicated between 32S and 28S and between 25S and 22S. A broad zone is located from 8S and 0. The zone is probable from 8S and 6S and possible from 6S to 0.

A broad anomalous zone is apparent between 21N and 46N. Within this zone, two definite anomalies are indicated; one between 25N and 29N, the other between 41N and 43N. Between 48N and 52N the base line (B/L) changes direction from north-south to northwest-southeast. The definite anomaly located on this portion of the line (49N to 51N) is probably a continuation of the zone detected on Line 40+00N and again on L - B/L between 41N and 43N.

4. SUMMARY AND CONCLUSIONS

The Induced Polarization and Resistivity results have outlined several possible diamond drill targets on the Mix Claim Group.

The majority of the recommended drill hole locations are in the northern section of the grid in order to discover possible extensions of previously surveyed zones to the south.

Our experience has indicated (see Appendix) that the strongest IP response may be due to concentrations of pyrite mineralization, while weaker anomalies may be of more economic interest. Therefore, drill targets have been selected in order to test both types of response.

The following drill holes are recommended.

Hole	Location Collar	Dip	Direction	Length
DDH1	Line 9600N 35E	45°	Grid East	350'
DDH2	Line 9600N 40E	90°	Vertical	350'
DDH3	Line 8800N 34E	90°	Vertical	350'
DDH4	Line 8000N 6E	90°	Vertical	350'

Hole	Location of Collar	Dip	Direction	Length
DDH5	Line 8000N 34E	45°	Grid East	350'
DDH6	Line 6000N 10E	45°	Grid West	350'
DDH7	Line 4000N 2W	45°	Grid East	350' +
DDH8	Line 4000N 3E	45°	Grid East	350' +
DDH9	Line 2400S 27E	45°	Grid East	200'
DDH10	Base Line 51N	45°	Grid Southeast	350'
DDH11	Base Line 42N	90°	Vertical	350'
DDH12	Base Line 27N	90°	Vertical	350'

DDH 12 is situated over a previously drilled zone. The drilling of this location would be contingent on whether or not sufficient information has already been obtained from the previous drilling.

McPHAR GEOPHYSICS COMPANY

David K. Fountain

David K. Fountain, P. Eng.
Geophysicist

P. J. Misener

D. J. Misener, Ph. D.
Geophysicist

Dated: October 15, 1973

ASSESSMENT DETAILS

PROPERTY: Phelps Dodge Corporation of Canada Ltd.		MINING DIVISION: Liard
SPONSOR: Mix Claim Group		PROVINCE: British Columbia
LOCATION: Mess Creek		
TYPE OF SURVEY: Induced Polarization		
OPERATING MAN DAYS:	85	DATE STARTED: July 12, 1973
EQUIVALENT 8 HR. MAN DAYS	127.5	DATE FINISHED: August 7, 1973
CONSULTING MAN DAYS:	4	NUMBER OF STATIONS: 371
DRAUGHTING MAN DAYS:	9	NUMBER OF READINGS: 3546
TOTAL MAN DAYS:	140.5	MILES OF LINE SURVEYED: 12.61

CONSULTANTS:

David K. Fountain, 62 Patina Drive, Willowdale, Ontario.
J. Misener, 208 Lord Seaton Drive, Willowdale, Ontario.

FIELD TECHNICIANS:

J. MacNeil, 175 Cooper Street, Cambridge, Ontario.
R. Bing, c/o 669 Valdes Drive, Kamloops, B.C.
Plus 2 Helpers: Supplied by Client

DRAUGHTSMEN:

B. Boden, 103 Petworth Crescent, Agincourt, Ontario.
V. Young, 64 Highcourt Crescent, Scarborough, Ontario.

McPHAR GEOPHYSICS COMPANY

David K. Fountain

David K. Fountain, P.Eng.
Geophysicist

Dated: October 15, 1973

STATEMENT OF COST

Phelps Dodge Corporation of Canada Ltd.
Mess Creek, B.C.

Crew: J. MacNeil - R. King

21-1/4	days Operating		@ $250.00/day	$5,312.50
1	day Travel	)		
1½	days Preparation	)		
1½	days Standby	)5-1/4	@ $100.00/day	525.00
1-1/4	days Bad Weather	)		
½	day Breakdown			N.C.

Crew Expenses

Transportation	50.00	
Taxis	9.45	
Meals and Accommodation	160.61	
Freight and Brokerage	70.95	
Supplies	17.96	
	308.97	
+ 10%	30.90	
		339.87
		$6,177.37

McPHAR GEOPHYSICS COMPANY

David K. Fountain

David K. Fountain, P.Eng.
Geophysicist

Dated: October 15, 1973

Declared before me at the City
of Vancouver, in the
Province of British Columbia, this 11th
day of December 1973, A.D.

Sub - mining Recorder
A Commissioner for taking Affidavits within British Columbia
A ... for the Province of British Columbia

CERTIFICATE

I, David Kirkman Fountain, of the City of Toronto, Province of Ontario, do certify that:

1. I am a geophysicist residing at 62 Patina Drive, Willowdale 428, Ontario.

2. I am a graduate of the University of Toronto with a Bachelor of Applied Science Degree in Engineering Physics (Geophysics).

3. I am a member of the Society of Exploration Geophysicists, the European Association of Exploration Geophysicists and the Canadian Institute of Mining and Metallurgy.

4. I am a Registered Professional Engineer in the Provinces of British Columbia, Manitoba and Ontario, a Registered Professional Geophysicist in the Province of Alberta and a Registered Professional Geologist in the State of California, and have been practising my profession for eleven years.

5. The statements made in this report are based on a study of published geological literature and unpublished private reports.

6. Permission is granted to use in whole or in part for assessment and qualification requirements but not for advertising purposes.

Dated at Toronto

This 15th day of October 1973.

David Kirkman Fountain, B.A.Sc. P.Eng.

CERTIFICATE

I, D. Jim Misener, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geophysicist, residing at 208 Lord Seaton Road, Willowdale, Ontario.

2. I am a graduate of the University of Toronto with a B.A.Sc. in Engineering Physics, Geophysics Option (1967) and a M.A.Sc. Degree in Geophysics (1971) and a Ph. D. Degree in Geology and Geophysics (1973) from the University of British Columbia.

3. I have no direct, or indirect interest, nor do I expect to receive any interest directly or indirectly, in the property or securities of Phelps Dodge Corporation of Canada Limited, or any affiliate.

4. The statements made in this report are based on a study of published geological literature and unpublished private reports.

5. Permission is granted to use in whole or in part for assessment and qualification requirements, but not for advertising purposes.

Dated at Toronto

This 15th day of October, 1973

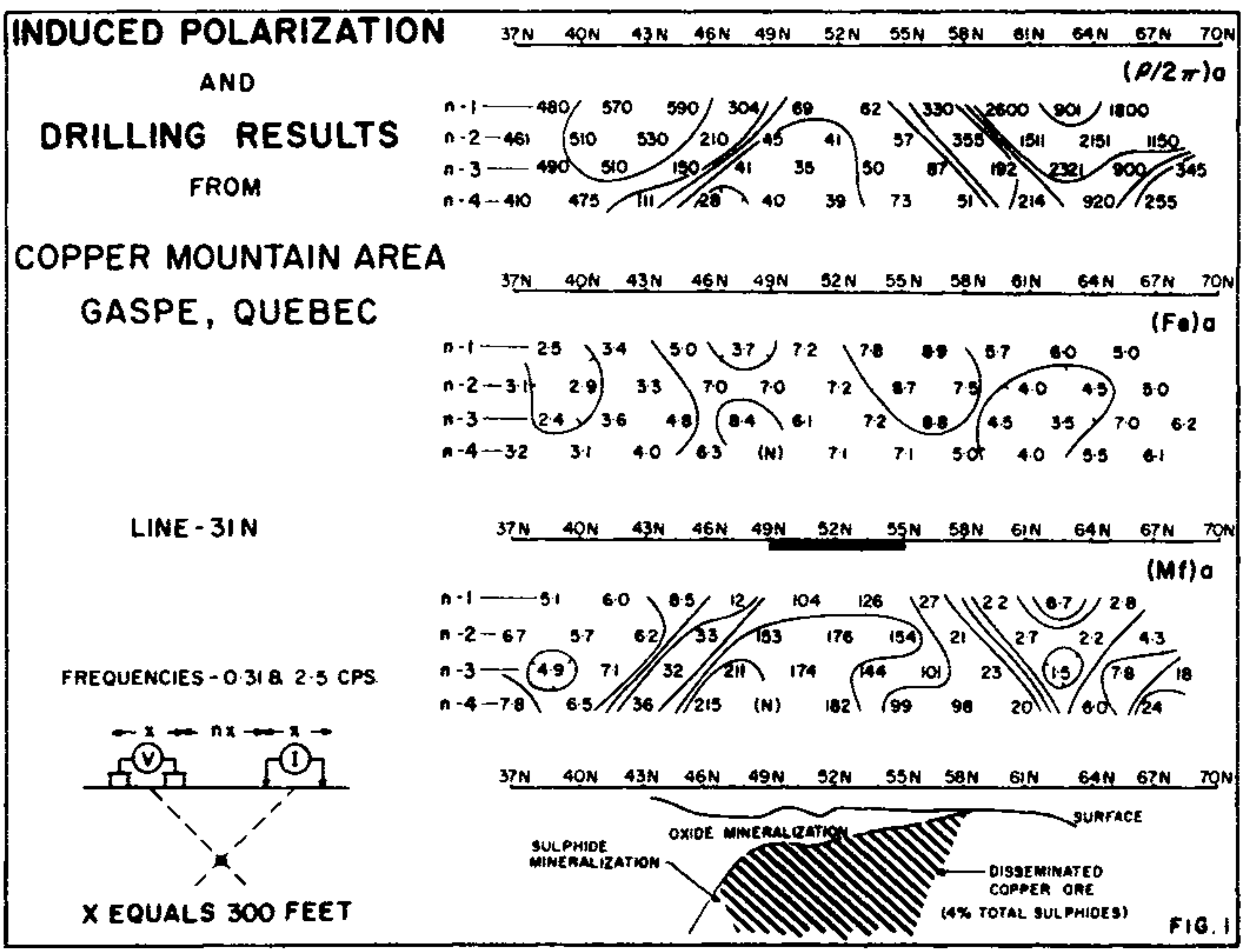
D. Jim Misener

D. Jim Misener, B.A.Sc. M.A.Sc. Ph. D.

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.



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.

