452

See M.M.A.R., 1962

REPORT ON
GEOPHYSICAL SURVEY
(INDUCED POLARIZATION)
WADE GROUP OF CLAIMS,
MERRITT, B.C.
NICOLA MINING DIVISION

FOR 92I/2W

GENERAL RESOURCES LIMITED

WADE 7 15
TEX 1

BY

D.B.SUTHERLAND, M.A.

AND

P.G.HALLOF, PH.D.

NAME AND LOCATION OF PROPERTY

WADE GROUP OF CLAIMS: 9 MILES ~~EAST~~ WEST OF MERRITT, 50°, ~~121°~~ 120°, SW

DATE STARTED - SEPTEMBER 25,1962
DATE COMPLETED - SEPTEMBER 29.1962

TABLE OF CONTENTS

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
No. 452 MAP

McPHAR GEOPHYSICS LIMITED

NOTES ON THE THEORY OF INDUCED POLARIZATION AND THE METHOD OF FIELD OPERATION

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 effectively stop all 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 "metal factor" or "M. F. " are a measure of the amount of polarization present in the rock mass being surveyed. This parameter has been found to be very successful in mapping areas of sulphide mineralization, even those in which all other geophysical methods have been unsuccessful. The induced polarization measurement is more sensitive to sulphide content than other electrical measurements because it is much more dependent upon the sulphide content. As the sulphide content of a rock is increased, the "metal factor" of the rock increases much more rapidly than the resistivity decreases.

Because of this increased sensitivity, it is possible to locate and outline zones of less than 10% sulphides that can't be located by E. M. Methods. The method has been successful in locating the disseminated "porphyry copper" type mineralization in the Southwestern United States.

Measurements and experiments also indicate that it should be possible to locate most massive sulphide bodies at a greater depth with induced polarization than with E. M.

Since there is no I. P. effect from any conductor unless it is metallic, the method is useful in checking E. M. anomalies that are suspected of being due to water filled shear zones or other ionic conductors. There is also no effect from conductive overburden, which frequently confuses E. M. results. It would appear from scale model experiments and calculations that the apparent metal factors measured over a mineralized zone are larger if the material overlying the zone is of low resistivity.

Apropos of this, it should be stated that the induced polarization measurements indicate the total amount of metallic constituents in the rock. Thus all of the metallic minerals in the rock, such as pyrite, as well as the ore minerals chalcopyrite, chalcocite, galena, etc. are responsible for the induced polarization effect. Some oxides such as magnetite, pyrolusite, chromite, and some forms of hematite also conduct by electrons and are metallic. All of the metallic minerals in the rock will contribute to the induced polarization effect measured on the surface.

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 a distance (X) apart. The potentials are measured at two other points (X) feet apart, in line with the current electrodes. The distance between the nearest current and potential 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 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. The resistivity values are plotted above the line and the metal factor values below. 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. These 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, model and theoretical investigations. The position of the electrodes when anomalous values are measured must be used 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 100 feet to 1000 feet for (X). In each case, the decision as to the distance (X) and the values of (N) 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 1 below demonstrates the method used in plotting the results. Each value of the apparent resistivity and the apparent "Metal factor" 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.

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

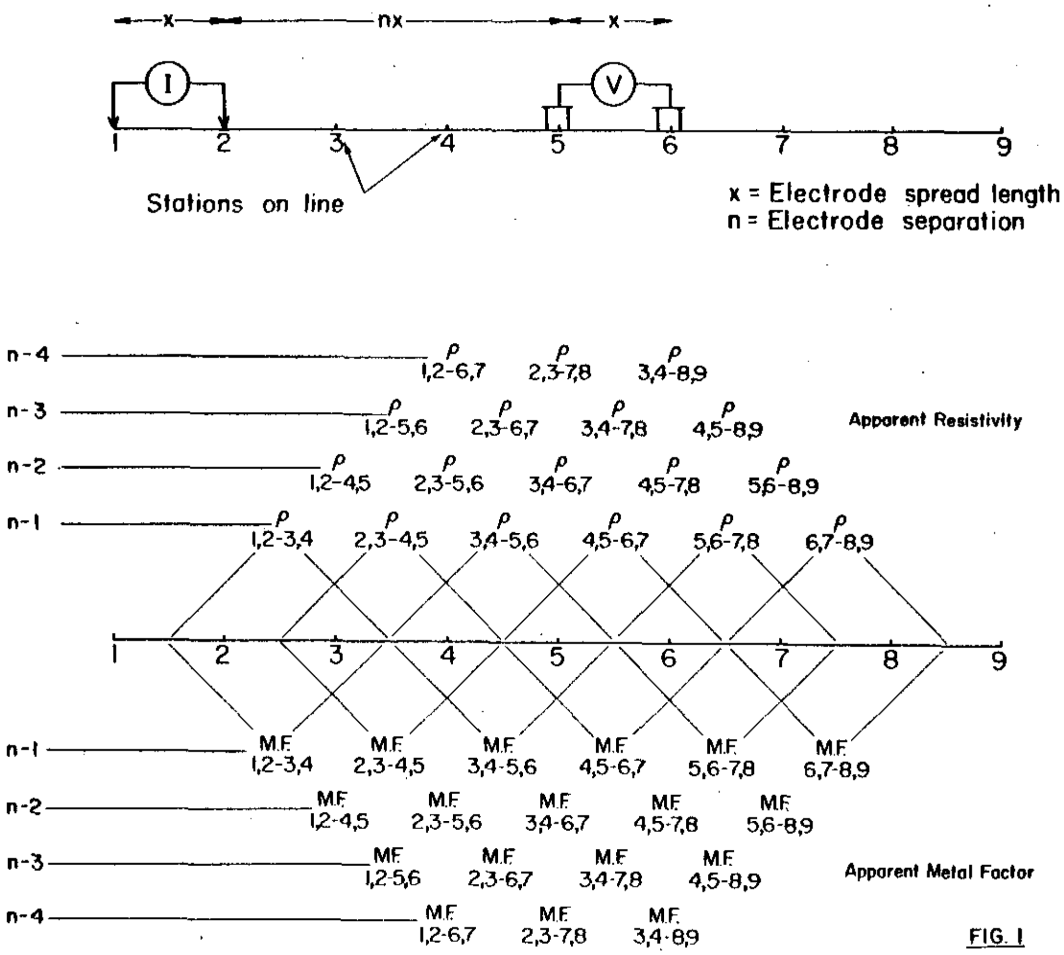

FIG. I

McPHAR GEOPHYSICS LIMITED

REPORT ON
GEOPHYSICAL SURVEY
(INDUCED POLARIZATION)
WADE GROUP OF CLAIMS,
MERRITT, B.C.,
NICOLA MINING DIVISION
FOR
GENERAL RESOURCES LIMITED

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1. INTRODUCTION

At the request of Mr. E. P. Chapman, Jr., consultant, an induced polarization survey has been carried out over parts of the Wade Group located near Merritt, Nicola Mining Division, British Columbia for General Resources Limited.

