

785

REPORT ON
INDUCED POLARIZATION SURVEY
MOE CLAIM GROUP
GRAND FORKS, BRITISH COLUMBIA
(49°, 118°, S.W.)

FOR

GRANBY MINING COMPANY LIMITED

BY

HUNTEC LIMITED
TORONTO, ONTARIO
DECEMBER, 1965

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ACCOMPANYING MAP (Map Pocket)

2 I. P. Reconnaissance: Profile Map of Chargeability
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Scale 1 inch to 200 feet

3

MOE GROUP

Scale 1 inch to 400 feet

INTRODUCTION

Between September 13th and September 21st, 1965, an Induced Polarization (I. P.) survey was carried out by Hunttec Limited for Granby Mining Company Limited. The survey area was covered by a group of 15 claims (MOE 1 to 6, 9, 10, 13, 15, 17, 22, 23, 25 FR and Bell Flower L3151) located on the southern flank of Pelly Mountain, some six miles to the northeast of Greenwood, British Columbia.

The geophysical crew was managed by P. E. Lane assisted by R. Stewart, both of Hunttec Limited. Granby Mining Company Limited provided a pool of five men from which the required helpers were drawn. The interpretation of the results of the survey and the report preparation by the writer, the drafting and the typing were carried out at the Toronto offices of Hunttec Limited.

The I. P. survey consisted of 4.28 line miles of reconnaissance work on five lines at 1000 foot intervals. Thus, a total of 118 readings were obtained along these lines at intervals of 200 feet with an electrode separation of 400 feet. In addition, Line 20+00NW was detailed with electrode separations of 100 and 200 feet, at intervals of 100 feet. The detail work added a total of 92 readings and a repetitive line mileage of 1.69 miles.

The picket lines surveyed are properly positioned on a map at a scale of 1 inch to 200 feet. The reconnaissance data are presented

as profiles along these lines using the following scales:

Apparent Chargeability data:	1 inch to 5.0 milliseconds
Apparent Resistivity data:	2 inches per logarithmic cycle, from 100 to 10,000 ohm-meters.

This map, located in the pocket at the end of this report, also shows the results of the interpretation.

The detail and the reconnaissance data obtained on Line 20+00NW and their interpretation are presented in the form of a fold-out profile located in Appendix II of this report. The same scales are used, that is, 1 inch to 200 feet for the horizontal distance, 1 inch to 5.0 milliseconds for the apparent chargeability data, and 2 inches per logarithmic cycle (500 to 10,000 ohm-meters) for the apparent resistivity data.

TECHNICAL DATA

The equipment used was a pulse-type induced polarization instrument designed and manufactured by Hunttec Limited. Power was obtained from a generator set (Serial No. 11) consisting of a gasoline motor coupled to a 400 cycle per second, three-phase generator. This power plant drove a transmitter unit (Serial No. 4) which provided a pulsed d. c. signal to the ground rated at 2.5 kw maximum. The cycling rate is 1.5 seconds "current on" and 0.5 seconds "current off", the pulses reversing continuously in polarity. The measurements were carried out with receiver unit Serial No. 2.

The data recorded in the field consist of careful measurements of the current (I) in amperes flowing through the current electrodes C_1 and C_2 , of the primary voltage (V_p) appearing between the measuring or potential electrodes P_1 and P_2 during the "current on" part of the cycle, and of the secondary voltage (V_s) appearing between the same electrodes during the "current off" part of the cycle. The apparent chargeability (M_a) in milliseconds, is calculated by dividing the secondary voltage, V_s , by the primary voltage, V_p , and multiplying by 400, which is the sampling time in milliseconds of the receiver unit. The apparent resistivity, in ohm-meters, is proportional to the ratio of the primary

voltage (V_p) to the measured current, (I), the proportionality constant depending on the geometry of the electrode array used. The resistivity and chargeability obtained are called "apparent" as they are values which that part of the earth sampled would have if it were homogeneous. As the earth sampled is usually inhomogeneous, the calculated apparent resistivity and apparent chargeability are functions of the actual resistivities and chargeabilities of the rocks and of the geometry of their distribution.