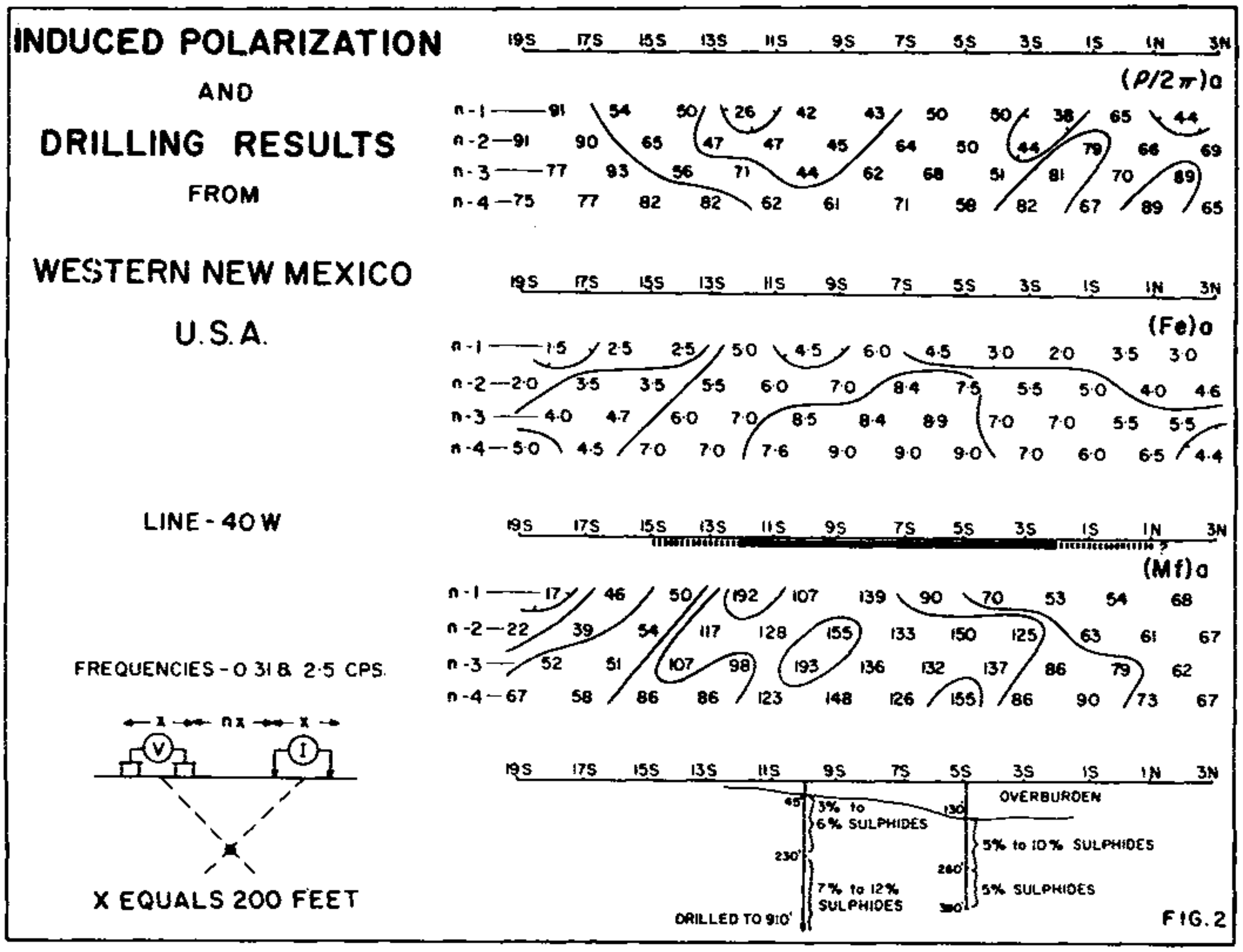
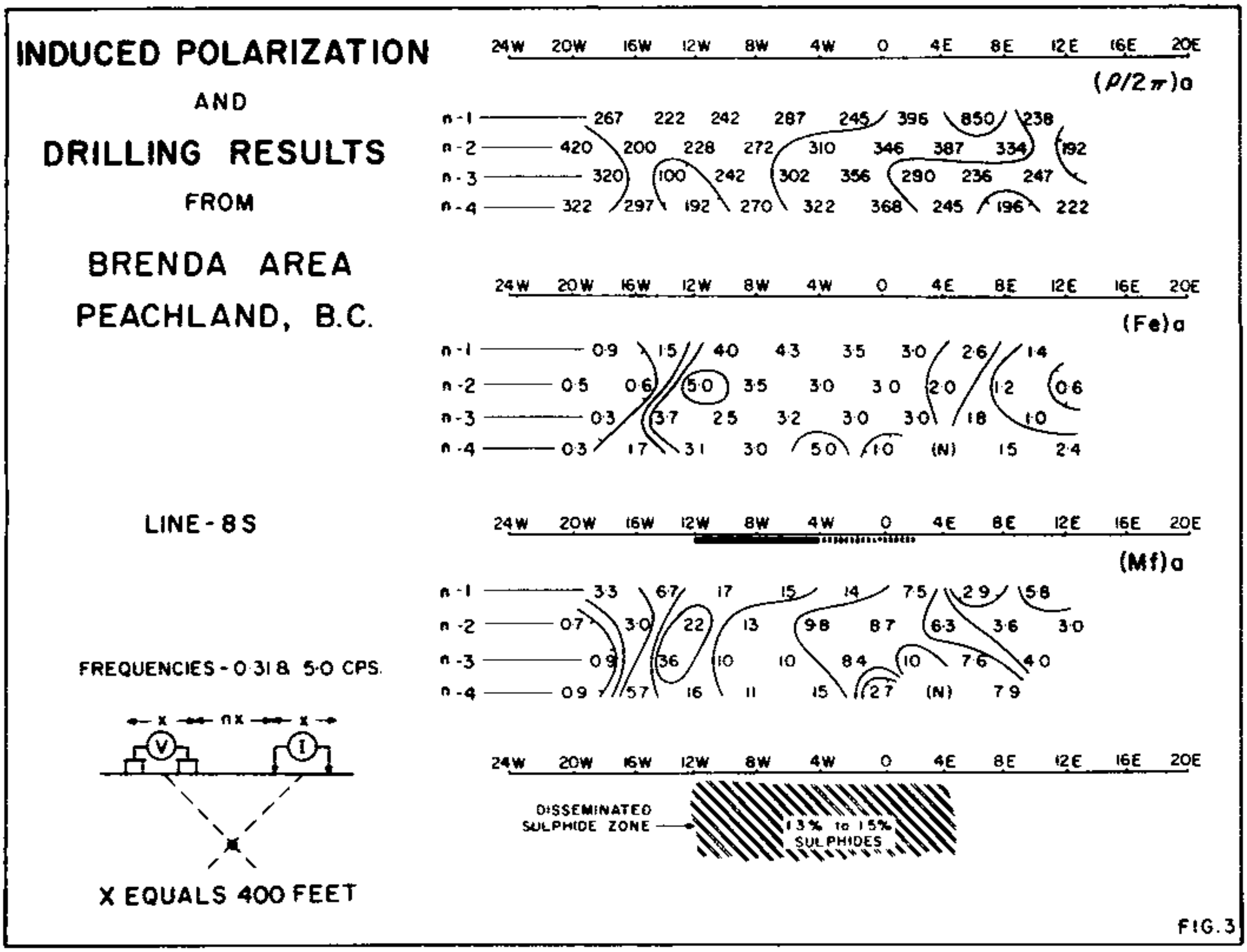


FIG. 2

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.



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 noisey 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

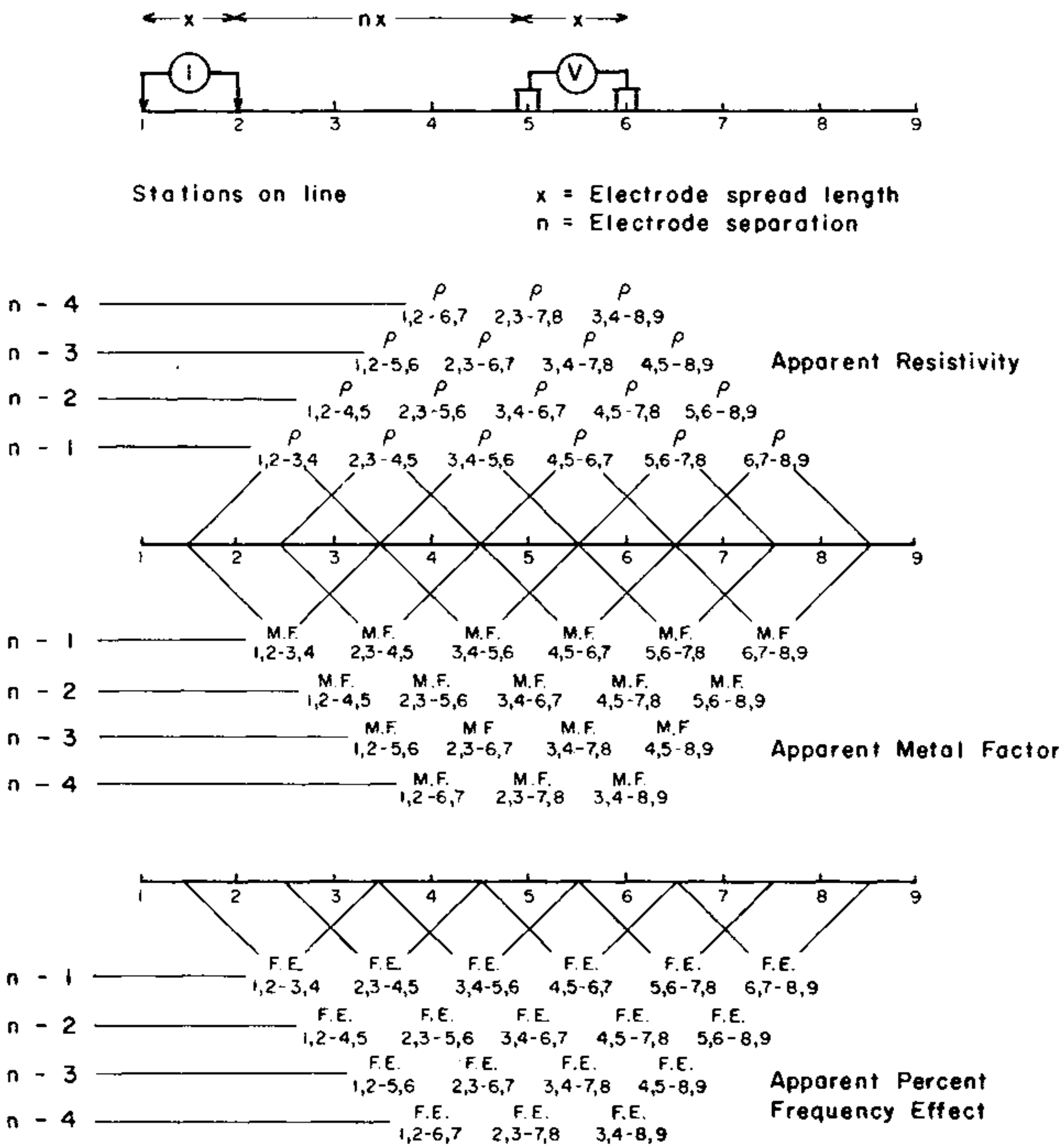
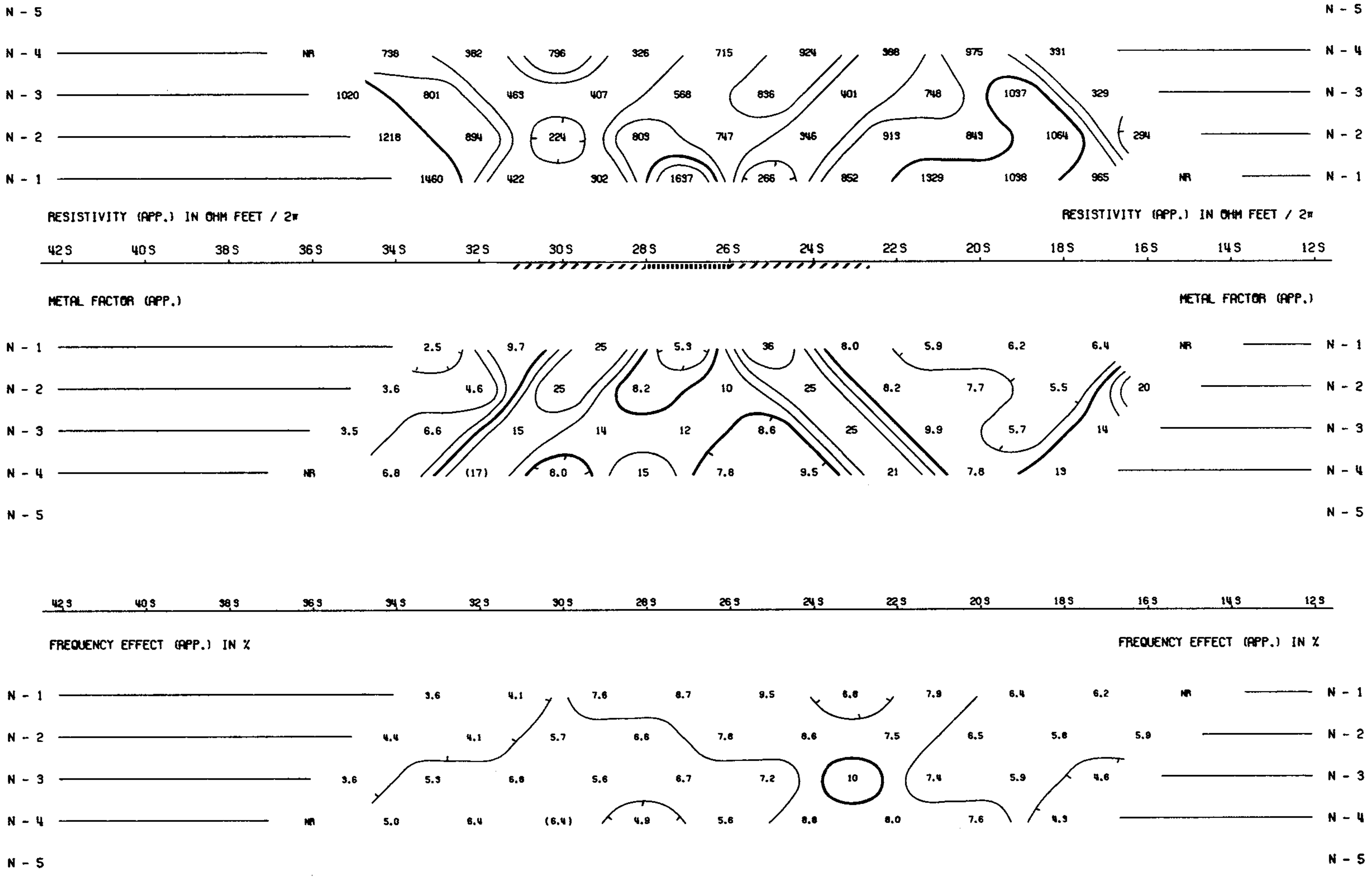


Fig. A



DWG. NO.- I.P.- 6097-1

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 2400E

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT → X X = 200FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: AUG. 1973

APPROVED:

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

DATE:

