762

REPORT ON 92I/6E&7W

INDUCED POLARIZATION

AND RESISTIVITY SURVEY

ON THE

ALAMO GROUP, SPENCES BRIDGE AREA, B. C.

FOR

SAN JACINTO EXPLORATION COMPANY LTD.

NO 92I/6E and 92I/7W

BY

ROBERT A. BELL, Ph. D.

AND

PHILIP G. HALLOF, Ph. D.

ALAMO CLAIM GROUP, SPENCES BRIDGE AREA

KAMLOOPS M. D., B. C. 50°N, 121°W.

DATE STARTED: November 7, 1965

DATE COMPLETED: November 21, 1965

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McPHAR GEOPHYSICS LIMITED

REPORT ON
INDUCED POLARIZATION
AND RESISTIVITY SURVEY
ON THE
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FOR
SAN JACINTO EXPLORATION COMPANY LTD.

1. INTRODUCTION

At the request of Mr. H.H. Shear, we have carried out a combined induced polarization-resistivity survey on the Alamo Group in the Spences Bridge Area of British Columbia for San Jacinto Exploration Company Limited. The property is in the Kamloops Mining Division, in the southeast quadrant of the 1° quadrilateral whose southeast corner is at 50°N, 121°W.

The survey consisted of six east-west lines, most of them across a broad magnetic low with several hundred gammas relief. Electrode separations of 100 feet and 200 feet were used with four readings from each transmitter location (i.e. n = 1, 2, 3 and 4.) Field work was performed during November 1965 using a McPhar frequency type IP system.

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 28N	200-foot spreads	Dwg. IP 2386-1
Line 12N	100-foot spreads	Dwg. IP 2386-2
Line 10N	100-foot spreads	Dwg. IP 2386-3
Line 8N	200-foot spreads	Dwg. IP 2386-4
Line 8N	100-foot spreads	Dwg. IP 2386-5
Line 6N	200-foot spreads	Dwg. IP 2386-6
Line 4N	200-foot spreads	Dwg. IP 2386-7

Enclosed with this report is Dwg. Misc. 3147, a plan map of the grid at a scale of 1" = 400'. The definite and possible induced polarization anomalies are indicated by solid and broken bars respectively on this plan map as well as the data plots. These bars represent the surface projection of the anomalous zones as interpreted from the location of the transmitter and receiver electrodes when the anomalous values were measured.

Since the induced polarization measurement is essentially an averaging process, as are all potential methods, it is frequently difficult to exactly pinpoint the source of an anomaly. Certainly, no anomaly can be located with more accuracy than the spread length; i. e. when using 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

No strong anomalies were indicated by the IP survey but there are weak effects on most of the lines. In some cases the anomalies are broad and may simply reflect rock type changes with differing background levels. In other cases the anomalies are suggestive of narrow zones of sparse metallic mineralization. The results for each line are summarized below.

Line 28N

Weak effects were measured at the Base Line suggesting a possible source at depth.

Line 12N

A possible weak shallow anomaly occurs at 6W - 7W coincident with a magnetic low of 300 gammas relief.

Line 10N

This line was run using 100-foot spreads. The results show a broad zone from about 1W to 7W, with above background IP effects and somewhat lower resistivities, correlating with the magnetic low. Within this zone there are somewhat stronger sections at 1W-2W, 4W-5W and 6W-7W.

Line 8N

Weak shallow anomalies occur at 0-4W, 12E and 22E on this line. The western anomaly coincides with the main magnetic low and correlates with the weak IP anomalies on Lines 10W and 12N. The feature at 12E coincides with a narrow weak magnetic low at the south end of the small lake and correlates with weak IP effects on Lines 6N and 4N.

The 100-foot detail on the western anomaly indicates two shallow sources, at 1W-2W and centred at 4W.

<u>Line 6N</u>

A broad zone of above background effects occurs on this line, with a possible shallow narrow source at 12E-14E.

<u>Line 4N</u>

A deep anomaly occurs at 10E-14E correlating with weak effects to the north.

4. SUMMARY AND RECOMMENDATIONS

No strong anomalies suggestive of narrow concentrated sources or broad zones of heavily disseminated metallics were indicated by the IP survey. Weak effects were measured on all lines and most of these anomalies appear to correlate into two zones. The western zone is coincident with a weak magnetic low. Further work does not seem to be justified unless the type of deposit being sought could contain only minor metallic mineralization.

McPHAR GEOPHYSICS LIMITED

Robert A. Bell

Robert A. Bell,
Geologist.

Philip G. Hallof

Philip G. Hallof,
Geophysicist.