The electrode configurations used for this survey are variations of the "three-electrode array". For this array, one current electrode, C_1 , and the two potential electrodes, P_1 and P_2 , are moved in unison along the survey lines. The spacing between C_1 and P_1 is the so-called "electrode separation" which controls the depth of penetration. The second current electrode, C_2 , remains fixed and is located at an "infinite" distance from C_1 , in practice, said distance being a minimum of ten times the distance $C_1 - P_1$ or "electrode separation".

The variations in the three-electrode array occur in the distance used between P_1 and P_2 . Thus, in the reconnaissance survey the distance $P_1 - P_2$ was half the "electrode separation" of 400 feet (this array is often called the Pole-Dipole Array). In the detailed

survey of Line 20+00NW, the distance $P_1 - P_2$ was equal to the distance $C_1 - P_1$ in the case of the 200 foot electrode separation (the proper three-electrode array), and was twice the electrode separation of 100 feet in the other case. In all three variations, the calculated chargeability and resistivity data are plotted half-way between C_1 and P_1 . These variations, used for reasons of logistics in the actual carrying out of the survey, do not significantly affect the results as long as the interpreter is and remains aware of these changes.

RESULTS AND INTERPRETATION

The values of apparent resistivity vary generally between 2000 and 4000 ohm-meters with some values somewhat lower. The observed variations cannot be correlated from line to line, nor do they appear to be related to variations of the apparent chargeability values. Thus, it is probable that the apparent resistivity values are controlled mainly by changes within the overburden, and/or by changes in the thickness of the overburden. Of course, the lack of line to line correlation may be partly enhanced by the relatively large distances involved.

The apparent chargeability values indicate two definite anomalous zones over a background value of approximately 5 milli-seconds. Zone 1 is observed from 16+50NE to 30+00NE on Line 20+00NW, and from 23+00NE to 30+00NE on Line 10+00NW. The detail data of Line 20+00NW indicate that this zone is complex, possibly composed of three or more bodies at a maximum depth of 100 feet although the central portion could be somewhat deeper. There are also some indications that the apparent dip (as it would be if measured along the line irregardless of the actual strike of the body) is shallow, and to the northeast. On Line 10+00NW, where the interpretation is limited by data from one electrode spacing only, the anomaly resembles more

the central, deeper portion of Zone 1 on Line 20+00NW, as if the outer portions did not reach Line 10+00NW. It is not observed on Line 30+00NW. Zone 1 is located in the general area of an E. M. conductor located by Hans Lundberg Surveys and of an aeromagnetic anomaly (some 2000 gammas above background) mapped by Aero-magnetic Surveys Ltd. in 1956. These three different types of anomalies may be related but more definite conclusions are not possible at the present time, in part due to the uncertainty in the relative location of these anomalies, and in part due to the uncertainty in line to line correlation of the I. P. survey.

Zone 2 is observed from 22+00NE to 29+00NE on Line 40+00NW, from 39+00NE to 45+00NE on Line 30+00NW, and from 41+50NE to 47+50NE on Line 20+00NW. It is not observed on Line 10+00NW within the survey area. On Line 20+00NW, where it was detailed, Zone 2 appears to be a fairly simple, fairly broad body, at a maximum depth of 100 feet. Its apparent dip along all three lines is very shallow, in fact, most probably shallower than the 60°NE suggested for the underlying volcanic and sedimentary rocks by the geological sketch provided by the client. This shallow apparent dip, in turn, suggests at least the possibility that the true strike of the body (and of the volcanic-sedimentary series) is more east-west as indicated by

the tentative correlation between Lines 40+00NW and 30+00NW, than northwest-southeast as would be the case in the correlation between Lines 30+00NW and 20+00NW. Thus, it is possible that Zone 2 extends beyond the survey area in an easterly direction from Line 20+00NW in such a manner that it was not reached by Line 10+00NW. This tentative correlation from line to line also suggests the possibility of a fault as shown on the accompanying map. However, it must be emphasized that this line to line correlation is only one out of many different possibilities and that the correct correlation cannot be determined on the basis of the available data because of the wide line interval.

The sulphide content of Zone 1 is difficult if not impossible to evaluate due to the complexity of its anomaly. However, its maximum amplitude of over 15 milliseconds above background requires an absolute minimum of 1% sulphides or equivalent metallic minerals. It is possible that some chargeability effects may be due to the magnetite indicated by the aeromagnetic survey if the two anomalies coincide. On the other hand, the presence of an E. M. anomaly does suggest that sulphides or graphite are present.

