REPORT ON
INDUCED POLARIZATION SURVEY
RONDAH CLAIM GROUP
($56^{o}54'$N, $125^{o}19'$W) for
TYEE LAKE RESOURCES LTD.

by PEER NORGAARD, P. ENG.

AUGUST 18-26, 1970

REPORT ON

INDUCED POLARIZATION SURVEY

FOR

TYEE LAKE RESOURCES LIMITED

ON

THE "RONDAH" CLAIM GROUP
55°, 125° NE

OMINECA MINING DIVISION

BRITISH COLUMBIA

BY

GEOTERREX LIMITED
(PROJECT 85-122)

August 18 - 26, 1970

OTTAWA, Ontario
September 1970

P. Norgaard, P.Eng.
Geophysicist.

geoterrex ltd.

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ACCOMPANYING THIS REPORT

I. INTRODUCTION

In the period from August 18 to August 26, 1970, Geoterrex Limited of 1312 Bank Street, Ottawa, Ontario, completed an induced polarization survey on the "Rondah" claim group located in the Duckling Creek area, Ominoca Mining Division, British Columbia on behalf of Tyee Lake Resources Limited of 510 West Hastings Street, Vancouver, British Columbia.

The purpose of the induced polarization survey was to map the subsurface distribution of polarizable material within an area of interest previously defined by geological and geochemical surveys.

A total of approximately 54,000 line feet of I.P. survey including detailed work was completed in the above period. The survey was carried out by G. O'Reilley, a Geoterrex staff geophysicist under the supervision of P. Norgaard, P.Eng., Senior Geophysicist with Geoterrex Limited.

II. DESCRIPTION OF THE SURVEY AREA AND CLAIMS COVERED

The "Rondah" claim group is located in the Duckling Creek Area of the Omineca Mining Division, British Columbia. The claims are situated north of Old Hogem, 100 miles northeast of Smithers and four miles west of the Uslika access road. They are at latitude 56°54'N and longitude 125°19'W. The specific claims on which induced polarization work was completed at this time are as follows:

- Rondah #3 to #8 inclusive
- Rondah #11 to #16 inclusive

The location of the survey area is shown on Figure 1 included in the Appendix to this report.

The Rondah claims are situated in an area of rugged mountains where the elevations generally range from 4500 feet to 6500 feet.

The grid layout on the claim group was supplied to Geoterrex Limited by Tyee Lake Resources Limited.

III. PERSONNEL AND TIME DISTRIBUTION

The following is a list of the Geoterrex Limited personnel necessary to the completion of the induced polarization survey including field work, compilation, interpretation of data and reporting; the listing also indicates the number of eight (8)-hour man-days spent by each person on the project:

Name and Address	No. of Man-Days	Dates 1970
G. O'Reilley, Geophysicist c/o 1312 Bank Street Ottawa, Ontario	7	Aug. 19 - Aug. 25
P. Norgaard, Geophysicist 7493 Springland Drive Ottawa, Ontario	2	Sept. 29, 30
Vinod Gupta, Geophysicist c/o 1312 Bank Street Ottawa, Ontario	2	Sept. 16, 17
Patric Volard, Operator S.S. #1 Kimberly, B.C.	7	Aug. 19 - Aug. 25
D. McLarty, Helper c/o 1312 Bank Street Ottawa, Ontario	7	Aug. 19 - Aug. 25
R. Dufour, Draftsman 394 Donald Street Ottawa, Ontario	4	Sept. 2, 3, 4, 24
Total of Man-Days	29	

IV. SURVEY INSTRUMENTS

Direct current, pulse-type induced polarization equipment was employed for the survey.

The I.P. receiver is of Newmont design and manufactured by Scintrex Limited, Concord, Ontario. The receiver has the integration time constant adjusted to give readings of apparent chargeability equivalent to those with a timing cycle of 3:3:1 in spite of the fact that it actually operates on a timing cycle of 2:2:0.65 (current "off" time, secs., current "on" time, secs., integration time, secs.).

The transmitter and motor-generator set are manufactured by Huntec Limited, Toronto, Ontario. A power supply and a transmitter of 2.5 kilowatt rating were used for the present survey.

Detailed specifications for the instruments are enclosed in the Appendix to this report.

V. SURVEY PROCEDURE

V.1 Survey Procedure:

The induced polarization survey was completed using the pole-dipole electrode configuration which is illustrated in Figure 2 in the Appendix to this report. The pole-dipole array is known as the equispaced three array when the three moving electrodes are spaced equidistant along the survey line for a particular reading.

For the reconnaissance coverage of the area, most of the lines were covered using a dipole length of 200 feet and a pole-dipole separation of 400 feet; in this case the reading interval was 200 feet.

Lines 0 and 45 were covered using a dipole length of 100 feet and a pole-dipole separation of 200 feet; the reading interval along the line was 100 feet.

For purposes of better definition of causative bodies and interpretation of anomalies, detailed work was completed on selected sections of lines using various dipole lengths with various pole-dipole separations. For the detailed work the reading interval along a section of line was never larger than the dipole length employed.

V.2 Data Observed:

The field measurements taken are as follows:

i) The applied current, Ia, flowing through the two current electrodes.

ii) The primary voltage, Vp, which exists between the potential electrodes while the current is flowing.

iii) The apparent chargeability, Ma, which is the I.P. effect noted for one complete cycle; i.e. for two current pulses applied in opposite directions.

V.3 Data Reduction:

The apparent chargeability, Ma, in milliseconds or millivolt-seconds per volt is read directly on the Newmont type I.P. receiver. As mentioned earlier in this report, the chargeability is measured for a complete cycle rather than per single pulse.