Dated: February 10, 1966

ASSESSMENT DETAILS

PROPERTY: Alamo Property

MINING DIVISION: Kamloops

SPONSOR: San Jacinto Exploration Company Limited

PROVINCE: British Columbia

LOCATION: Spences Bridge Area

TYPE OF SURVEY: Induced Polarization

OPERATING MAN DAYS:	49	DATE STARTED:	November 7, 1965
EQUIVALENT 8 HR. MAN DAYS:	73.5	DATE FINISHED:	November 21, 1965
CONSULTING MAN DAYS:	1.5	NUMBER OF STATIONS:	133
DRAUGHTING MAN DAYS:	5.0	NUMBER OF READINGS:	712
TOTAL MAN DAYS:	80.0	MILES OF LINE SURVEYED:	4.0

CONSULTANTS:
R. A. Bell, 50 Hemford Crescent, Don Mills, Ontario.
P. G. Hallof, 5 Minorca Place, Don Mills, Ontario.

FIELD TECHNICIANS:
P. Makulowich, 1429 Birchmount Road, Scarborough, Ontario.
R. Simkus, 134 Stibbard Avenue, Toronto 12, Ontario.

Helpers - 3 - supplied by client.

DRAUGHTSMEN:
E. Helkio, Apt. 4, 1203 Don Mills Road, Don Mills, Ontario.
B. Marr, 19 Kenewen Court, Toronto 16, Ontario.

McPHAR GEOPHYSICS LIMITED

Robert A. Bell

R. A. Bell,
Geologist.

Dated: February 9, 1966

SUMMARY OF COSTS

San Jacinto Exploration Co. - Alamo Property

Crew (2 men)

6 1/2 days Operating	@ $195.00/day	$1,267.50
1/2 day Travel	@ $ 75.00/day	37.50
Charge per contract of $200 less than 10 operating days		200.00
		$1,505.00

Expenses Crew

Transportation - Air		
Van-Tor-Your portion 1/2 =	150.00	
Meals and Accommodation	17.75	
Telephone and Telegraph	17.25	
Freight and Brokerage	164.79	
	349.79	
Less Credit on Prorated	50.00	299.79
		$1,804.79

McPHAR GEOPHYSICS LIMITED

Robert A. Bell

Robert A. Bell,
Geologist.

Dated: February 10, 1966

CERTIFICATE

I, Robert Alan Bell, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geologist residing at 50 Hemford Crescent, Don Mills, (Toronto) Ontario.

2. I am a graduate of the University of Toronto in Physics and Geology with the degree of Bachelor of Arts (1949); and a graduate of the University of Wisconsin in Economic Geology with the degree of Ph. D. (1953).

3. I am a member of the Society of Economic Geologists and a fellow of the Geological Association of Canada.

4. I have been practising my profession for over fifteen 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 the San Jacinto Exploration Company Limited.

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

Dated at Toronto

This 10th day of February 1966

Robert A. Bell

Robert A. Bell, Ph. D.

CERTIFICATE

I, Philip George Hallof, of the City of Toronto, Province of Ontario, do hereby certify that:

1. I am a geophysicist residing at 5 Minorca Place, Don Mills, (Toronto), Ontario.

2. I am a graduate of the Massachusetts Institute of Technology with a B.S. Degree (1952) in Geology and Geophysics, and a Ph.D. Degree (1957) in Geophysics.

3. I am a member of the Society of Exploration Geophysicists and the European Association of the Exploration Geophysicists.

4. I have been practising my profession for ten 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 the San Jacinto Exploration Company Limited.

6. The statements made in this report are based on a study of published literature and unpublished private reports and geophysical data.

Dated at Toronto

This 10th day of February 1966

Philip G. Hallof

Philip G. Hallof, Ph.D.

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 South-western 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

