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REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY ON THE BISHOP COPPER PROSPECT MONO COUNTY, CALIFORNIA FOR LEVIATHON MINING, INCORPORATED

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

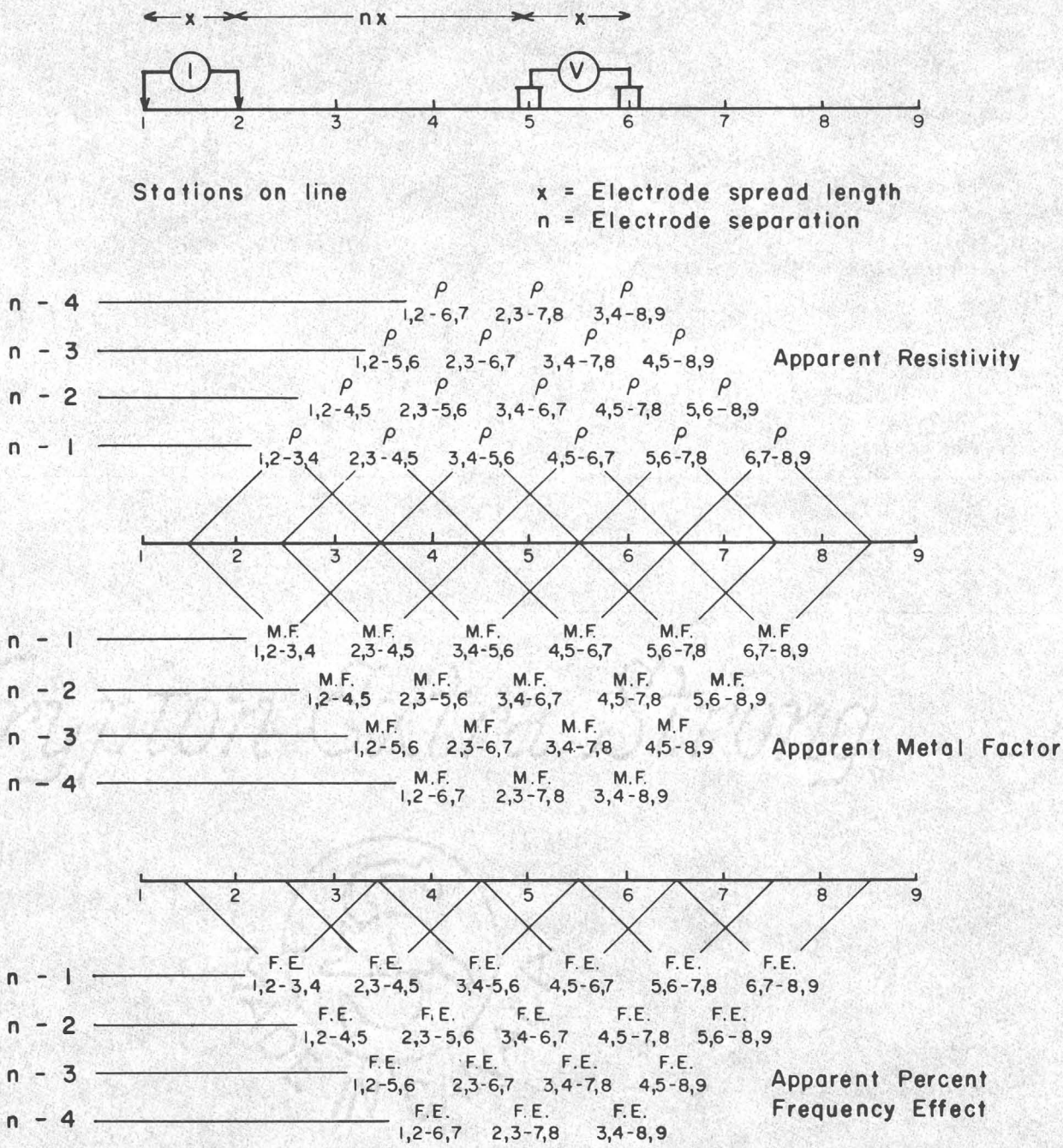

Fig. A

McPHAR GEOPHYSICS

REPORT ON THE
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
ON THE
BISHOP COPPER PROSPECT
MONO COUNTY, CALIFORNIA
FOR
LEVIATHON MINING, INCORPORATED

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1. INTRODUCTION

At the request of Mr. Cecil J. Coveney, Geological Consultant to Leviathon Mining, Incorporated, McPhar has completed an induced polarization and resistivity survey on Leviathon's Bishop Copper Prospect, T. 5S., R. 33 E. and R. 34 E., Mono County, California. The geology and mineralization within the Emerald claim group, located in the central portion of the prospect area, were mapped and described by Mr. Frank Lee of Western Geological Services, Ltd., and are briefly summarized below.

The oldest rocks within the mapped area are a complexly-faulted sequence of Paleozoic sediments and metasediments. In the western part of the area unaltered Cambrian limestone and chert beds strike north-northwest and dip southwest. In the central and eastern parts of the area former limestones have been altered to marble, and former siltstones, mudstones, and shales have been altered to phyllite and hornfels. The metamorphosed Paleozoic rocks are intruded by Mesozoic diorite, as a stock or stocks in the southeastern part of the area and as north-northwest

trending dike swarms in the north-central part of the area. Leucocratic syenite, which crops out in the southern part of the area, is regarded as an end phase of the Mesozoic intrusive activity. Both the Paleozoic and Mesozoic rocks are in turn intruded by Early-Middle Tertiary (?) microdiorite dikes. The microdiorite dikes, which are most conspicuous in the western part of the area, also trend north-northwest, and appear to have been controlled by major faults.

The area is divided into two distinct mineral provinces by a major northeast-trending fault, fault A. North of fault A Cambrian limestone, chert, and banded marble constitute a pyrite-chalcopyrite-gold province. Here, sulphide mineralization appears to have been introduced with or along microdiorite-limestone contacts. South of fault A is a lead-silver-copper province. In the southeastern part of the area a wide, low-dipping quartz dike appears to have been the feeder channel of an extensive quartz vein system. Stratigraphically below the dike, galena, chalcopyrite, and limonite after pyrite occur in vugs and as scattered, coarse crystal segregations.

The purpose of the induced polarization and resistivity survey was to search for and delineate hidden zones of concentrated sulphide mineralization within and adjacent to the Emerald claim group. The survey was performed by Raymond Monarez, crew chief. Survey coverage is tabulated below:

Electrode Spacing	Total Coverage	Effective Coverage
1000 feet	3.0	1.5
500 feet	30.1	18.3

Electrode Spacing	Total Coverage	Effective Coverage
250 feet	4.3	2.0
100 feet	1.2	0.7
TOTAL	38.6	22.5 Line Miles

The effective coverage is over those portions of the lines where data was obtained from one through five electrode intervals. The total coverage represents the distance actually traversed in order to obtain the effective coverage.

2. PRESENTATION OF RESULTS

The induced polarization and resistivity results are shown on the data plots listed below and are summarized on plan maps.

Line	Electrode Intervals	Dwg. No.
20N	500 feet	IP 5411-1
16N	500 feet	IP 5411-2
12N	500 feet	IP 5411-3
9N	500 feet	IP 5411-4
8N	500 feet	IP 5411-5
4N	500 feet	IP 5411-6
0N	500 feet	IP 5411-7
2S	250 feet	IP 5411-8
4S	500 feet	IP 5411-9
6S	250 feet	IP 5411-10
8S	500 feet	IP 5411-11

Line	Electrode Intervals	Dwg. No.
10S	250 feet	IP 5411-12
12S	500 feet	IP 5411-13
14S	250 feet	IP 5411-14
16S	500 feet	IP 5411-15
18S	250 feet	IP 5411-16
20S	500 feet	IP 5411-17
20S	100 feet	IP 5411-18
22S	250 feet	IP 5411-19
22S	100 feet	IP 5411-20
24S	500 feet	IP 5411-21
24S	100 feet	IP 5411-22
28S	500 feet	IP 5411-23
32S	500 feet	IP 5411-24
A	1000 feet	IP 5411-25
AO	500 feet	IP 5411-26
O	500 feet	IP 5411-27
BO	500 feet	IP 5411-28
D	500 feet	IP 5411-29
E	500 feet	IP 5411-30

The induced polarization results are shown on two maps, Dwg. I.P.P. 4604-1 and Dwg. I.P.P. 4604-2. A map at a scale of 1" = 500 feet shows all the results obtained within the survey area with the exception of those along Line E. Line E was run near the trailer at the entrance to the prospect. The results obtained on the Emerald claim group are also shown on

the geology map prepared by Mr. Lee at a scale of 1" = 200 feet, Dwg. I.P.P. 4604-3.

In this report both percent frequency effect (PFE) anomalies and metal factor (MF) anomalies are shown on the plan maps. Percent frequency effect is a measure of the intensity of polarization, and anomalies are classified as very weak - very strong. The percent frequency effect anomaly map is useful in outlining polarizable areas without emphasis being given to the resistivity of the areas. Metal factor (MF) is obtained by combining the percent frequency effect and the resistivity. A good conductor (low resistivity) that is strongly polarizable (high percent frequency effect) will give a well-defined or definite metal factor anomaly. Less well-defined metal factor anomalies are designated as probable or possible.

The percent frequency effect and metal factor parameters are complementary. The relative importance of each type of information depends upon the particular geophysical environment and the type of target expected. For example, a mineralized silicified zone will give a strong percent frequency effect anomaly, but may not give a definite metal factor anomaly. Alternatively, an oxidized ore zone may only give a weak percent frequency effect anomaly, but will give a definite metal factor anomaly pattern. Judicious consideration of both the percent frequency effect and the metal factor results permits a comprehensive evaluation of the geophysical environment.

The anomalies as shown on the data plots and plan maps represent the surface projection of the polarizable zones. Contacts or faults inferred from the resistivity patterns are also shown, on plan only. Anomaly

boundaries and fault locations should be considered accurate to the electrode interval used.

The anomalies shown on the plan maps are designated shallow, moderate, or deep. At larger dipole separations a greater volume of rock is averaged, in lateral extent as well as depth. The data plots, therefore, cannot represent true depth. Depths can be calculated from the apparent resistivity data in the case of ideal horizontal layers, but even this calculation depends on an assumed resistivity contrast between the zone at depth and the overlying rock. Although ambiguous, the simple depth designations are useful for correlating or comparing anomalous zones obtained on adjacent survey lines. Drill hole information from one or more zones frequently permits one to make a fair depth estimate for other zones. The following depth generalizations apply to porphyry copper and contact-replacement bodies:

	Apparent Depth (dipole separations)	Drill Hole Depth (in dipole lengths)
Shallow	1 - 2	$\frac{1}{2}$ - 1
Moderate	2 - 3	1 - $1\frac{1}{2}$
Deep	3 - 5	$1\frac{1}{2}$ - 2 +

Thus, a shallow zone is one detected at one-to-two dipole separations and should be tested by a drill hole from a half-to-one dipole length deep.

The induced polarization method is a geophysical tool used to determine the electrical properties of the earth. The final evaluation of the induced polarization anomalies, e.g., which of the anomalies constitutes the most favourable exploration target, must be based on available geologic evidence and concepts.

3. DISCUSSION OF RESULTS

As shown on the anomaly maps, the induced polarization and resistivity survey detected a deep, definite metal factor anomalous zone in the central portion of the grid. The definite zone extends from Line 20S northward along Line AO, within the Emerald claim group. The zone, detected at 500-foot electrode intervals, is characterized by both low resistivities and weak-moderate PFE's at depth. Line A, which was run at 1000-foot electrode intervals along the zone shows low resistivities and strong PFE's at depth. The definite anomalous zone occurs in a valley, and is mostly covered by alluvium. The resistivity results indicate that the alluvium cover is not thick. The northern end of the anomaly, along Line 8N and Line 4N, occurs beneath shattered marble with related hornfels and phyllite. Copper mineralization is exposed at two pits along Line 8N, just west of Line A. The southern end of the anomaly, along Line 20S, occurs at moderate depth within quartz-veined diorite. The associated moderate PFE anomaly is shallow, and occurs in the vicinity of two quartz veins and a pit that shows copper mineralization.

There are a few isolated, definite metal factor anomalies that lie outside the main, north-trending anomalous zone. A definite metal factor anomaly occurs at shallow-moderate depth along the western portion of Line 9N. This anomaly occurs in the vicinity of copper showings and two narrow, limonite gossan zones, and is characterized by a narrow resistivity low and weak PFE's. The resistivity low may be partly a topographic effect. The definite metal factor anomalies in the eastern parts of Line 16N and Line 4N are associated with low resistivity zones at depth. The definite anomaly

in the eastern part of Line 0N is shallow in the interval 25E - 30E; the associated weak PFE anomaly is also shallow. The definite anomaly at the eastern end of Line 12S is characterized by both low resistivities and moderate PFE's at depth.

The strongest PFE anomalies obtained at 500-foot electrode intervals occur at the eastern ends of Line 20S, Line 24S, Line 28S, and Line 32S. Line 20S shows two moderate PFE anomalies: one is centred at 35E and occurs at shallow-moderate depth on the east side of the wide, low-dipping quartz vein; the other occurs in the interval 45E - 50E and is shallow. The latter PFE anomaly was detailed at 100-foot electrode intervals and traced across Line 22S and Line 24S. The corresponding metal factor results obtained at 100-foot electrode intervals show a definite anomalous zone.

In the western part of the grid, the results obtained at 500-foot electrode intervals show possible-probable metal factor anomalies and only very weak - weak PFE anomalies. The probable anomalies that occur west of Line 0 along Line 8S and Line 12S are associated with narrow resistivity low zones within altered and sheared marble. The results obtained at 250-foot electrode intervals show a shallow, weak PFE anomalous zone along Line 6S, Line 10S, and Line 14S, in the vicinity of Line BO. The zone is associated with a swarm of microdiorite dikes in Cambrian limestone.

4. CONCLUSIONS AND RECOMMENDATIONS

The deep, untested metal factor anomalous zone on the Emerald claim group, which is approximately 3500 feet long and 1000 feet wide, constitutes an exploration target that should be tested by drilling. The stronger results obtained at 1000-foot electrode intervals indicate that the

source is deep. Three vertical drill holes are recommended to initially test this zone:

1. a 2000-foot hole located at 5S on Line A and at 11.5E on Line 4S,
2. a 1500-foot hole located at 10E on Line 8N and at 7.5N on Line A,
3. a 1000-foot hole located at 20E on Line 16S.

The anomalous zone was detected in a valley, and although only very weak - weak PFE's were obtained over the churn drill holes on the hill in the western part of the area, sulphides may be too deep here to have been detected with 500-foot electrode intervals. If the drilling results are encouraging, the western part of the area should be surveyed at 1000-foot electrode intervals.

The narrow, shallow anomalous zone on the Majestic claim group in the eastern part of the area is also an exploration target that should be tested by drilling. Favourable lead-silver mineralization is reported to have been discovered in outcrop nearby. Since the zone occurs on a hillside, three vertical drill holes at least 200 feet deep are recommended at the following locations:

1. at 45E on Line 20S
2. at 44E on Line 22S
3. at 45E on Line 24S

If the results are encouraging, the zone should be further delineated.

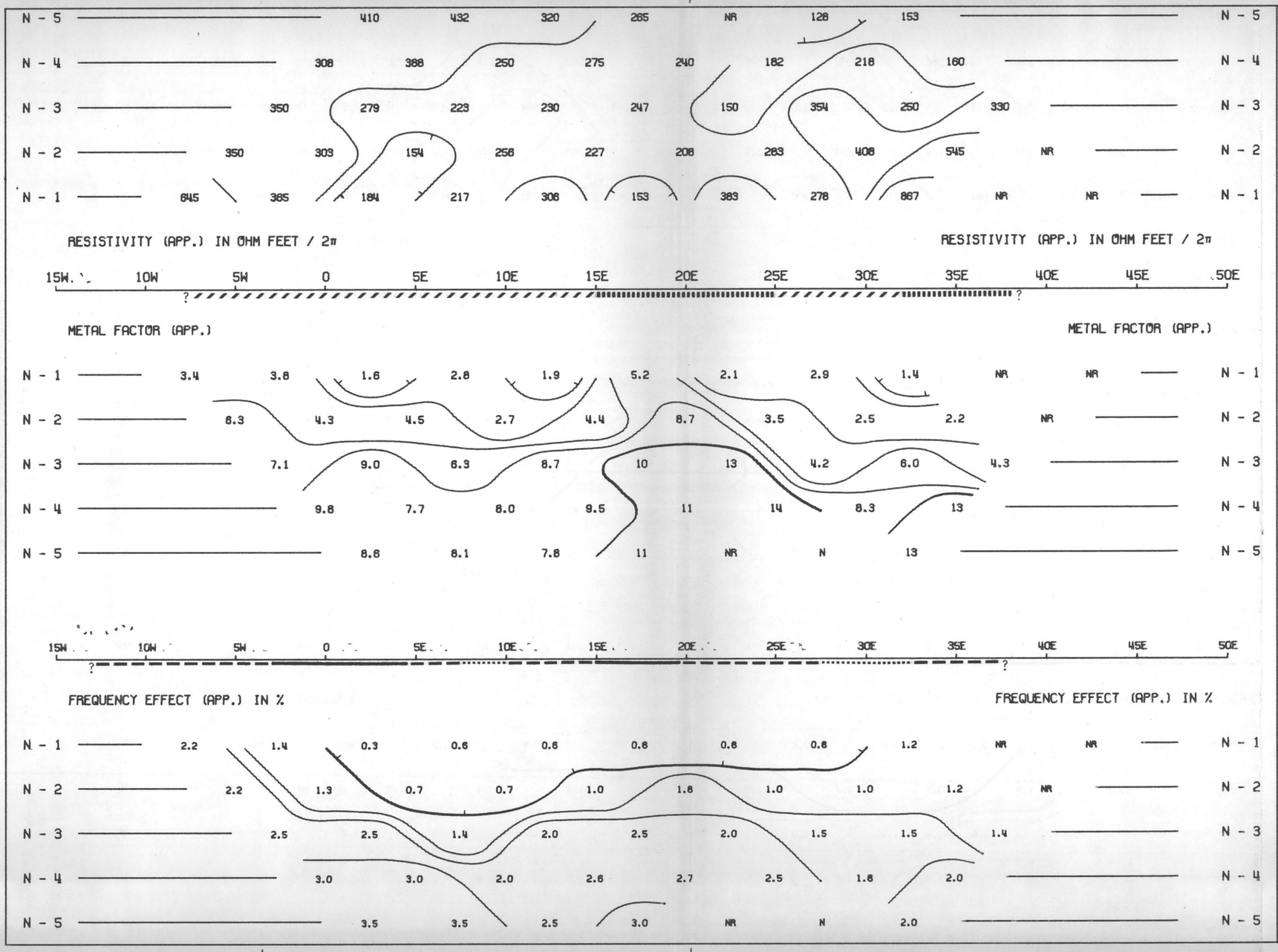
The moderate PFE anomaly at shallow - moderate depth along Line 20S, in the vicinity of the wide, low-dipping quartz dike, should also be tested by drilling. Mr. Lee reports that past selective mining of the

galena and chalcopyrite mineralization below the dike was locally quite extensive. A vertical drill hole, 500-feet deep and located at 35E on Line 20S is recommended to test the anomaly.