The sulphide content of Zone 2 is estimated at 2 to 10%. Magnetite can be ruled out as no magnetic anomaly is reported in this

part of the property. Graphite is a definite possibility in view of the great strike length suggested by the tentative line to line correlation.

SUMMARY AND RECOMMENDATIONS

Two chargeable zones are outlined by the present I. P. survey. Both zones show a shallow apparent dip along the lines. Zone 1 is observed on Lines 10+00NW and 20+00NW, is complex, at a depth of 100 feet or less although possibly deeper in the center, and contains an absolute minimum of 1% sulphides.

Zone 2 is observed on Lines 20+00NW, 30+00NW and 40+00NW, is a simple body at a maximum depth of 100 feet, with between 2 and 10% sulphides.

The possibility of graphite instead of sulphides is definitely present in the case of Zone 2. Magnetite may have some chargeable effect in the case of Zone 1.

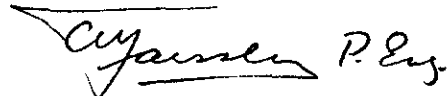
The line to line correlation as shown on the accompanying map is very uncertain due to the great line interval. Therefore, drilling at this stage must be considered as being very risky due to the uncertain definition of the areal extent of these bodies. However, as both Zones 1 and 2 warrant further investigation, a more detailed I. P. survey is recommended. Such a survey should be carried out on lines not more than 400 feet apart, preferably 200 feet, with stations at 100 foot intervals or closer. A proper drilling program can then be prepared on the basis of the new data.

If it is imperative that some drilling be carried out at this stage the best locations, on the basis of the available data, would be:

- Zone 1: 24+00NE on Line 20+00NW, or up to 200 feet to the southeast of this location.
- Zone 2: 46+00NE on Line 20+00NW.

Both drill holes may be drilled in southerly or southwesterly direction with an inclination of approximately 60° . However, it is not possible to guarantee that these drill holes will find their target and it is possible that some drill-hole search pattern may be required to establish the cause of these anomalies at this stage.

HUNTEC LIMITED



C. W. Faessler, P. Eng.,
Senior Geophysicist.

APPENDIX I

1 - Claims Surveyed

- MOE Group: all of Claims Nos. 2 to 6 inclusive, 15, 22 and 23,
and parts of Claims Nos. 1, 9, 10, 13, 17 and 25 FR.
- Bell Flower: all of Claim No. L3151.

2 - Miles Surveyed

The reconnaissance phase of the survey consists of five lines, 1000 feet apart surveyed at 200 foot intervals with a variation of the three-electrode configuration using an electrode separation of 400 feet.

The detail phase of the survey consisted in obtaining additional data on one of the reconnaissance lines with two other variations of the three-electrode configuration with electrode separations of 100 and 200 feet at intervals of 100 feet.

<u>Electrode Separation</u>	<u>Stn. Interval</u>	<u>Miles</u>	<u>Readings</u>
400 (Reconnaissance)	200	4.28	118
200 (Detail)	100	0.89	48
100 (Detail)	100	0.80	44

3 - Personnel Employed on Survey

<u>Name</u>	<u>Occupation</u>	<u>Address</u>	<u>Period</u> (1965)
P. E. Lane	Geophysicist	1450 O'Connor Dr. Toronto, Ontario	Sept. 13, 15-18, 20, 21
R. Stewart	Operator	same	Sept. 13, 15-18, 20, 21

<u>Name</u>	<u>Occupation</u>	<u>Address</u>	<u>Period (1965)</u>
J. Le Sergent	Helper	Box 172, Greenwood, B. C.	Sept. 13, 15-17 20, 21
A. Elliot	Helper	Box 190, Greenwood, B. C.	Sept. 13, 15-17 20, 21
P. Papone	Helper	Granby Mine Phoenix, B. C.	Sept. 18
K. Papone	Helper	same	Sept. 18
C. W. Faessler	Geophysicist	1450 C' Connor Dr. Toronto, Ontario	Sept. 3, 4, 6, 7
J. Wilson (Miss)	Drafting	same	Sept. 3, 6
P. Ryan (Mrs.)	Drafting	same	Oct. 19, 20, 21
L. Brunton (Mrs.)	Typing	same	Sept. 7