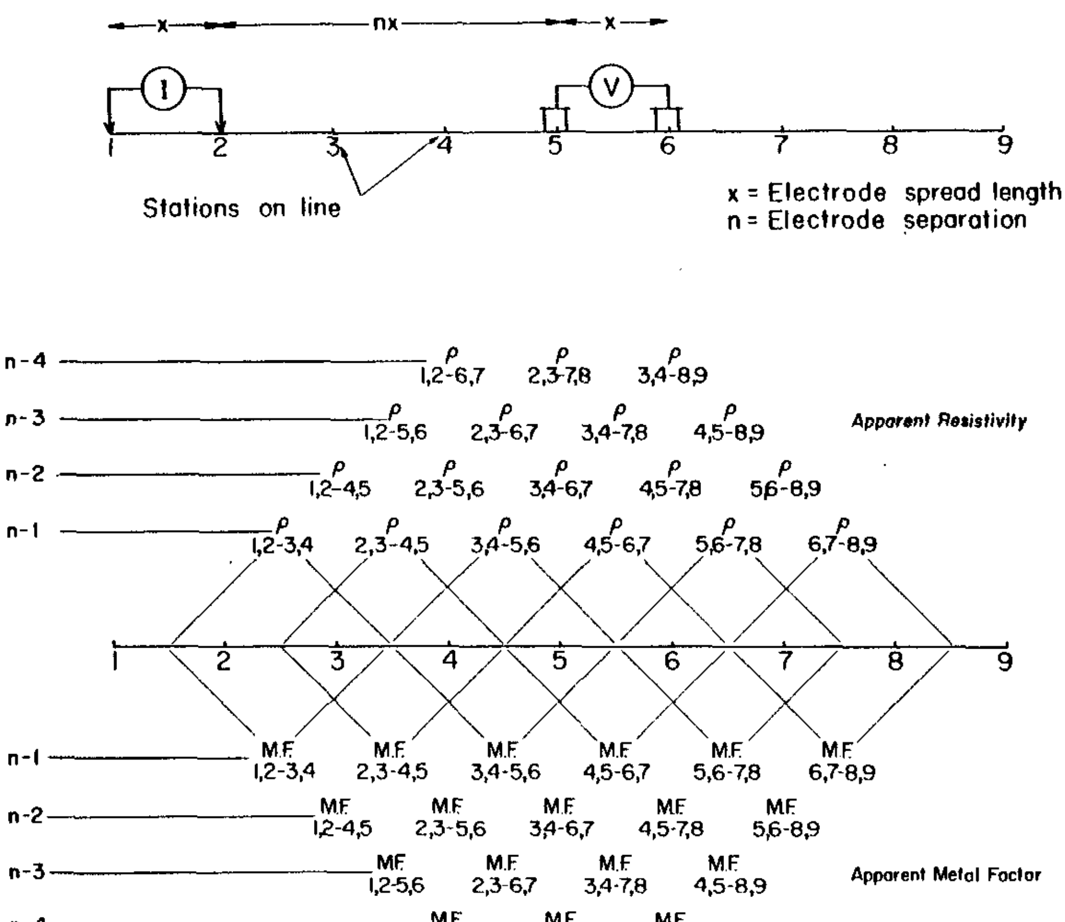


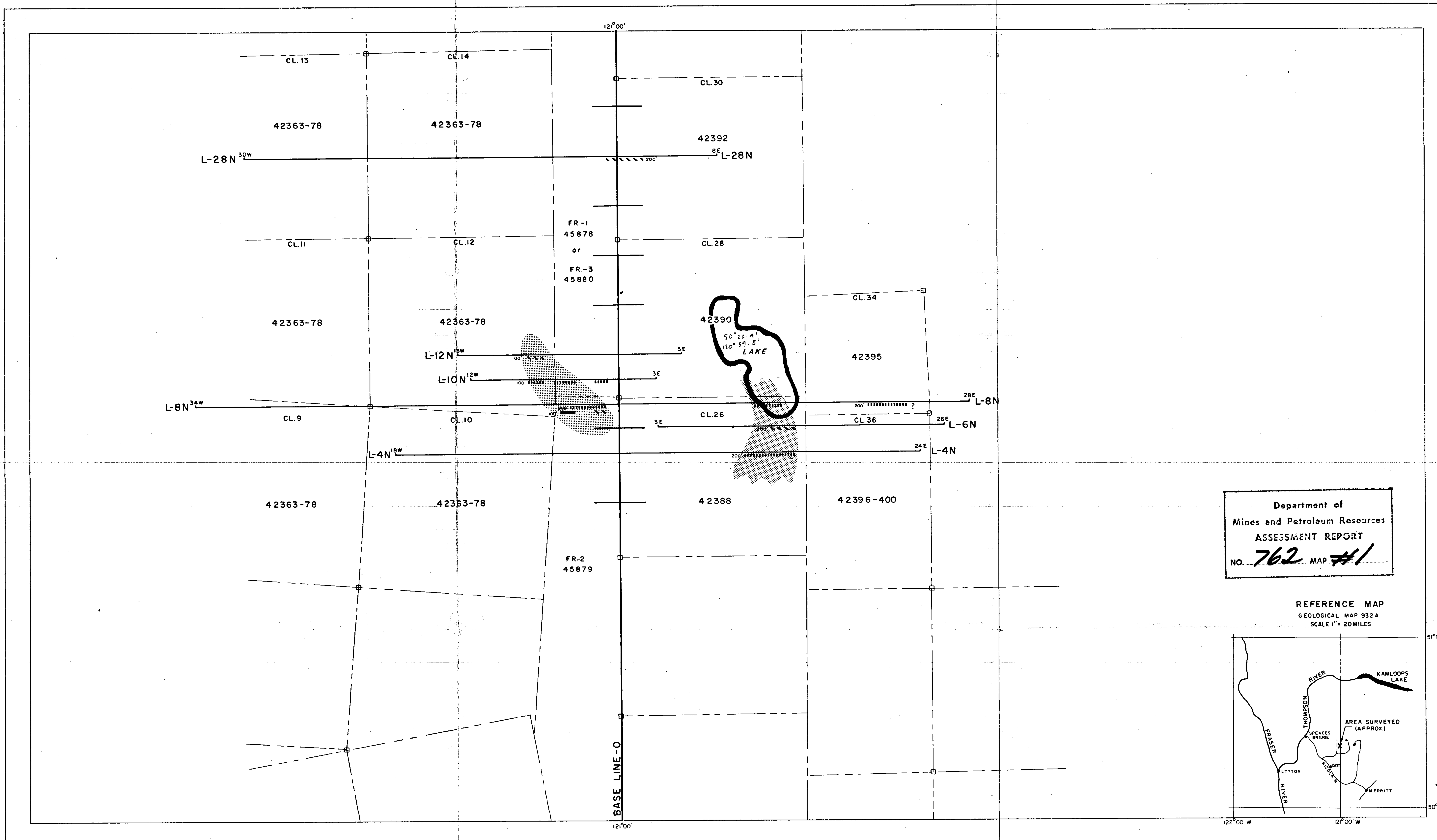
FIG. 1

DWG. MISC. 3147

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

LOCATION MAP



ASTRONOMIC N

SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE
Numbers at end of anomalies indicate spreads used.

SAN JACINTO EXPLORATION COMPANY LIMITED

ALAMO PROPERTY, SPENCES BRIDGE AREA, KAMLOOPS M.D. - B.C.

SCALE

400 200 0 400 800 1200 1600 2000 FEET

One Inch = Four Hundred Feet

weakly ANOMALOUS ZONE

762

#762

DRAWN: E.N.H.
DATE: FEB. 1966