McPHAR GEOPHYSICS INCORPORATED

Anthony M. Hauck III
Geophysicist.

Dated: April 1, 1970



DWG. NO.- I.P.-5411-1

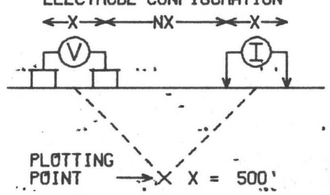
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT

MONO COUNTY, CALIFORNIA

LINE NO.- 20N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

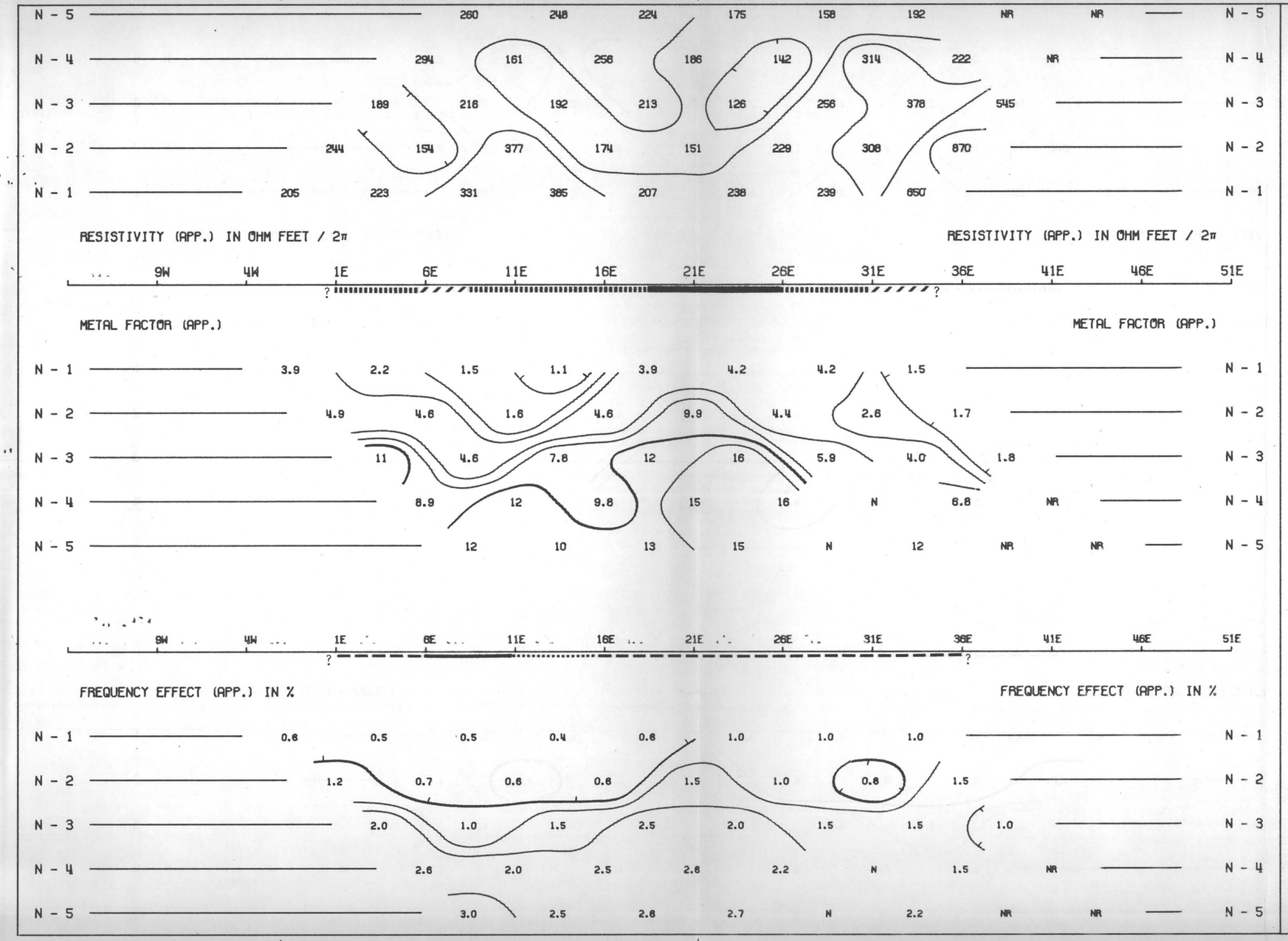
DATE: April 1/70

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

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.-5411-2

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT

MONO COUNTY, CALIFORNIA

LINE NO.- 16N

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT → X = 500'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

DATE: April 1/70

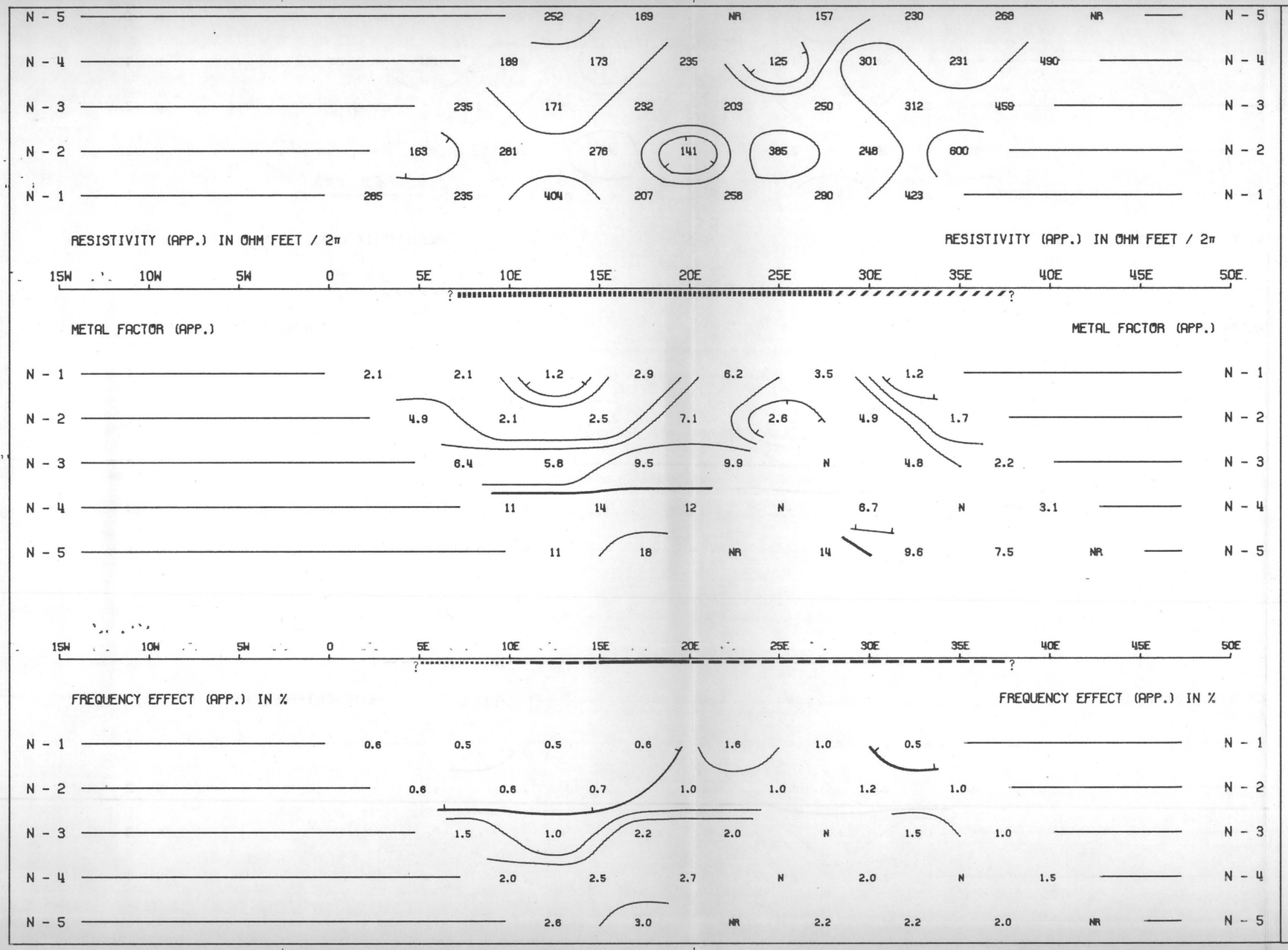
McPHAR GEOPHYSICS INCORPORATED

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

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.-5411-3

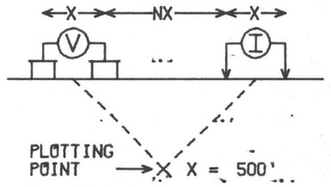
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT

MONO COUNTY, CALIFORNIA

LINE NO.- 12N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

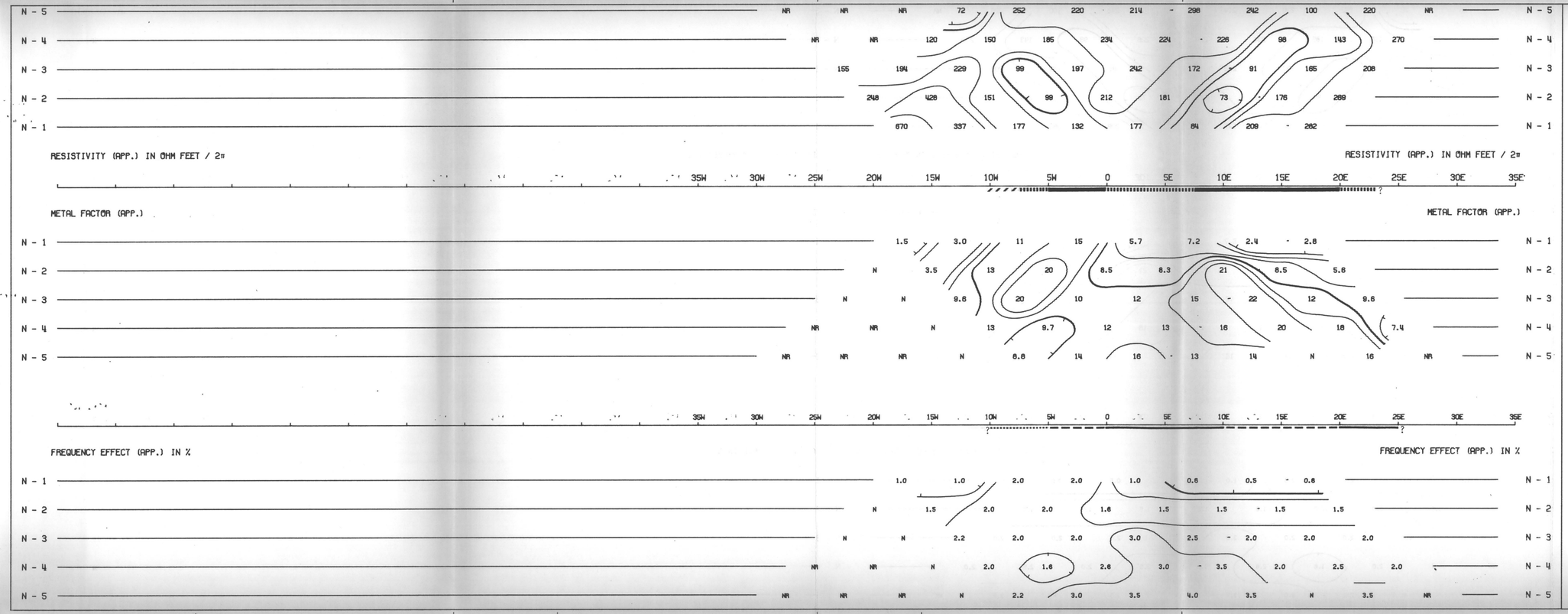
DATE: April 1/70

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

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.-5411-4

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT

MONO COUNTY, CALIFORNIA

LINE NO.- 9N

ELECTRODE CONFIGURATION

X — NX — X

V I

PLOTTING POINT → X = 500'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

DATE:

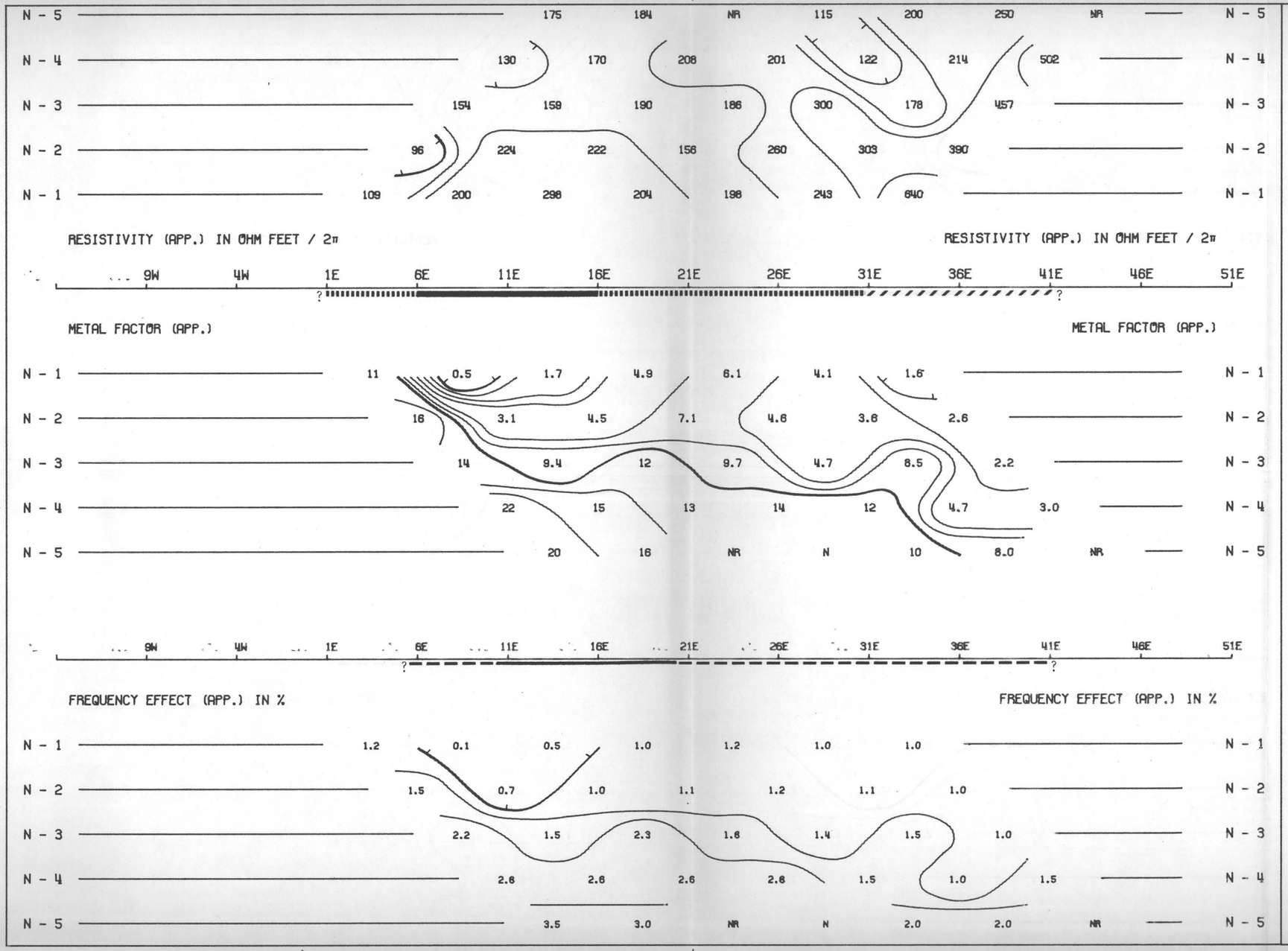
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS INCORPORATED

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.-5411-5

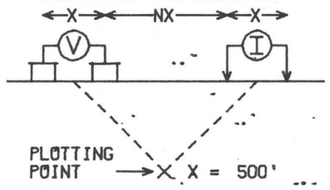
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT

MONO COUNTY, CALIFORNIA

LINE NO.- 8N

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

DATE: April 1/70

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

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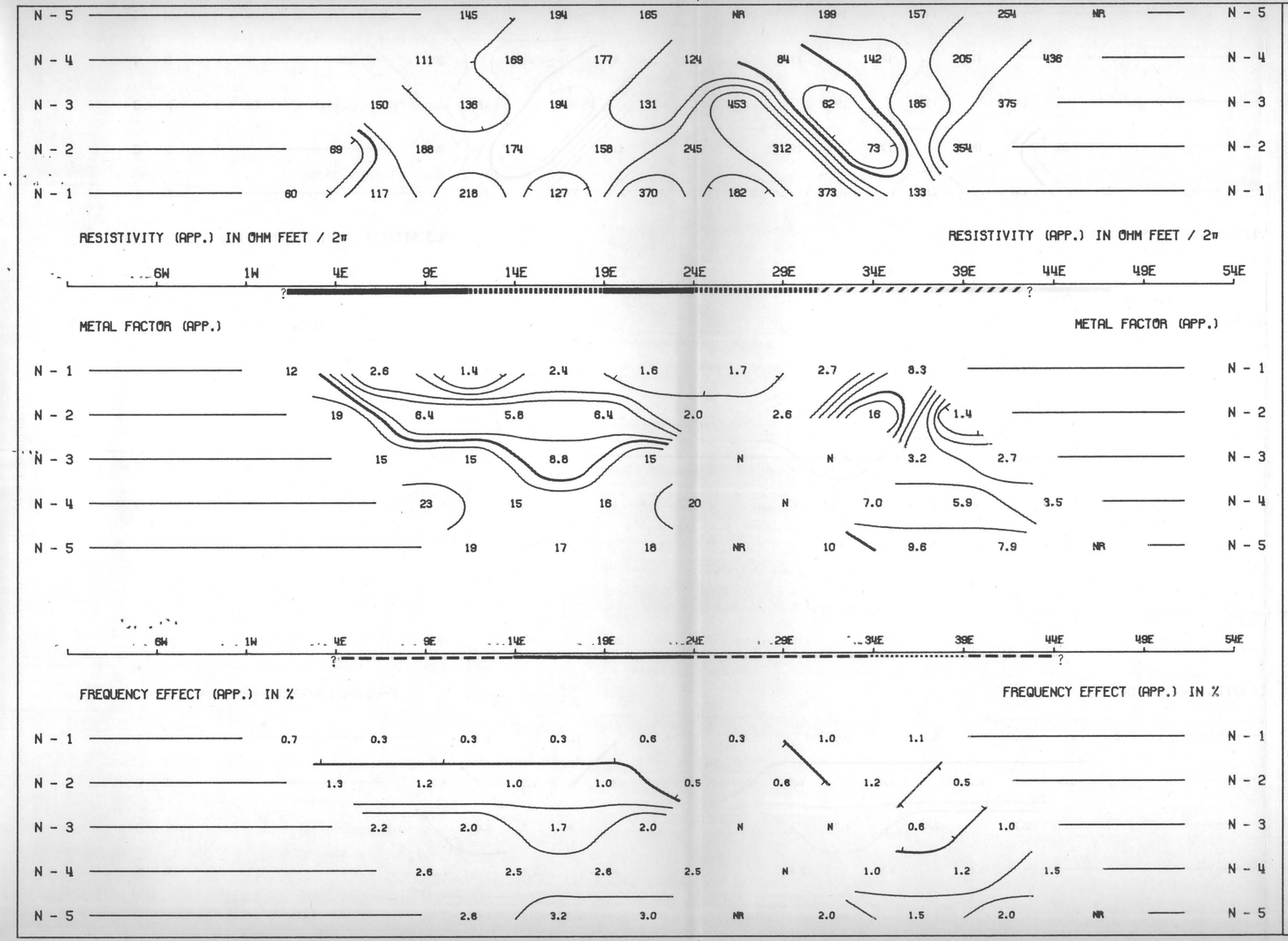
INDUCED POLARIZATION AND RESISTIVITY SURVEY

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



DWG. NO.- I.P.-5411-6

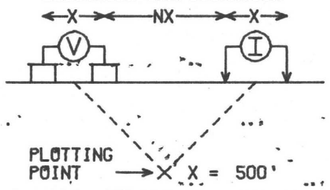
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT

MONO COUNTY, CALIFORNIA

LINE NO.- 4N.

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

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

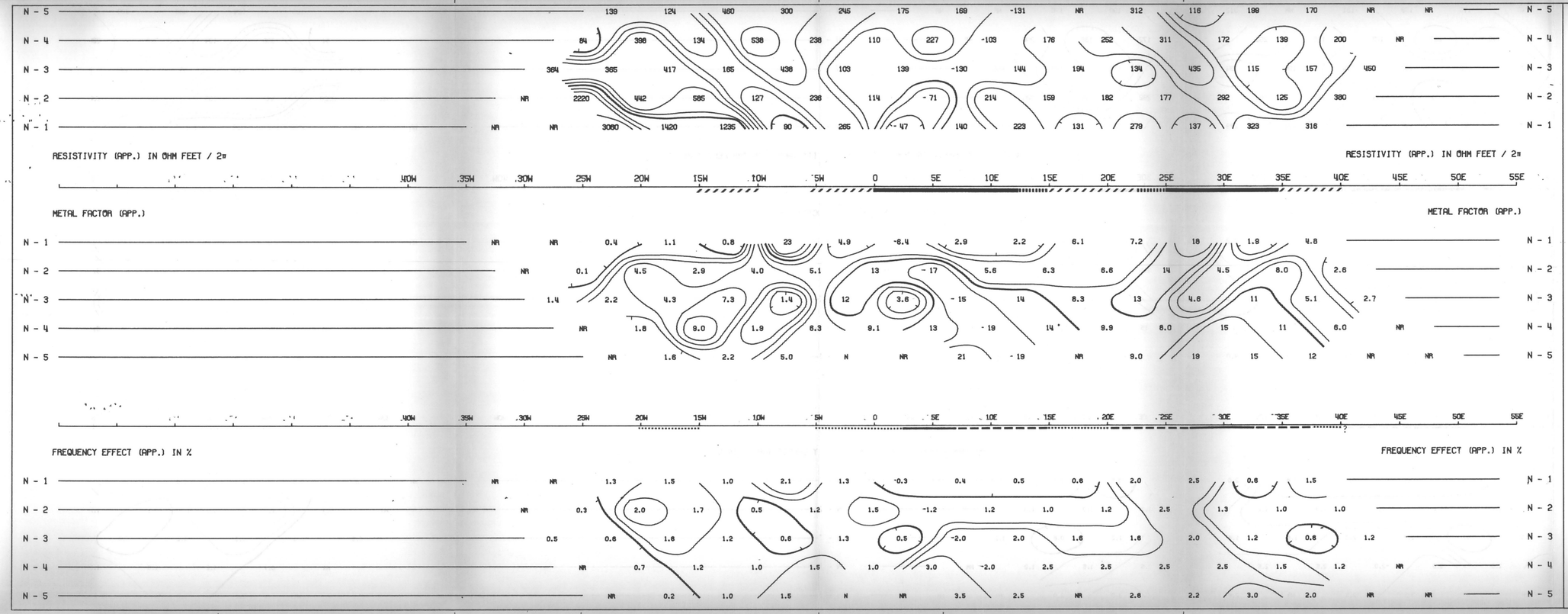
DATE: April 1/70

McPHAR GEOPHYSICS INCORPORATED

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.-5411-7

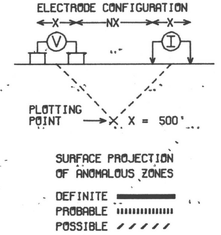
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT

MONO COUNTY, CALIFORNIA

LINE NO.- 0.

ELECTRODE CONFIGURATION



FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

DATE: April 1/70

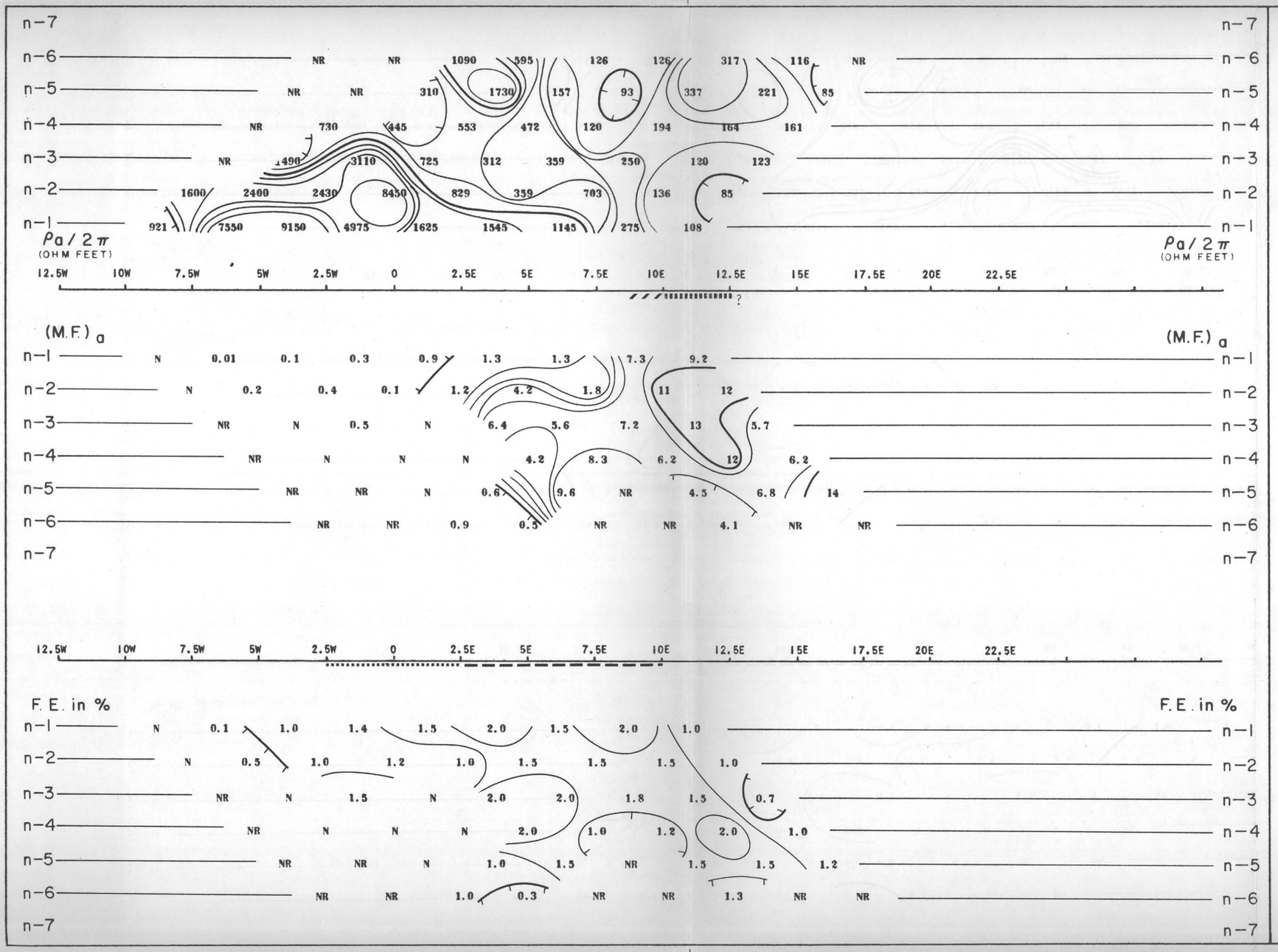
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS INCORPORATED

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.-5411-8

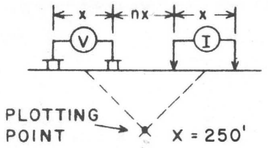
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT,

MONO COUNTY, CALIFORNIA.

LINE NO.- 2S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 Hz

DATE SURVEYED: OCT. 1969

APPROVED:

DATE: April 1/70

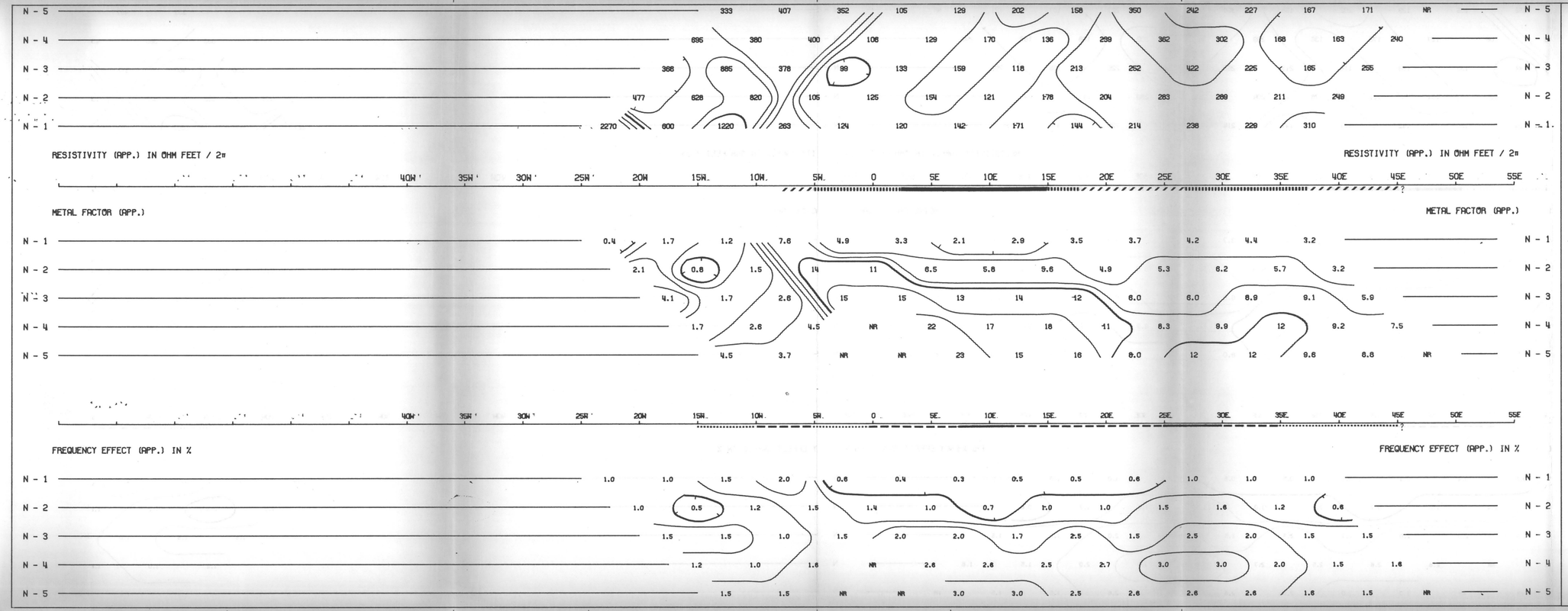
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1-1.5-2-3-5-7.5-10

McPHAR GEOPHYSICS INCORPORATED

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.-,I.P.-5411-9

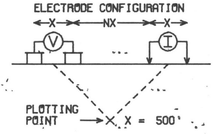
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT

MONO COUNTY, CALIFORNIA

LINE NO.- 4S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

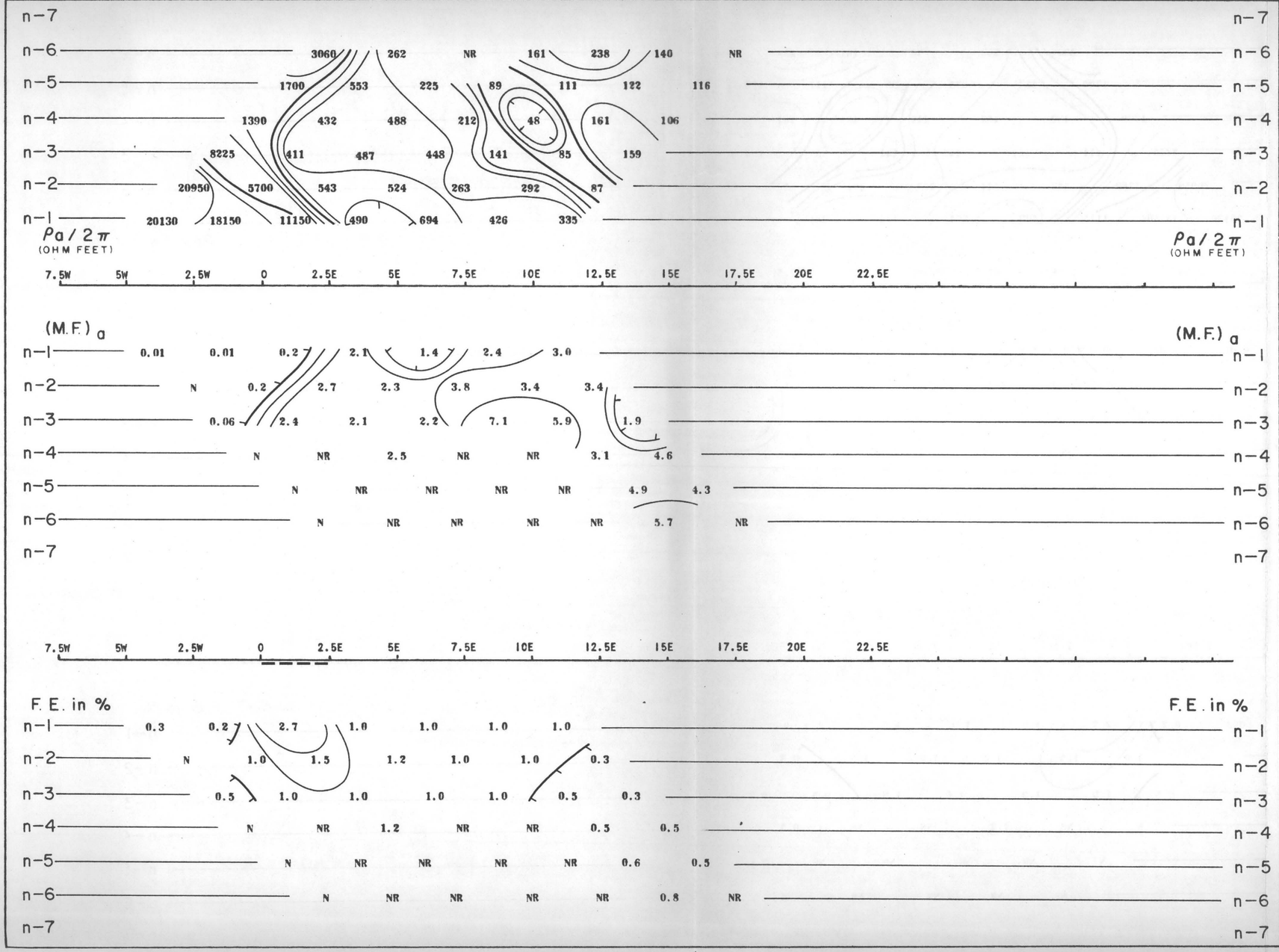
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE: April 1/70

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.-5411-10

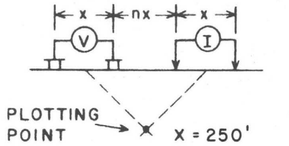
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT,

MONO COUNTY, CALIFORNIA.