From the observations of primary voltage, Vp, and the applied current, Ia, the apparent resistivity is calculated at each station as follows:

$$\rho a = \frac{Vp}{Ia} \cdot K$$

Where ρa is the apparent resistivity in ohm meters
Vp is the primary voltage in volts
Ia is the applied current in amps
K is a constant dependent on the array geometry

VI. DATA PRESENTATION

The apparent chargeability and apparent resistivity data are presented in profile form on plates 1 and 2 accompanying this report at a horizontal scale of 1 inch = 200 feet. Please note that for the sake of clarity of presentation of the results, the lines are not spaced to scale on the profile plots. The chargeability results are plotted at a scale of 1 inch = 10 milliseconds and the resistivities at a logarithmic scale as shown.

The reconnaissance chargeability values are also presented in contoured form on plate 3 at a scale of 1 inch = 200 feet and a contour interval of 5.0 milliseconds. As this chargeability data was obtained with two different electrode spacings the contours are "broken" and the results from lines 0 and 45 are contoured separately.

VII. DISCUSSION OF RESULTS

To aid in the interpretation of the induced polarization survey data, Tyee Lake Resources Limited made available to Geoterrex the results of a ground magnetic survey completed over the greater part of the grid as well as reports by Woodcock (1970) and Lammle (1970) which describe the local geology, and results of geochemical studies in the area.

Three anomalous zones were noted during the present induced polarization survey; the distribution of these zones is best described on the chargeability contour plan on plate 3 accompanying this report. The three zones which have been designated zones A, B and C for easy reference, will be discussed in turn below:

Zone A:

The most spectacular of the three anomalies is zone A which has a chargeability peak of 98.0 milliseconds at the base line on line 12S. This zone is located on the eastern contact between the Hogem Batholith and the Takla Group volcanic rocks which in this area are chiefly basalts. The volcanics have been pyritized along the contact with the batholith and in the region of this I.P. anomaly the alteration related to this contact has associated chalcopyrite and magnetite which has been located in float consisting mainly of mineralized basaltic rock (Woodcock, Lammle).

If along this mineralized contact there is a relationship between the chalcopyrite and magnetite mineralization, then the combination of magnetic data and induced polarization survey results could form the basis for selection of possible target areas within the extensive I.P. anomaly which is to be expected in a pyritized zone such as exists here (Woodcock).

Zone A is open towards the south off the present grid but terminates abruptly towards the north somewhere near line 0. Lammle reports the possible existence of "right lateral faulting" between lines 0 and 4N which could explain this sudden "cut-off". A careful examination of the magnetic data confirms the presence of a cross cutting structure here which interrupts and offsets the northwest, southeast striking magnetic trends in this area. A second parallel structure is indicated between lines 12S and 16S by offsets in the magnetic trends.

Zone A has a well defined associated magnetic anomaly on lines 8S and 12S which would make this area of prime interest if there happens to be any relationship between the presence of the magnetite and the disseminated chalcopyrite. It is in this region that most of the mineralized float containing chalcopyrite has been located.

Zone A is also related to a general resistivity "high" which probably reflects the altered zone along the contact since such a change in the apparent resistivity generally is related to a geological change unless it can be associated with a decrease in the thickness of overburden.

Detailed I.P. work was completed across the width of the chargeability anomaly on line 8S for purposes of interpretation of the anomaly here and with the aim of locating drill holes in the event subsequent drilling of the zone is undertaken. Some detailed work was also completed on zone A on line 20S but the line does not extend far enough towards grid west to traverse the zone completely.

On line 8S the zone was traversed using the equi-spaced three electrode array and electrode spacings of 50 ft., 100 ft., and 200 ft. The greatest concentration of polarized material is located between station 1+00W and station 4+00E; the batholith-volcanics contact is mapped at station 1+00W on this line. A magnetic anomaly of 4200 gammas above a background of about 1000 gammas falls within the limits of the core of the I.P. anomaly as defined by the chargeability results obtained using the 50 ft. electrode spacing; the magnetic anomaly peak is located at the base line. Two chargeability anomaly peaks were noted within the anomalous zone in the course of doing the small electrode spacing survey namely at 0+25W and 2+25W. Considering that the magnetometer survey was conducted on the basis of 100 ft. station intervals it is quite possible to have direct correlation between the magnetic anomaly peak of 4200 gammas and the chargeability anomaly peak noted at 0+25W.

A depth of cover of about 25 ft. over source material of a concentration of 4% - 8% average by volume are solutions which fit the results obtained on this line.

An analysis of the magnetic anomaly located at the mapped position of the geological contact here yields possible solutions of subsurface depths to the top of the source material of 30 ft. - 50 ft. and a width of about 100 ft. The susceptibility is in the order of 0.013 cgs units which is roughly equivalent to 4% to 5% of magnetite by volume. Such a volume of magnetite is normally not expected to yield a chargeability anomaly of the amplitude noted here but it would certainly contribute to the total volume of polarizable material present with the results that the percentage by volume of metallic sulphide probably is less than 4% - 8% by volume as noted above.

Magnetic anomaly peaks of 4200 gammas at the base-line and 3850 gammas at station 3+00E on line 12S both fall within the chargeability anomaly obtained here by the reconnaissance survey coverage; no detailed I.P. work was completed on this line.

The detailed work completed on line 20S locates the source of the 69.0 millisecond anomaly peak between 3+00W and 4+50W. A depth of cover of 35 ft. over source material of a concentration of 3% - 6% average by volume would fit the chargeability results obtained here. The presence of magnetite is suggested by the magnetic anomaly peak of 2500 gammas at 4+00W. The I.P. survey on this line does not cover the complete width of zone A as the readings obtained at the extreme west end of the line are still anomalous. Abundant pyrite and some magnetite are noted on the geological map in this vicinity (Lammle).