APPROVED:
DATE:

McPHAR GEOPHYSICS

DWG. MISC. 3147

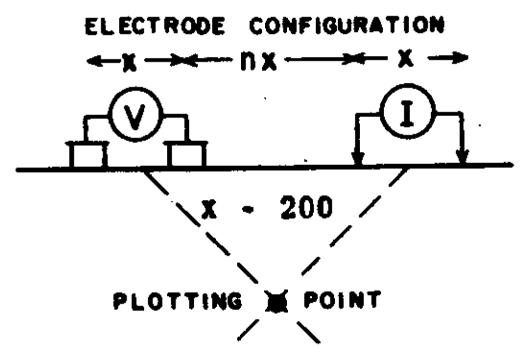
DWG. NO.-I.P.-2386-1

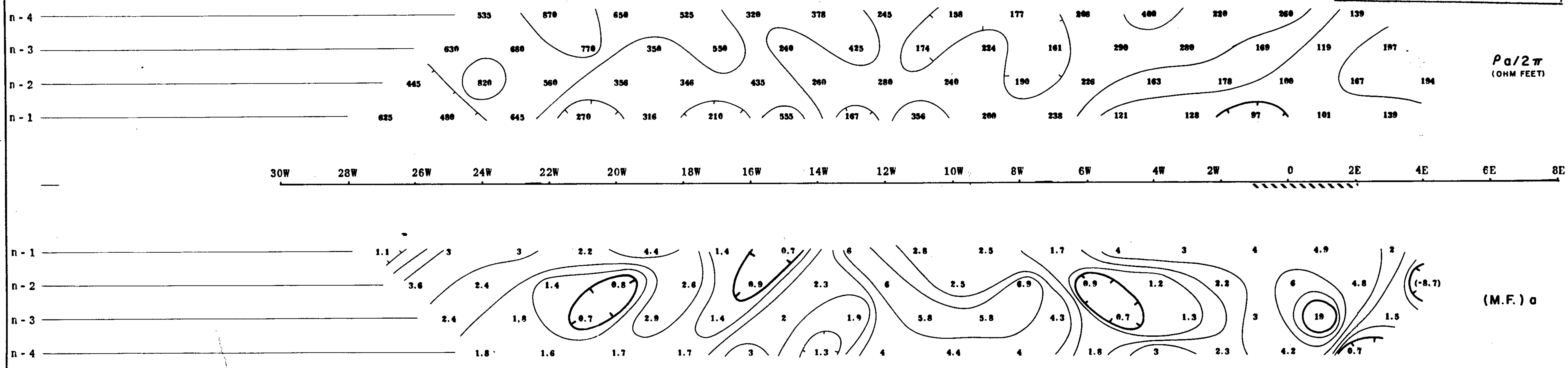
McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: - CONTOURS AT LOGARITHMIC MULTIPLES OF 10-15-20-30-50-75-100

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 762 MAP #2





LINE NO.- 28 N

SURFACE PROJECTION OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE

SAN JACINTO EXPLORATION COMPANY LIMITED

ALAMO PROPERTY, SPENCES BRIDGE AREA, KAMLOOPS M.D.- B.C.