Previous work on the property includes complete geologic coverage as well as induced polarization surveys of selected portions, by Hunting Survey Corporation and Asarco. In addition Asarco also carried out some magnetic surveying. The predominant mineralization consists of pyrite disseminations containing varying amounts of chalcopyrite. A graphitic zone has been recognized in the vicinity of a showing on the Wade No. 1 claim.

Five lines were surveyed in the Anomaly No. 6 Area across the contact between the Nicola Series and the porphyry intrusive. In addition, a single line was run across the Asarco No. 1 Cut to directly compare the frequency I.P. results with those previously obtained with the pulse apparatus.

The surveying was carried out during September 1962.

2. PRESENTATION OF RESULTS

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

Anomaly No. 6 Area

Line 48N	400-foot spreads	Dwg. I.P. 2937-1
Line 52N	300-foot spreads	Dwg. I.P. 2937-2
Line 56N	300-foot spreads	Dwg. I.P. 2937-3
Line 60N	400-foot spreads	Dwg. I.P. 2937-4
Line 60N	200-foot spreads	Dwg. I.P. 2937-5
Line 64N	400-foot spreads	Dwg. I.P. 2937-6

Asarco No. 1 Cut Area

Line 1W	400-foot spreads	Dwg. I.P. 2937-7

Enclosed with this report is Dwg. Misc. 4730, a plan map of part of the property at a scale of 1" to 200 feet. The definite and possible induced polarization anomalies are indicated by solid and broken bars respectively on this plan map as well as the data plots. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

Since the induced polarization measurement is essentially an averaging process, as are all potential methods, it is frequently difficult to exactly pinpoint the source of an anomaly. Certainly, no anomaly can be located with more accuracy than the spread length; i.e. when using 200' spreads the position of a narrow sulphide body can only be determined to lie between two stations 200' apart. In order to locate sources at some depth, larger spreads must be used, with a corresponding increase in the uncertainties of location. Therefore, while the center of the indicated anomaly probably corresponds fairly well with source, the length of the indicated anomaly along the line should not be taken to represent the exact edges of the anomalous material.

3. DISCUSSION OF RESULTS

A. ANOMALY NO. 6 AREA

Some anomalous response was obtained on each of the lines surveyed on this portion of the property. Together these appear to form a continuous zone that coincides with the contact between the Nicola Series and the porphyry intrusive. The results on the individual lines are discussed in the following.

Line 48N; Dwg. I.P. 2937-1

A moderate but quite definite anomaly is centered at 14W on this line. The western edge of the anomaly is indefinite while the east edge is quite sharp.

The source appears to be shallow compared to the spread length of 400 feet and probably extends to depth in the vicinity of 14W to 18W.

Line 52W; Dwg. I.P. 2937-2

Small values indicative of a shallow, weak source occur in the vicinity of 10W. Larger metal factors occur on the wide separations near 16-19W indicating a more concentrated source either at depth or to the side of the line. These results are similar to those obtained on the wide separations on Line 56N at 13-16W and together may represent a deeper and better portion of the source. It is not clear whether these results represent two separate features or one zone, plunging to the west, and increasing in intensity with depth.

Line 56N; Dwg. I.P. 2937-3

The results on this line are quite complex.

A shallow and relatively narrow source is indicated to lie between 13W and 16W by the values for N-1 and N-2. Additional surveying with shorter spreads would be worthwhile to confirm this interpretation. There is a small magnetic high from 13-16W but it is difficult to assess its importance.

Larger and perhaps more significant metal factor values are apparent for N-3 and N-4 at the same locality on this line. As previously mentioned these are similar to the results obtained on

Line 52N and may indicate a deeper and more concentrated source.

Line 60N, Dwg. I.P. 2937-4 and -5

This line was first surveyed with 400 foot spreads (Dwg. I.P. 2937-4). Compared to this spread length the definite anomaly from 6-10W appears to be narrow shallow and due to a relatively concentrated source. Similar to Line 52N the east edge of the anomaly is well-defined while the western edge is quite indistinct and a weaker continuation of the source material could extend for several hundfed feet. A westerly dip is suggested by the contour pattern: this appears to be consistent with the geological mapping.

The line was detailed with an electrode spread of 200 feet (Dwg. I.P. 2937-5). On this data plot the anomalous source appears to be deep with respect to the spread length and suggests a depth of the top of roughly 200 feet. These results are the best obtained in this vicinity and test drilling has been recommended on this line to establish the cause of the anomalies.

Although there is a weak magnetic high in the vicinity of 10W on this line, the results do not appear to be closely correlated with the induced polarization anomaly.

Line 64N, Dwg. I.P. 2937-6

A weak anomaly occurs at about 10W on this line. Like most of the other anomalies in this area, it is associated with a distinct resistivity low. There appears to be no significant magnetic relief on this part of the traverse.

B. ASARCO CUT, NO. 1 AREA

Line No. 1W, Dwg. I.P. 2937-7

A single line was surveyed on the south portion of the property to compare the results of the frequency method with those obtained in the Hunting Survey using the pulse apparatus. The Asarco Cut No. 1 is located at approximately 7 + 50N on Line 1W, and is reported to contain graphitic beds, some pyrite mineralization and minor copper values.

The I.P. results on this line suggest a single source of variable metallic content. In the vicinity of 9-11N the concentration of metallic material appears to increase with depth.

However, similar effects could result from the two bodies described below:

The first is a broad area of sparse metallic content that may extend from about 6N to 12N at shallow depth. It is somewhat difficult to judge, but the metallic material reported in Cut No. 1 could be typical of this shallow source.