APPENDIX II

I. P. Profile, Detail Line 20+00NW

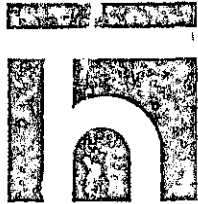
DETAILED STATEMENT OF WORK

1965

September 1	<u>Lay out base line</u>		
	2 men @ 1/2 day	74.00	37.00
	(Boyd Hardwicke, Chief Engineer, Grand Forks, B. C.) (Noel J. Kirby, Surveyor, Grand Forks, B. C.)		
2	<u>Set up Intervals along base line</u>		
	2 men @ 1/2 day		37.00
	(as above)		
1-8	<u>Slash lines</u>		
	James Forshaw Ltd. (see attached copy of invoice)		295.90
9-10	<u>Stake out lines</u>		
	2 men, 2 days		148.00
	(as above)		
13-21	<u>I/P. Survey</u>		
	Huntec Limited (see attached copy of invoice)		2,620.00
	James Forshaw Ltd. (see attached copy of invoice)		423.23
	P. Papove & K. Papove (see Appendix 1 of Huntec Report) 16 hours @ 2.90		<u>46.40</u>
			3,607.53

INVOICE

HUNTEC LIMITED



1450 O'Connor Drive, Toronto 16, Ontario, Canada.

Telephone: 751-1244

Cables: Questor

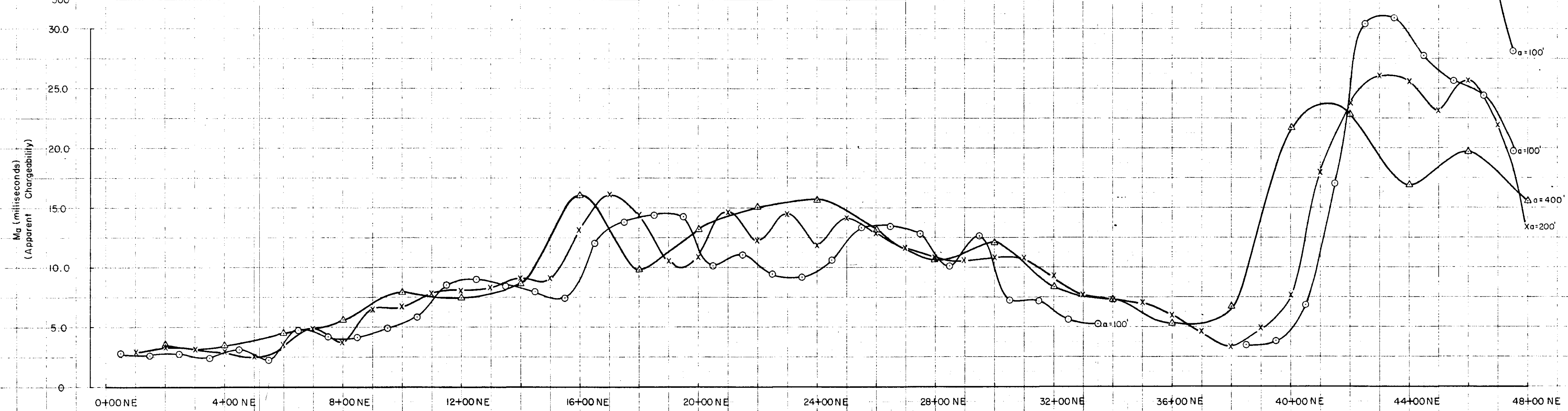
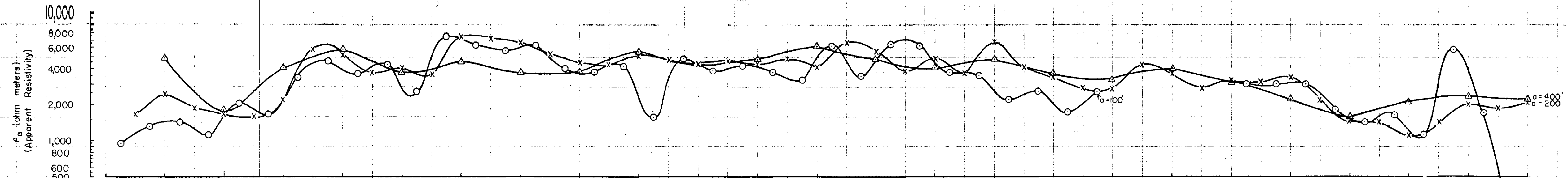
TO: Granby Mining Company Ltd.
Phoenix Copper Division
P.O. Box 490
Grand Forks, B.C.

