681

REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY ON THE GOAT AND KIM CLAIM GROUPS

681

104G/3W

SPHALER CREEK AREA, BRITISH COLUMBIA

FOR

KENNCO EXPLORATIONS (WESTERN) LTD.

BY

PHILIP G. HALLOF, Ph. D.

NAME AND LOCATION OF PROPERTY:

GOAT AND KIM CLAIM GROUPS, SPHALER CREEK AREA

LIARD MINING DIVISION, B. C. 57°/131° S. E.

DATE STARTED: July 25, 1965

DATE COMPLETED: July 30, 1965

TABLE OF CONTENTS

Part A:	Notes on theory and field procedures	6 pages	
Part B:	Report	6 pages	**Page**
1.	Introduction		1
2.	Presentation of Results		1
3.	Discussion of Results		2
4.	Assessment Details		4
5.	Summary of Cost		5
6.	Certificate		6
Part C:	Illustrations	6 pieces	
#1	Plan Map (in pocket)	Dwg. Misc. 3108	
	I.P. Data Plots	Dwg. IP 2237-1 to -5 #2, #3, #4, #5, #6	

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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

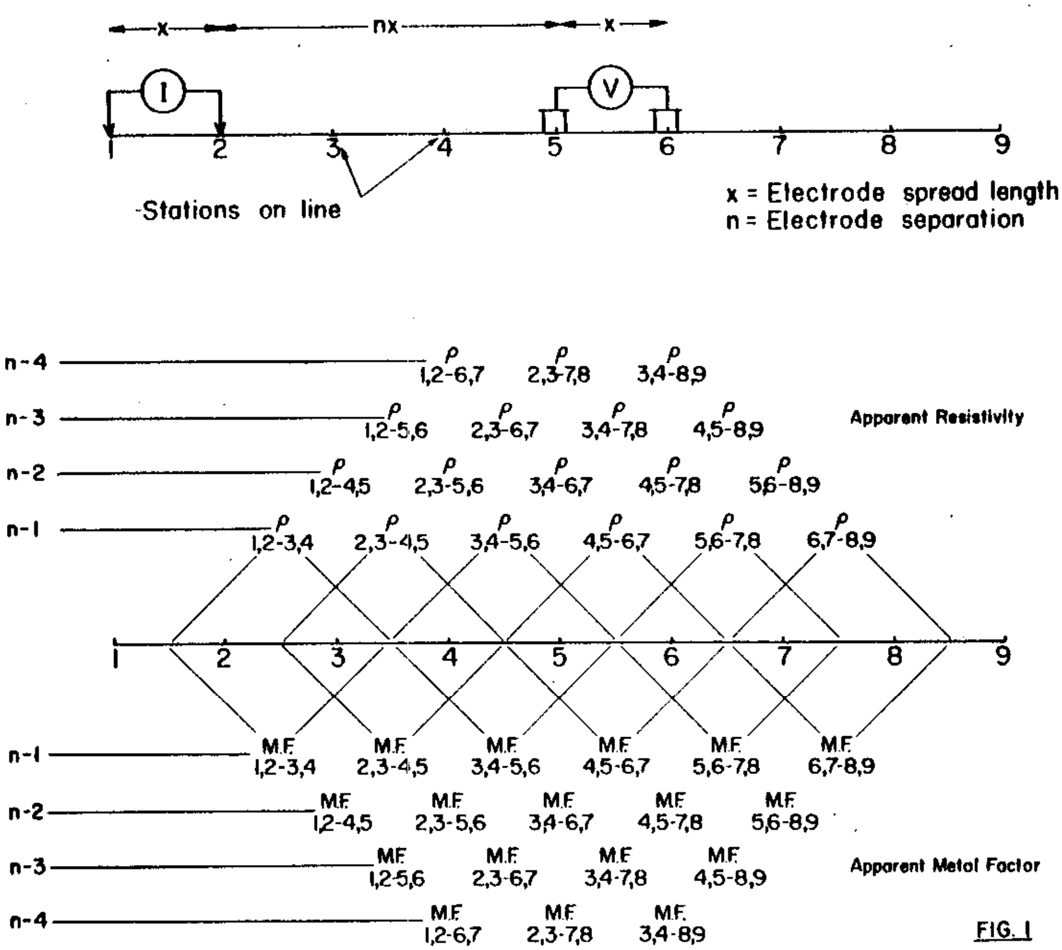

FIG. I

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REPORT ON THE INDUCED POLARIZATION AND RESISTIVITY SURVEY ON THE GOAT AND KIM CLAIM GROUPS SPHALER CREEK AREA, BRITISH COLUMBIA FOR KENNCO EXPLORATIONS (WESTERN) LTD.