LINE NO.- 6S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 Hz

DATE SURVEYED: OCT. 1969

APPROVED: G.M.

DATE: April 1/70

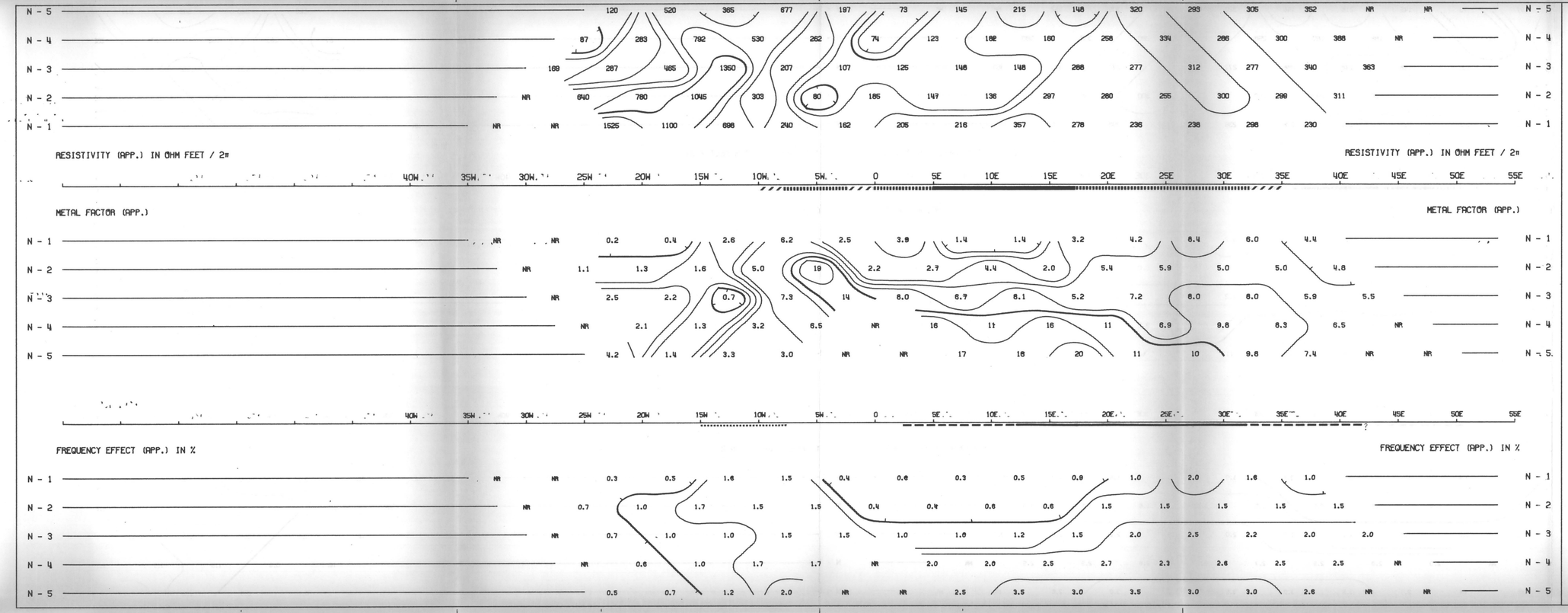
McPHAR GEOPHYSICS INCORPORATED

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

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.- I.P.-5411-11

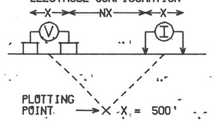
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT

MONO COUNTY, CALIFORNIA

LINE NO:- 8S.

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

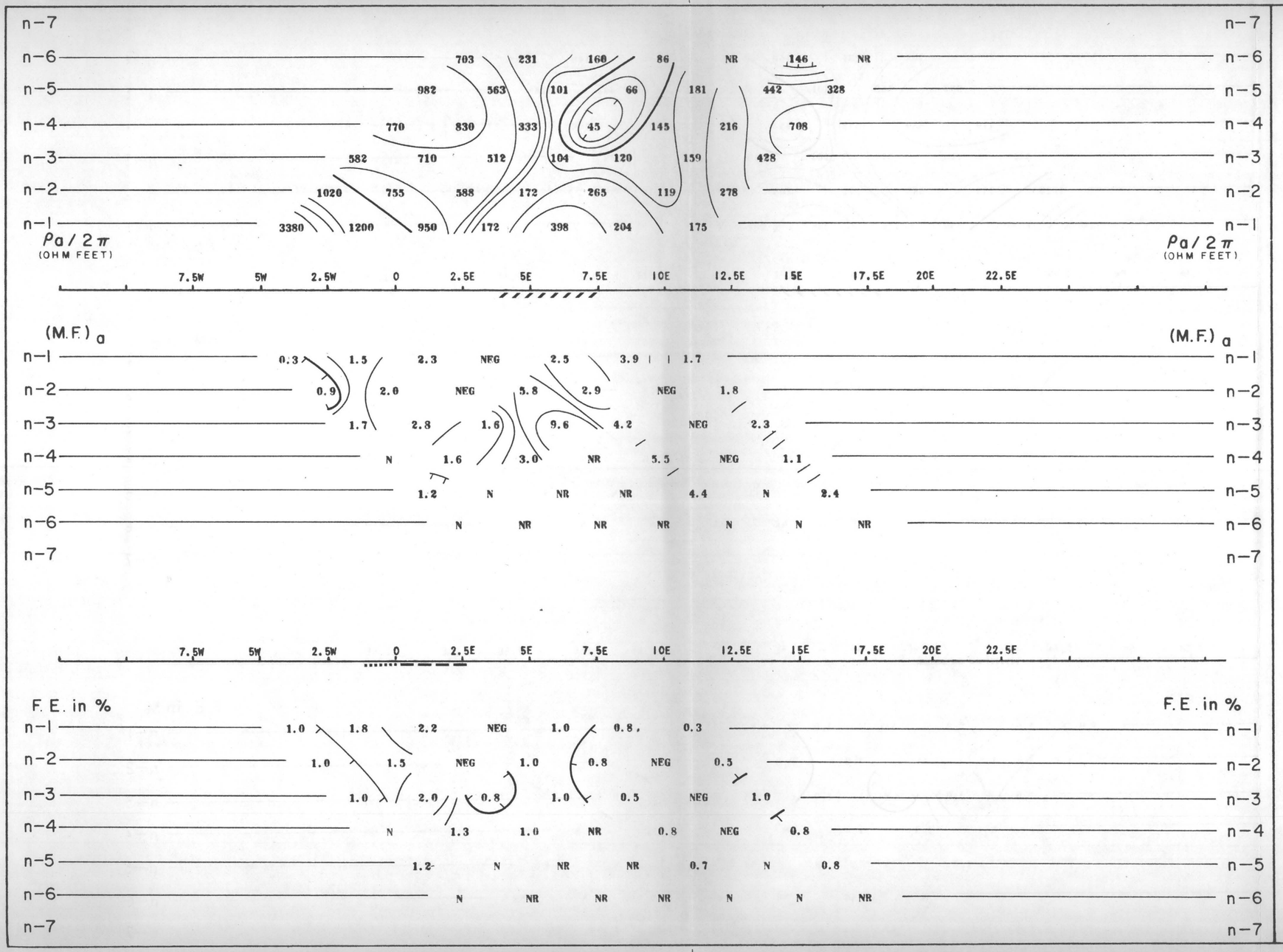
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE: April 1970

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.-5411-12

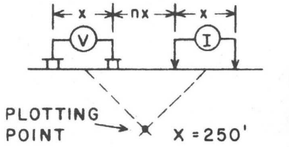
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT,

MONO COUNTY, CALIFORNIA.

LINE NO.- IOS

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0·31–2·5 Hz

DATE SURVEYED: OCT. 1969

APPROVED:

DATE: April 1/70

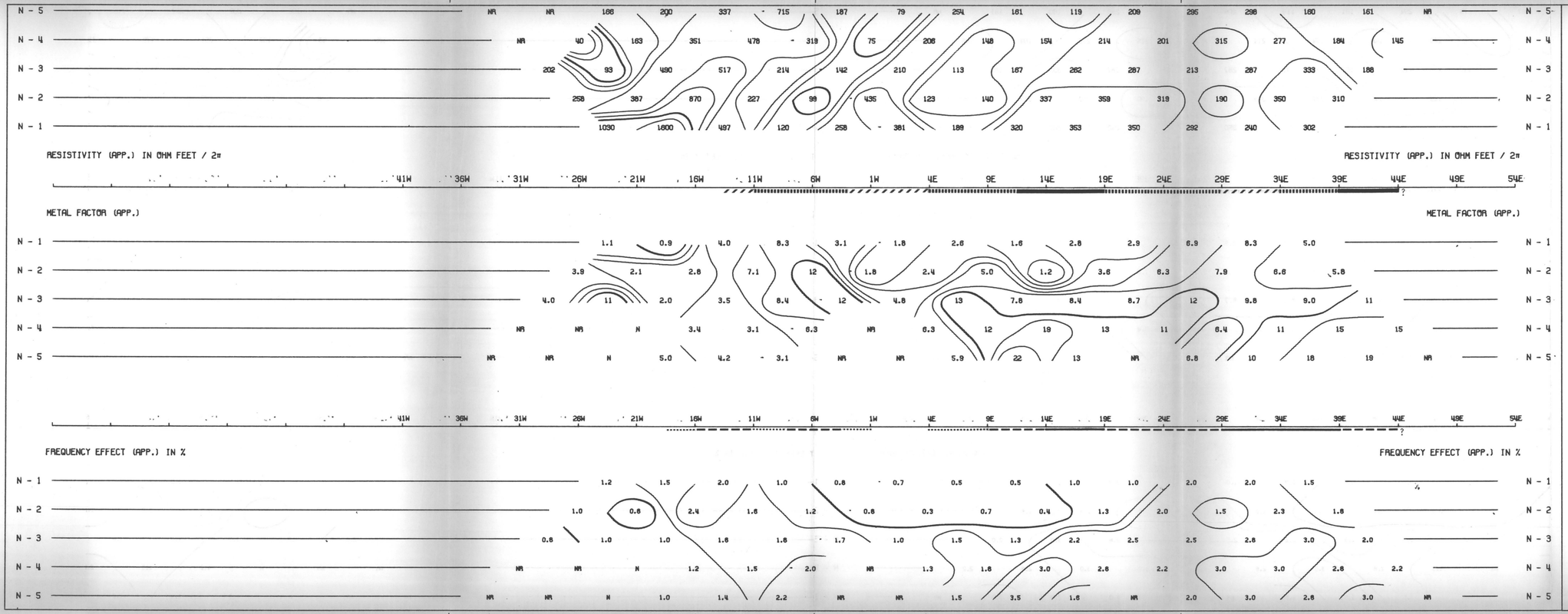
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1-1·5-2-3-5-7·5-10

McPHAR GEOPHYSICS INCORPORATED

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.- I.P.-5411-13

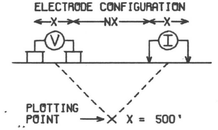
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT

MONO COUNTY, CALIFORNIA

LINE NO.- 12S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

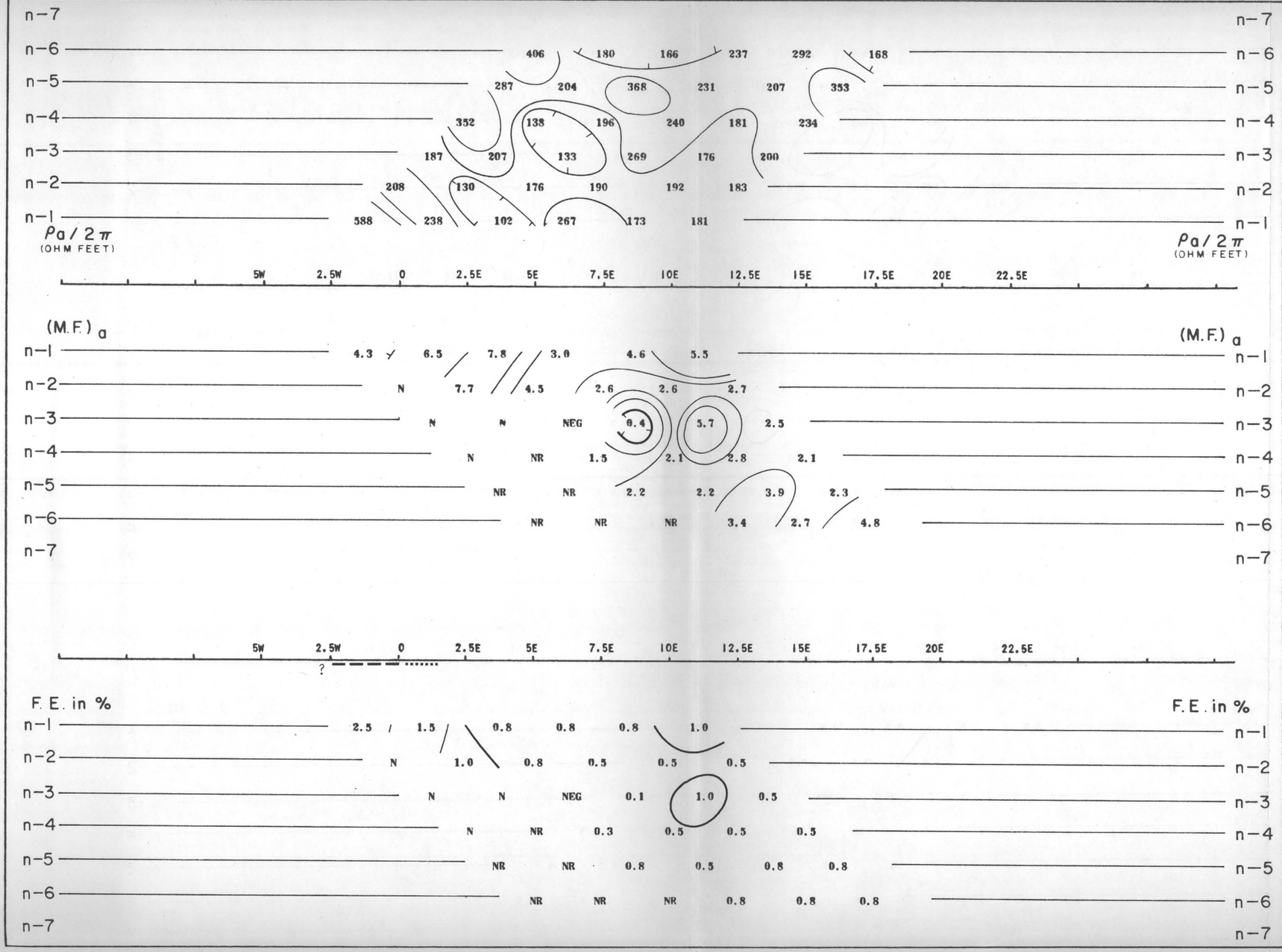
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE:

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.-5411-14

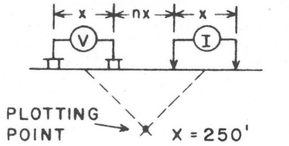
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT,

MONO COUNTY, CALIFORNIA.