Higher metal factors on the wider separation indicate a second and somewhat stronger source located either at depth or to the side of the line, in the vicinity of 10N. Considering the resistivities, the metallic content of this postulated deeper source is about the same as the zone recommended for testing on Line 60N. If available geological indicates that this zone is beneath Line 1W rather than to the side, then this deeper source should be tested by a vertical hole at 10N. However, a single hole may not be sufficient and additional holes at 9N and 11N may be required to thoroughly test the anomaly.

Additional surveying with smaller spreads on adjacent lines would reduce the present uncertainty in the location of this anomaly.

Comparing the McPhar results with those of the Hunting Survey, we find that the limits of the shallow sources agree reasonably well considering that the McPhar data was taken with 400 foot spreads and consequently cannot be expected to locate the edge of a shallow source with an accuracy of better than several hundred feet. With the McPhar data, the deeper source appears to be only one or two separations wide and may not extend farther north than 12 or 14N. However, there is only a minimum of data and additional surveying would be required to establish firmly the northern limit of the deeper source.

4. SUMMARY & RECOMMENDATIONS.

A series of weak to moderate induced polarization indications suggest that a zone of anomalous metal factor material extends more or less continuously from 48N to 64N. This zone appears to coincide with an inferred fault at or near the contact of the Nicola Series and the porphyry intrusive.

Further investigations should be made of these anomalies which vary in both depth and intensity. Following discussions with Mr. R.B. Stokes, Senior Engineer for the company, the following drill hole has been spotted to test the most favourable results:

Line 60N at 9W. vertical, to a depth of 600 feet. All of the data should be re-assessed on the basis of the results obtained in this drill hole.

An anomaly of similar magnitude occurs on Line 1W and a drill hole may be considered warranted at 9N on this line to test it. However, present information is limited in this area and additional detail surveying would be desirable before the start of the drilling program.

McPHAR GEOPHYSICS LIMITED

D. B. Sutherland
Geophysicist.

Philip G. Hallof

P.G.Hallof
Geophysicist.

Dated: November 8,1962

ASSESSMENT DETAILS

PROPERTY: Wade Group

MINING DIVISION: Nicola

SPONSOR: General Resources Ltd.

PROVINCE: British Columbia

LOCATION: Merritt B.C.

TYPE OF SURVEY: Induced Polarization

DATE STARTED: September 25/62

OPERATING MAN DAYS: 40

DATE FINISHED: September 29/62

EQUIVALENT 8 HR. MAN DAYS: 60

NUMBER OF STATIONS: 90

CONSULTING MAN DAYS: 3

NUMBER OF READINGS TAKEN: 380

DRAUGHTING MAN DAYS: 3

MILES OF LINE SURVEYED: 4.8

TOTAL MAN DAYS: 66

CONSULTANTS:

D. B. Sutherland, 412 Eglinton Avenue, East, Apt. 604, Toronto 12, Ontario
P. G. Hallof, 5 Minorca Place, Don Mills, Ontario.

FIELD TECHNICIANS:

Jim Lee, 264 Oriole Parkway, Toronto 7, Ontario
and 7 helpers supplied by Client.

DRAUGHTSMEN:

R. McKenzie, 55 Shannon Drive, Scarborough, Ont.
D. Grant, 85 Yardley Ave. Toronto, Ont.

McPHAR GEOPHYSICS LIMITED.

D. B. Sutherland

Dated: November 8, 1962

SUMMARY OF COST.

September 1962.

Crew

5 Operating Days	@ 160.00/ day	$ 800.00
2 Travel Days	@ 50.00/ day	100.00

Expenses

Airfare (pro-rated 7/17 -Toronto-Vancouver-Toronto)	89.77
Meals & Accommodation	85.30
Taxis etc.	11 .00
Telephone & telegraph	20.68
Airfreight	38.39
	$1,145.14

McPHAR GEOPHYSICS LTD.

Don B. Sutherland.
Geophysicist.

Dated November 8, 1962

CERTIFICATE.

I, Don Benjamin Sutherland, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geophysicist residing at 412 Eglinton East, Toronto, Ontario.
2. I am a graduate of the University of Toronto in Physics & Geology with the degree of Bachelor of Arts (1953); and with the degree of Master of Arts (1954).
3. I am a member of the Society of Exploration Geophysicists and a member of the European Association of Exploration Geophysicists.
4. I have been practising my profession for over eight years.
5. I have no direct or indirect interest, nor do I expect to receive any interest directly or indirectly in the property or securities of General Resources Ltd.
6. The statements made in this report are based on a study of the published geological literature and unpublished private reports.

Dated at Toronto.

This 8 day of November 1962

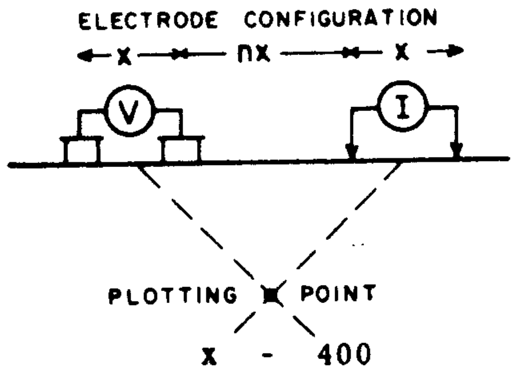
Don B. Sutherland. M.A.