1. INTRODUCTION

At the request of Mr. H. W. Fleming, geophysicist for the Company, an induced polarization and resistivity survey has been carried out on the Goat and Kim Claim Groups in the Sphaler Creek Area of British Columbia for Kennco Explorations (Western) Ltd. The property is in the Liard Mining Division, in the southeast quadrant of the one degree quadrilateral whose southeast corner is at 57°N-131°W.

The area was indicated as being of interest by a reconnaissance geochemical survey. The induced polarization survey was planned in an attempt to locate any unknown zones of mineralization that might be associated with the geochemical anomalies.

2. PRESENTATION OF RESULTS

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

Line 300N	200' electrode intervals	Dwg. IP 2237-1
Line 135N	200' electrode intervals	Dwg. IP 2237-2
Line 130N	200' electrode intervals	Dwg. IP 2237-3
Line 105E	200' electrode intervals	Dwg. IP 2237-4
Line 100E	200' electrode intervals	Dwg. IP 2237-5

Also enclosed with this report is Dwg. Misc. 3108, a plan map of the area covered by the survey. 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

The results from the Sphaler Creek Area show generally high resistivities. In most cases the IP effects measured are small. There are a few, low magnitude IP anomalies indicated. The most important looking anomaly is at the eastern end of Line 130N; however, the results would have to be extended to the east to outline the source.

The results from the reconnaissance IP survey on the Goat and Kim Claim Groups are essentially blank. There are no IP effects that indicate substantial volumes of metallic mineralization that might be of interest.

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof (per RAB)

Philip G. Hallof,
Geophysicist.

Dated: August 24, 1965

ASSESSMENT DETAILS

PROPERTY: Goat and Kim Claim Groups

MINING DIVISION: Liard

SPONSOR: Kennco Explorations (Western) Ltd.

PROVINCE: British Columbia

LOCATION: Sphaler Creek Area

TYPE OF SURVEY: Induced Polarization

OPERATING MAN DAYS:	12.5	DATE STARTED:	July 25, 1965
EQUIVALENT 8 HR. MAN DAYS:	18.75	DATE FINISHED:	July 30, 1965
CONSULTING MAN DAYS:	1	NUMBER OF STATIONS:	34
DRAUGHTING MAN DAYS:	3	NUMBER OF READINGS:	144
TOTAL MAN DAYS:	22.75	MILES OF LINE SURVEYED:	1.09

CONSULTANTS:

P. G. Hallof, 5 Minorca Place, Don Mills, Ontario.

FIELD TECHNICIANS:

J. Parker, Box 340, Choiceland, Saskatchewan.
P. Bellehumeur, Box 72, Ramore, Ontario.
3 helpers supplied by client.

DRAUGHTSMEN:

F.R. Peer, 38 Torrens Avenue, Toronto 6, Ontario.
R. Woods, Apt. 401, 1222 York Mills Road, Don Mills, Ontario.
B. Kovacs, Box 149, Unionville, Ontario.

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof (per RRB)

Philip G. Hallof,
Geophysicist.

Dated: August 24, 1965

SUMMARY OF COST

Goat & Kim - Sphaler Creek

Crew

2-1/2 days Operating	@ $185.00/day	$ 462.50
1/2 day Standby	@ $ 65.00/day	32.50
		162.50

Expenses

2-1/2 days Travel	@ $65.00/day	$162.50		
Airfare		192.00		
Taxis, etc.		10.00		
Meals and Accommodation		103.41		
Telephone and Telegraph		21.00		
Freight		15.98		
Supplies		23.19		
Miscellaneous		2.25		183.92
		~~$530.33~~	- 1/2 -	~~265.17~~
		367.83		$ ~~760.17~~
				641.42

McPHAR GEOPHYSICS LIMITED

Philip G. Hallof (per RAB)

Philip G. Hallof,
Geophysicist.

Dated: August 24, 1965

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, direct or indirect, in the property or securities of Kennco Explorations (Western) 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 24th day of August 1965

Philip G. Hallof (per RAB)

Philip G. Hallof, Ph.D.