For the purpose of checking the source material of zone A it is suggested that drilling be carried out on the basis of the results obtained on line 8S where the chargeability anomaly peak locations have been specified along with the corresponding calculated depth of cover. Both the magnetic and I.P. results indicate apparently vertically dipping source material.

Zone B:

This chargeability anomaly is located on the east central boundary of the Rondah Claim Group. It was noted on line 4S and the east extension of lines 0 and 4N. The zone is open towards the north but terminates towards the south between lines 4S and 8S. Since the main part of the anomaly is located outside the claim boundary, there is no magnetic coverage over the zone. Disseminated pyrite in basalt has been mapped near the zone between lines 4N and 8N so this should be a suspected cause of the I.P. anomaly.

Detailed I.P. work which was completed across the zone on line 4N locates the anomaly axis at 24+25E where a single anomaly peak was obtained using the 50 ft. equispaced three array electrode configuration. A depth of cover of about 35 ft. over source material of a concentration of 3% - 5% average by volume could yield the type of chargeability response noted here.

The geological map of the claim group (Lammle) suggests that zone B might be located within the volcanics near the batholith contact which here is displaced from the contact position near zone A by possible faulting.

Zone C:

Zone C was noted on line 28S only and is open towards the south, but terminates towards the north between lines 24S and 28S. Detailed work was completed over the zone on line 28S where the axis of the anomaly coincides with outcropping basalt containing 5% - 10% pyrite, some magnetite and a trace of chalcopyrite (Lammle).

The detailed work completed using the 50 ft. electrode spacing located the apparent chargeability peak of 68.0 milliseconds at 6+75E. The type of response noted here using the various electrode spacings (50 ft., 100 ft., 200 ft.) suggests that the polarized material comes to surface (which fits the correlating outcropping - mineralization) and that the depth to the centre of the anomaly source is in the order of 100 ft. - 150 ft. The dip of the source material appears to be near vertical.

VIII. CONCLUSION

The present I.P. survey has located three distinct apparent chargeability anomalies caused by the presence of polarizable material located at or near surface. Disseminated pyrite is abundant within the areas of the anomalous zones but in addition, chalcopyrite and magnetite have been located in float and in outcrop near the axis of Zone A in the vicinity of lines 8S and 12S. Considering that there might be a relationship between the magnetite and the copper mineralization, the magnetic data can serve as a guide to define local areas of interest within the vast chargeability anomaly caused by the abundant pyrite mineralization.

For Zone A the correlating magnetic anomalies with magnetic material located at about the same depth as the source material for the chargeability anomaly indicate that the higher chargeabilities are (besides pyrite) caused at least in part by disseminated magnetite.

To check the source of the most interesting section of Zone A drilling is suggested on line 8S where information for positioning drill holes has been provided.

Respectfully submitted,

V. Gupta

V. Gupta, M.Sc.,
Geophysicist.

P. Norgaard, P.Eng.,
Geophysicist.

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
P. NORGAARD

Expiry Date: November 26, 1970

geoterrex ltd.

INSTRUMENT SPECIFICATIONS

1. RECEIVER:

Electrical -

Primary Voltage Range	300 microvolts to 30V Accuracy ± 3%
Input Impedance	300 K ohms
Chargeability (M) Reading Range	0-100 and 0-3 milliseconds Accuracy ± 5%
Curve Factor (L) Reading Range	0-100 and 0-300 milliseconds Accuracy ± 5%
Delay Time Before Integration	0.45 seconds
SP and VLF Noise Compensation	Manual: ± 1.5 millivolts Automatic: 1mV range ± mV total 30 mV range ± IV total
Power Supply	Internal rechargeable nickel cadmium batteries. Rated life 45 hours/charge
Temperature Range	-20° to 130°F (-29°C to +50°C)
Humidity Range	to 100% non-condensing

Note: A time reference signal is remotely obtained from the received primary signal to give coherent detection.

Automatic SP corrections are applied during each reading period using a memory circuit.

Mechanical -

Weight	13½ lbs. (6.1 kg) including batteries
Dimensions	14" x 11" x 6½" (35.5 cm x 28 cm x 16.5 cm)

INDUCED POLARIZATION TRANSMITTER:

2.5 kw System -

This system delivers 2500 watts to the ground, but is still portable by a 3-man crew. Typical penetration is about 1200 to 1500 feet. The 2.5 kw transmitter is essentially the same as the 7.5 kw transmitter with the exception of the following specifications:

Output	300-5000 volts DC in 8 steps 3 amps maximum
Input	3 phase 400 cps 115 volt 2.75 KVA
Output	2 ranges
Current Meter	0-1.5 amps and 0-3 amps $\pm$ 2%
Dummy Load	2 Level - 1750 watts and 500 watts
Size	21" x 17" x 11½" (53.1 cm x 43.2 cm x 29.2 cm)
Weight	Console 50 lbs (22.7 kg) Shipping weight 75 lbs (34.0 kg)

MOTOR GENERATOR SET

Output	2.75 KW 120 volts 400 cycle 3 phase 13.8 amps/phase
Engine	Brill and Stratton 6 HP at 3600 RPM
Fuel	Capacity: 0.92 Imperial Gals. (4.1 litres) Consumption: Approx. 1.2 lbx/KWH (.5 kg/KWH)
Alternator	6000 RPM Belt Driven. Sealed bearing, rotating field.