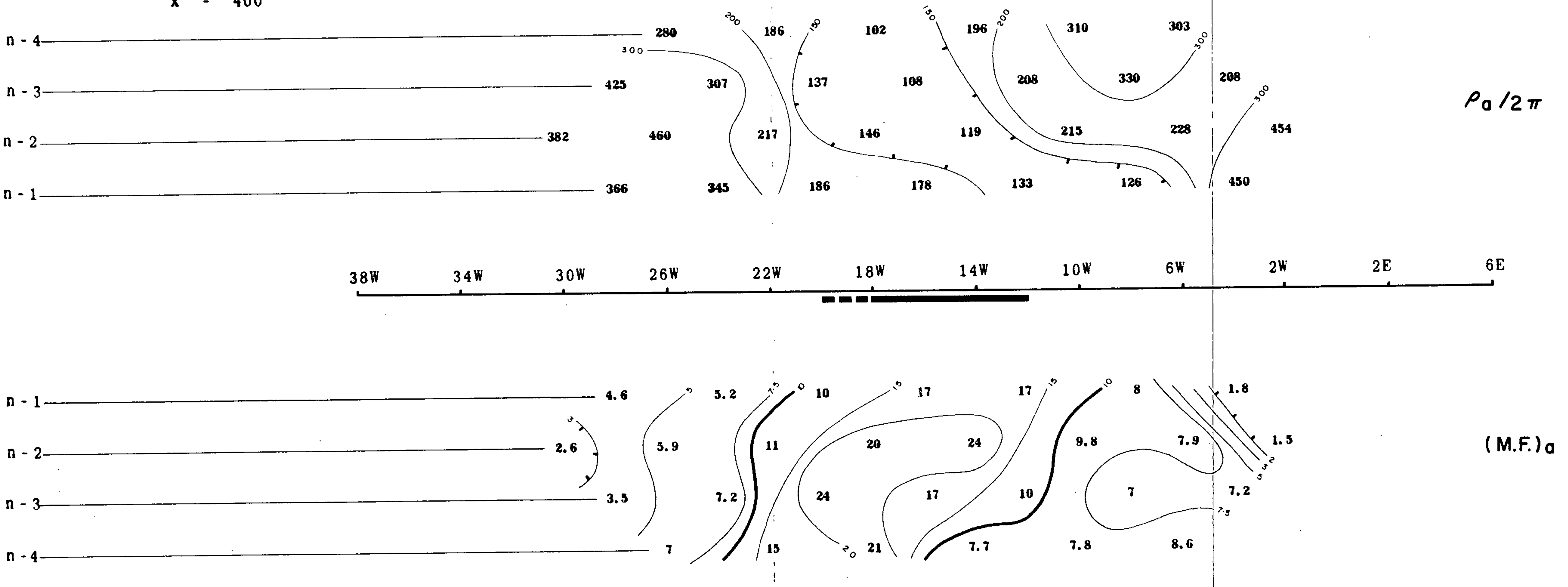
DWG. NO.-I.P.-2937-1

452

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





LINE NO.-48N

GENERAL RESOURCES LIMITED

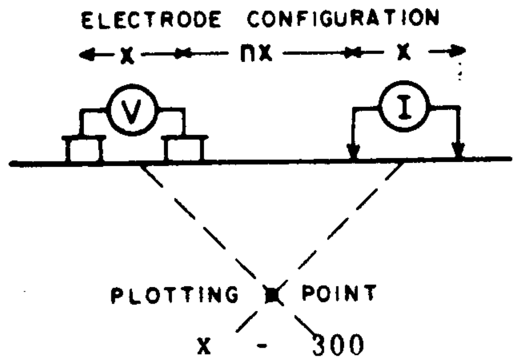
WADE GROUP
MERRITT, BRITISH COLUMBIA
NICOLA MINING DIVISION
Scale- One inch= 400 Feet

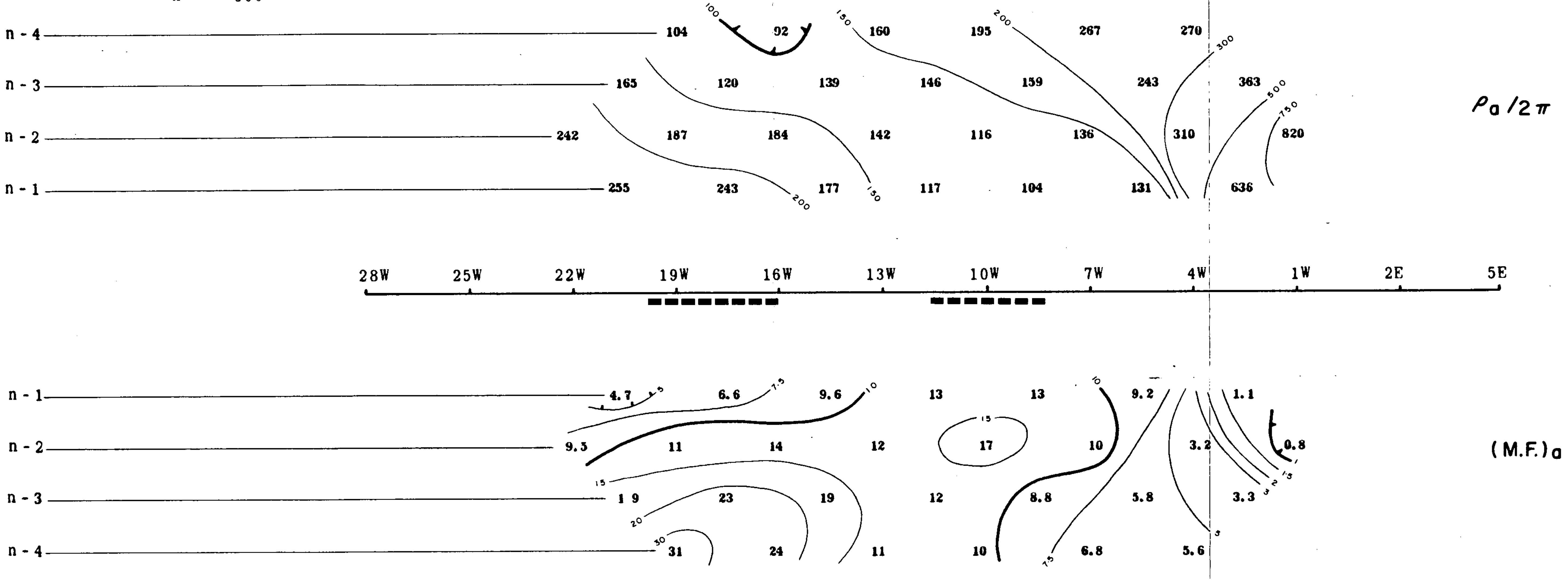
ANOMALOUS ZONE ▬▬▬
POSSIBLE ANOMALOUS ZONE ▬ ▬ ▬
NOTE
LOGARITHMIC CONTOUR INTERVAL

FREQUENCY·31 – 5 C.P.S.
DATE SURVEYED SEPT'62
APPROVED
DATE Nov 7/62

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





LINE NO.-52N

GENERAL RESOURCES LIMITED

WADE GROUP
MERRITT, BRITISH COLUMBIA
NICOLA MINING DIVISION
Scale- One inch = 300 Feet

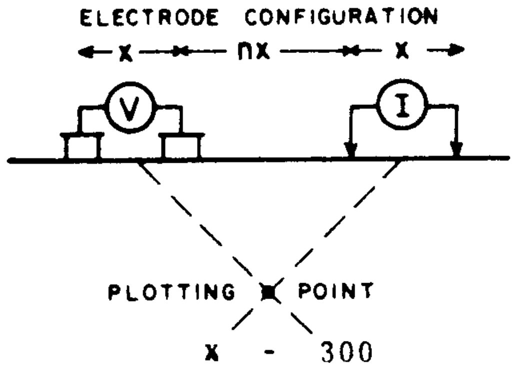
ANOMALOUS ZONE ▬▬▬
POSSIBLE ANOMALOUS ZONE ▬ ▬ ▬
NOTE
LOGARITHMIC CONTOUR INTERVAL