DWG. NO.-I.P.-2237-1

ELECTRODE CONFIGURATION

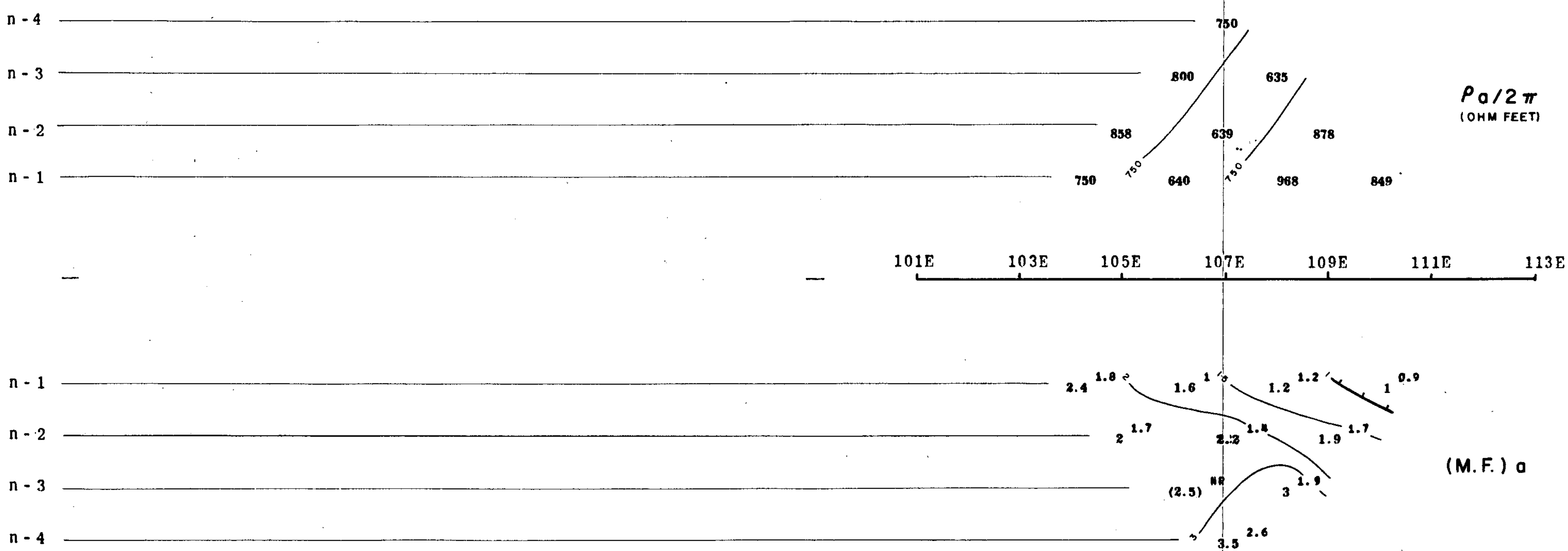
x - 200

PLOTTING POINT

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 681 MAP #2



LINE NO.-300

KENNCO EXPLORATIONS (WESTERN) LIMITED

681

GOAT and KIM CLAIM GROUPS, SPHALER CREEK AREA — LIARD M.D., B.C.