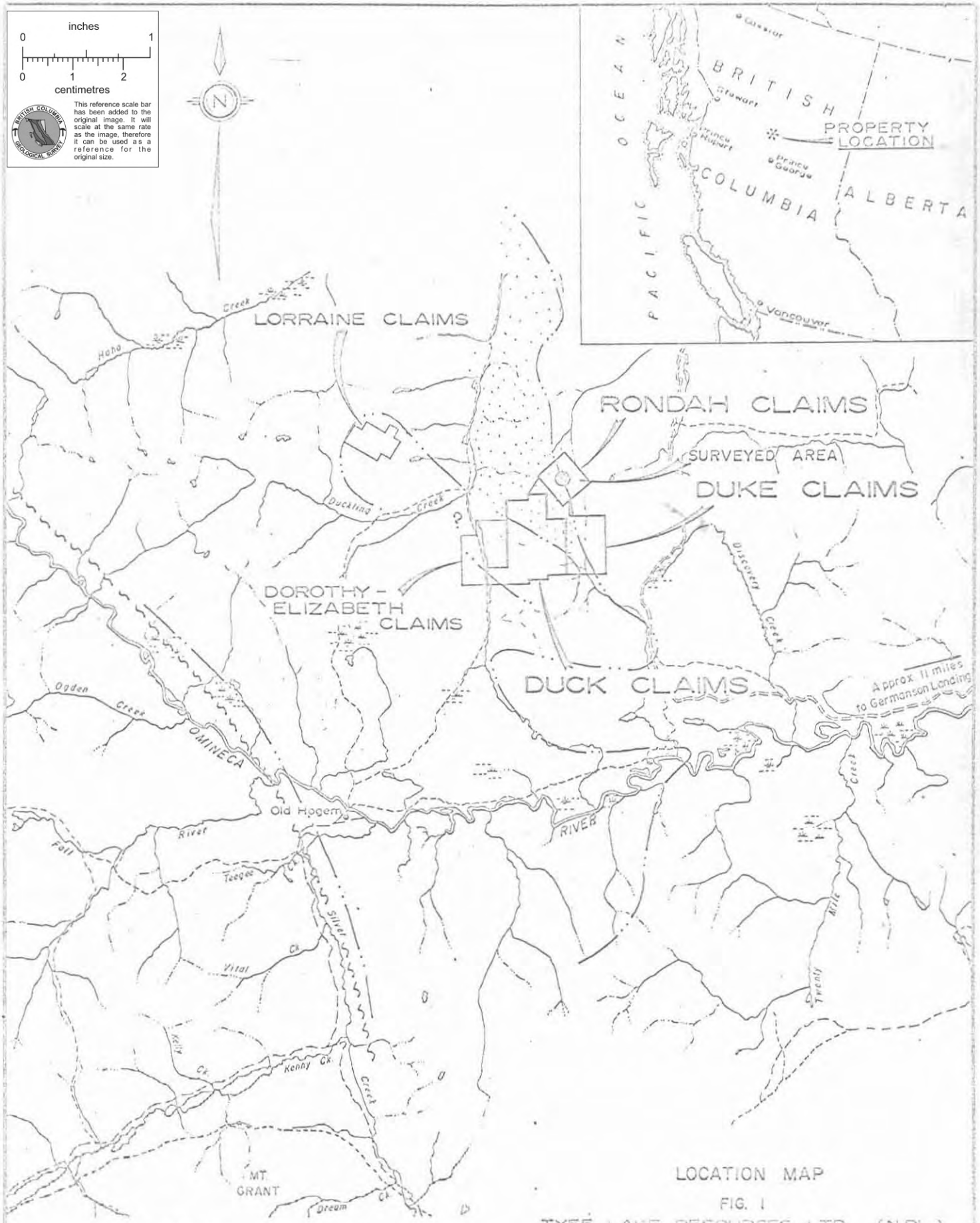
Motor Generator Set (Cont'd)

Voltage	Huntec static SCR type regulator. Dismounted and connected to alternator by cable and plug. Regulation ± 3%
Construction	Resiliently mounted in protective carrying frame.
Size	30" x 18½" x 21" (76.2 cm. x 47.0 cm x 53.0 cm)
Weight	Operational: 90 lbs (40.8 kg.) Shipping: 150 lbs (68.0 kg.)

REFERENCES

Woodcock, J.R., 1970, The Duckling Creek Properties
Unpublished geological report,
Tyee Lake Resources Limited, Vancouver, B.C.

Lammle, C.A.P., 1970, Reconnaissance geology and geochemistry Duck and Rondah claims 93N14 Omineca M.D., B.C., Unpublished report,
Tyee Lake Resources Limited, Vancouver,
B.C.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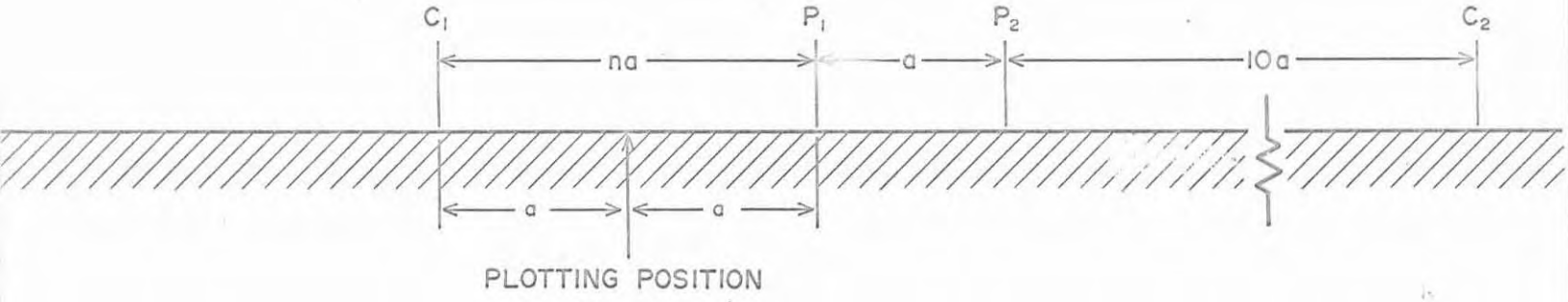
N
OCEAN
PACIFIC
BRITISH
COLUMBIA
ALBERTA
PROPERTY LOCATION
Stewart
Prince Rupert
Prince George
Vancouver
LORRAINE CLAIMS
RONDAH CLAIMS
SURVEYED AREA
DUKE CLAIMS
DUCK CLAIMS
DOROTHY - ELIZABETH CLAIMS
Approx 11 miles to Germanson Landing
Duckling Creek
Discovery Creek
Ogden Creek
OMINECA
Old Hogem
Fall River
Teegee
Silver
Vital Ck
Kelly Ck
Kenny Ck
Creek
MT. GRANT
Dream Ck
RIVER
Twenty Mile Creek
LEGEND
Syenite Complex
Granodiorite ; Syenodiorite
Nicola - Takla
LOCATION MAP
FIG. 1
TYEE LAKE RESOURCES LTD (N.PL.)
DUCKLING CREEK AREA
OMINECA M.D.
GENERAL GEOLOGY
Data largley from J.E. Armstrong, G.S.C. Memoir 252
SCALE APPROX. 1"= 4 Miles
Miles 5
0
5 Miles
August, 1970