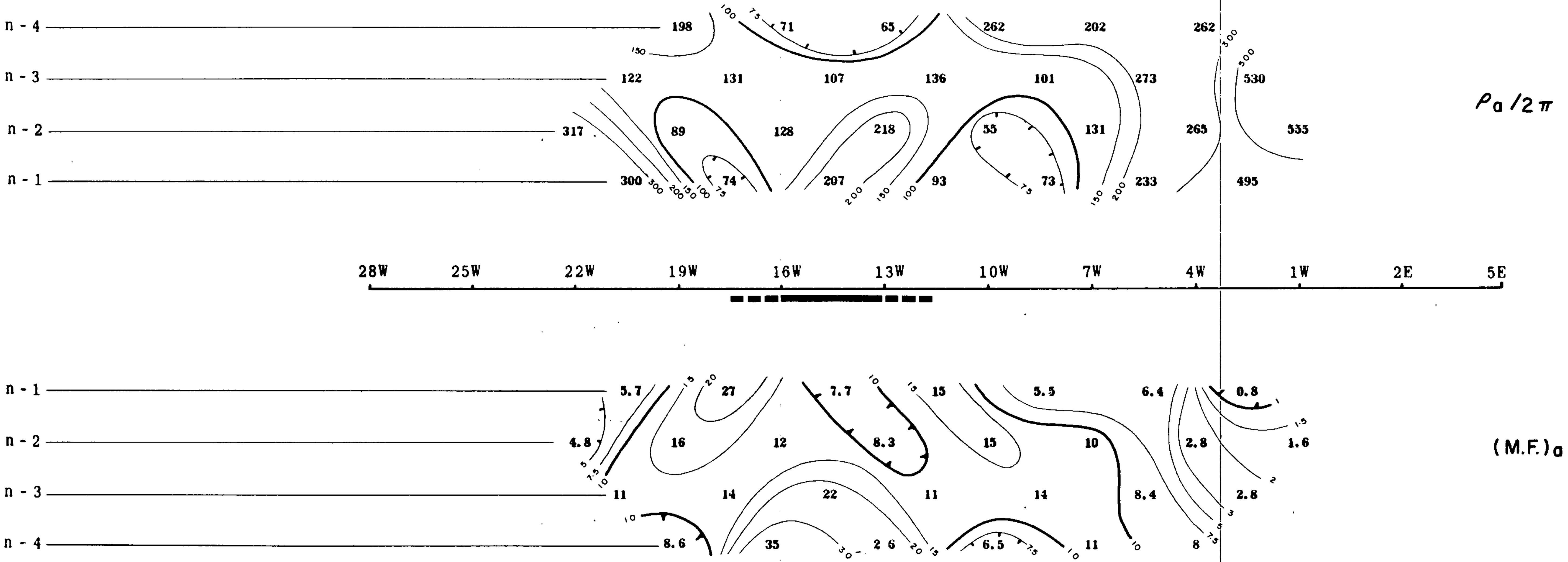
FREQUENCY: 31 - 5 C.P.S.
DATE SURVEYED SEPT '62
APPROVED
DATE Nov 7/62

DWG. NO.-I.P.-2937-3

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





LINE NO.-56N

GENERAL RESOURCES LIMITED

WADE GROUP
MERRITT, BRITISH COLUMBIA
NICOLA MINING DIVISION
Scale- One inch= 300 Feet

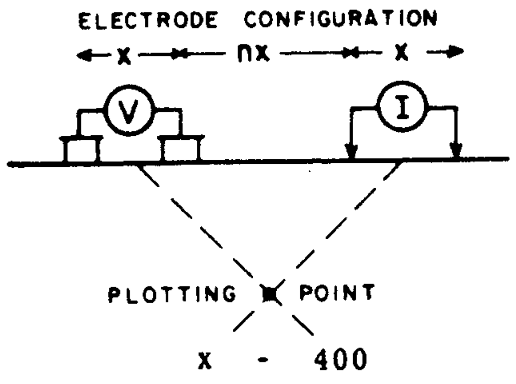
ANOMALOUS ZONE ▬▬▬
POSSIBLE ANOMALOUS ZONE ▬ ▬ ▬
NOTE
LOGARITHMIC CONTOUR INTERVAL

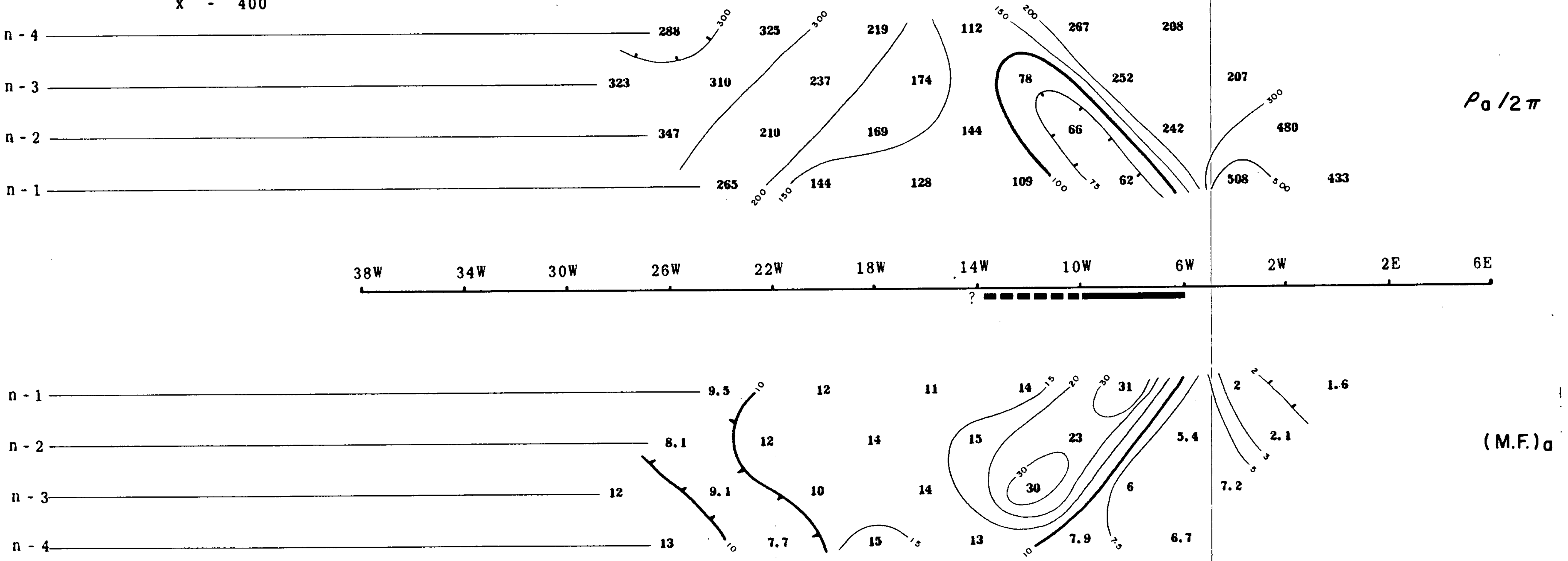
FREQUENCY 31-5 C.P.S.
DATE SURVEYED SEPT '62
APPROVED
DATE Nov 7/62