LINE NO.- 14S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0·31–2·5 Hz

DATE SURVEYED: OCT. 1969

APPROVED:

DATE: April 1/70

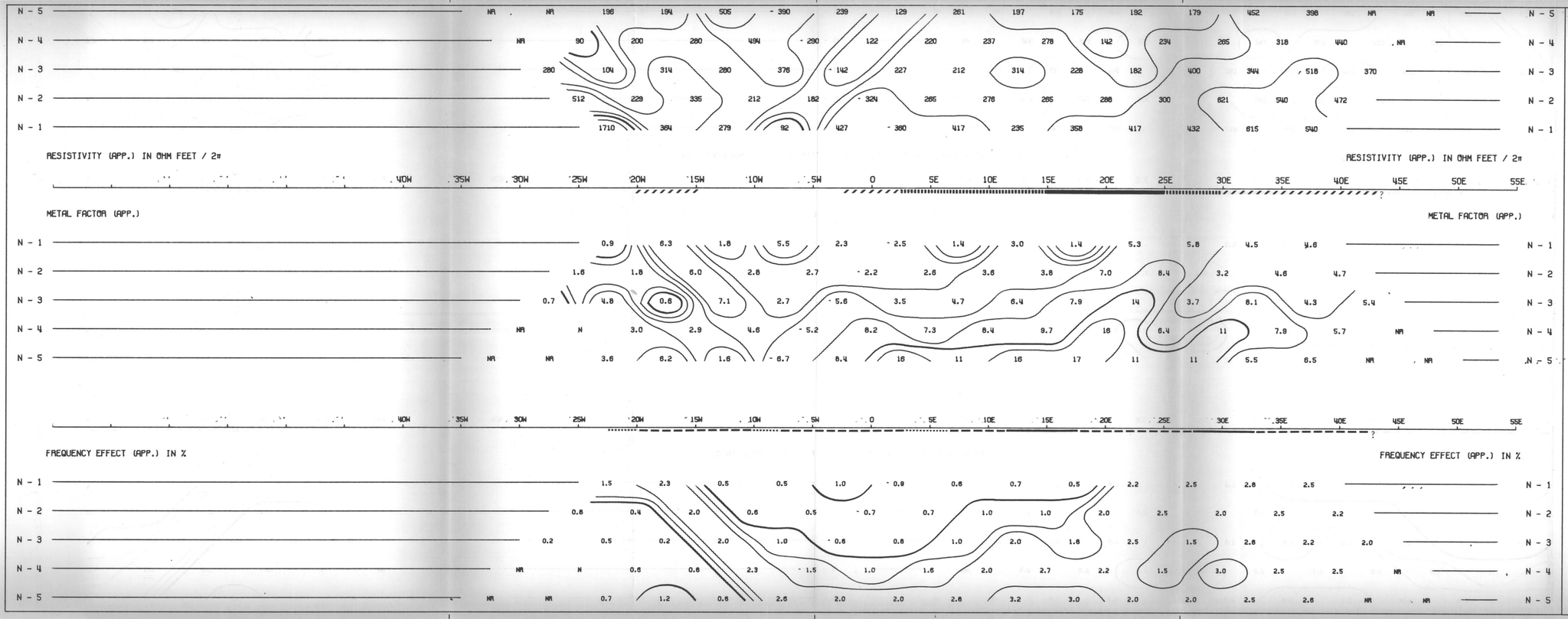
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1-1·5-2-3-5-7·5-10

McPHAR GEOPHYSICS INCORPORATED

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



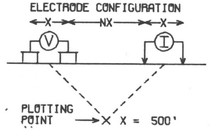
DWG. NO.- I.P.-5411-15

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT
MONO COUNTY, CALIFORNIA

LINE NO.- 16S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

DATE: April 1/70

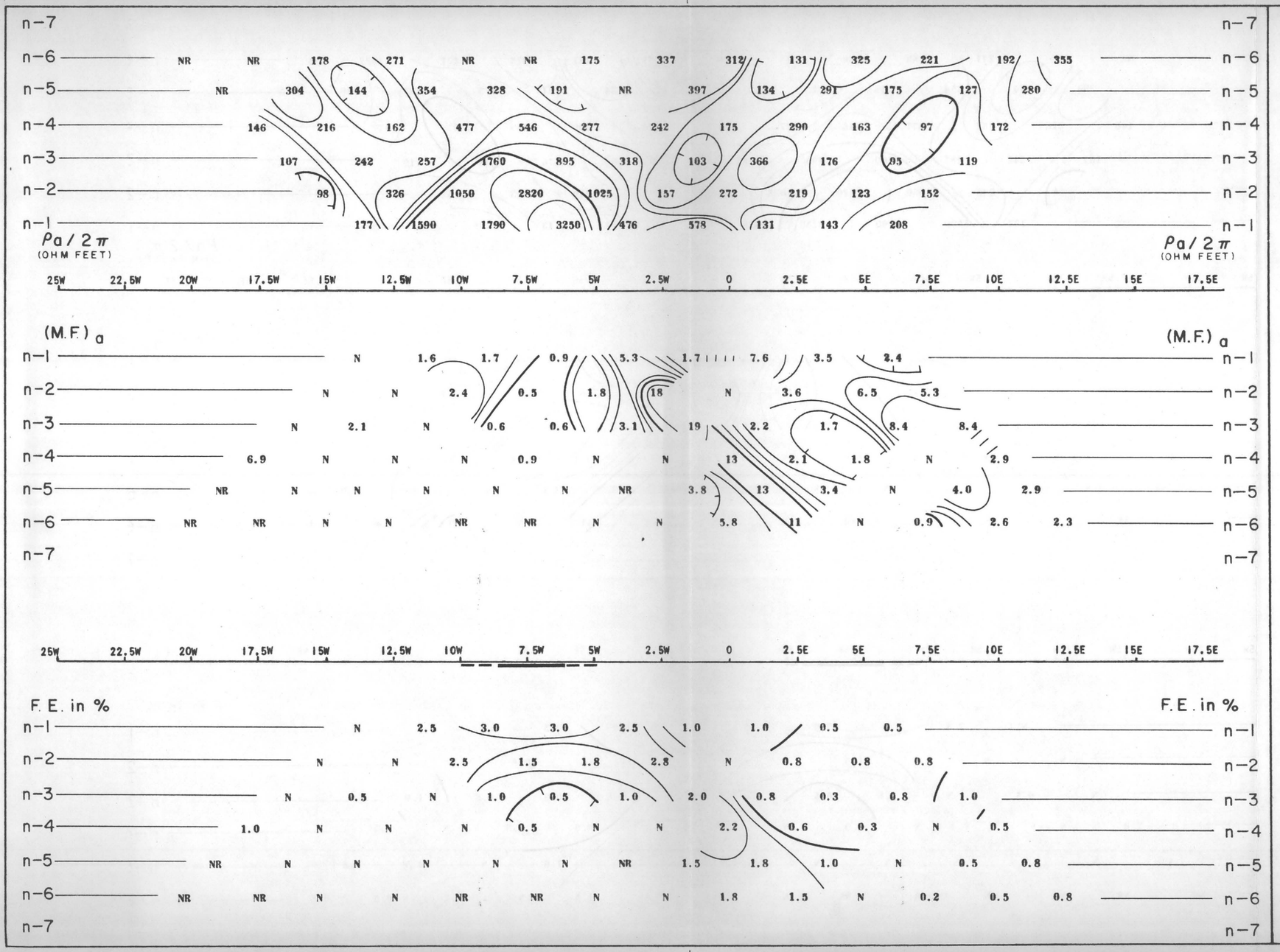
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS INCORPORATED

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.-5411-16

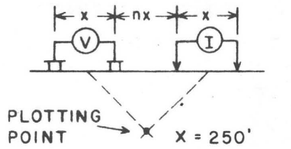
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT,

MONO COUNTY, CALIFORNIA.

LINE NO.- 18S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 Hz

DATE SURVEYED: OCT. 1969

APPROVED: M.H.

DATE: April 1/70

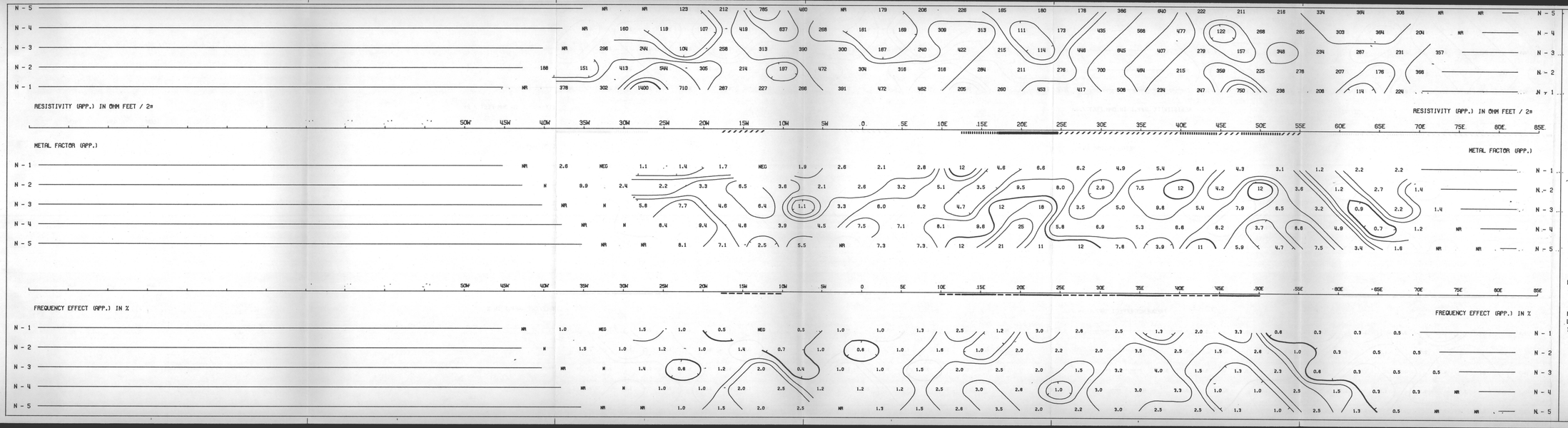
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1-1.5-2-3-5-7.5-10

McPHAR GEOPHYSICS INCORPORATED

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



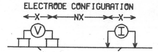
DWG. NO.- I.P.-5411-17

LEVIATHØN MINING, INC.

BISHOP COPPER PROSPECT
MONO COUNTY, CALIFORNIA

LINE NO.- 20S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

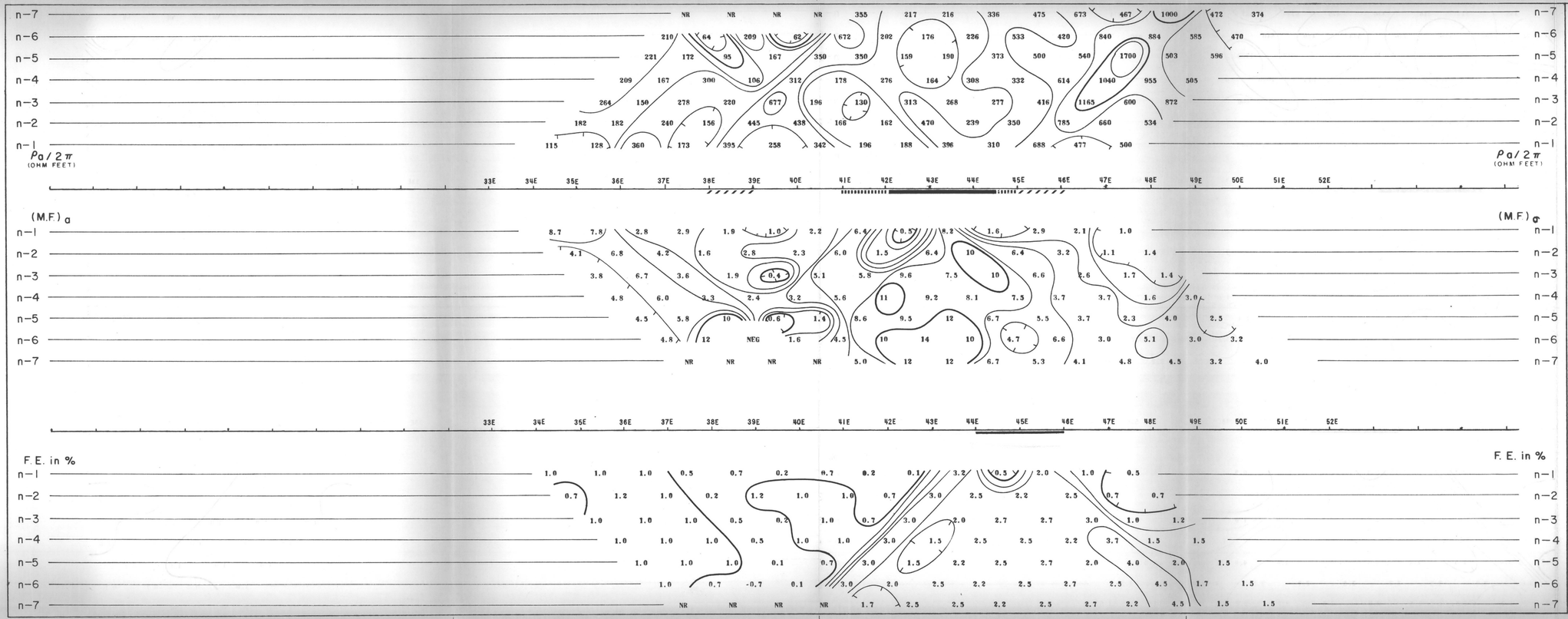
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

DATE: April 17 1970

McPHAR GEØPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

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



DWG NO.-I.P.-5411-18

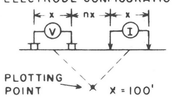
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT,

MONO COUNTY, CALIFORNIA.

LINE NO.- 20S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES 0.31-2.5 Hz

DATE SURVEYED OCT. 1969

APPROVED

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

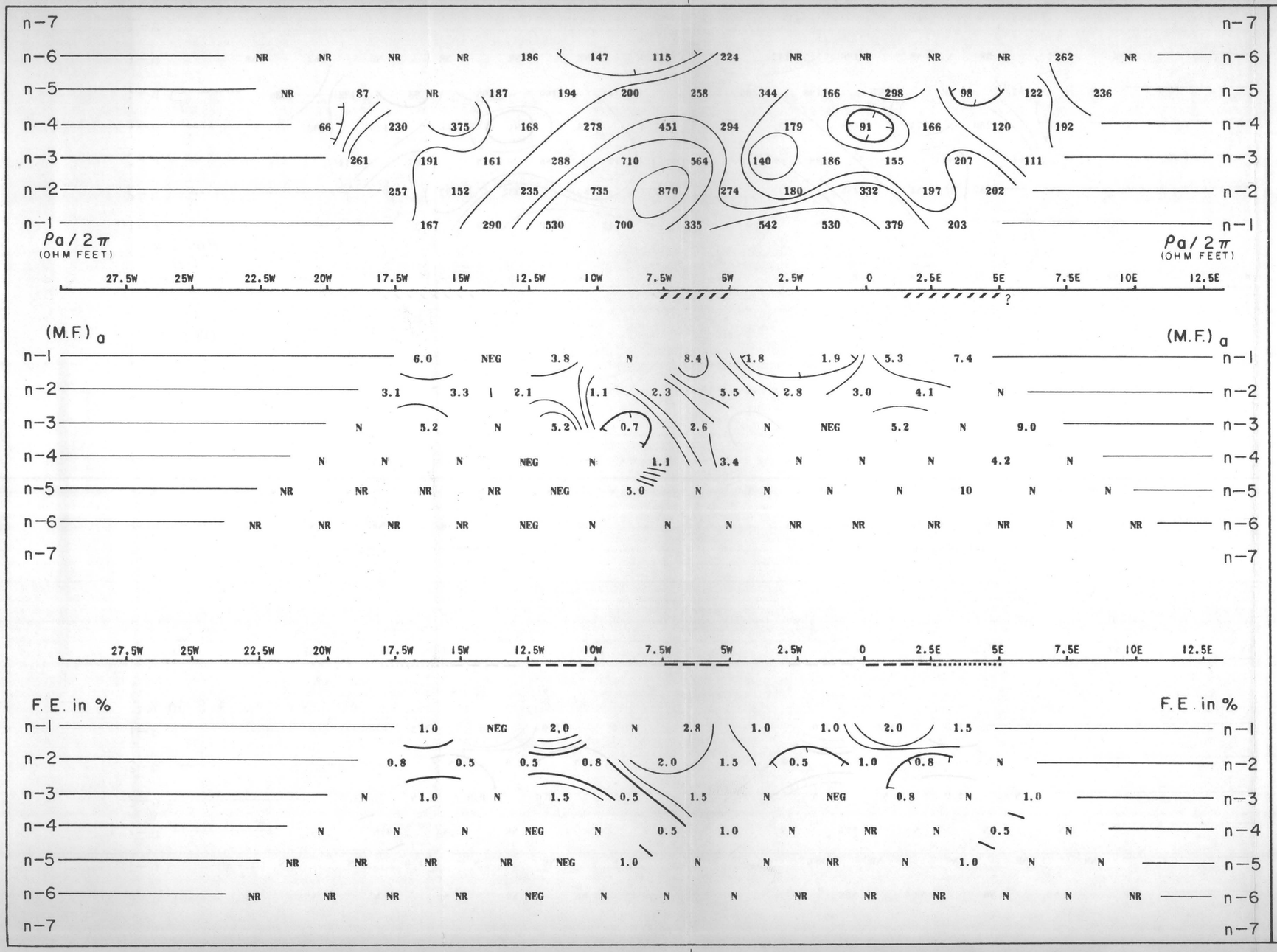
DATE April 1/70

McPHAR GEOPHYSICS INCORPORATED MERRITT

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.-I.P.-5411-19

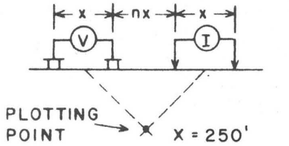
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT,

MONO COUNTY, CALIFORNIA.

LINE NO.- 22S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0·31–2·5 Hz

DATE SURVEYED: OCT. 1969

APPROVED: A.M.N.