POLE-DIPOLE ELECTRODE ARRAY



EQUISPACED THREE ELECTRODE ARRAY

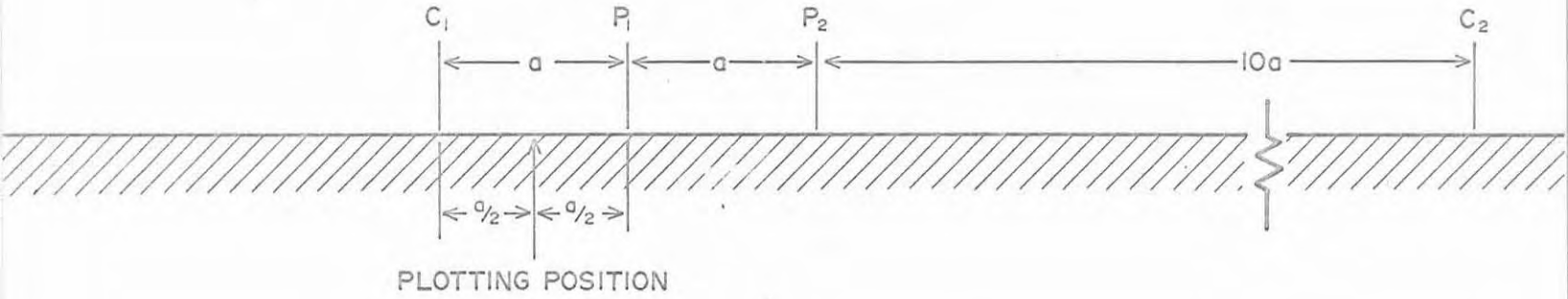
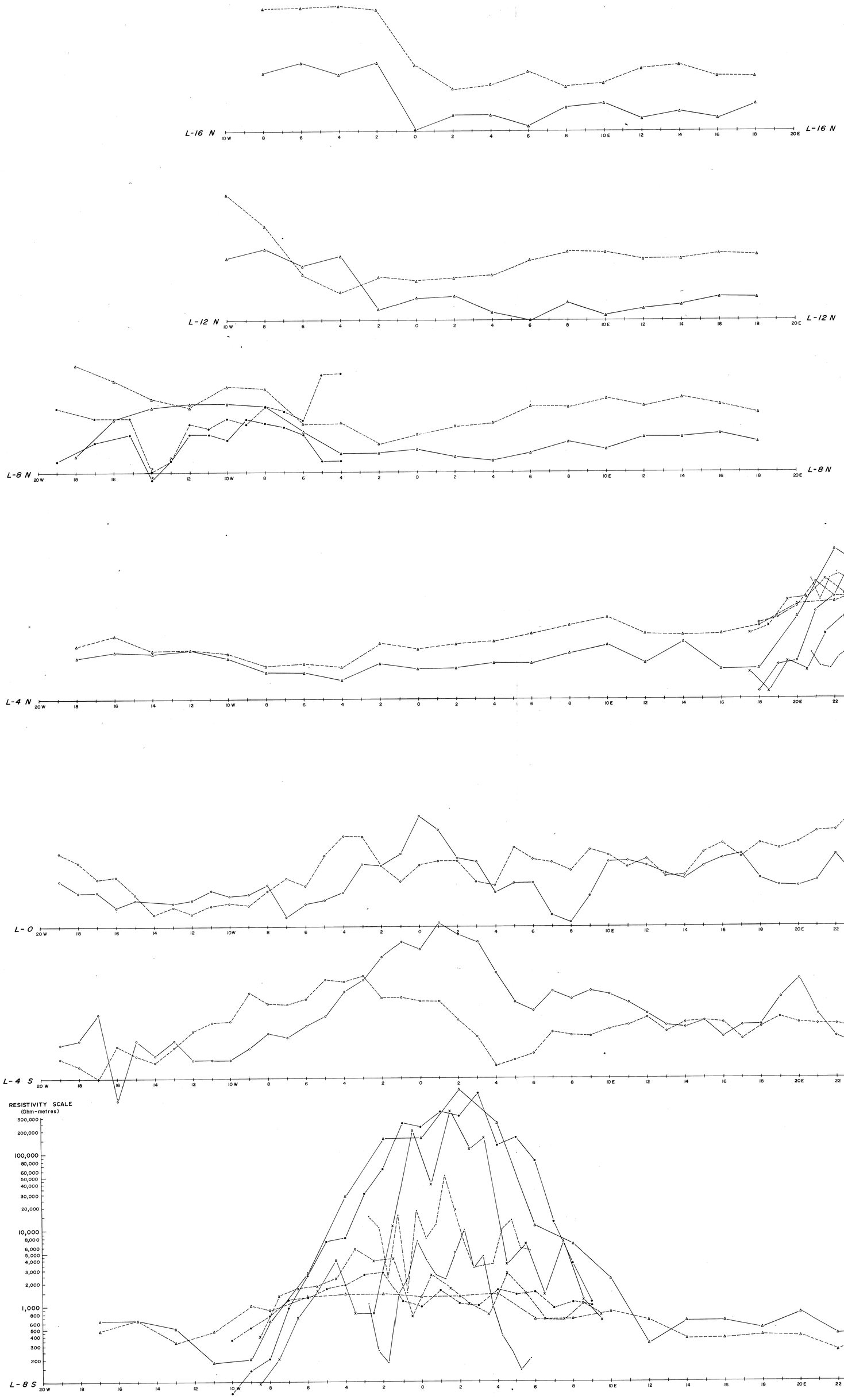