DATE: December 30, 1965

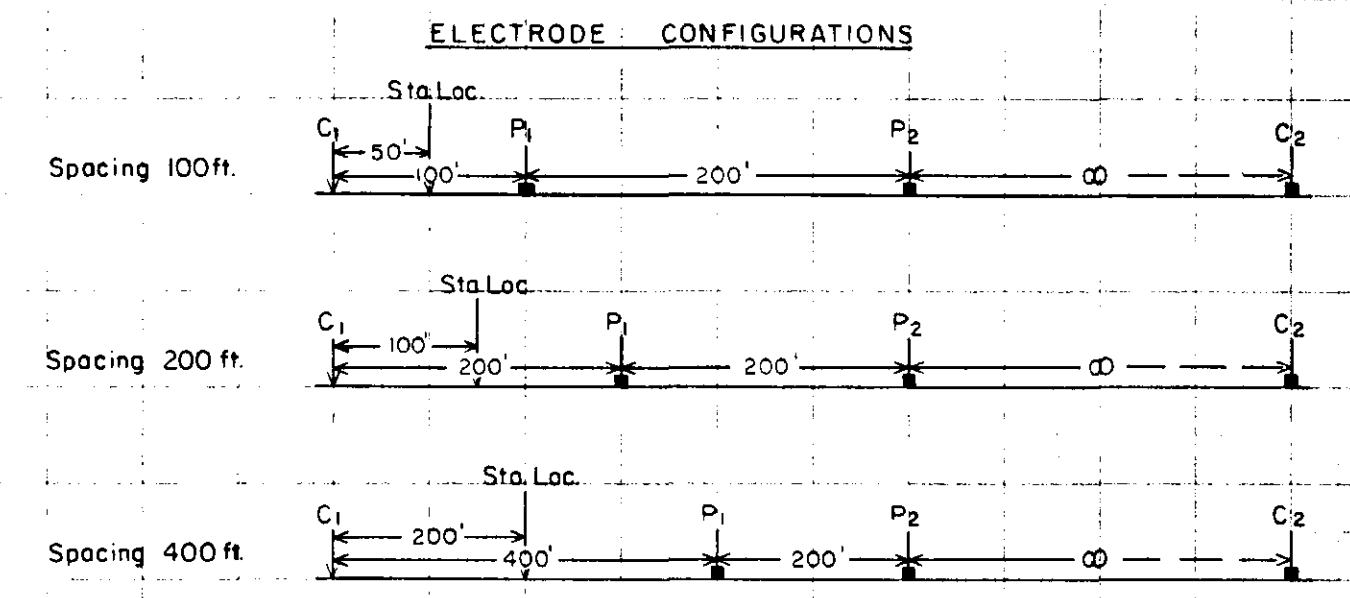
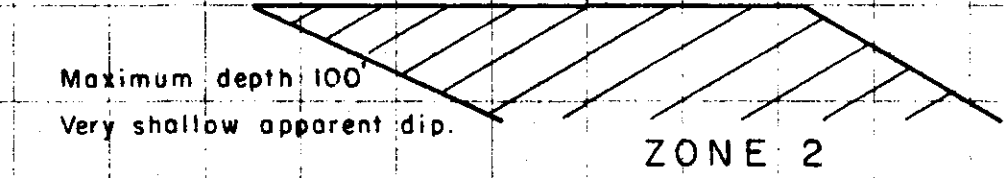
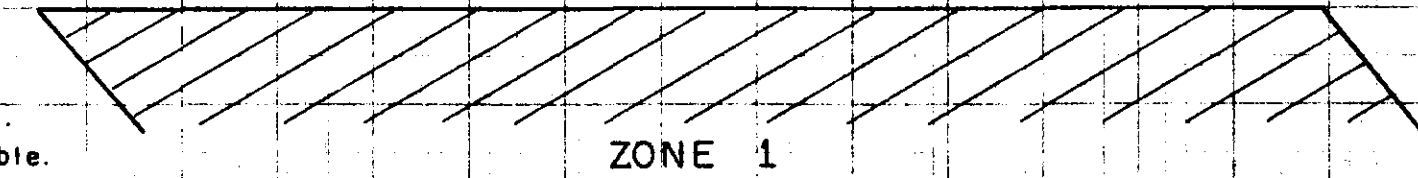
TERMS: Net 30 days