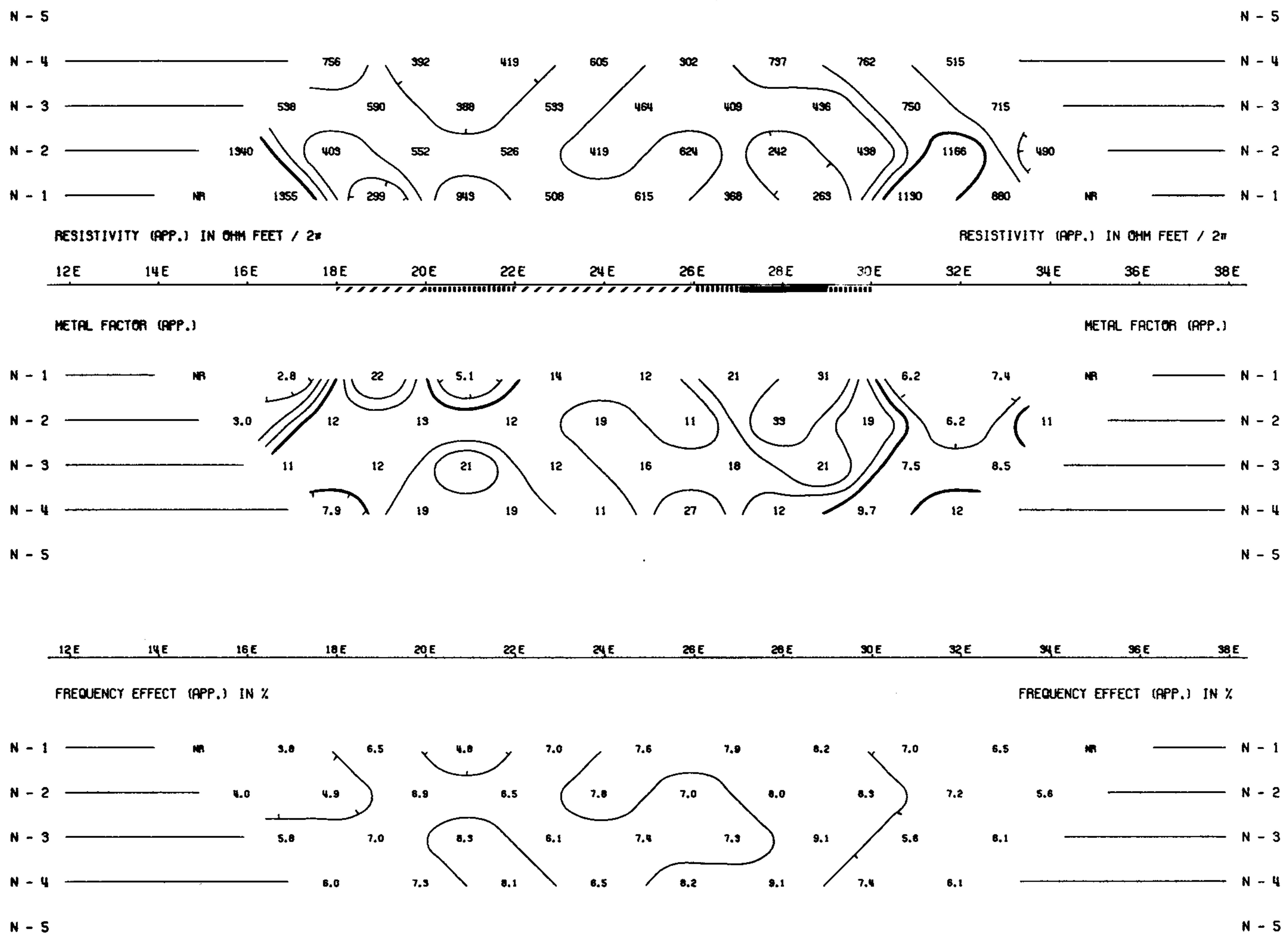
PROVINCE OF BRITISH COLUMBIA PROFESSIONAL ENGINEER

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



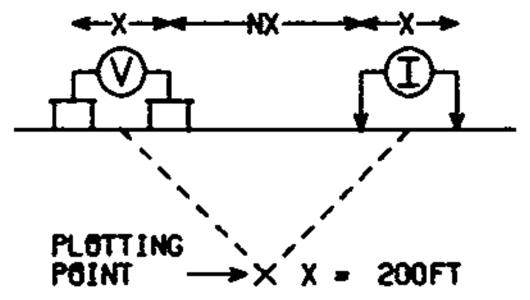
DWG. NO.- I.P.-6097-2

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 2400S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: AUG 1973

APPROVED:

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

DATE:

PROFESSIONAL ENGINEER, PROVINCE OF BRITISH COLUMBIA, B. K. FOUNTAIN

Expiry Date: April 25, 1974

4155

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION

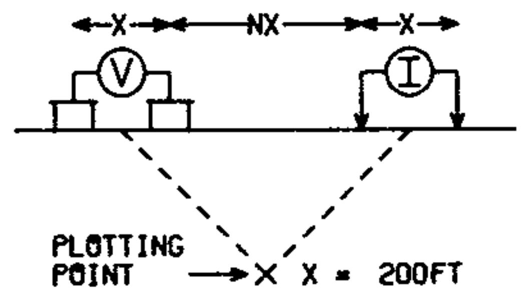
DWG. NO.- I.P.- 6097-3

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 800N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: [illegible] 1973

APPROVED:

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

DATE:

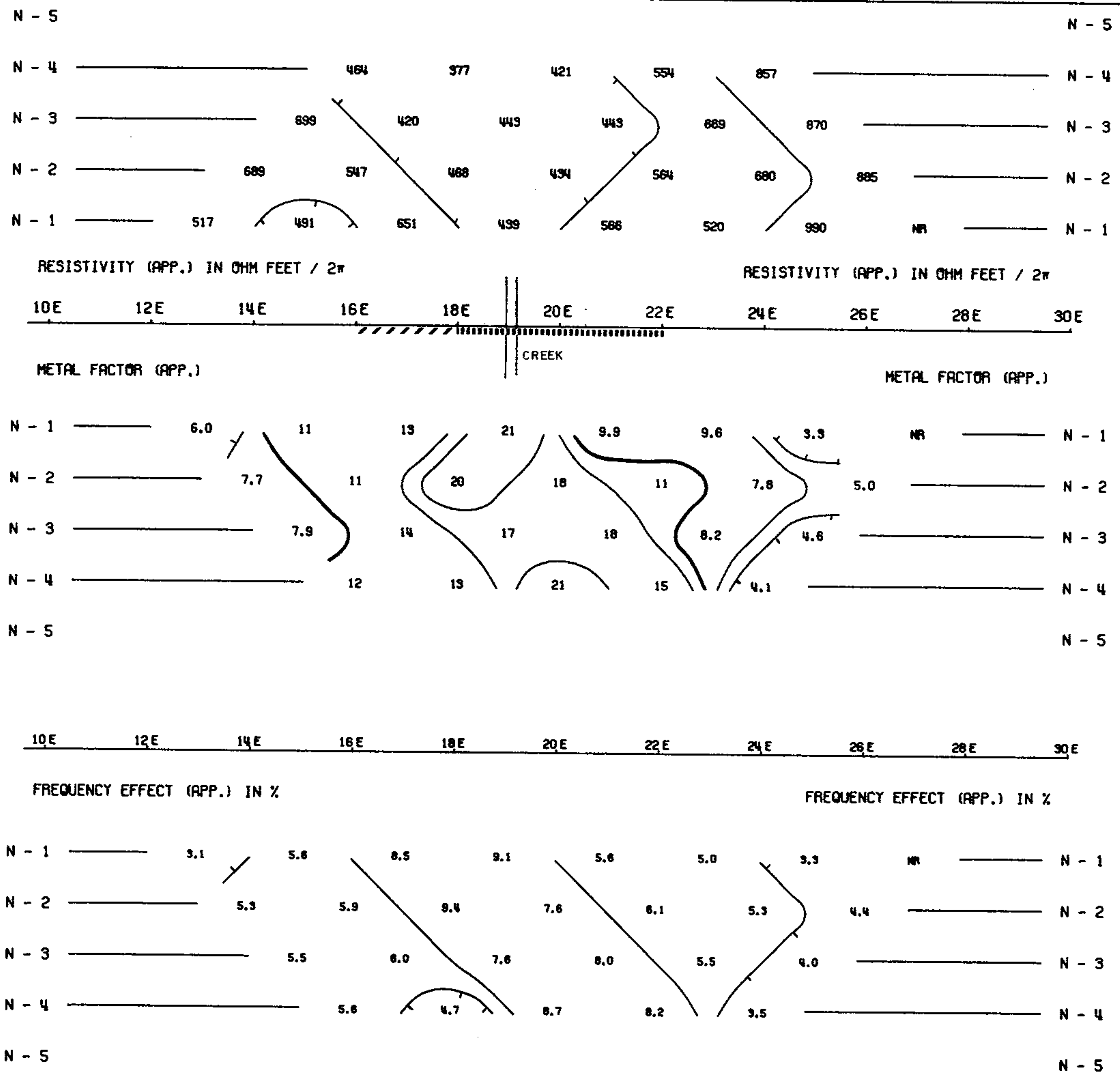
4755

April 25, 1974

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



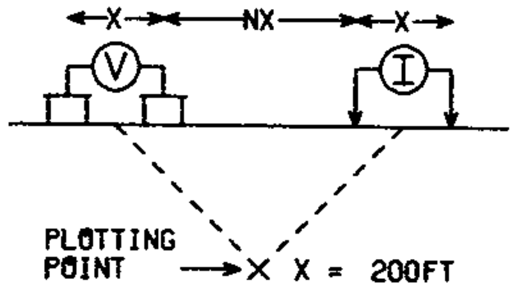
DWG. NO.- I.P.- 6097-4

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 1200N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JULY 1973

APPROVED:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA

DATE:

Expiry Date, April 25, 1974

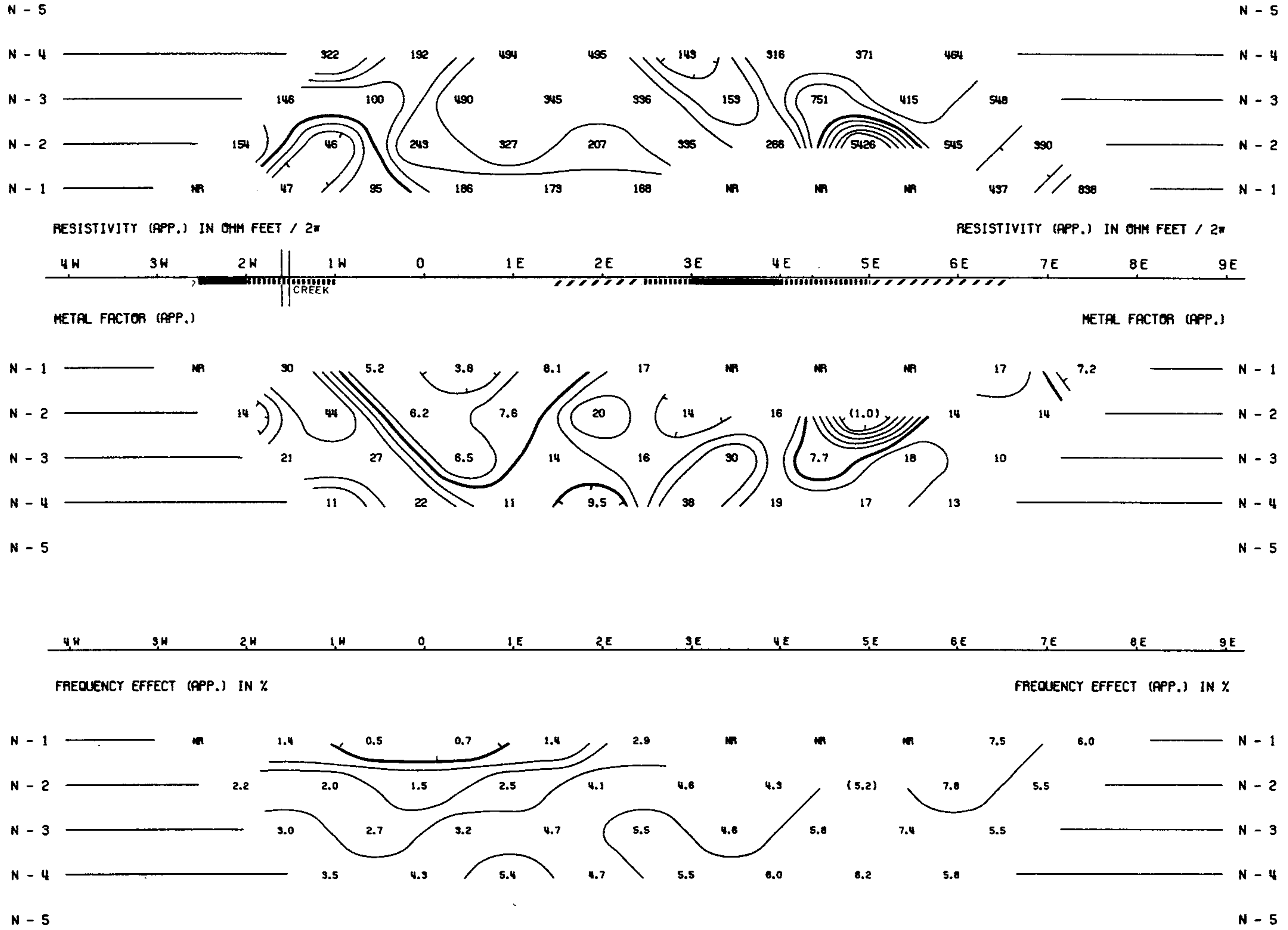
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