FIG: 2 POLE-DIPOLE ELECTRODE CONFIGURATIONS.



INDUCED POLARIZATION SURVEY

FOR

TYEE LAKE RESOURCES LTD.

ON

THE RONDAH CLAIM GROUP

OMINECA MINING DIVISION
BRITISH COLUMBIA

PLATE I

PROFILE PLAN

85 - 122

SCALES

HORIZONTAL . . . . . 1 INCH = 200 FEET

APPARENT CHARGEABILITY . . . 1 INCH = 10 MILLISECONDS

APPARENT RESISTIVITY . . . . . LOGARITHMIC AS SHOWN

NOTE : LINES ARE NOT SPACED TO SCALE

LEGEND

APPARENT CHARGEABILITY — APPARENT RESISTIVITY

a = 50'
n = 1

a = 100'
n = 1
n = 2

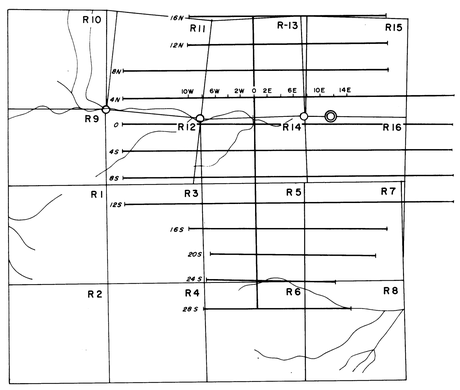
a = 200'
n = 1
n = 2

ELECTRODE CONFIGURATION . . . . POLE DIPOLE . . . C1 ↓ na — P1 ↓ P2 ↓ a

EFFECTIVE DC PULSE I.P. TIMING SEQUENSE . . . 3 : 3 : 1
ON OFF INTERGRATION

LOCATION MAP

SCALE . . . . . 1" = 1000'
(R STANDS FOR RONDAH)



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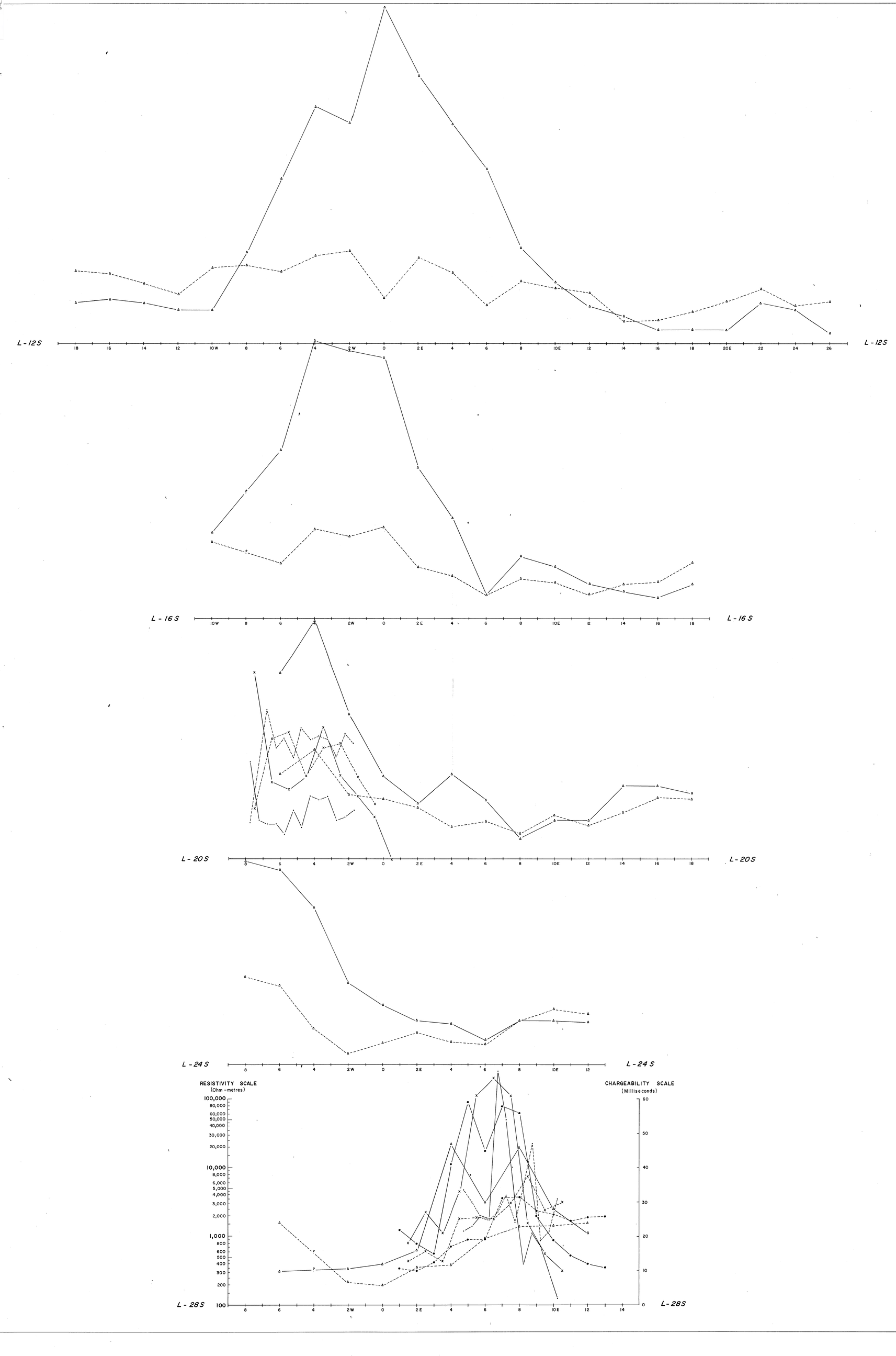