DWG. NO.-I.P.-2937-4

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





LINE NO.-60N

GENERAL RESOURCES LIMITED

WADE GROUP
MERRITT, BRITISH COLUMBIA
NICOLA MINING DIVISION
Scale- One inch= 400 Feet

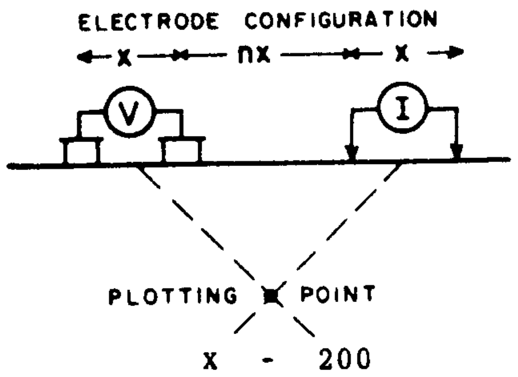
ANOMALOUS ZONE ▬▬▬▬
POSSIBLE ANOMALOUS ZONE ▬ ▬ ▬
NOTE
LOGARITHMIC CONTOUR INTERVAL

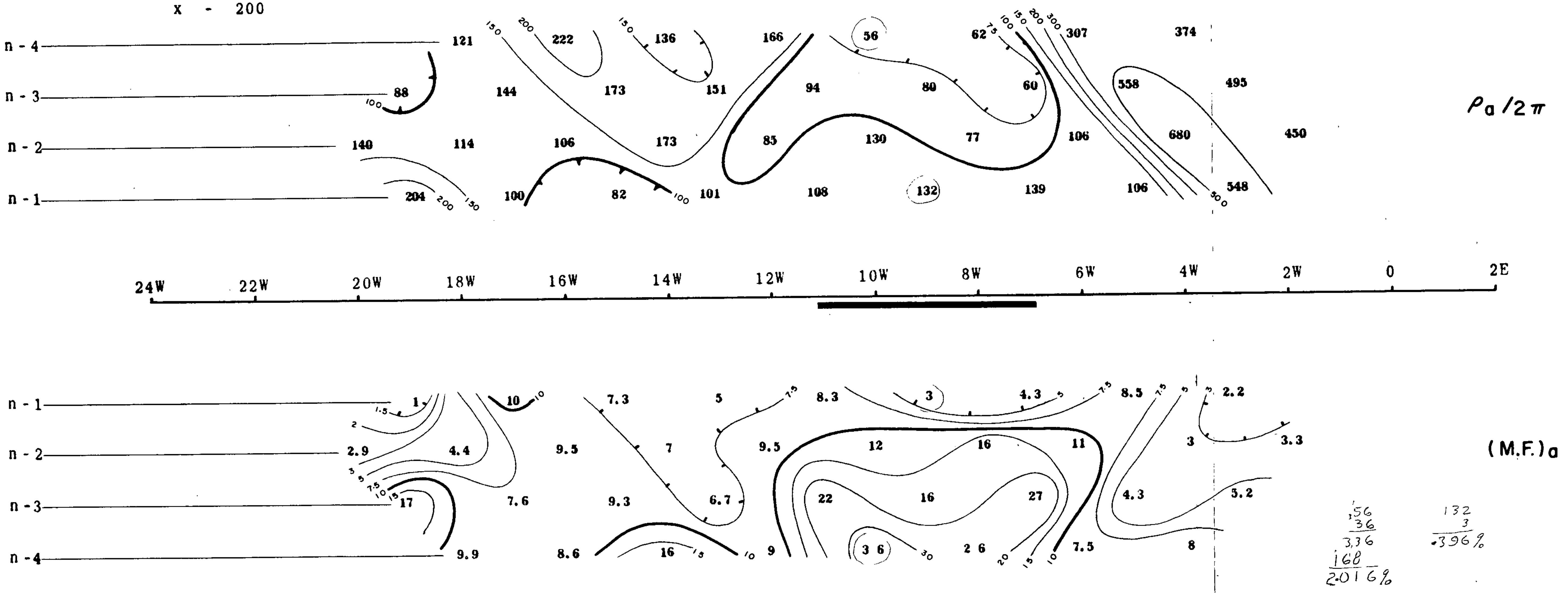
FREQUENCY-31-5 C.P.S.
DATE SURVEYED SEPT'62
APPROVED
DATE Nov 8/62

DWG. NO.-I.P.-2937-5

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





LINE NO.-60N

GENERAL RESOURCES LIMITED

WADE GROUP
MERRITT, BRITISH COLUMBIA
NICOLA MINING DIVISION
Scale- One inch = 200 Feet

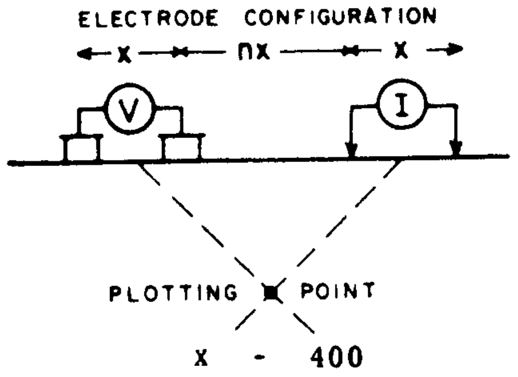
ANOMALOUS ZONE ▬▬▬
POSSIBLE ANOMALOUS ZONE ▬ ▬ ▬
NOTE
LOGARITHMIC CONTOUR INTERVAL