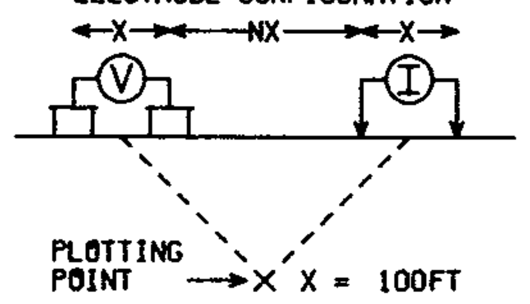
DWG. NO.- I.P.- 6097-5

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 2800N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: AUG 1973

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

APPROVED:

DATE:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

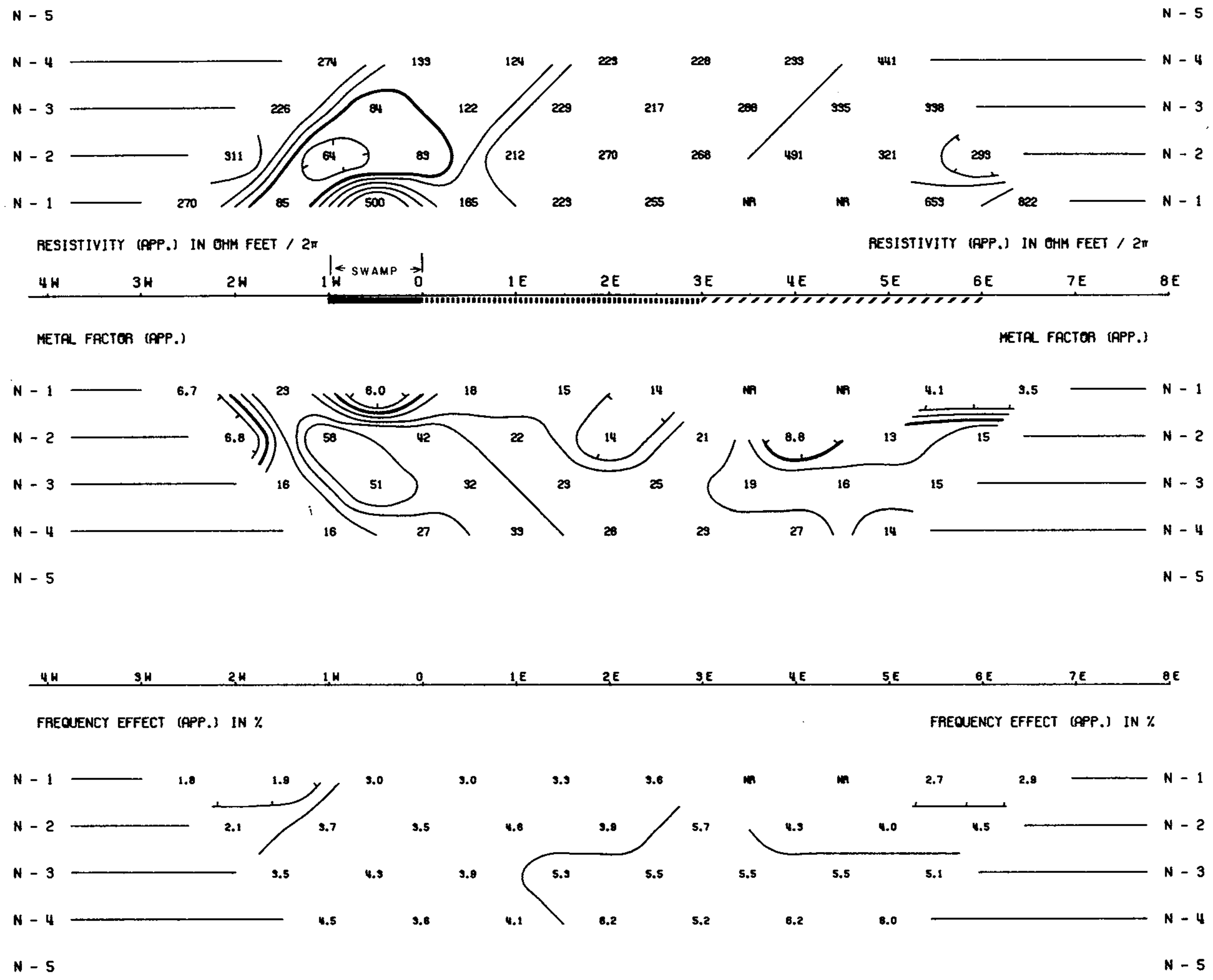
Expiry Date April 25, 1974

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



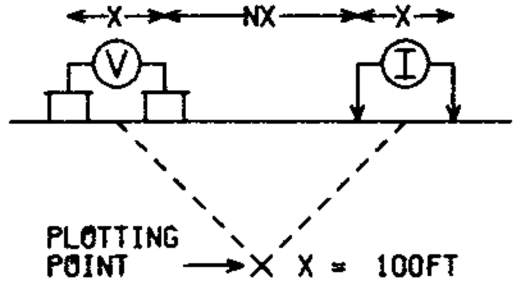
DWG. NO.- I.P.- 6097-6

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 3200N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: AUG 1973

APPROVED:

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

DATE: 22/10/73

PROFESSIONAL ENGINEER — PROVINCE OF BRITISH COLUMBIA

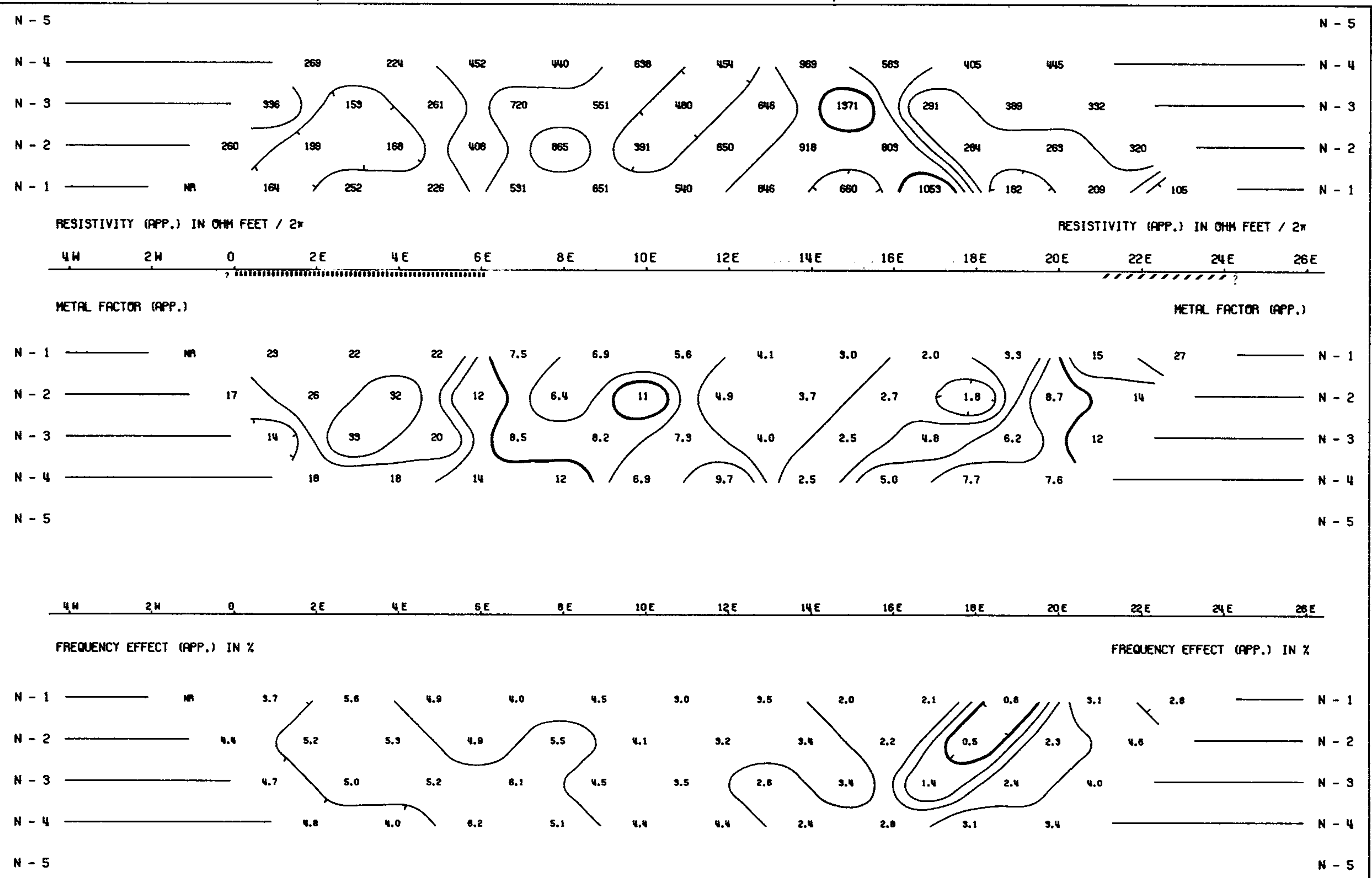
Expiry Date: April 25, 1974

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.-6097-7

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 3600N

ELECTRODE CONFIGURATION

PLOTTING POINT X = 200FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1973

APPROVED:

DATE:

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

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

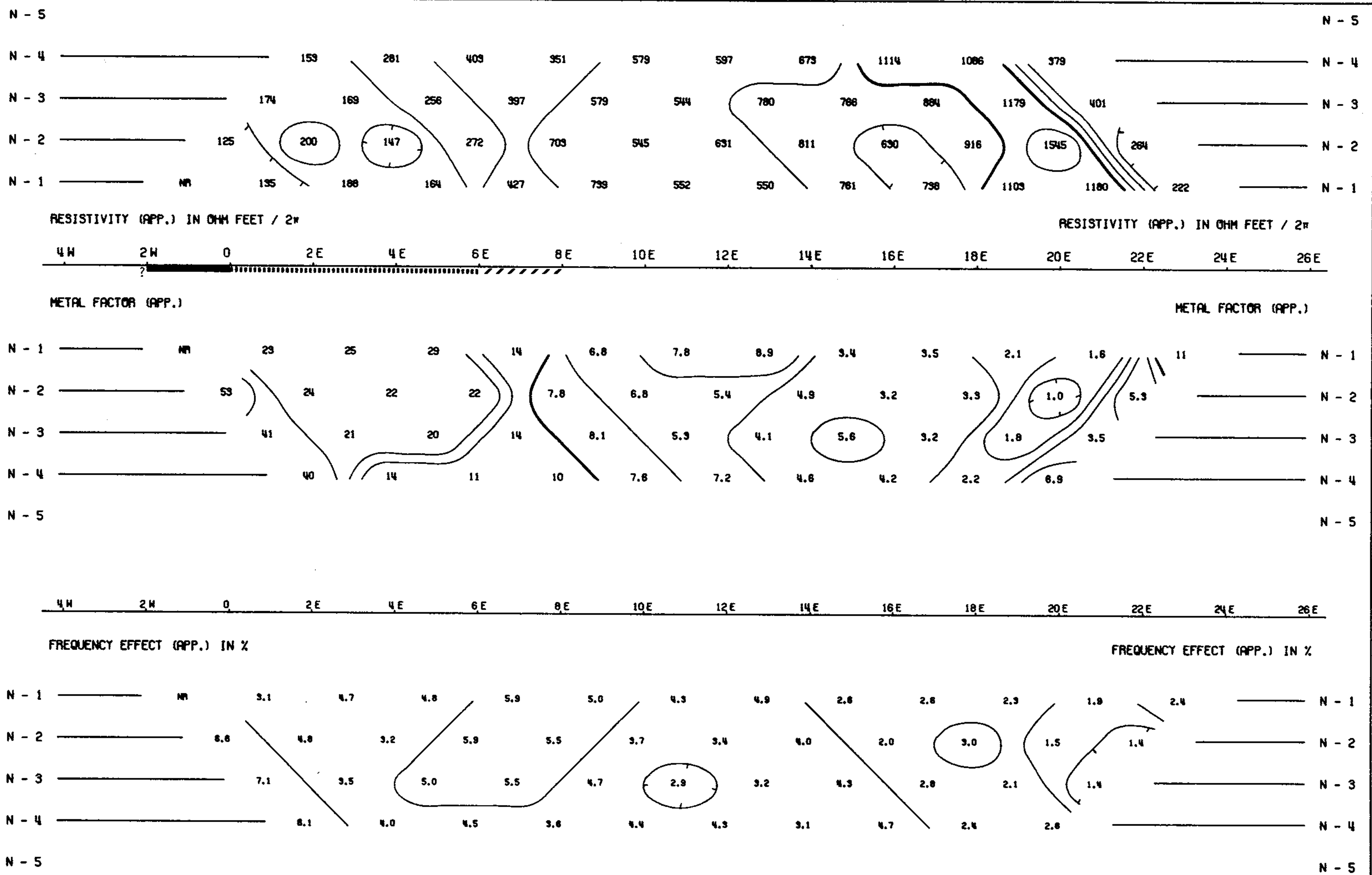
Expiry Date: April 25, 1974

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 6097-8

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 4000N

ELECTRODE CONFIGURATION

X NX X

V I

PLOTTING POINT X = 200FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: [illegible]/1973