INDUCED POLARIZATION SURVEY

FOR

TYEE LAKE RESOURCES LTD.

ON

THE RONDAH CLAIM GROUP

OMINECA MINING DIVISION
BRITISH COLUMBIA

PLATE 2

PROFILE PLAN

85 - 122

SCALES

HORIZONTAL . . . . . 1 INCH = 200 FEET

APPARENT CHARGEABILITY . . . . 1 INCH = 10 MILLISECONDS

APPARENT RESISTIVITY . . . . . LOGARITHMIC AS SHOWN

NOTE: LINES ARE NOT SPACED TO SCALE

LEGEND

APPARENT CHARGEABILITY APPARENT RESISTIVITY

a = 50'
n = 1

a = 100'
n = 1
n = 2

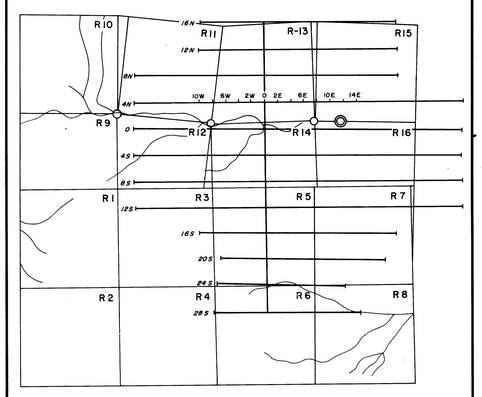
a = 200'
n = 1
n = 2

ELECTRODE CONFIGURATION . . . . POLE-DIPOLE . . . C1 ↓ na · P1 P2 a

EFFECTIVE D.C. PULSE I.P. TIMING SEQUENSE . . . 3 : 3 : 1
ON OFF INTERGRATION

LOCATION MAP

SCALE . . . . . 1" = 1000'
(R STANDS FOR RONDAH)



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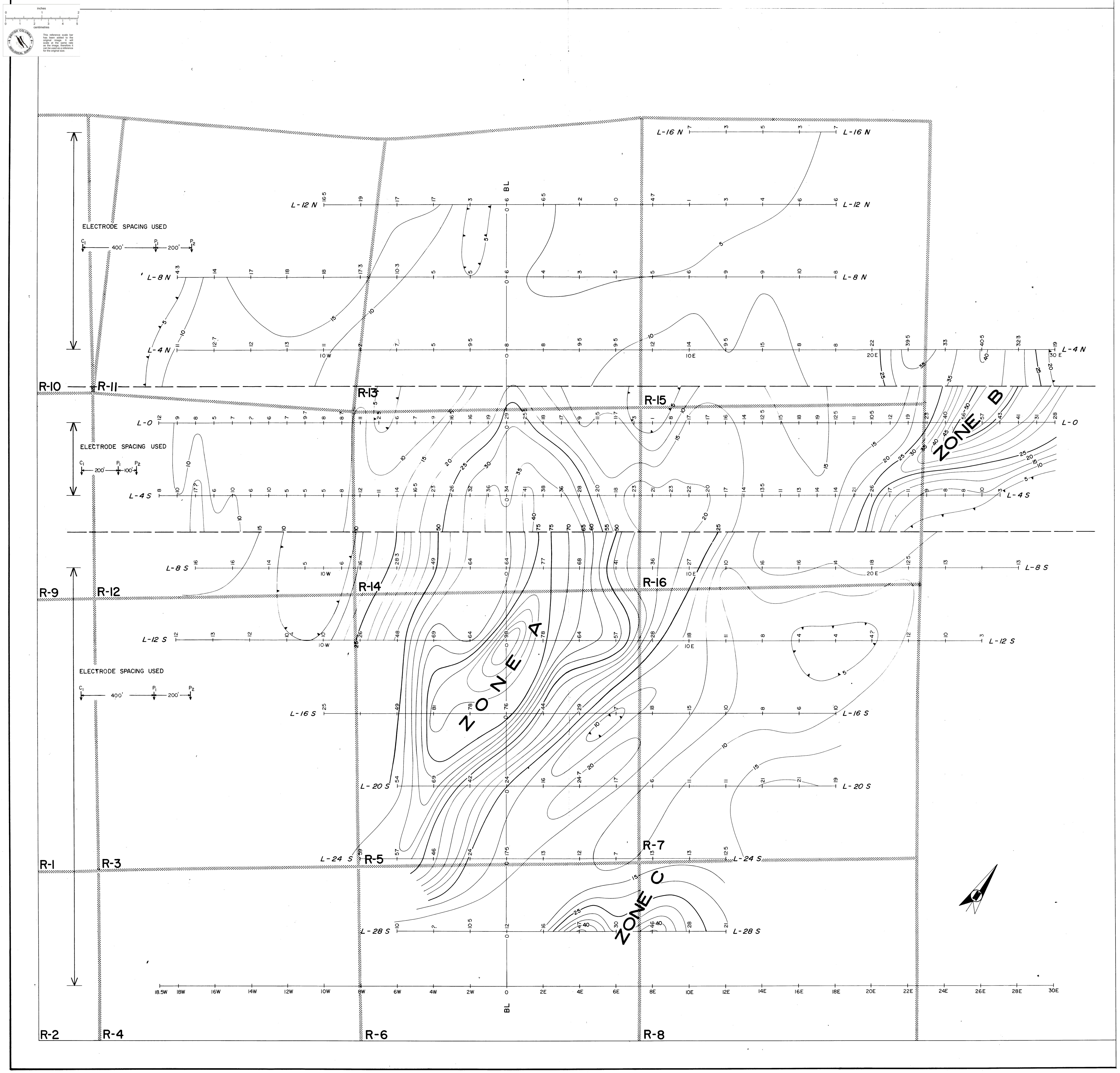