Scale-One inch= 200 Feet

NOTE LOGARITHMIC CONTOUR INTERVAL

762

FREQUENCY 0.31-5 C.P.S.
DATE SURVEYED NOV. 1965
APPROVED
DATE

McPHAR GEOPHYSICS LIMITED

DWG. NO.-I.P.-2386-2

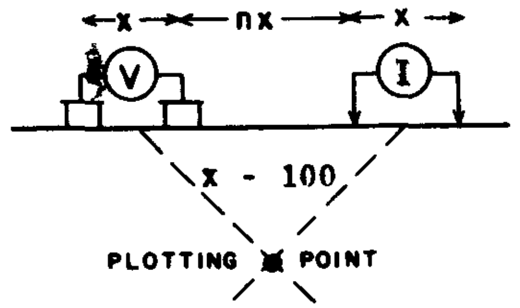
McPHAR GEOPHYSICS LIMITED

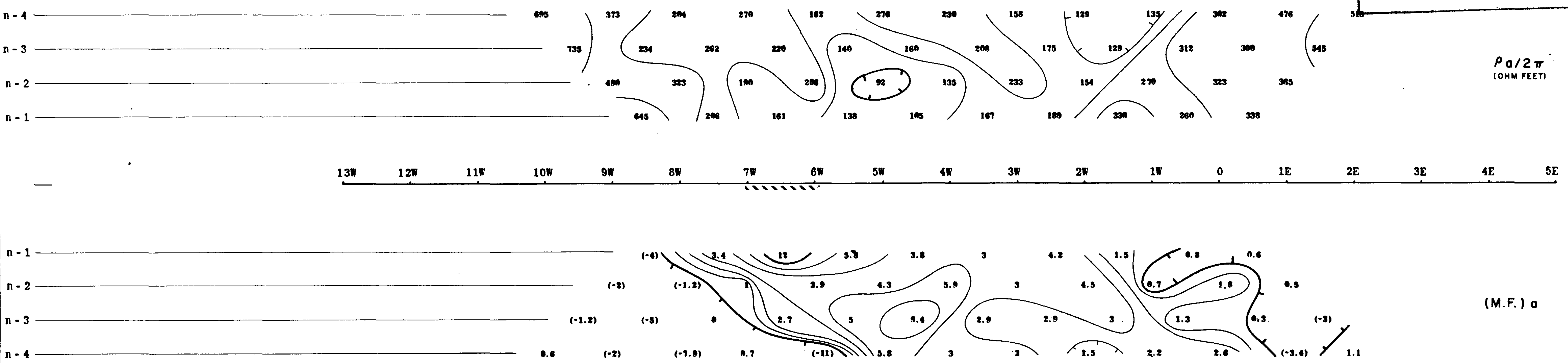
INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: - CONTOURS AT LOGARITHMIC MULTIPLES OF 10-15-20-30-50-75-100

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 762 MAP #3

ELECTRODE CONFIGURATION





LINE NO.- 12 N

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

SAN JACINTO EXPLORATION COMPANY LIMITED

ALAMO PROPERTY, SPENCES BRIDGE AREA, KAMLOOPS M.D.- B.C.