Scale — One inch = 200 Feet

NOTE: LOGARITHMIC CONTOUR INTERVAL

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCY 0.31-5 CPS

DATE SURVEYED JULY 1965

APPROVED RAB

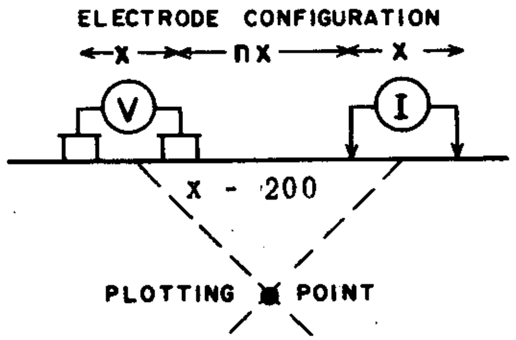
DATE Aug 25/65

McPHAR GEOPHYSICS LIMITED

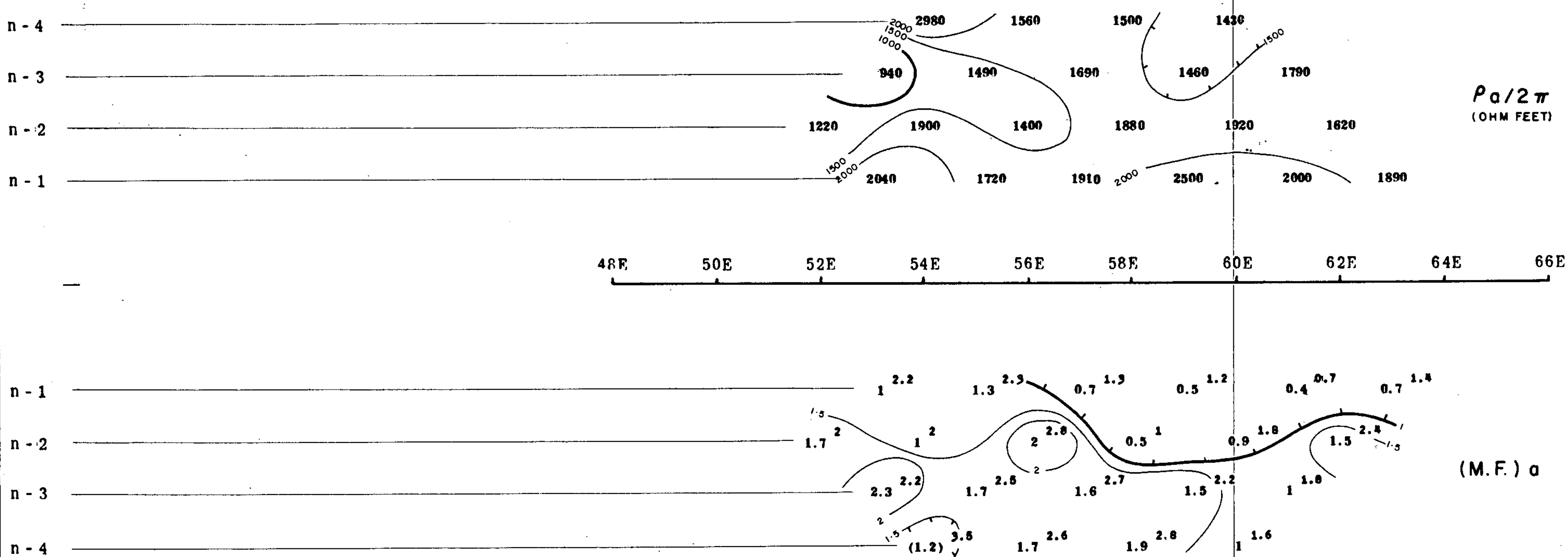
DWG. NO.-I.P.-2237-2

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 681 MAP #3



LINE NO.- 135 N

KENNCO EXPLORATIONS (WESTERN) LIMITED

GOAT and KIM CLAIM GROUPS, SPHALER CREEK AREA — LIARD M.D., B.C.