INDUCED POLARIZATION SURVEY

FOR

TYEE LAKE RESOURCES LTD.

ON

THE RONDAH CLAIM GROUP

OMINECA MINING DIVISION

BRITISH COLUMBIA

PLATE 3

CHARGEABILITY CONTOUR MAP

85 - 122

SCALE ....1 INCH = 200 FEET

CONTOUR INTERVAL .... 5 MILLISECONDS

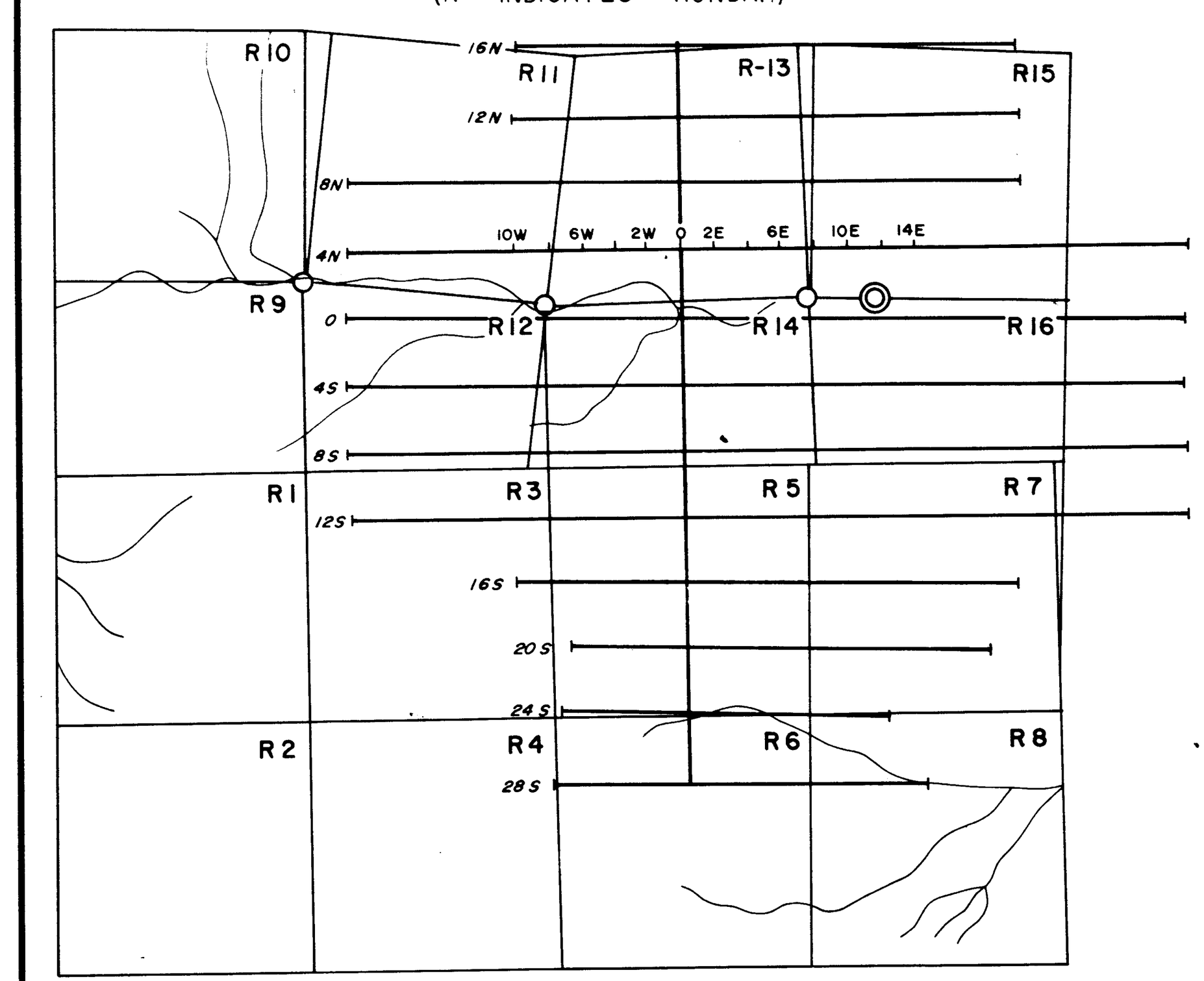
ELECTRODE CONFIGURATION .... POLE-DIPOLE

EFFECTIVE D.C. PULSE I.P. TIMING SEQUENSE ... 3 : 3 : 1 (ON OFF INTERGRATION)

LOCATION MAP

SCALE .... 1" = 1000'

(R INDICATES RONDAH)



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