OUR ORDER NO:	OUR ACCT. NO: PH-303/65	DATE SHIPPED:	VIA:
<p style="text-align: center;">DESCRIPTION:</p> <p><u>Induced Polarization Survey - Phoenix Mine Property -</u> <u>near Greenwood, British Columbia</u></p> <p>Services of I.P. crew and equipment, interpretation and report</p> <p>Survey days - Sept. 13, 15-18, 20, 1965 6 days @ \$315.00 per day</p> <p>Standby days - Sept. 14, 1965 1 day @ \$230.00 per day</p> <p>Mobilization fee</p> <p style="text-align: right;"><i>[Handwritten Signature]</i></p> <p>e/ & o.e.</p>			<p style="text-align: center;">AMOUNT:</p> <p style="text-align: right;">\$1,890.00</p> <p style="text-align: right;">230.00</p> <p style="text-align: right;"><u>500.00</u></p> <p style="text-align: right;"><u><u>\$2,620.00</u></u></p>

INVOICE NO: N^o 1250



Very complex zone.
 Max. depth 100' (central
 sections may be deeper).
 Very shallow dip is probable.

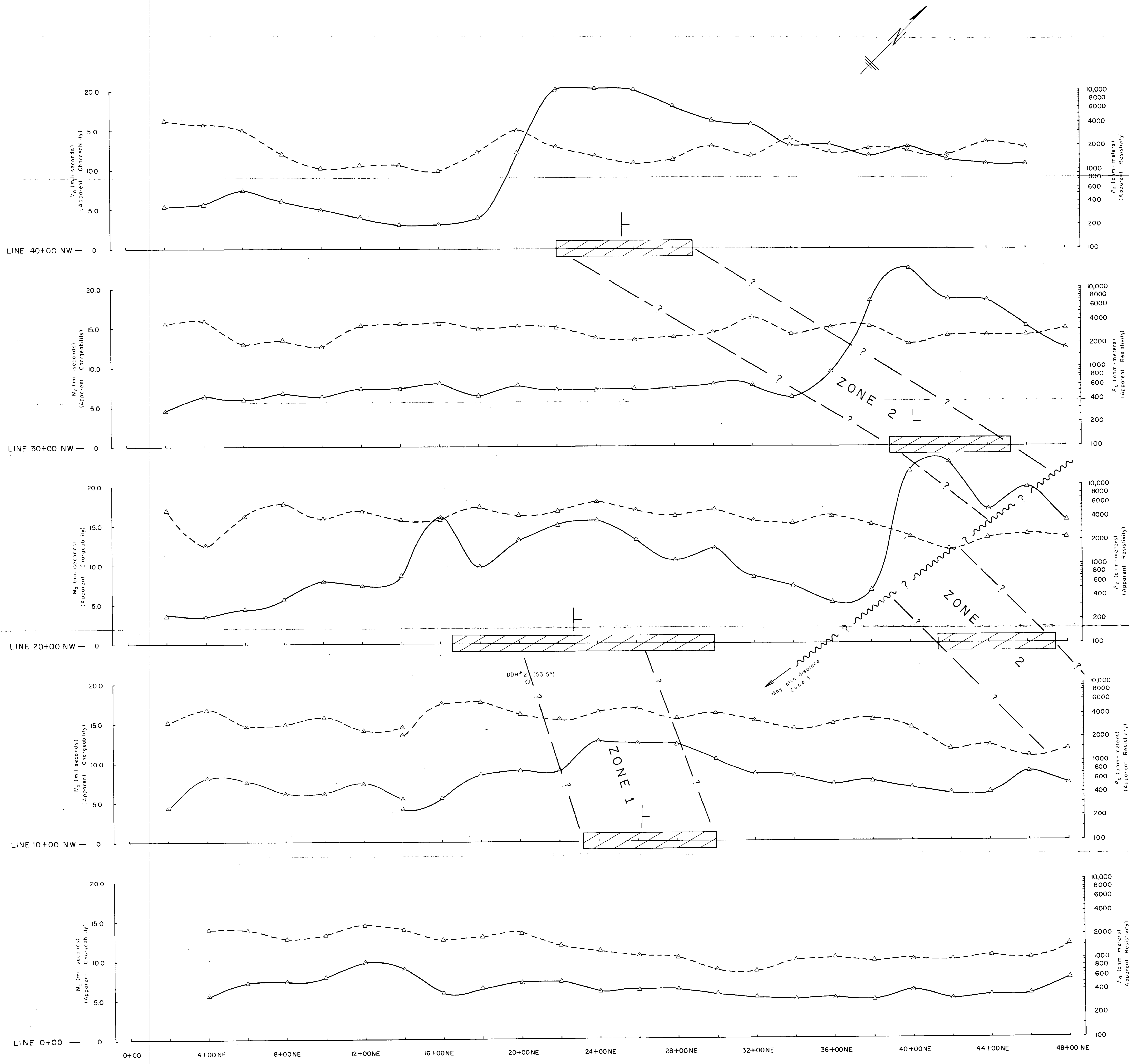


Department of