Scale-One inch= 100 Feet

NOTE LOGARITHMIC CONTOUR INTERVAL

762

FREQUENCY 0.31-5 C.P.S.
DATE SURVEYED NOV. 1965
APPROVED
DATE

McPHAR GEOPHYSICS LIMITED

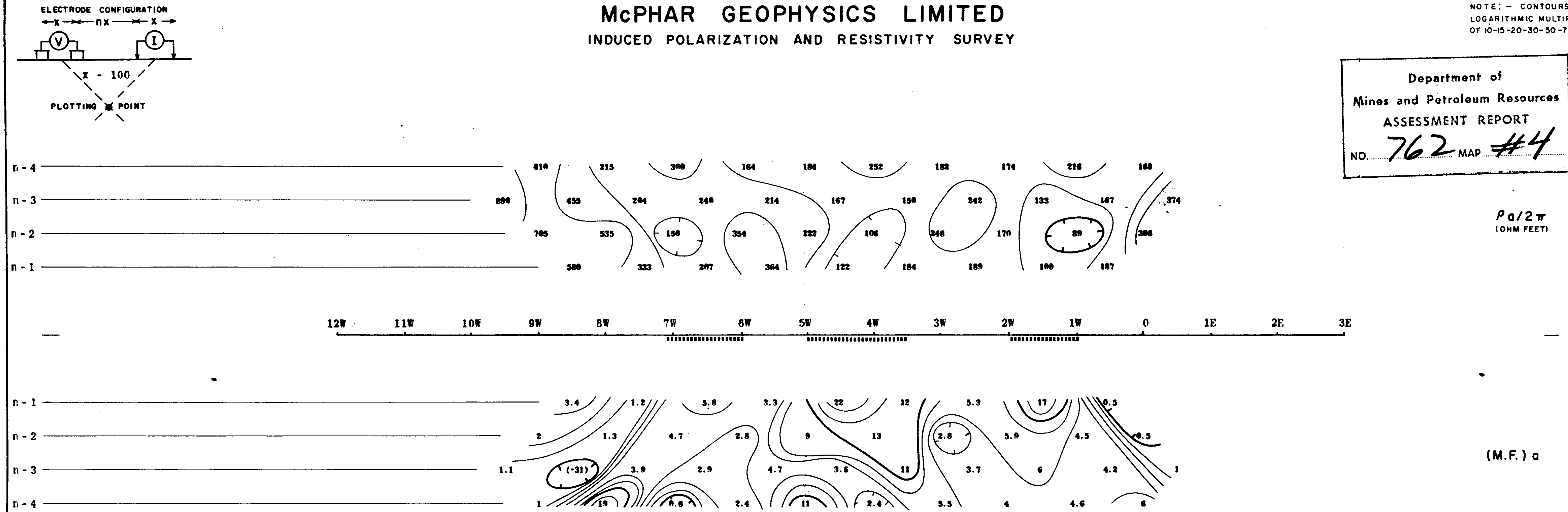
DWG. NO.-I.P.-2386-3

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: - CONTOURS AT LOGARITHMIC MULTIPLES OF 10-15-20-30-50-75-100

Department of Mines and Petroleum Resources ASSESSMENT REPORT NO. 762 MAP #4



LINE NO.—10N

762

SAN JACINTO EXPLORATION COMPANY LIMITED

ALAMO PROPERTY, SPENCES BRIDGE AREA, KAMLOOPS M.D.—B.C.

Scale—One inch= 100 Feet

NOTE LOGARITHMIC CONTOUR INTERVAL

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCY 0.31 - 5 C.P.S.

DATE SURVEYED NOV. 1965

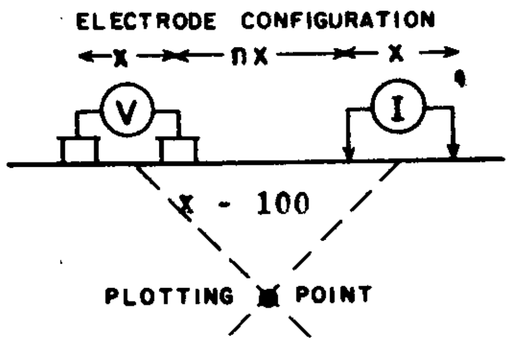
APPROVED

DATE 1/2/66

McPHAR GEOPHYSICS LIMITED

McPHAR GEOPHYSICS LIMITED
INDUCED POLARIZATION AND RESISTIVITY SURVEY
ELECTRODE CONFIGURATION
x - 200
PLOTTING POINT
NOTE: - CONTOURS AT LOGARITHMIC MULTIPLES OF 10 15-20-30-50-75-100
Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 762 MAP #5
ρa/2π (OHM FEET)
(M.F.) a
n - 1
n - 2
n - 3
n - 4
34W 32W 30W 28W 26W 24W 22W 20W 18W 16W 14W 12W 10W 8W 6W 4W 2W 0 2E 4E 6E 8E 10E 12E 14E 16E 18E 20E 22E 24E 26E 28E
LINE NO.-8N
SURFACE PROJECTION OF ANOMALOUS ZONES
DEFINITE
PROBABLE
POSSIBLE
SAN JACINTO EXPLORATION COMPANY LIMITED
ALAMO PROPERTY, SPENCES BRIDGE AREA, KAMLOOPS M.D.- B.C.
Scale—One inch= 200 Feet
NOTE: LOGARITHMIC CONTOUR INTERVAL
762
FREQUENCY
DATE SURVEYED NOV. 1965
APPROVED
DATE 10/2/66
McPHAR GEOPHYSICS LIMITED