DATE: April 1/70

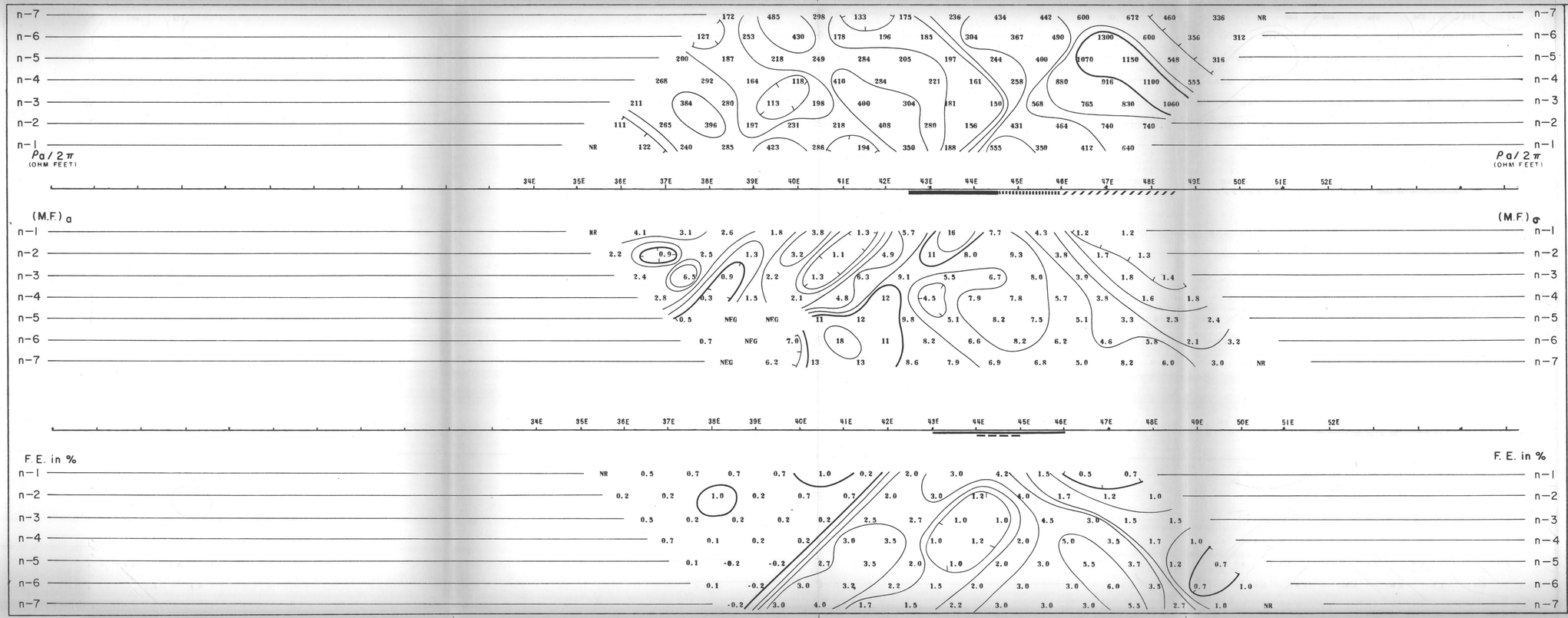
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1-1·5-2-3-5-7·5-10

McPHAR GEOPHYSICS INCORPORATED

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG NO.-I.P-5411-20

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT,

MONO COUNTY, CALIFORNIA.

LINE NO.- 22S

ELECTRODE CONFIGURATION

x nx x

PLOTTING POINT

X = 100'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCIES 0·31—2·5 Hz

DATE SURVEYED OCT. 1969

APPROVED

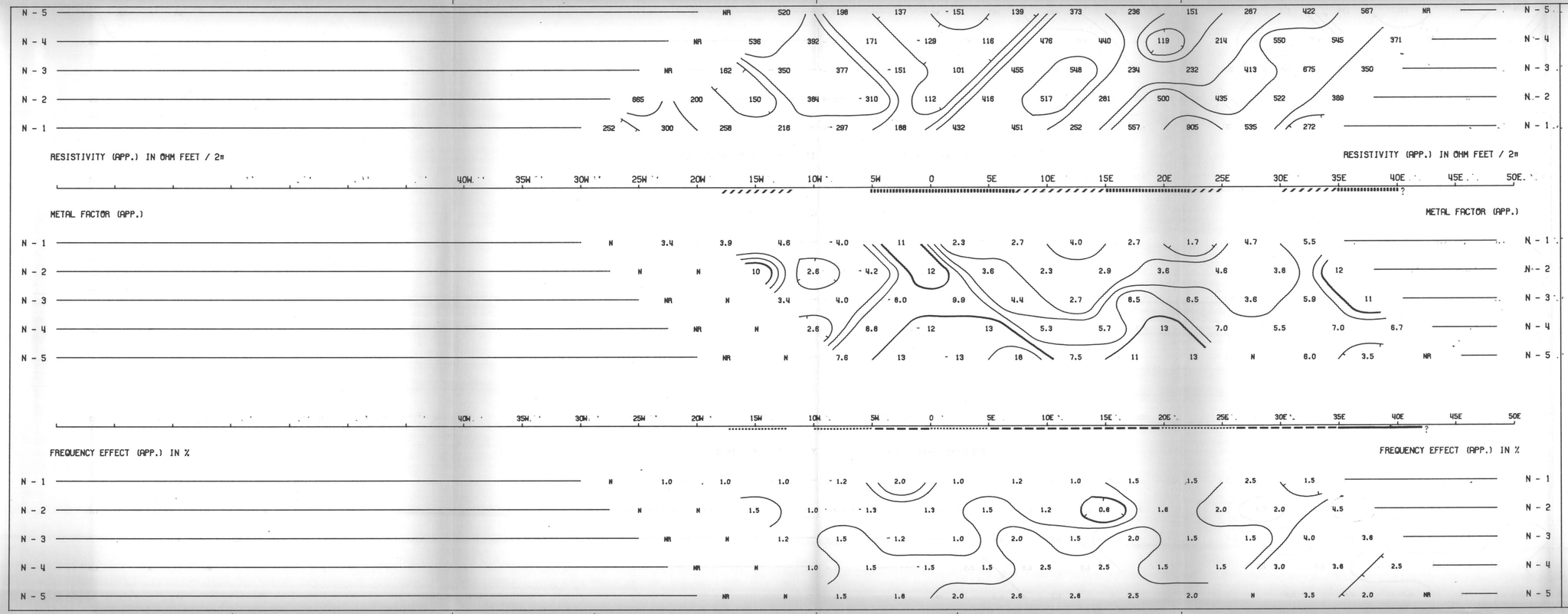
DATE April 1/70

NOTE CONTOURS AT LOGARITHMIC INTERVALS 1-1·5-2-3-5-7·5-10

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



DWG. NO.- I.P.-5411-21

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT
MONO COUNTY, CALIFORNIA

LINE NO.- 24S

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT → X = 500'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

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

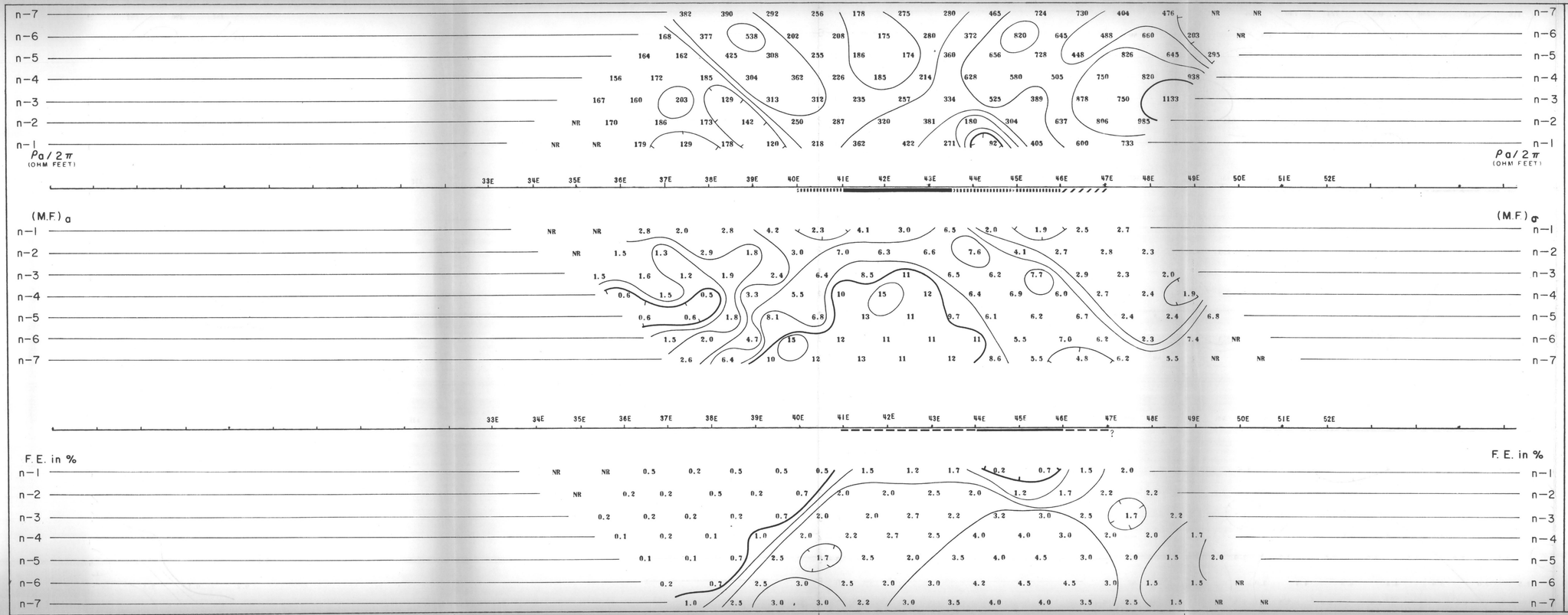
DATE: April 1, 1970

McPHAR GEOPHYSICS INCORPORATED

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

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



DWG NO.-IP-5411-22

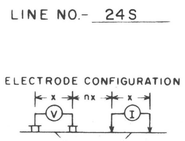
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT,

MONO COUNTY, CALIFORNIA.

LINE NO.- 24S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES 0·31–2·5 Hz

DATE SURVEYED OCT. 1969

APPROVED

DATE April 1/70

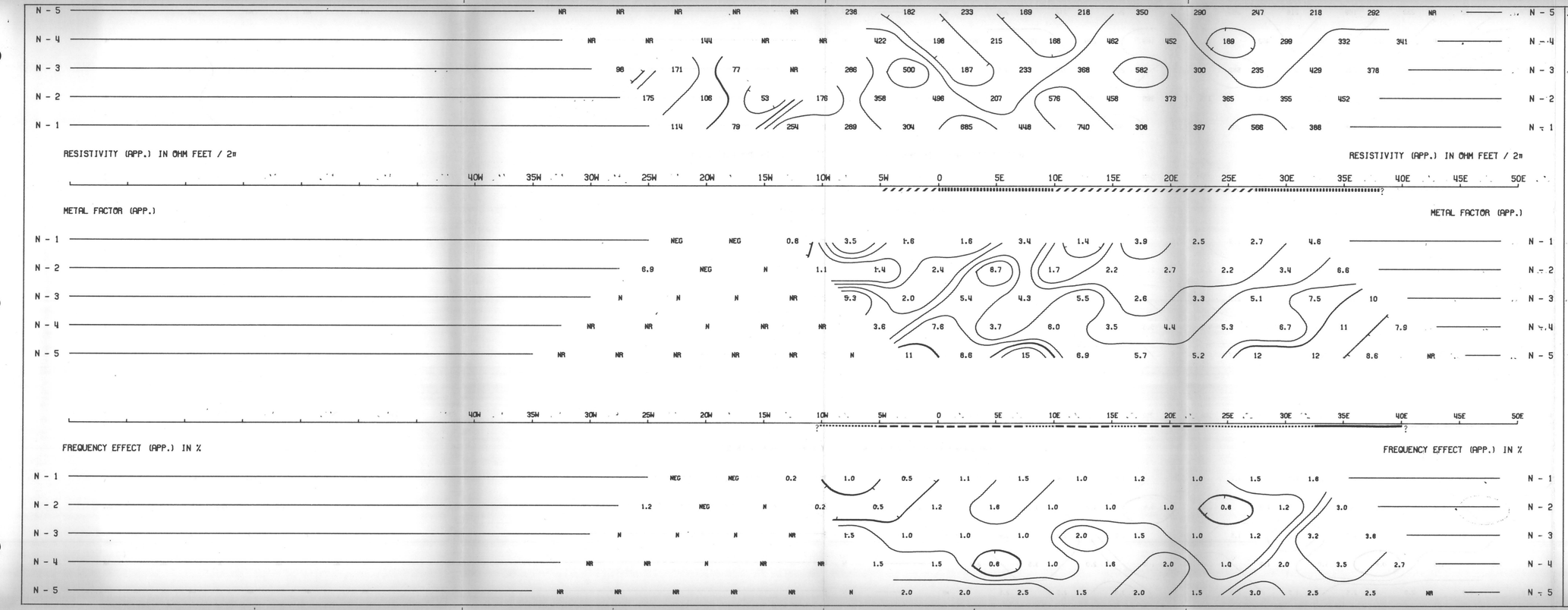
NOTE CONTOURS AT LOGARITHMIC INTERVALS 1-1·5-2-3-5-7·5-10

McPHAR GEOPHYSICS INCORPORATED

McPHAR

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY



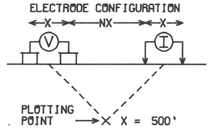
DWG. NO.- I.P.-5411-23

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT
MONO COUNTY, CALIFORNIA

LINE NO.- 28S

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

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

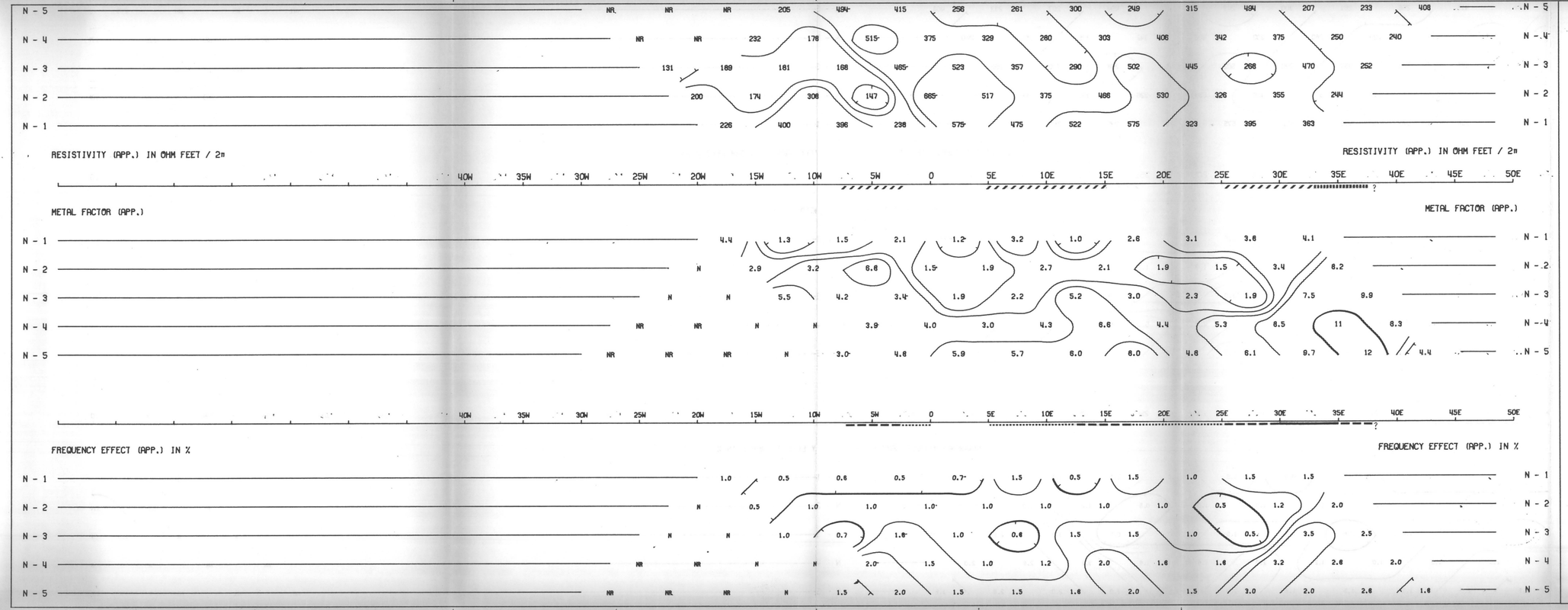
DATE: April 1/75

McPHAR GEOPHYSICS INCORPORATED

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

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



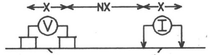
DWG. NO.- I.P.-5411-24

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT
MONO COUNTY, CALIFORNIA

LINE NO.- 32S

ELECTRODE CONFIGURATION



PLOTTING POINT → X = 500'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: OCT 1969

APPROVED:

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

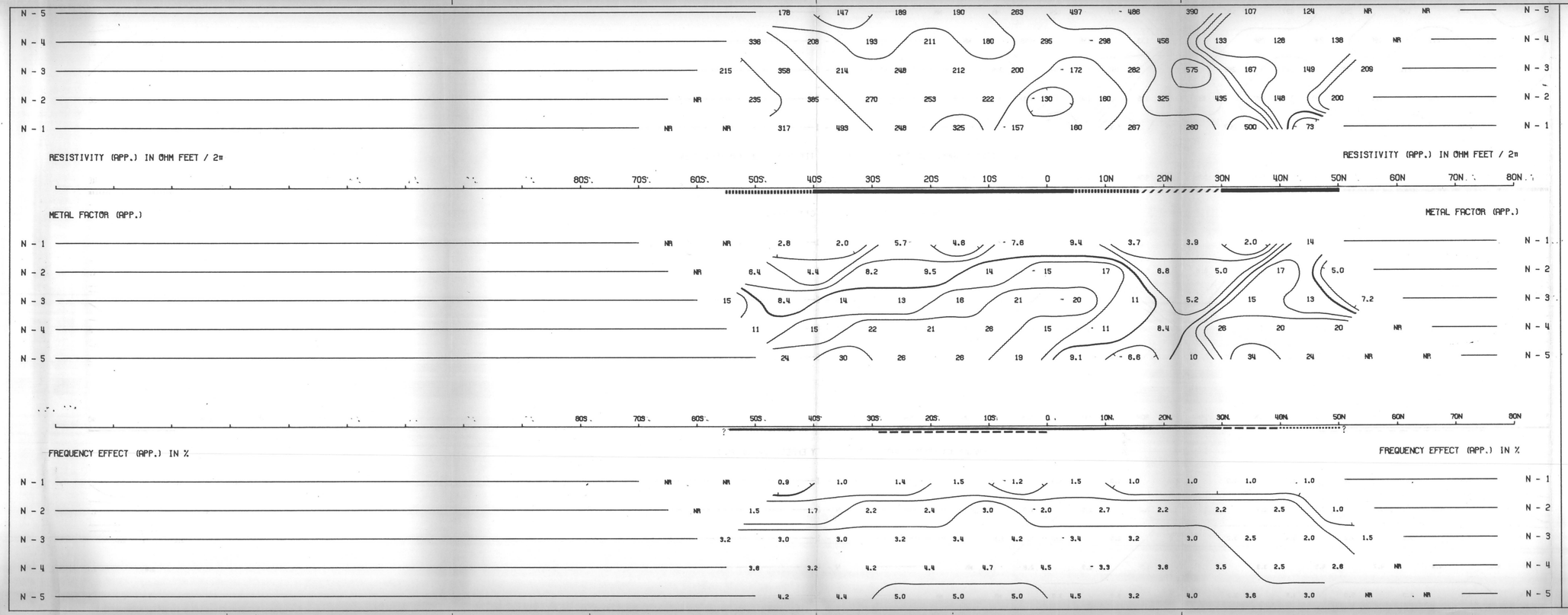
DATE: April 1/70

McPHAR GEOPHYSICS INCORPORATED

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

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



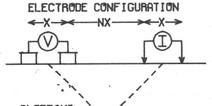
DWG. NO.- I.P.-5411-25

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT
MONO COUNTY, CALIFORNIA

LINE NO.- A

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: DEC 1969

APPROVED:

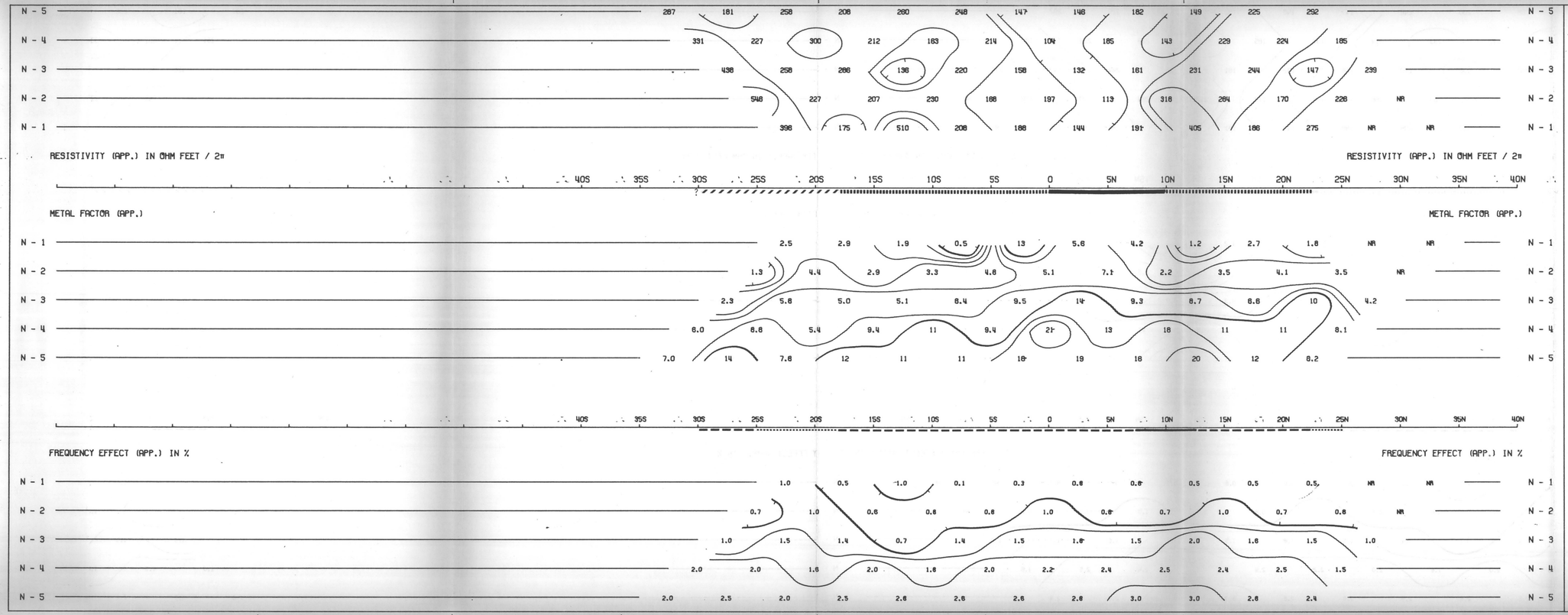
DATE:

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

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

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



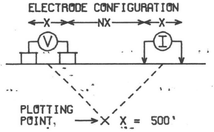
DWG. NO.- I.P.-5411-26

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT
MONO COUNTY, CALIFORNIA

LINE NO.- A-0

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: SEPT '69

APPROVED:

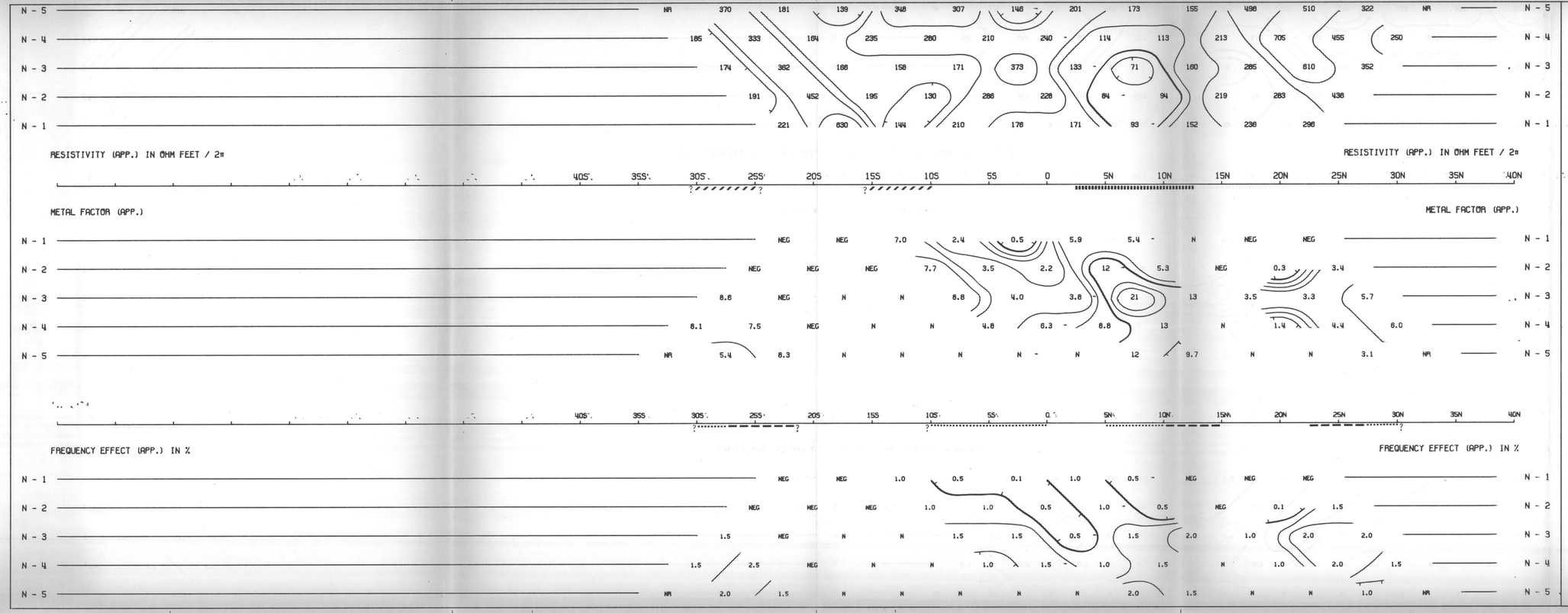
DATE: Sept 1/70

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

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.-5411-27

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT
MONO COUNTY, CALIFORNIA

LINE NO.- 0

ELECTRODE CONFIGURATION

X — NX — X

PLOTTING POINT → X = 500'

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: SEPT '69

APPROVED:

DATE:

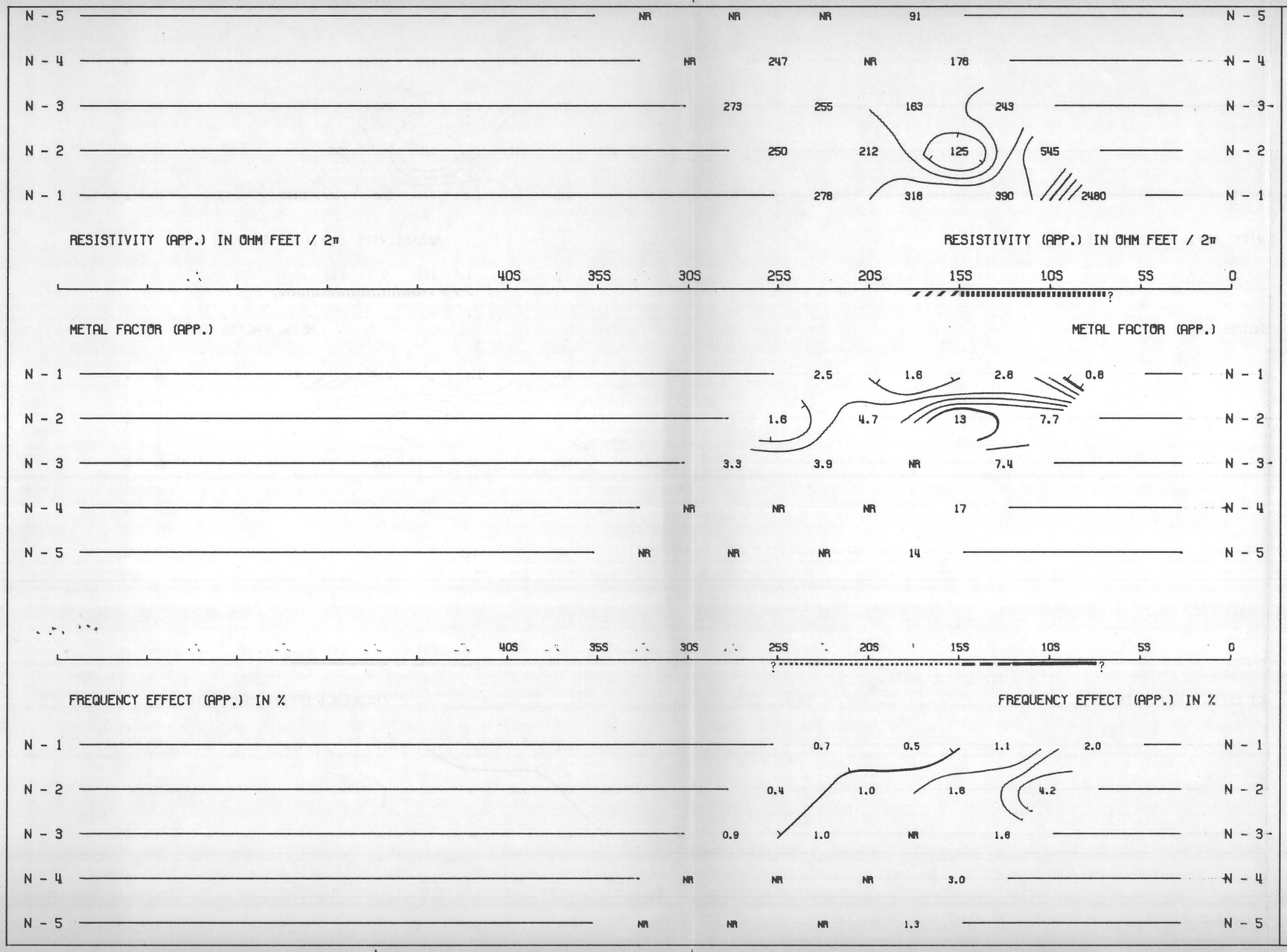
NOTE: CONTOURS AT LOGARITHMIC INTERVALS 1.-1.5-2.-3.-5.-7.5-10

McPHAR GEOPHYSICS INCORPORATED

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.-5411-28

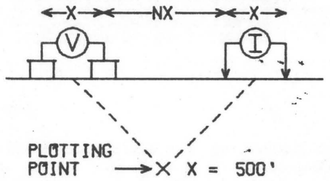
LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT

MONO COUNTY, CALIFORNIA

LINE NO.- B-0

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: SEPT '69

APPROVED:

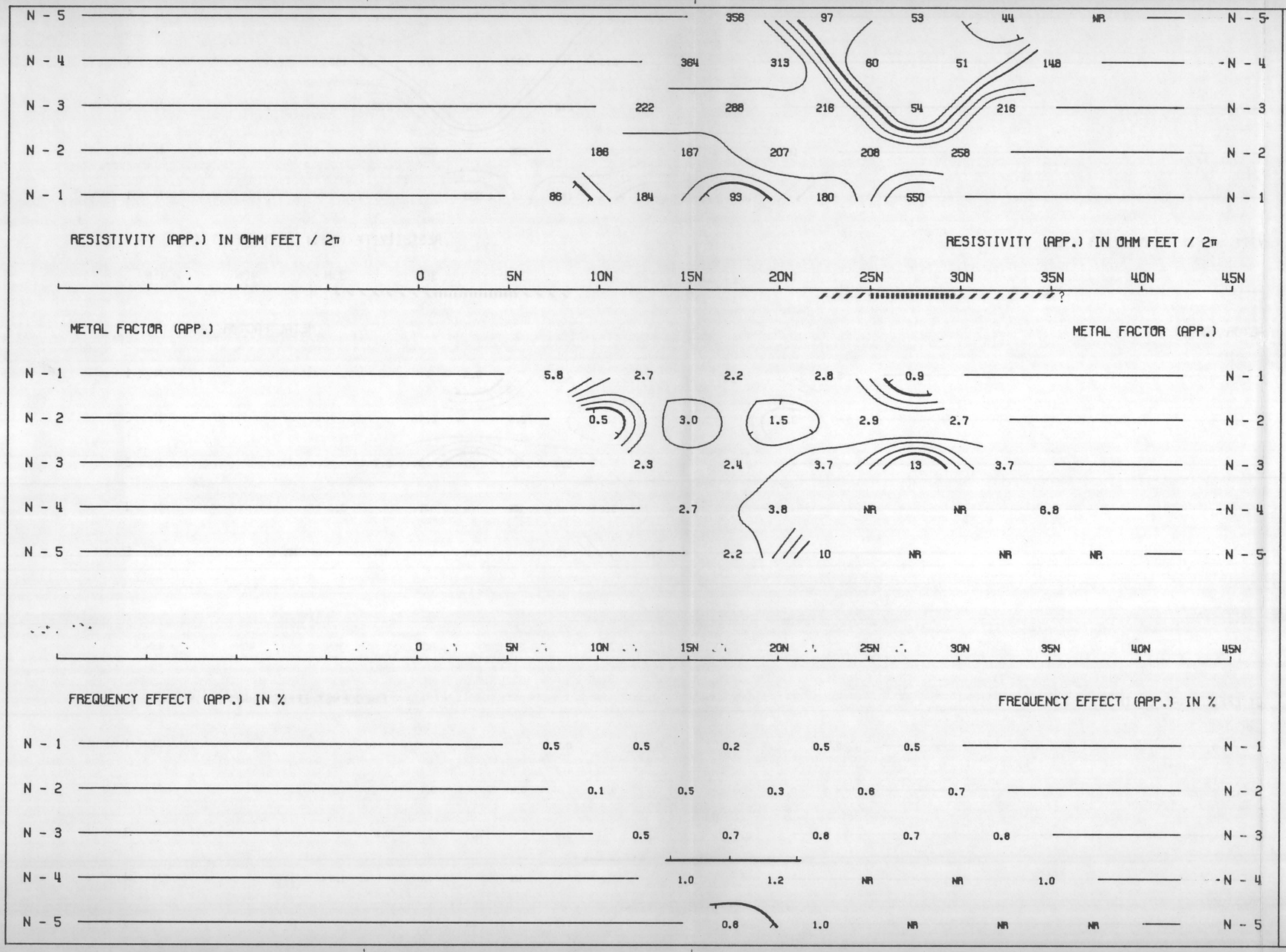
DATE: April 1/70

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

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

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



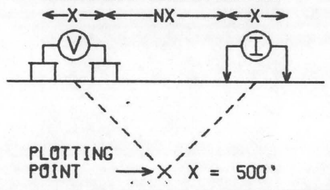
DWG. NO.- I.P.-5411-29

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT
MONO COUNTY, CALIFORNIA

LINE NO.- 0

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: SEPT '69

APPROVED:

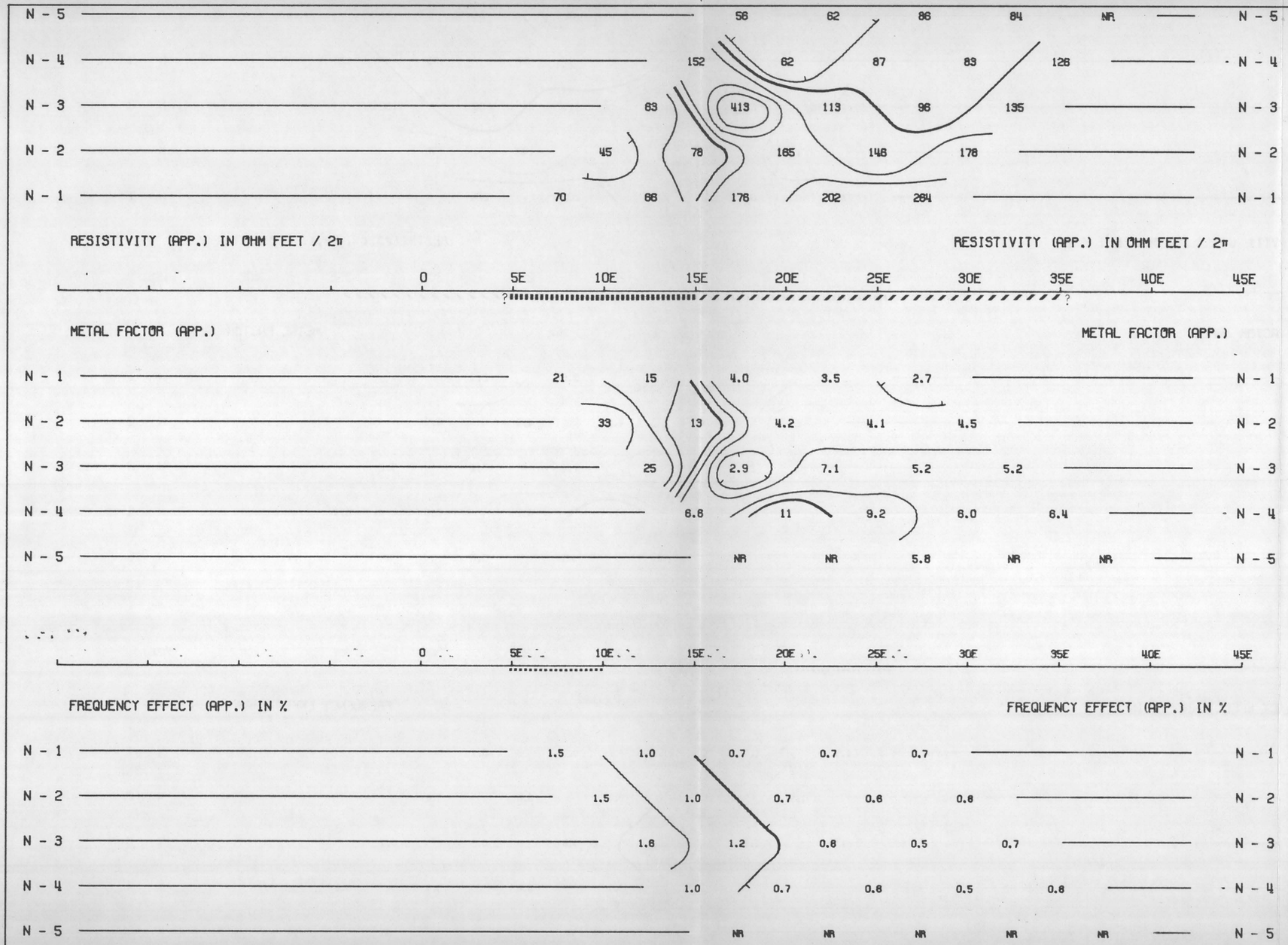
DATE: April 1, 70

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

McPHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

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



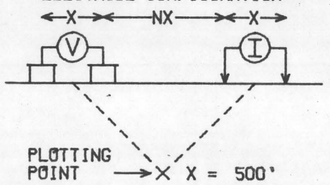
DWG. NO.- I.P.-5411-30

LEVIATHON MINING, INC.

BISHOP COPPER PROSPECT
MONO COUNTY, CALIFORNIA

LINE NO. E

ELECTRODE CONFIGURATION



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCIES: 0.31-2.5 CPS

DATE SURVEYED: SEPT '69

APPROVED:

DATE: April 1/70

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

McPHAR GEOPHYSICS

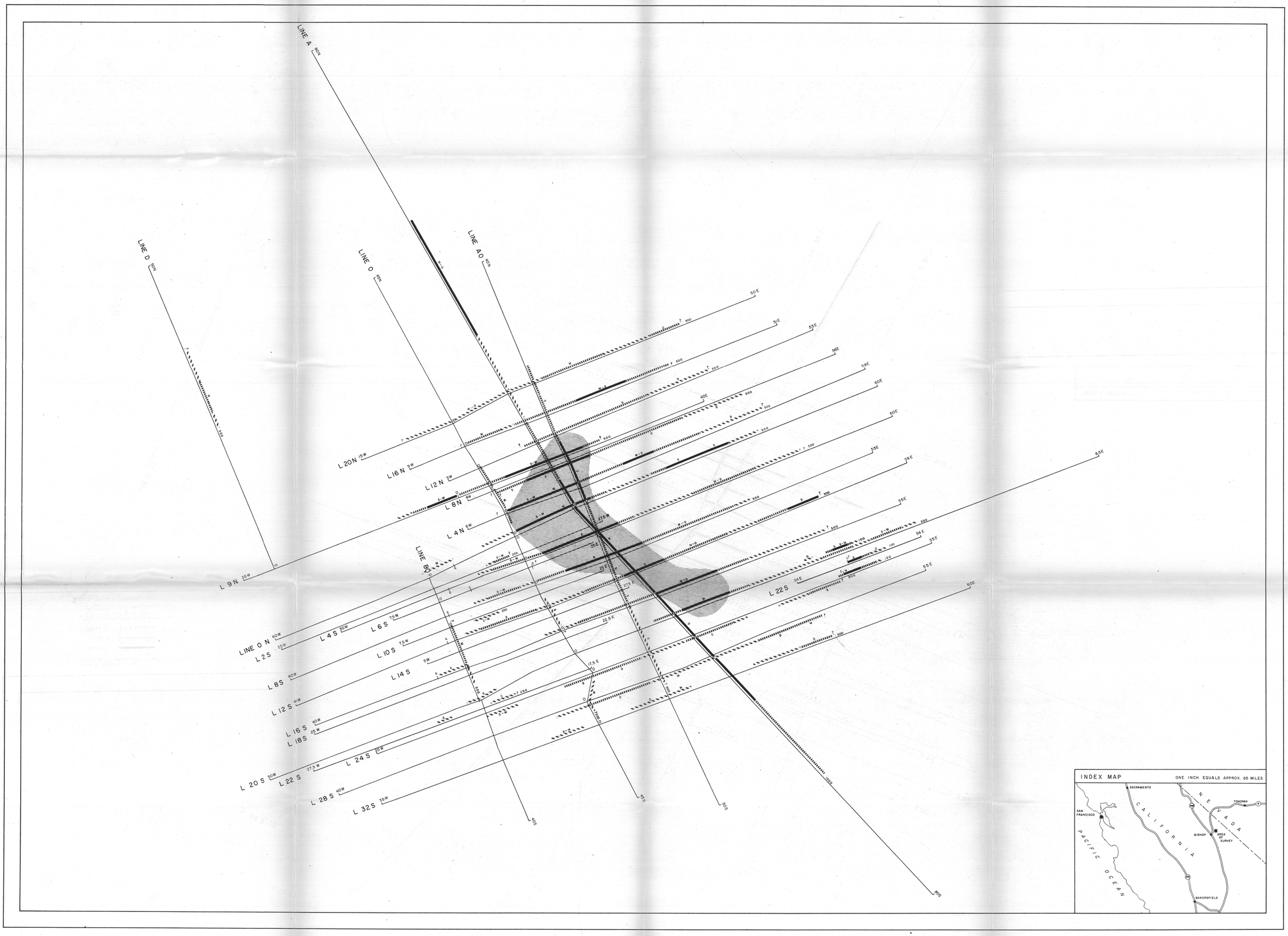
INDUCED POLARIZATION AND RESISTIVITY SURVEY

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

Mc PHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP



N

SURFACE PROJECTION OF METAL FACTOR ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

NOTE: Number at the end of anomaly indicates spread used

APPARENT DEPTH (S=shallow, M=moderate, D=deep)

C = CONTACT, F = FAULT

LEVIATHON MINING INC

BISHOP COPPER PROSPECT, MONO COUNTY, CALIFORNIA

SCALE

FEET 500 0 500 1000 1500 2000 2500 FEET

1 INCH EQUALS 500 FEET

METAL FACTOR ANOMALY MAP

ANOMALOUS M.F. ZONE

DRAWN: JK

DATE: JAN. 70

APPROVED: G.M.H.

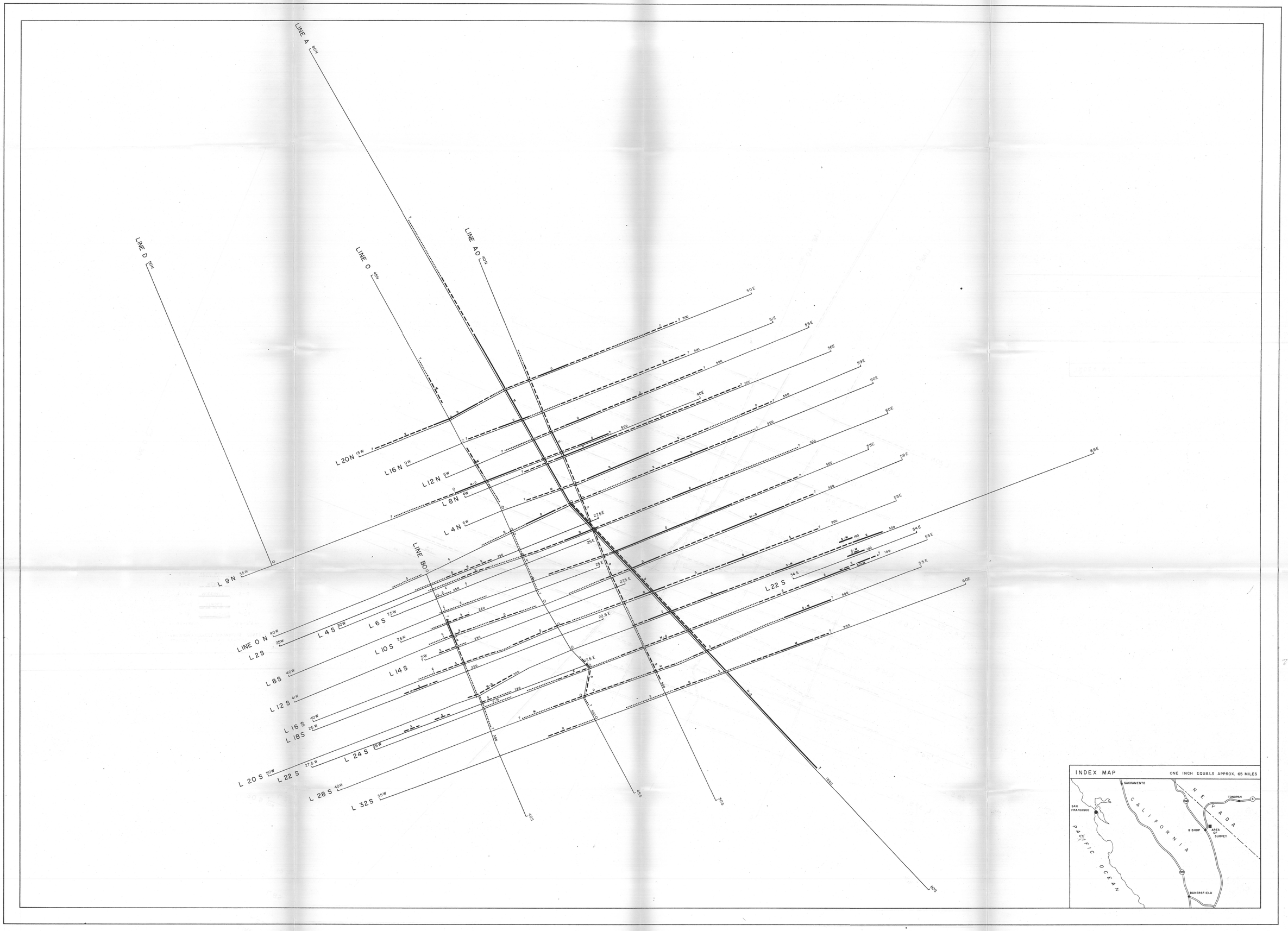
DATE: April 1/70

DWG.IPP-4604-1

Mc PHAR GEOPHYSICS

INDUCED POLARIZATION AND RESISTIVITY SURVEY

PLAN MAP



SURFACE PROJECTION OF PERCENT FREQUENCY EFFECT ANOMALOUS ZONES

0.1 – 1.25 ~		0.3 – 2.5 ~
> 10	VERY STRONG	> 7.5
7.5 – 10	STRONG	5 – 7.5
5 – 7.5	MODERATE	3 – 5
3 – 5	WEAK	2 – 3
2 – 3	VERY WEAK	1.5 – 2

LEVIATHON MINING INC

BISHOP COPPER PROSPECT, MONO COUNTY, CALIFORNIA

SCALE

FEET 500 0 500 1000 1500 2000 2500 FEET

1 INCH EQUALS 500 FEET

PERCENT FREQUENCY EFFECT ANOMALY MAP

DRAWN JK

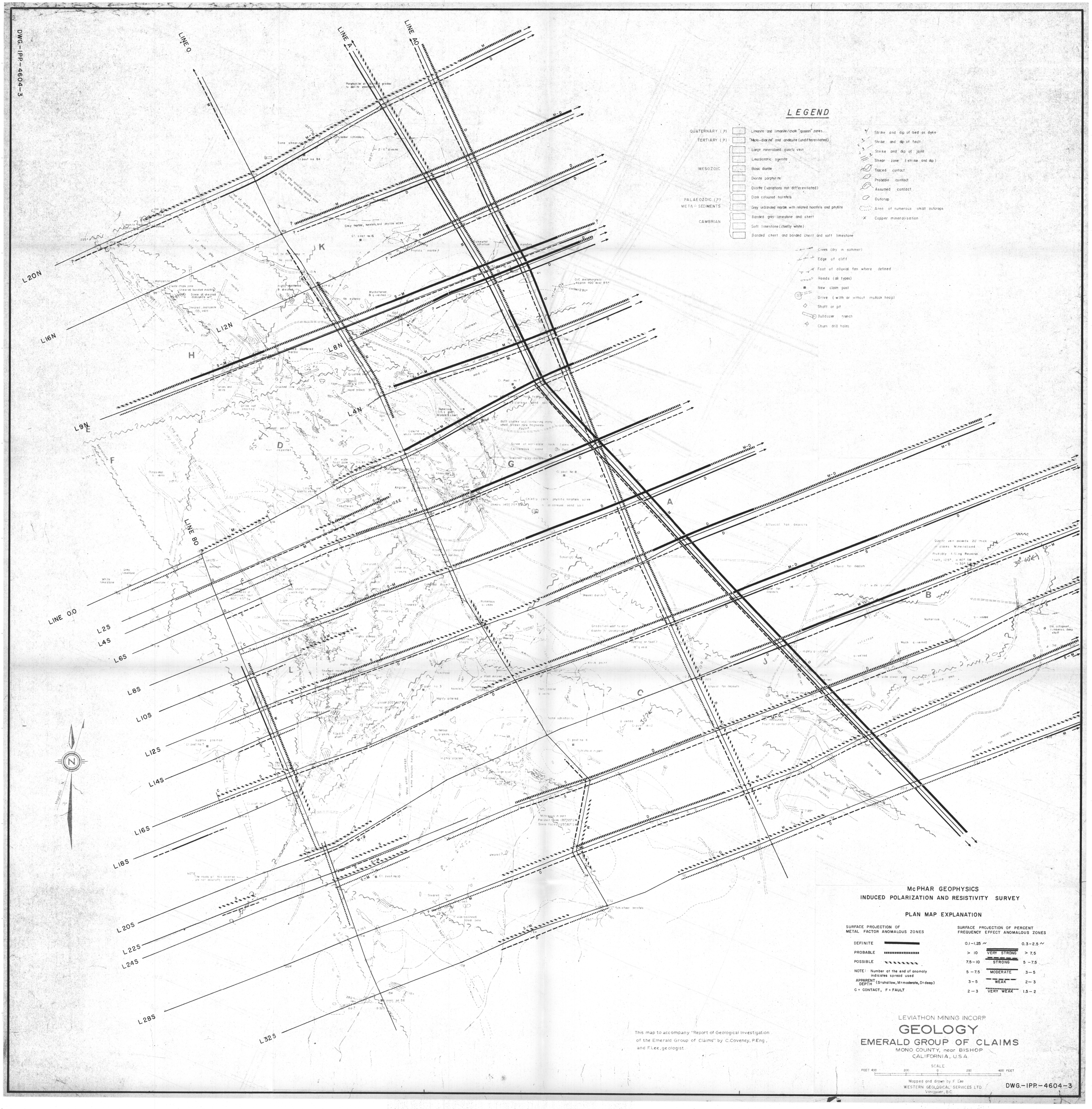
DATE JAN. '70

APPROVED G.M.N.

DATE April 1/70

McPHAR GEOPHYSICS INCORPORATED

DWG. IPP.-4604-2

DWG. IPP-4604-2

DWG.-IPP-4604-3