681

Scale — One inch = 200 Feet

NOTE LOGARITHMIC CONTOUR INTERVAL

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

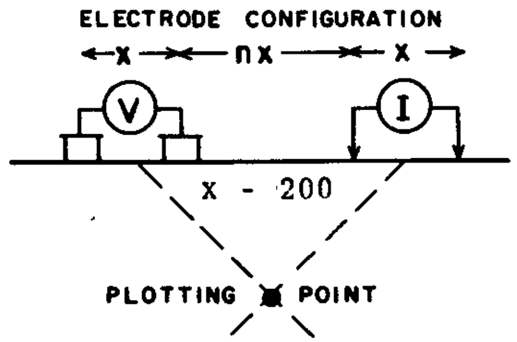
POSSIBLE

FREQUENCY 0.3 - 5 CPS

DATE SURVEYED JULY 1965

APPROVED RAB

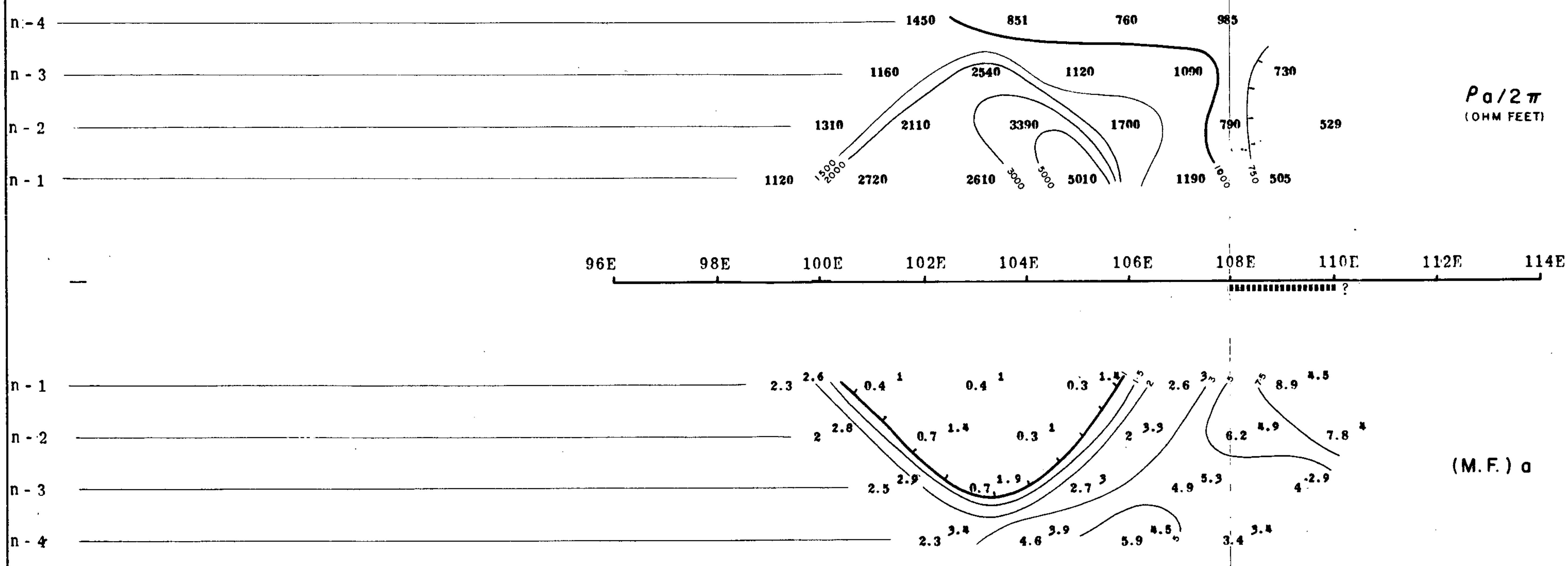
DATE Aug 25/65



McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 681 MAP #4



LINE NO.– 130 N

KENNCO EXPLORATIONS (WESTERN) LIMITED

GOAT and KIM CLAIM GROUPS, SPHALER CREEK AREA – LIARD M.D., B.C.

Scale – One inch = 200 Feet

NOTE: LOGARITHMIC CONTOUR INTERVAL

681

SURFACE PROJECTION
OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCY 0.31 - 5 CPS
DATE SURVEYED JULY 1965
APPROVED RAB
DATE Aug 25/65