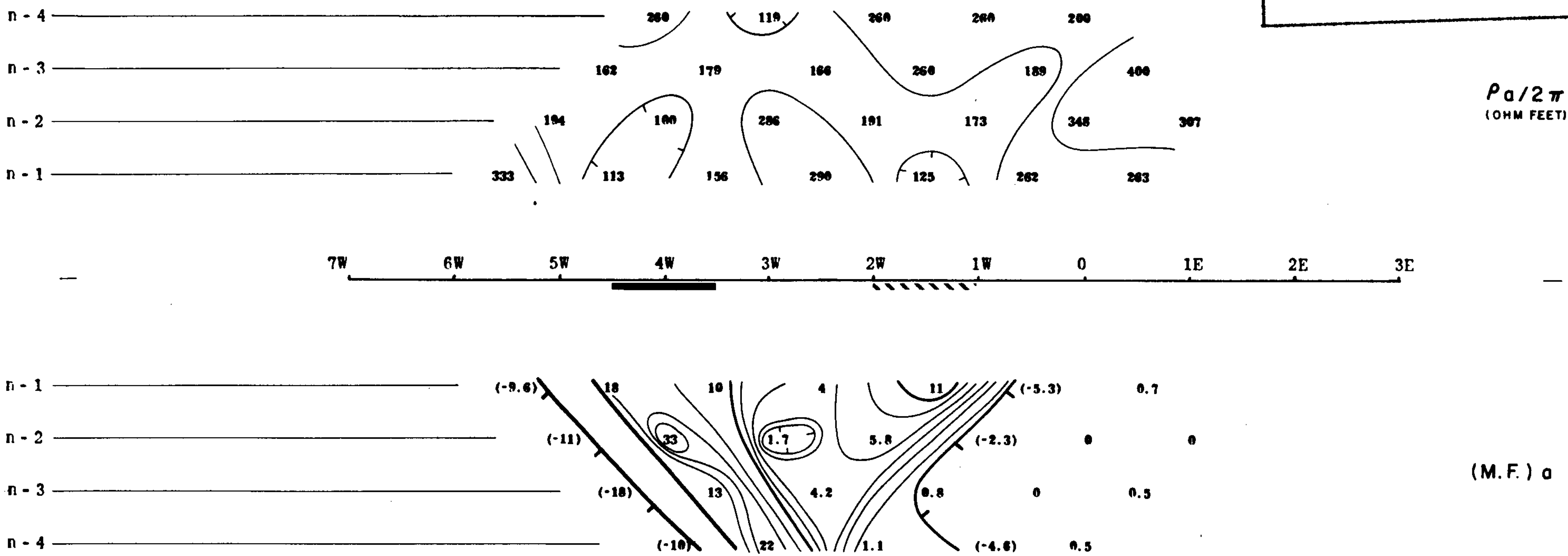
DWG. NO.–I.P.–2386-5



McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: – CONTOURS AT LOGARITHMIC MULTIPLES OF 10-15-20-30-50-75-100



ρa/2π (OHM FEET)

(M.F.) a

LINE NO.– 8 N

762

SAN JACINTO EXPLORATION COMPANY LIMITED

ALAMO PROPERTY, SPENCES BRIDGE AREA, KAMLOOPS M.D.– B.C.

Scale – One inch = 100 Feet

NOTE LOGARITHMIC CONTOUR INTERVAL

SURFACE PROJECTION OF ANOMALOUS ZONES

- DEFINITE
- PROBABLE
- POSSIBLE

FREQUENCY 0.31 C.P.S.