APPROVED:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN

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

DATE:

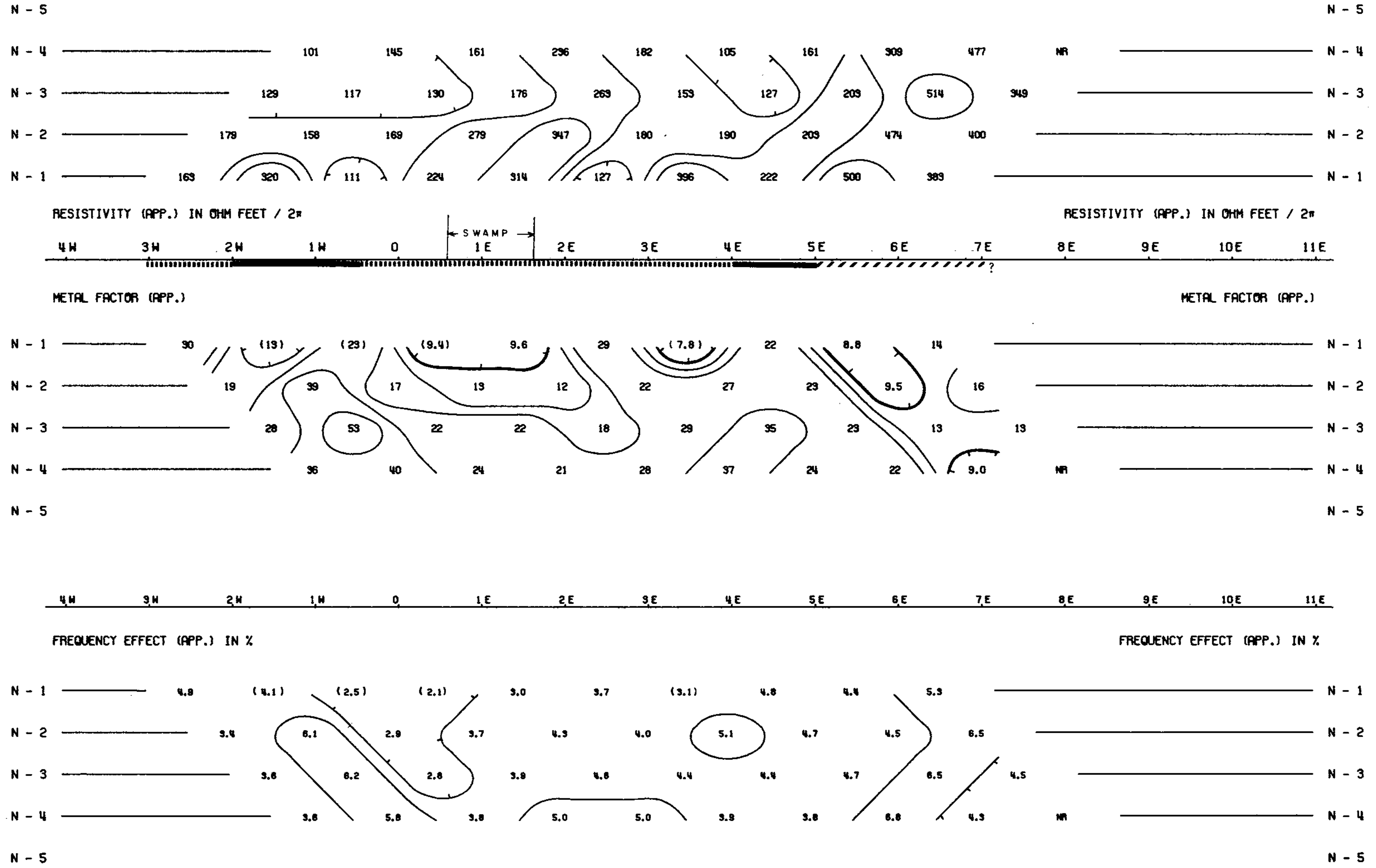
Expiry Date: April 25, 1974

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



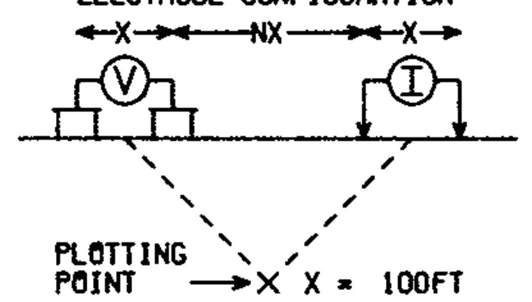
DWG. NO.- I.P.-6097-9

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 4000N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: AUG 1973

APPROVED:

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

DATE:

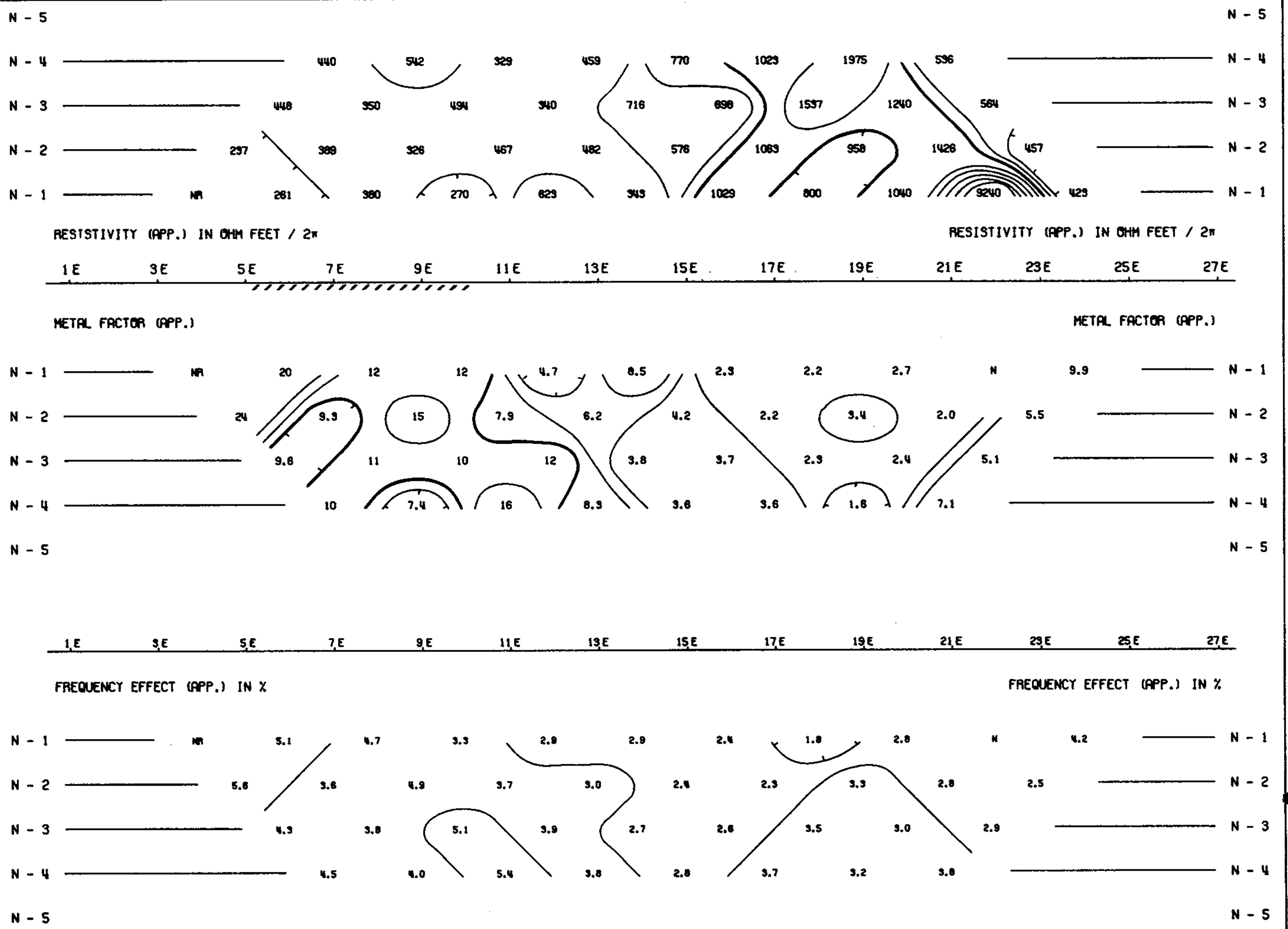
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN
Expiry Date: April 25, 197?

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



DWG. NO.- I.P.-6097-10

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 4400N

ELECTRODE CONFIGURATION

X NX X

PLOTTING POINT X = 200FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1973

APPROVED

DATE

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

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. K. FOUNTAIN

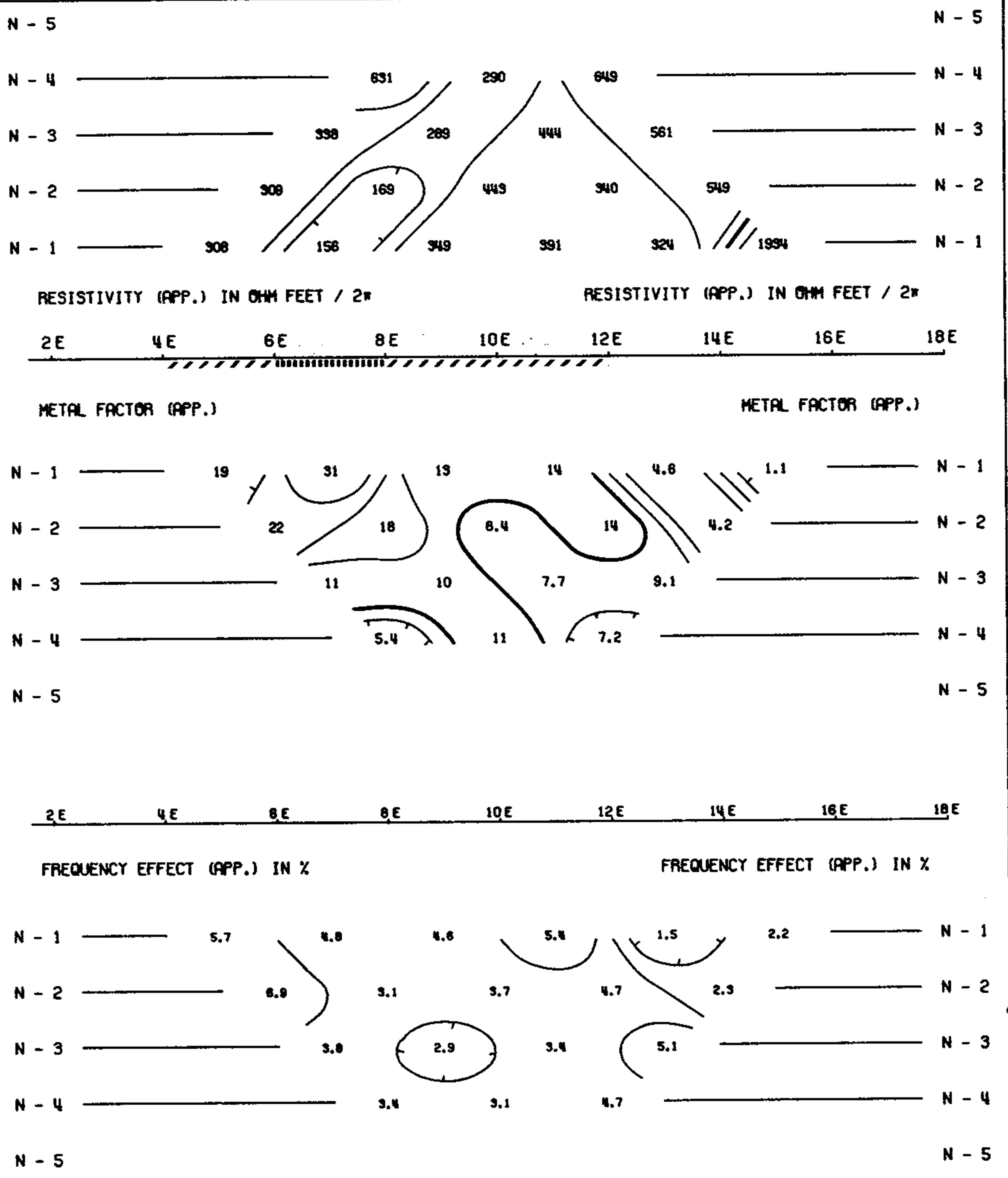
Date: April 25, 1974

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



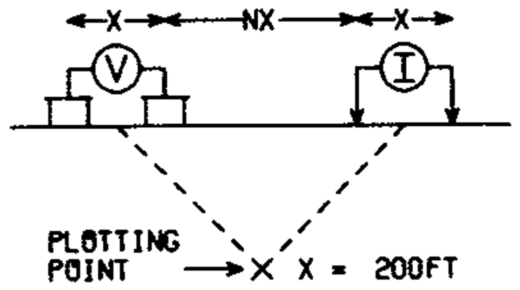
DWG. NO.- I.P.-6097-11

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 4800N

ELECTRODE CONFIGURATION



PLOTTING POINT → X X = 200FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1973