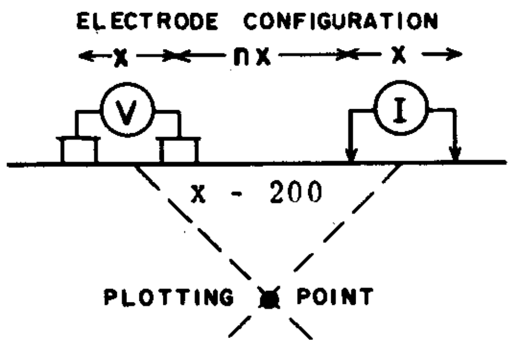
McPHAR GEOPHYSICS LIMITED

DWG. NO.-I.P.-2237-4

McPHAR GEOPHYSICS LIMITED

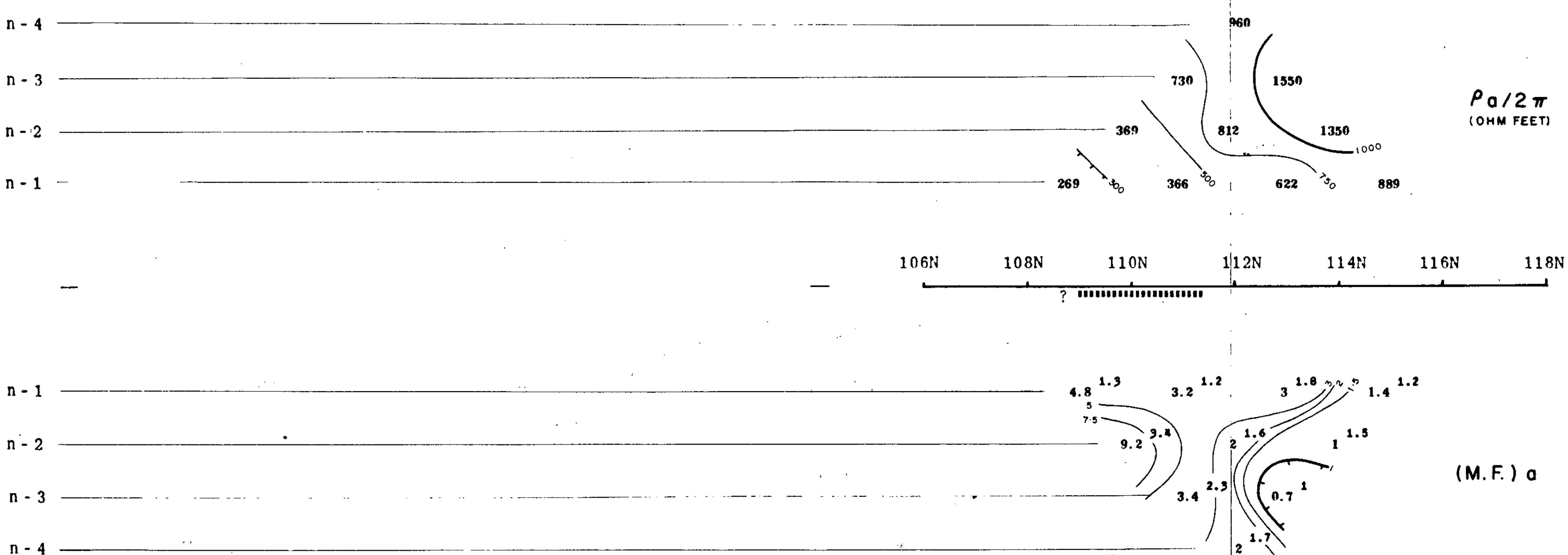
INDUCED POLARIZATION AND RESISTIVITY SURVEY

ELECTRODE CONFIGURATION



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 681 MAP #5

LINE NO.-105 E



KENNCO EXPLORATIONS (WESTERN) LIMITED

GOAT and KIM CLAIM GROUPS, SPHALER CREEK AREA - LIARD M.D., B.C.

Scale - One inch = 200 Feet

NOTE: LOGARITHMIC CONTOUR INTERVAL

681

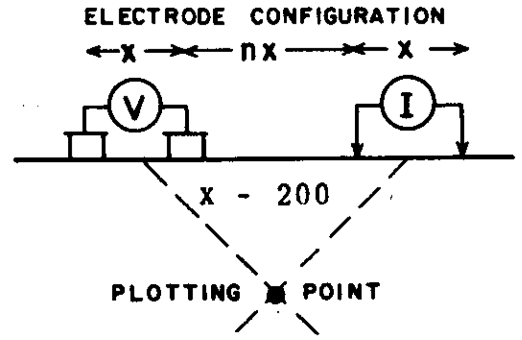
SURFACE PROJECTION
OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