 Mines and Petroleum Resources
 ASSESSMENT REPORT
 NO. 785 MAP # 1

GRANBY MINING COMPANY LIMITED
 INDUCED POLARIZATION SURVEY
 GREENWOOD, B.C.
 DETAIL PROFILES WITH INTERPRETATION
 LINE 20+00 NW

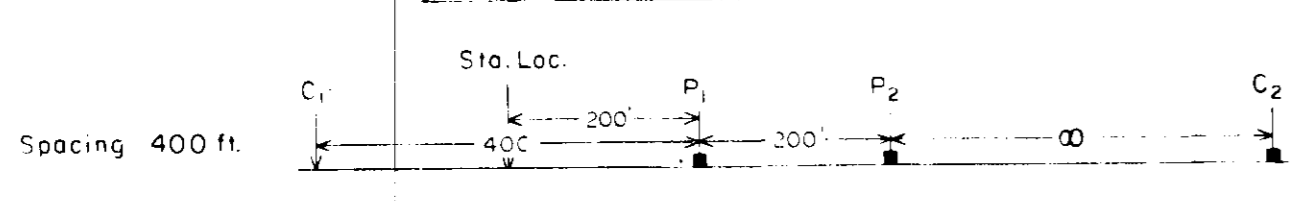
SCALES: Distance: 1 inch = 200 feet
 Chargeability: 1 inch = 5.0 milliseconds
 Resistivity: 2 inches = 1 cycle (logarithmic)

HUNTEC LIMITED, Toronto, Canada - Dec., 1965
 C. W. Foessler, P.Eng., Senior Geophysicist



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 785 MAP # 2

ELECTRODE CONFIGURATION



Note: Configuration is reversed (C₁ is to the NE) for L.0+00 and L.10+00 NW from 2+00 NE to 14+00 NE.

—△— Apparent Chargeability profile
- - -△- - - Apparent Resistivity profile

INTERPRETATION LEGEND

- Anomalous zone
- Shallow apparent dip
- Tentative line to line correlation
- Possible fault

NOTE: Line to line correlation is very uncertain due to the great (1000') line interval.