APPROVED:

DATE:

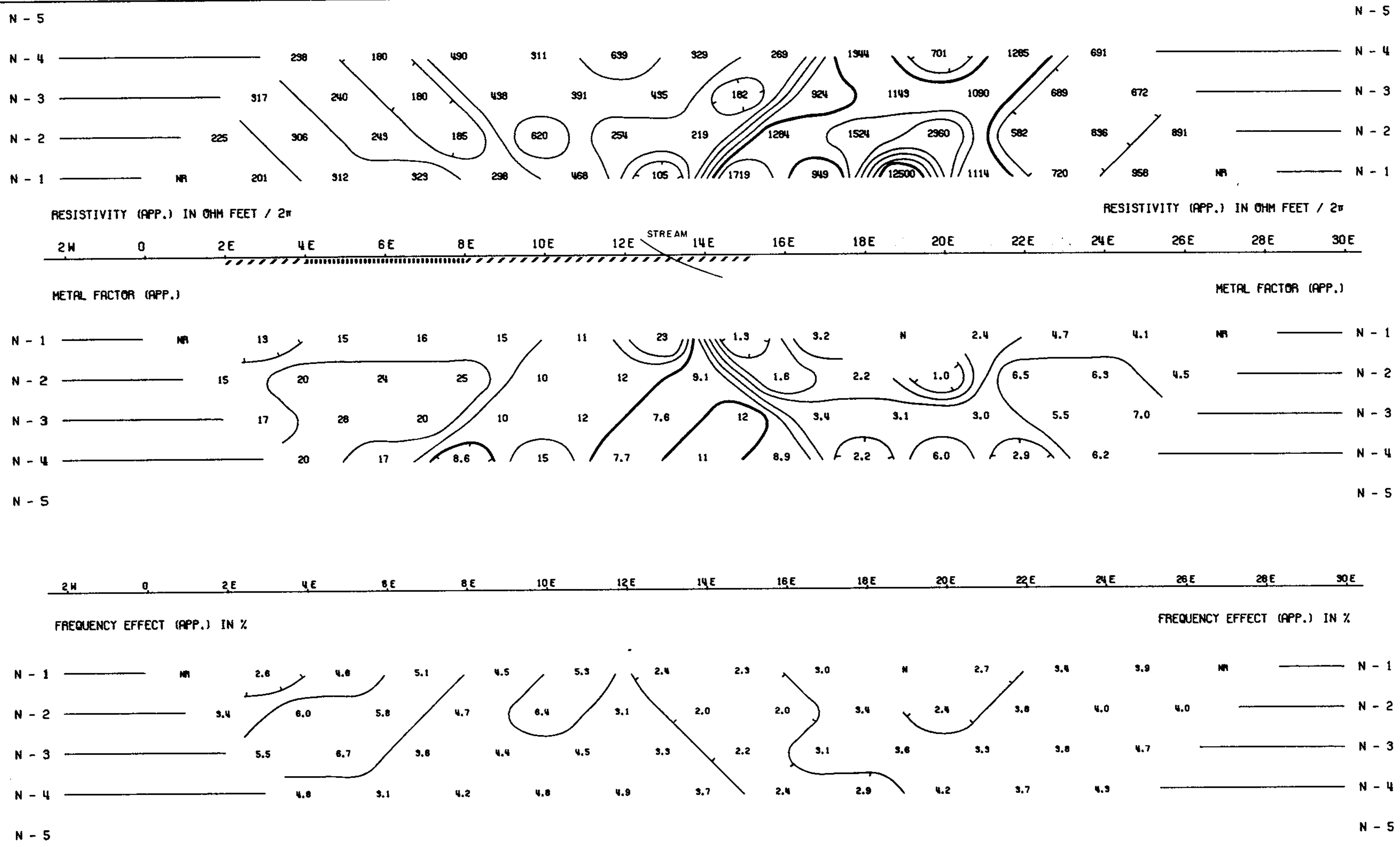
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



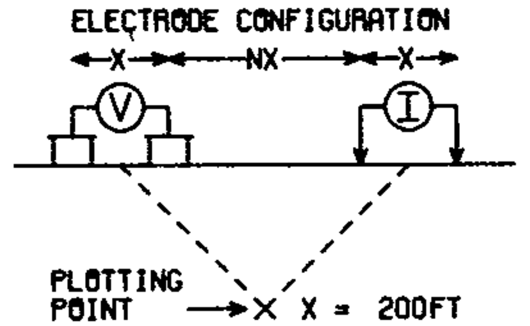
DWG. NO.- I.P.- 6097-12

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 5200N

ELECTRODE CONFIGURATION



PLOTTING POINT → X X = 200FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1973

APPROVED:

DATE:

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

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. K. FOUNTAIN

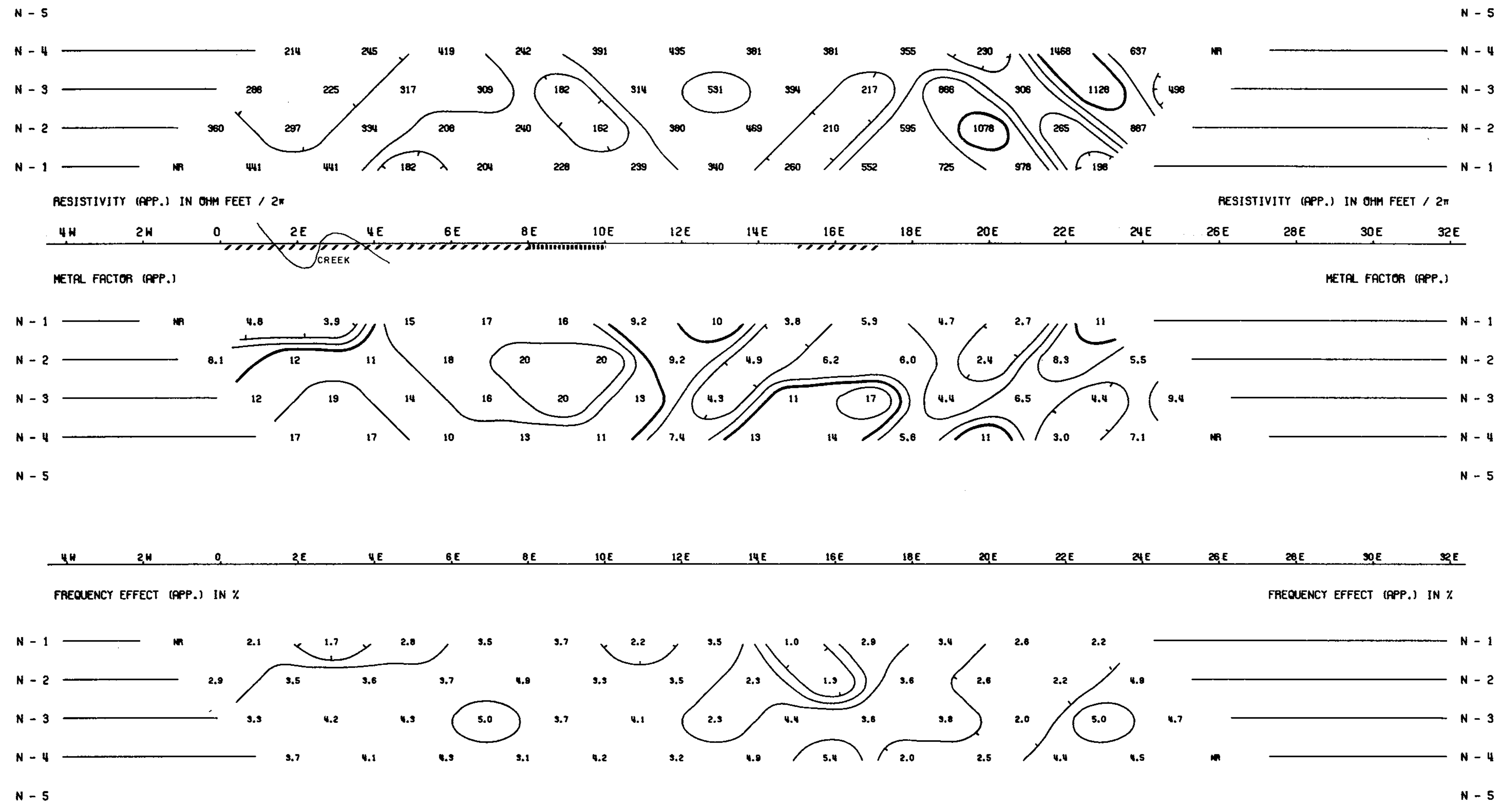
Expiry Date: April 25, 1974

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 6097-13

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 5600N

ELECTRODE CONFIGURATION

PLOTTING POINT X = 200FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1973

APPROVED

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

DATE:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. K. FOUNTAIN

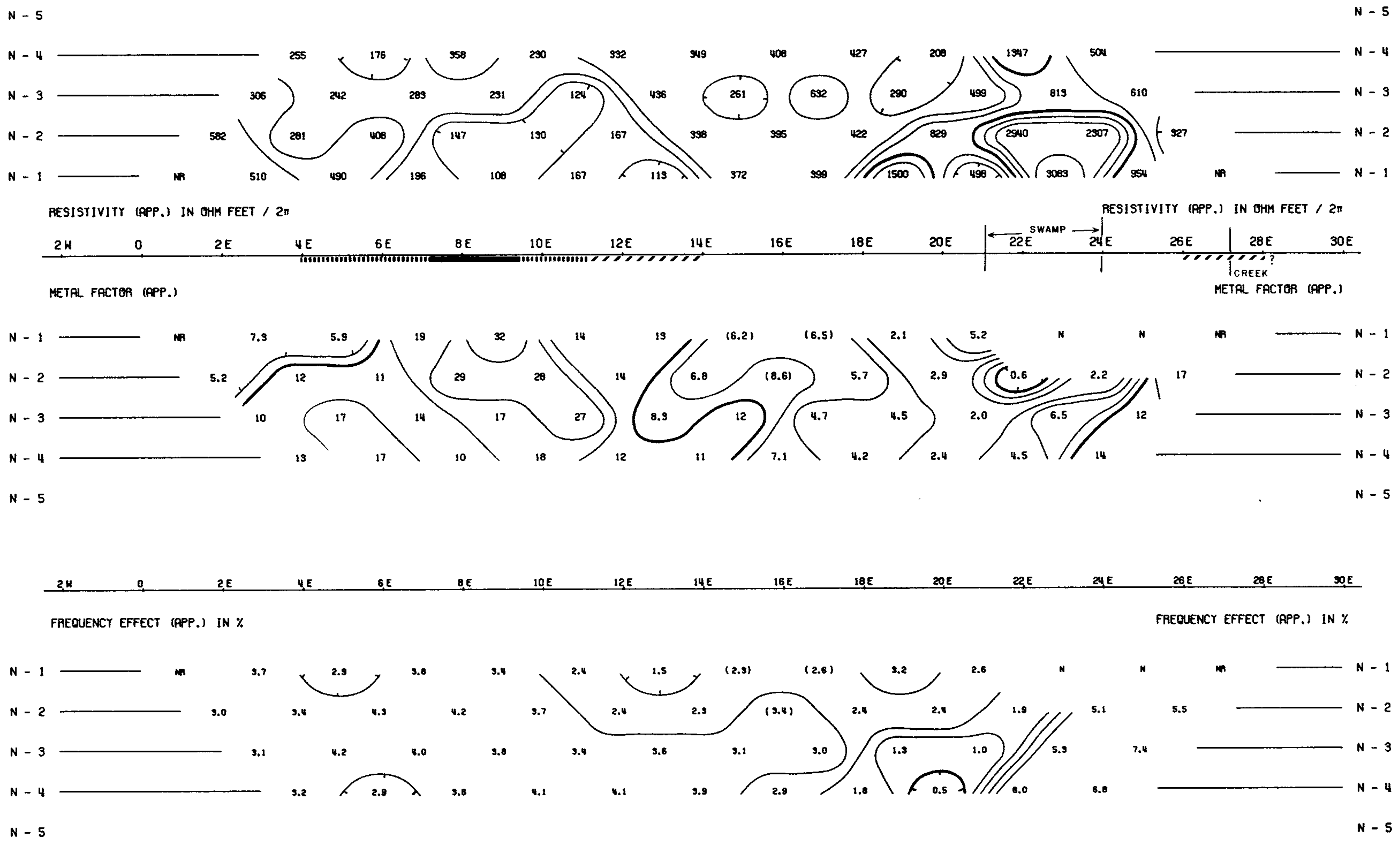
Expiry Date: April 25, 1974

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



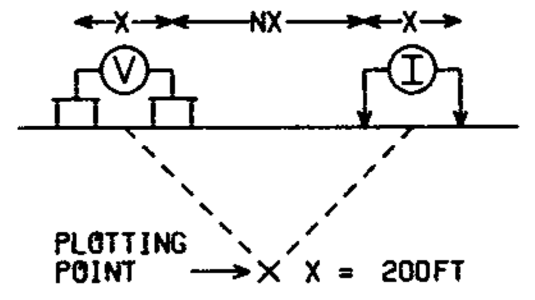
DWG. NO.- I.P.-6097-14

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 6000N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1973