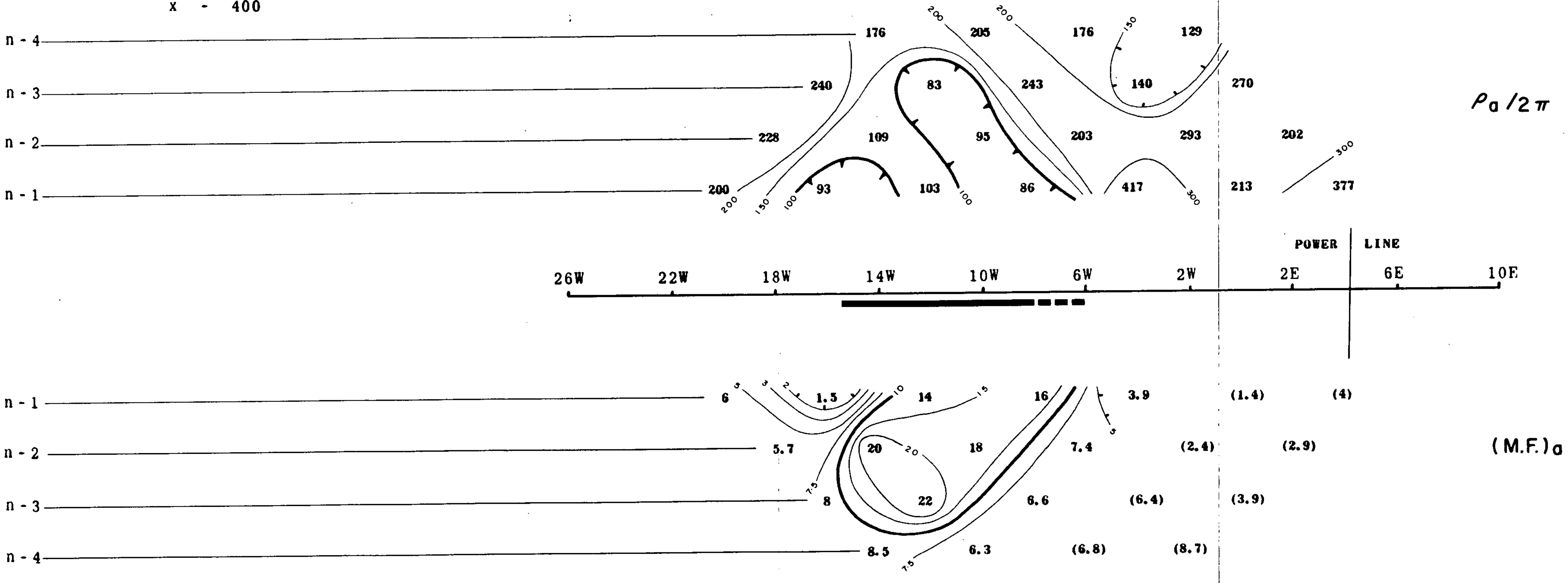
FREQUENCY 31 - 5 C.P.S.
DATE SURVEYED SEPT '62
APPROVED
DATE Nov 7/62

DWG. NO.-I.P.-2937-6

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





LINE NO.- 64N

GENERAL RESOURCES LIMITED

WADE GROUP
MERRITT, BRITISH COLUMBIA
NICOLA MINING DIVISION
Scale - One inch = 400 Feet

ANOMALOUS ZONE ▬▬▬
POSSIBLE ANOMALOUS ZONE ▬ ▬ ▬
NOTE
LOGARITHMIC CONTOUR INTERVAL

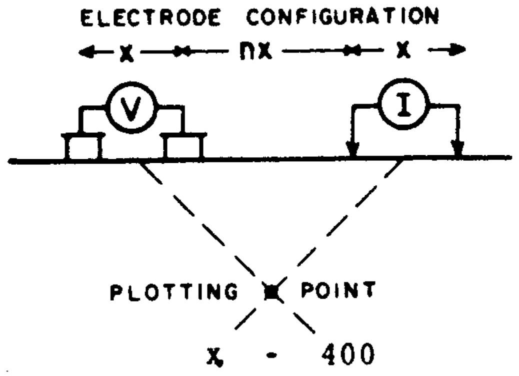
FREQUENCY 31 - 5 C.P.S.
DATE SURVEYED SEPT '62
APPROVED
DATE Nov 7/62