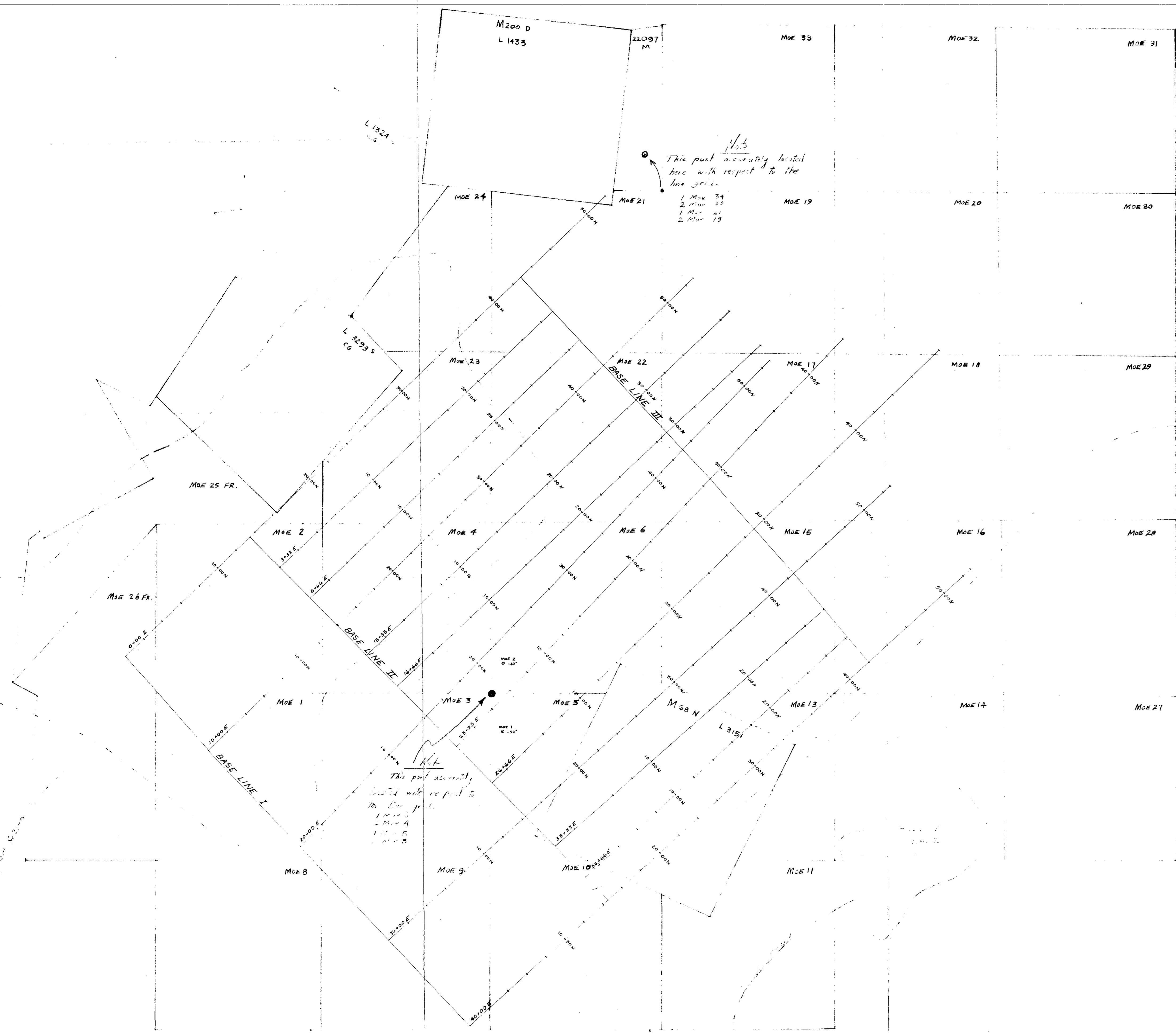
GRANBY MINING COMPANY LIMITED
INDUCED POLARIZATION SURVEY
GREENWOOD, B. C.
RECONNAISSANCE PROFILES WITH INTERPRETATION

SCALES:-
Distance: 1 inch = 200 feet
Chargeability: 1 inch = 5.0 milliseconds
Resistivity: 2 inches = 1 cycle (logarithmic)

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HUNTEC LIMITED, Toronto, Canada - December, 1965

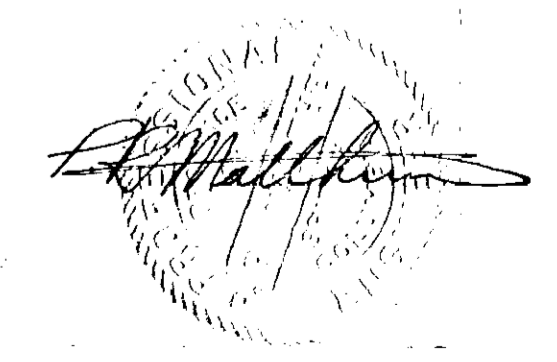
Charles P. King
C. W. Taessler, P. Eng., Senior Geophysicist



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Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 785 MAP # 3



MINES AND PETROLEUM RESOURCES
DEPARTMENT
1973
MOE GROUP
SCALE 1:400 APR 1984