FREQUENCY 0.31-5 CPS
DATE SURVEYED JULY 1965
APPROVED RA
DATE Aug 28/65

McPHAR GEOPHYSICS LIMITED

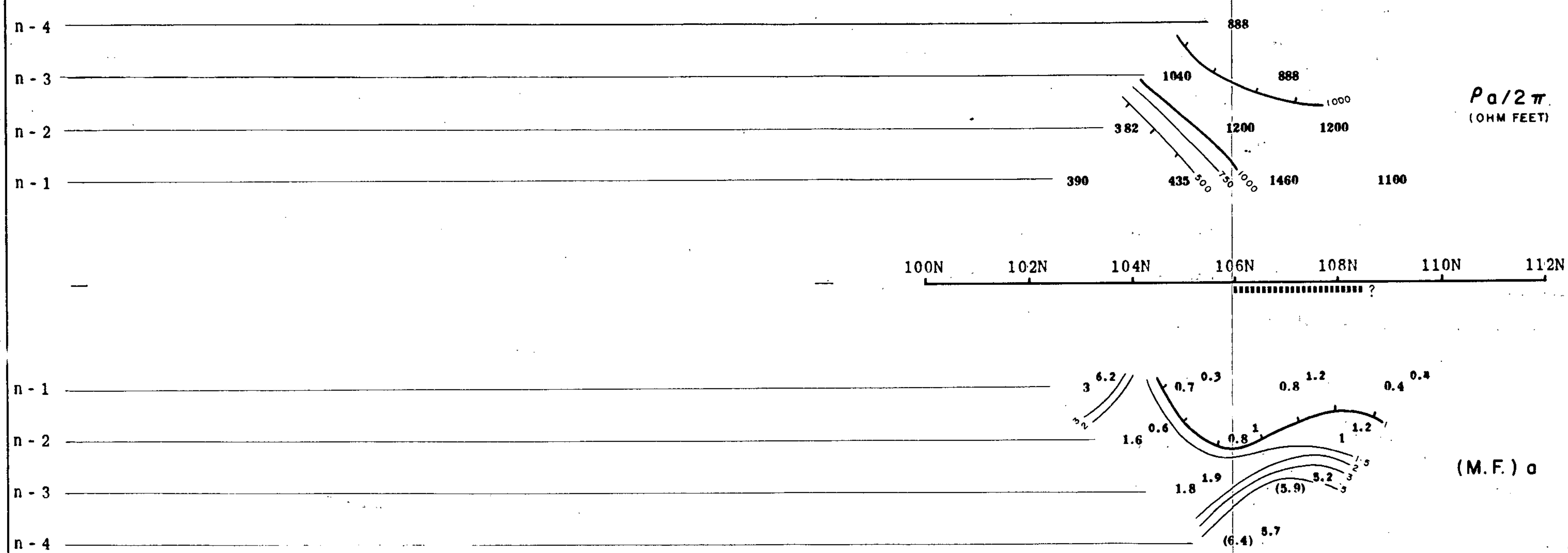
DWG. NO.-I.P.-2237-5



McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 681 MAP #6



LINE NO.- 100 E

KENNCO EXPLORATIONS (WESTERN) LIMITED

GOAT and KIM CLAIM GROUPS, SPHALER CREEK AREA – LIARD M.D., B.C.

681

Scale – One inch = 200 Feet

NOTE LOGARITHMIC CONTOUR INTERVAL

SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE

PROBABLE

POSSIBLE

FREQUENCY 0.31-5 CPS

DATE SURVEYED JULY 1965

APPROVED RAA

DATE Aug 25/65

McPHAR GEOPHYSICS LIMITED

DOMINION OF CANADA:
PROVINCE OF BRITISH COLUMBIA
TO WIT:

In the Matter of Assessment Work on the Goat 1 to 48 Mineral Claims, and Kim 1 to 10 Mineral Claims.

I, Ben A. Bradshaw, Kennco Explorations, (Western) Limited,

of Vancouver

in the Province of British Columbia, do solemnly declare that the costs incurred on assessment work on the Goat and Kim claim groups are as follows:

Wages:	A. Panteleyev	July 4-9	$ 110.46
	G. Rayner	July 4-9, July 29	172.55
	M. Sutherland	July 4-9, July 25-30	134.71
	H. Quock	July 4-9, July 25-30	163.60
	J. Williams	July 4-9, July 25-30	163.60
	R. Campbell	July 4-9, July 25-30	115.51
	R. Thompson	July 4-9	73.98
	H. Fleming	July 25-29	175.00
			$1,109.41

Contractor's Charges:			$ 657.50
Other Charges:	Bell Helicopter	10 hrs @ $99/hr	990.00
	Sikorsky S-58	2:20 hrs @ $320/hr	746.00
	Plane Charter	5 hrs @ $80/hr	400.00
	Salt	300 lbs @ 4¢	12.00
			$3,914.91

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

Declared before me at the City of Vancouver, in the Province of British Columbia, this 13 day of September 1965, A.D.