APPROVED:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D.R. FOUNTAIN

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

DATE:

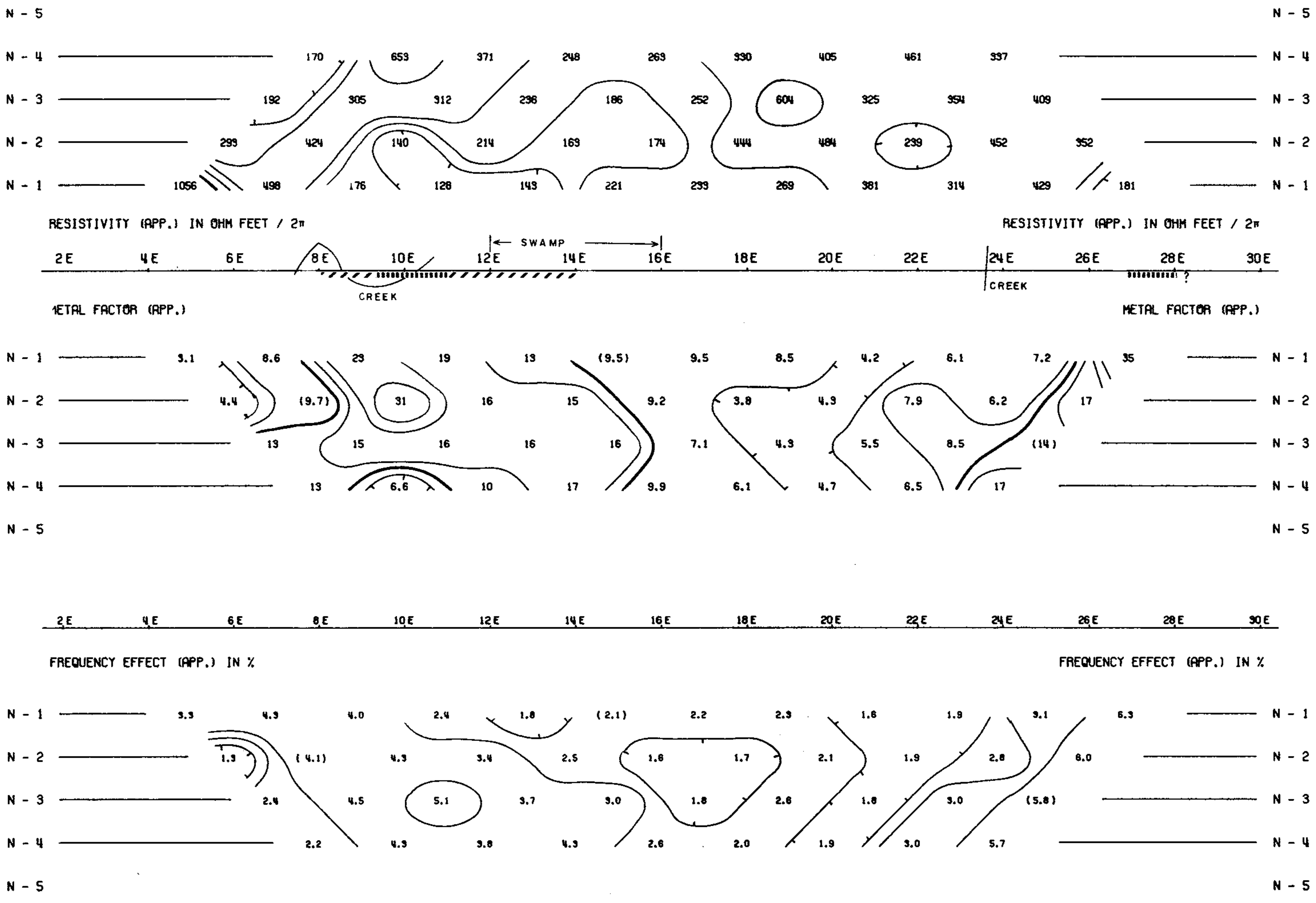
4755

Date. April 25, 1974

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.-6097-15

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 6400N

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT → X   X = 200FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: 1973

APPROVED:

DATE:

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

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

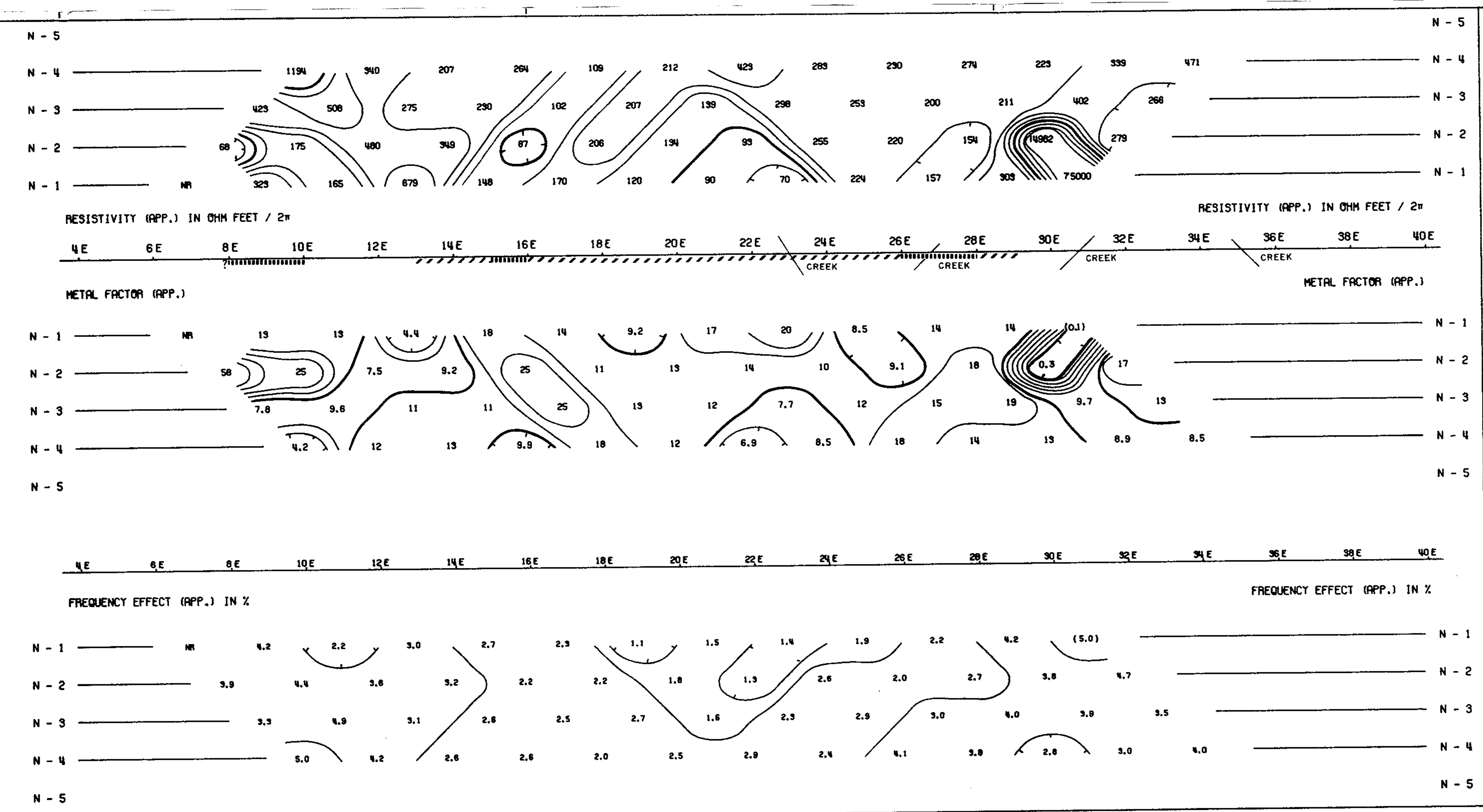
Expiry Date: April 25, 1974

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



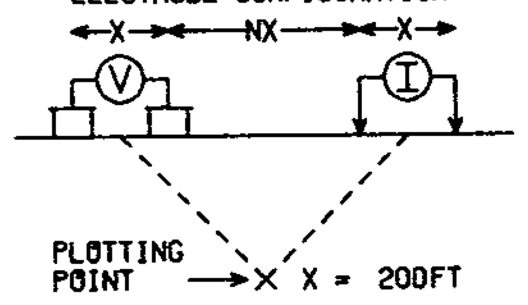
DWG. NO.- I.P.-6097-16

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 7200N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1973

APPROVED

DATE:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN

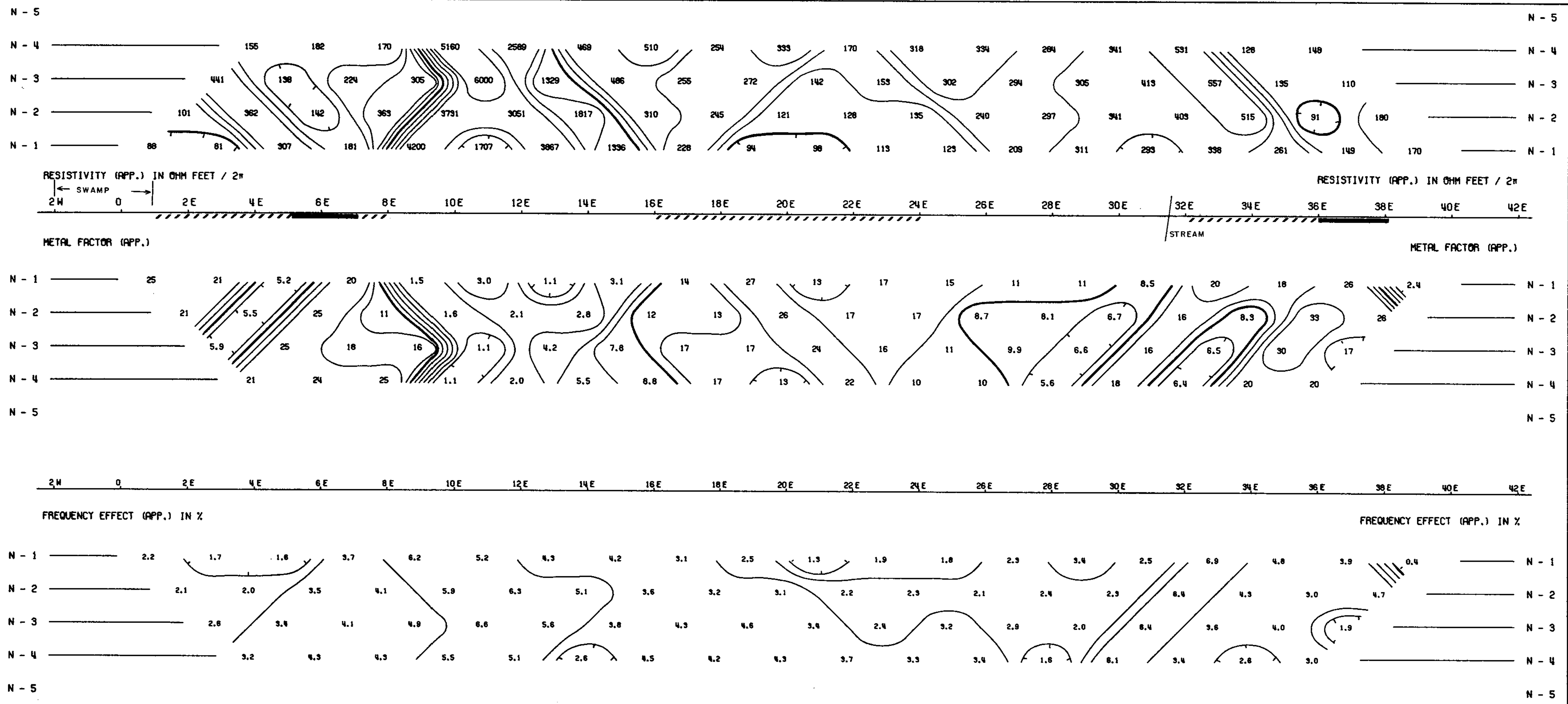
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 6097-17

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 8000N

ELECTRODE CONFIGURATION

X — NX — X

V I

PLOTTING POINT → X X = 200FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1973

APPROVED

DATE:

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

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D.K. FOUNTAIN

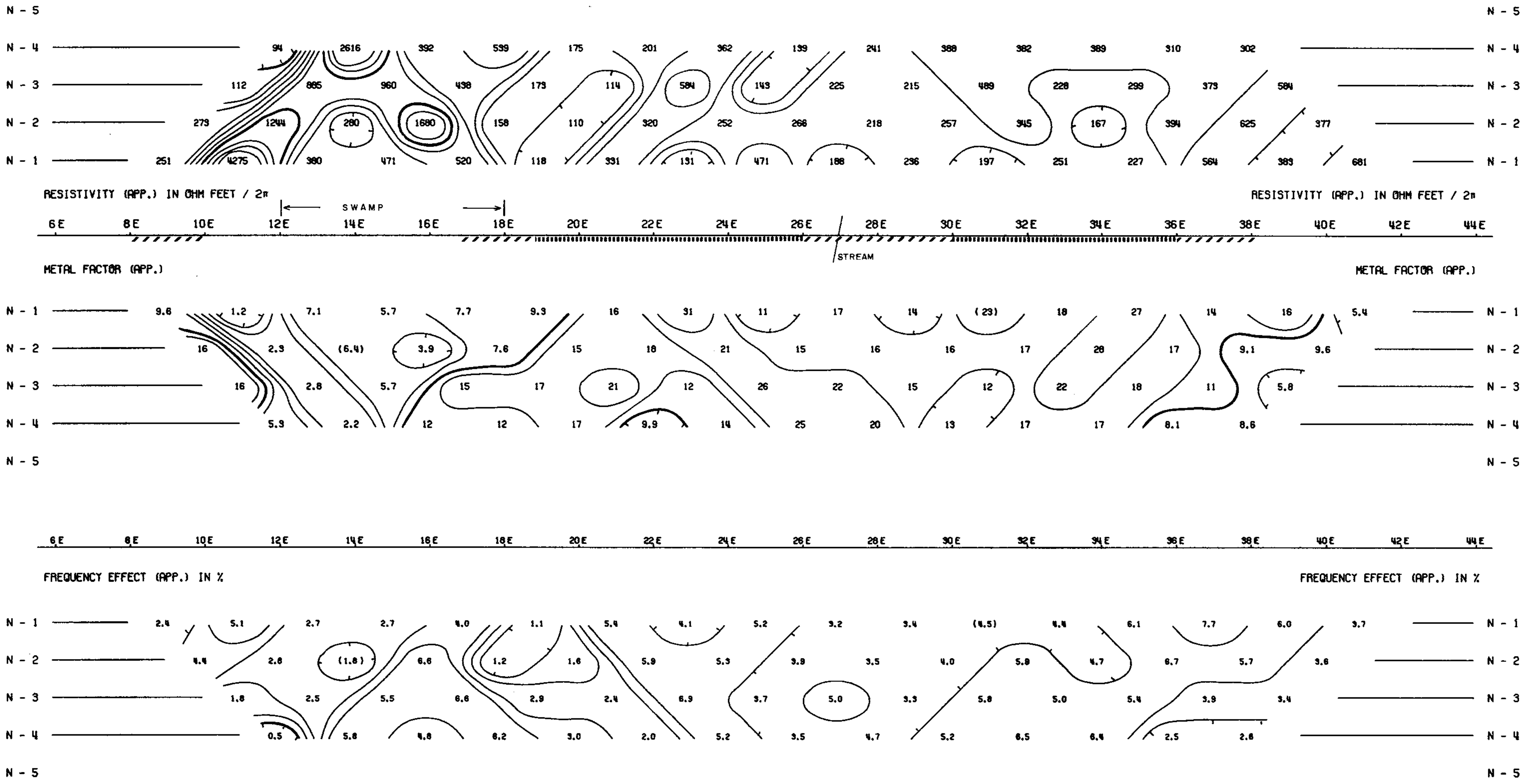
Expiry Date: April 25, 1974

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY MCPHAR COMPUTER DIVISION



DWG. NO.- I.P.- 6097-18

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D.,
BRITISH COLUMBIA

LINE NO.- 8800N

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT X = 200FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1973

APPROVED:

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
D. K. FOUNTAIN

DATE:

Expiry Date: April 25, 1974

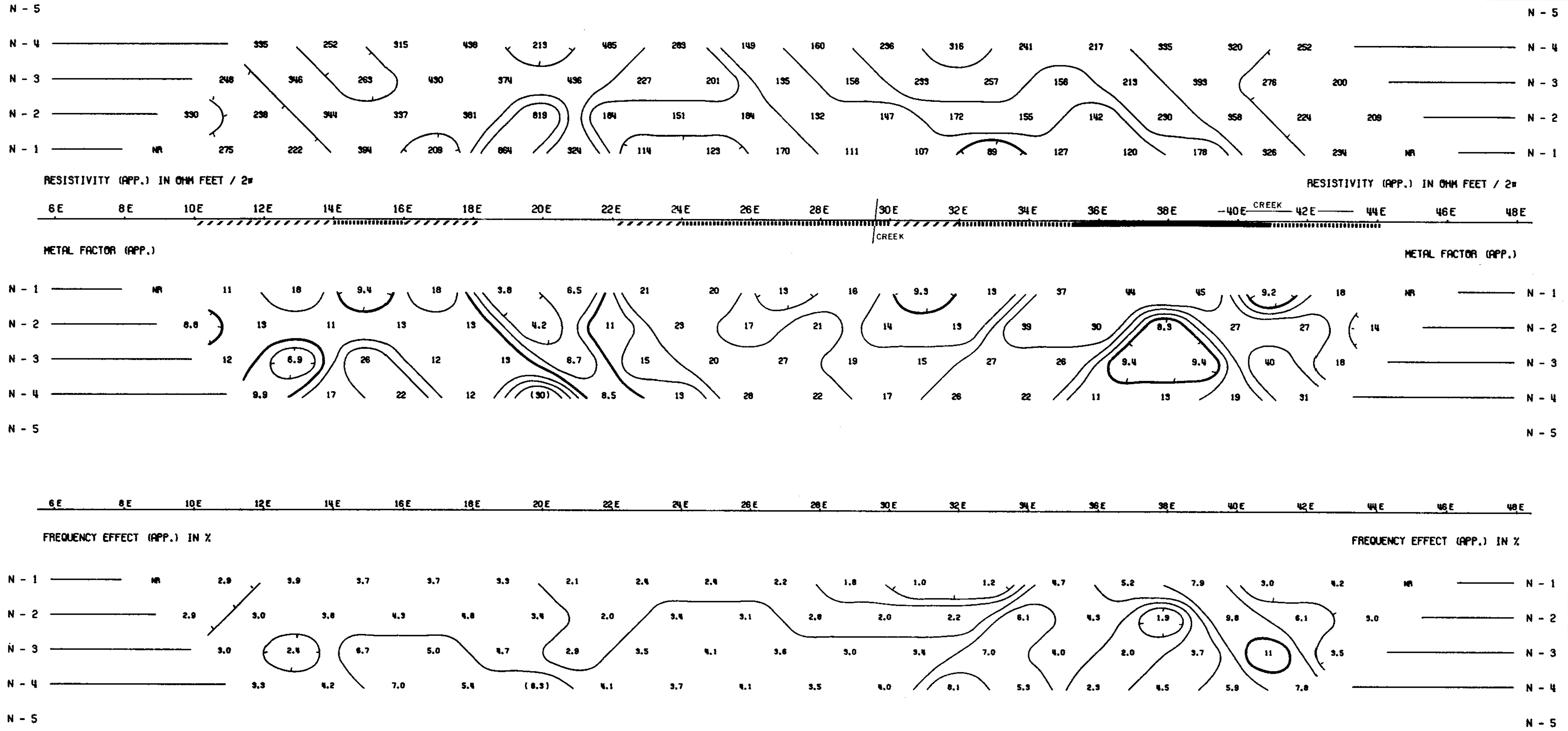
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION



DWG. NO.- I.P.-6097-19

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- 9600N

ELECTRODE CONFIGURATION

PLOTTING POINT X = 200FT

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: JUL 1973

APPROVED:

DATE:

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

PROFESSIONAL ENGINEER D. K. FOUNTAIN PROVINCE OF BRITISH COLUMBIA

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION

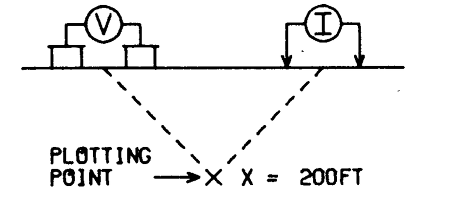
DWG. NO.- I.P.- 6097-20

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST-SIDE), LIARD M.D., BRITISH COLUMBIA

LINE NO.- B/L

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-5.0 HZ

DATE SURVEYED: AUG 1973

APPROVED

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

DATE:

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. K. FOUNTAIN

4755

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

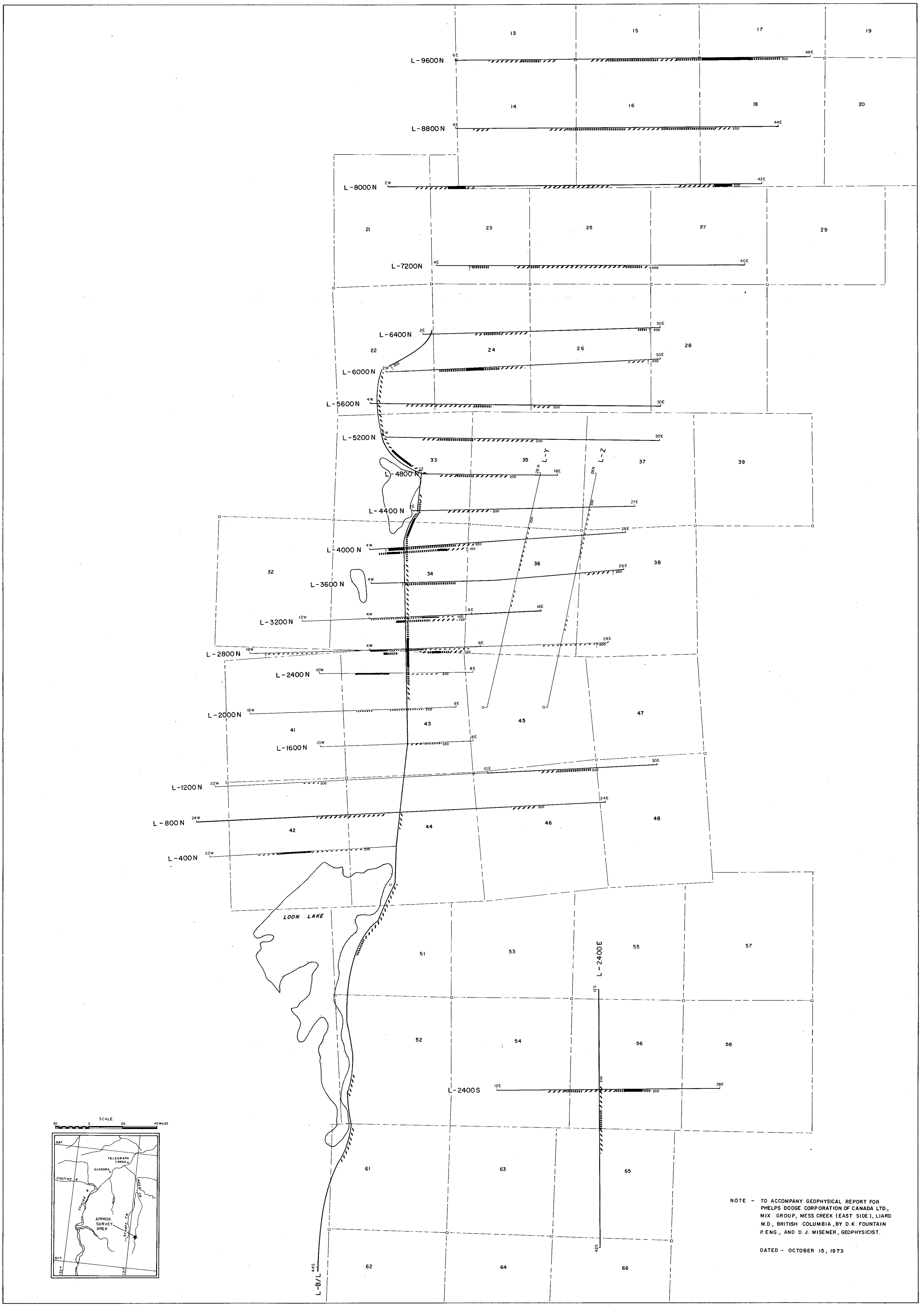
NOTE: THIS PLOT WAS PRODUCED BY McPHAR COMPUTER DIVISION

DWG. IPP-4915

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP



NOTE - TO ACCOMPANY GEOPHYSICAL REPORT FOR PHELPS DODGE CORPORATION OF CANADA LTD., MIX GROUP, MESS CREEK (EAST SIDE), LIARD M.D., BRITISH COLUMBIA, BY D.K. FOUNTAIN P. ENG., AND D.J. MISENER, GEOPHYSICIST.

DATED - OCTOBER 15, 1973

SURFACE PROJECTION OF ANOMALOUS ZONES

1973

DEFINITE

PROBABLE

POSSIBLE

Number at the end of anomaly indicates electrode interval

1972

DEFINITE

PROBABLE

POSSIBLE

PHELPS DODGE CORPORATION OF CANADA LTD.

MIX GROUP, MESS CREEK (EAST SIDE)

LIARD M.D., BRITISH COLUMBIA

SCALE

ONE INCH EQUALS FOUR HUNDRED FEET

POSITION OF IP SURVEY LINES FROM AUG. 22, 1973 GEOLOGICAL MAP BY R. BEATON.

DRAWN BLB

DATE OCTOBER 1973

APPROVED David K. Fountain

DATE Oct. 15/73

4755-M1

DWG. IPP-4915