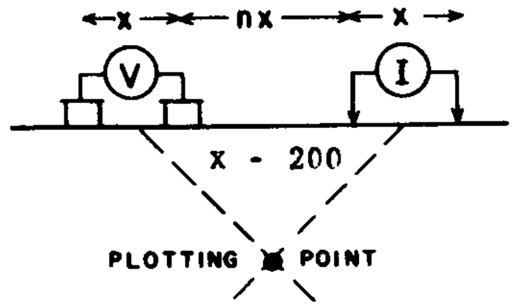
DATE SURVEYED NOV. 1965

APPROVED

DATE 10/2/66

DWG. NO.-I.P.-2386-6

ELECTRODE CONFIGURATION

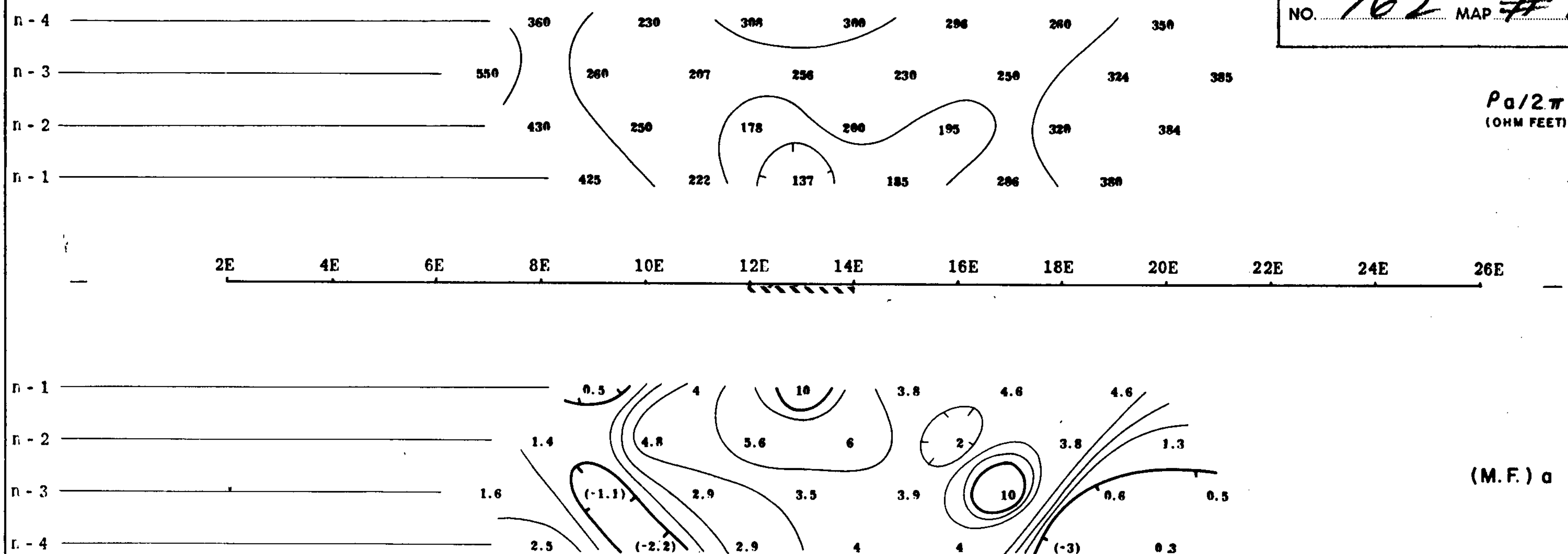


McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: - CONTOURS AT LOGARITHMIC MULTIPLES OF 10-15-20-30-50-75-100

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 762 MAP #7



ρa/2π (OHM FEET)

(M.F.) a

LINE NO.- 6N

762

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

SAN JACINTO EXPLORATION COMPANY LIMITED

ALAMO PROPERTY, SPENCES BRIDGE AREA, KAMLOOPS M.D.- B.C.

Scale- One inch = 200 Feet

NOTE LOGARITHMIC CONTOUR INTERVAL

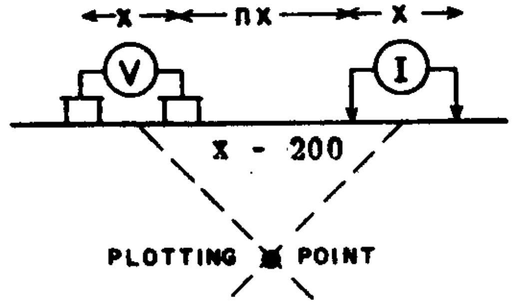
FREQUENCY 0.31 + 5 CPS
DATE SURVEYED NOV. 1965
APPROVED RG
DATE 10/2/66

DWG. NO.-I.P.- 2386-7

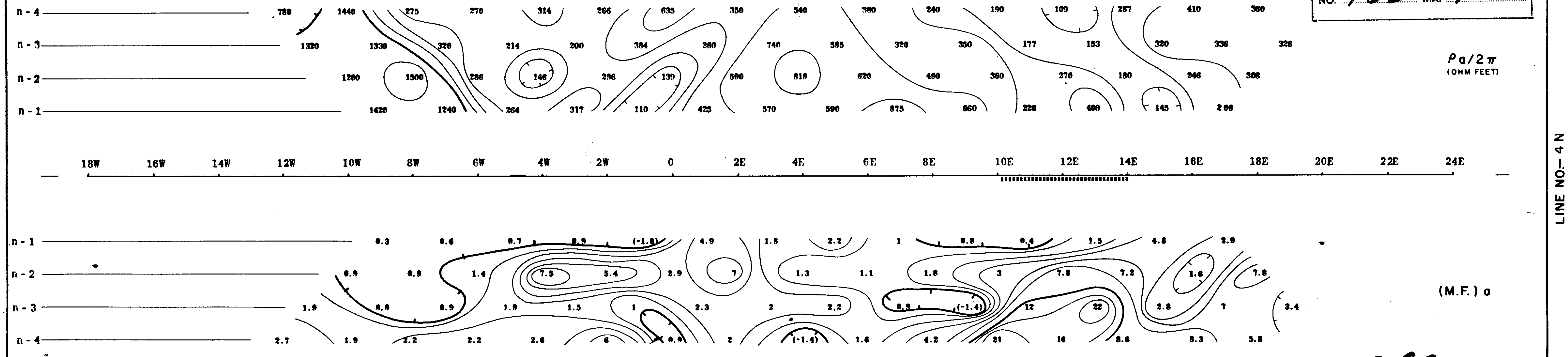
McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

NOTE: - CONTOURS AT LOGARITHMIC MULTIPLES OF 10-15-20-30-50-75-100



Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 762 MAP #8



762

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

SAN JACINTO EXPLORATION COMPANY LIMITED

ALAMO PROPERTY, SPENCES BRIDGE AREA, KAMLOOPS M.D. - B.C.

Scale-One inch = 200 Feet

NOTE LOGARITHMIC CONTOUR INTERVAL

FREQUENCY 0.31-5 C.P.S.

DATE SURVEYED NOV. 1965

APPROVED RAB

DATE 10/12/65

McPHAR GEOPHYSICS LIMITED