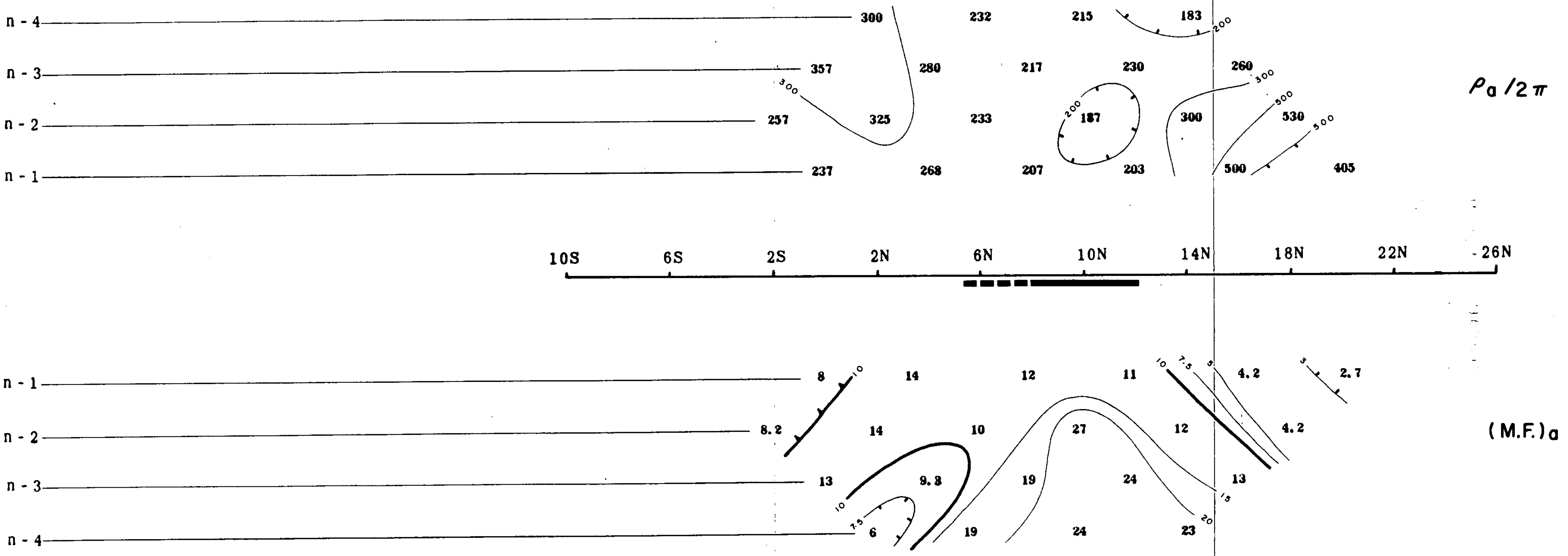
DWG. NO.-I.P.-2937-7

452

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY





LINE NO.-1W

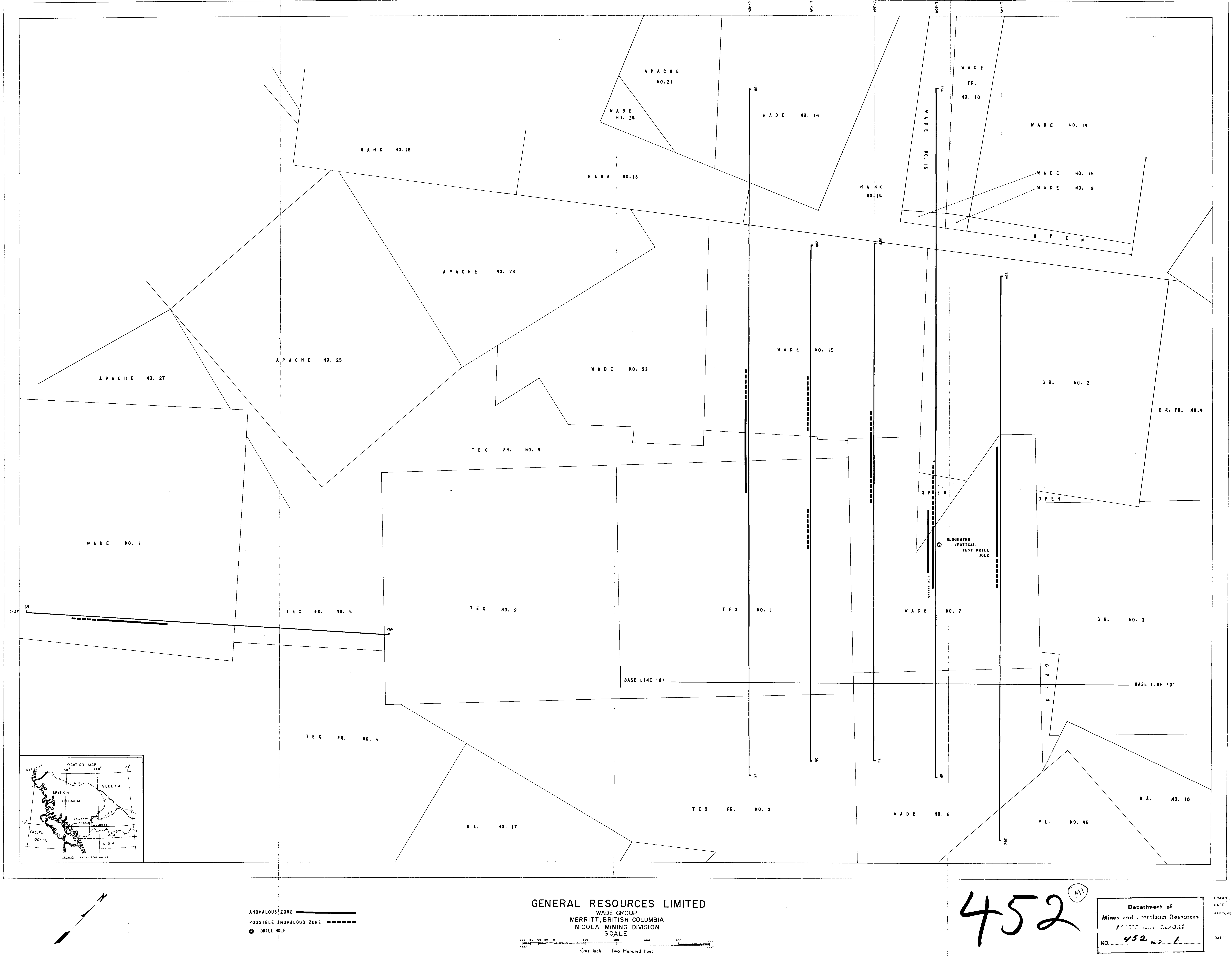
GENERAL RESOURCES LIMITED

WADE GROUP
MERRITT, BRITISH COLUMBIA
NICOLA MINING DIVISION
Scale- One inch = 400 Feet

ANOMALOUS ZONE ▬▬▬
POSSIBLE ANOMALOUS ZONE ▬ ▬ ▬
NOTE
LOGARITHMIC CONTOUR INTERVAL

FREQUENCY 31-5 C.P.S.
DATE SURVEYED SEPT'62
APPROVED JBS
DATE Nov 2/62

McPHAR GEOPHYSICS LIMITED
INDUCED POLARIZATION AND RESISTIVITY SURVEY
LOCATION MAP



ANOMALOUS ZONE ▬▬▬

POSSIBLE ANOMALOUS ZONE ▬ ▬ ▬

◎ DRILL HOLE

GENERAL RESOURCES LIMITED
WADE GROUP
MERRITT, BRITISH COLUMBIA
NICOLA MINING DIVISION

SCALE

200 150 100 50 0 200 400 600 800 1000
FEET

One Inch = Two Hundred Feet

452 (MI)

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 452 MAP 1

DRAWN: D.A.G.
DATE: NOV. 1962
APPROVED: ABS
DATE: Nov 7/6

DWG. MISC-47