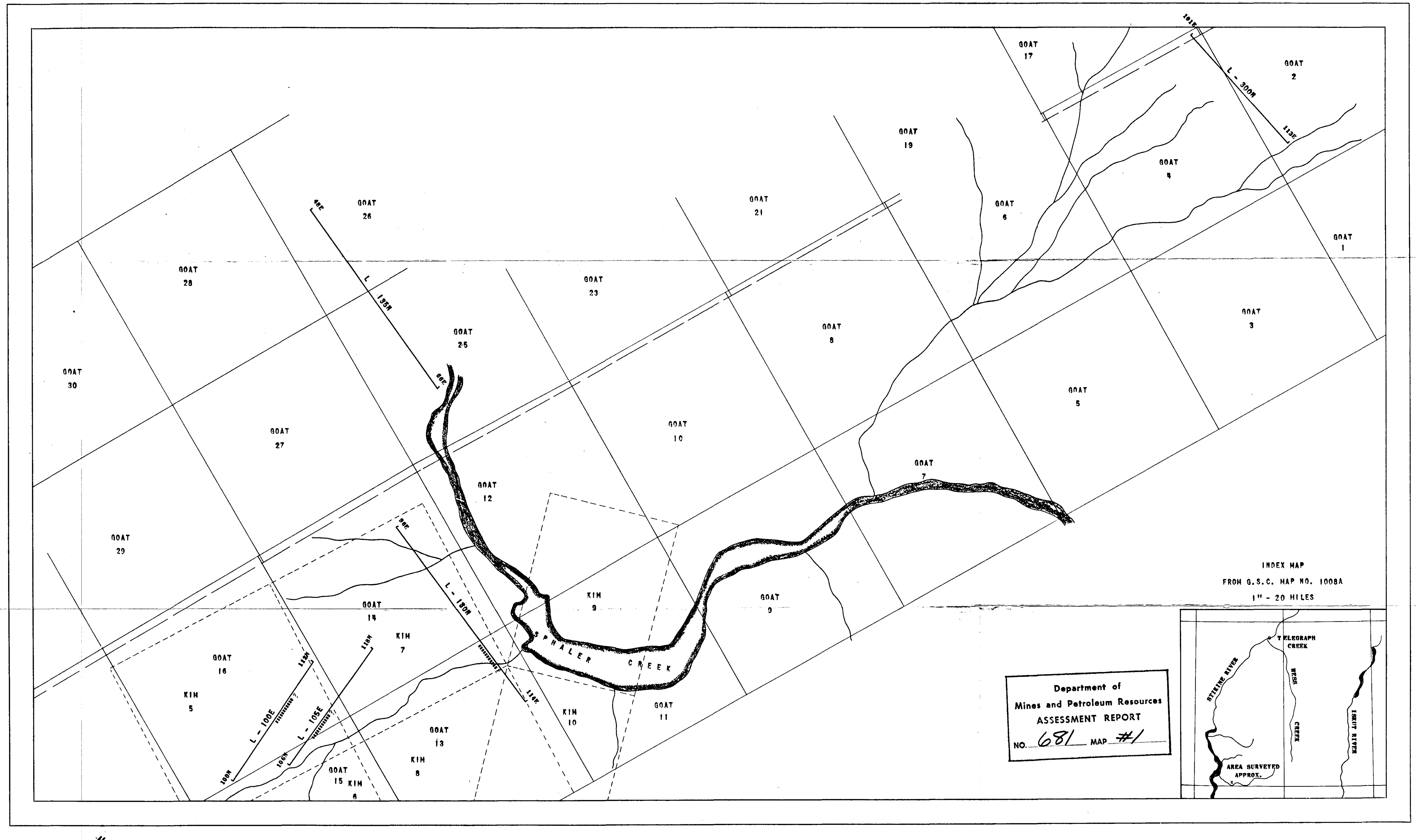
Ben A. Bradshaw

[signature]
~~A Commissioner, etc.~~
A Commissioner for taking Affidavits within British Columbia or A Notary Public in and for the Province of British Columbia.
Sub-mining Recorder

McPHAR GEOPHYSICS LIMITED

INDUCED POLARIZATION AND RESISTIVITY SURVEY

LOCATION MAP



SURFACE PROJECTION OF ANOMALOUS ZONES

DEFINITE
PROBABLE
POSSIBLE

KENNCO EXPLORATIONS (WESTERN) LIMITED

GOAT and KIM CLAIM GROUPS, SPHALER CREEK AREA — LIARD M.D., B.C.

SCALE

One Inch = Four Hundred Feet

To accompany report on Goat and Kim Groups

681 (M1)

DRAWN: F.R.P.
DATE: AUGUST, 1965
APPROVED: R.A.B.
DATE: Aug 25/65

McPHAR GEOPHYSICS LIMITED