

4805

921/2
GEOPHYSICAL REPORT

921/2E
4805

of the
INDUCED POLARIZATION SURVEY
on the
CAROLIN MINES OPTION--QUILCHENA CREEK PROPERTY
NICOLA MINING DIVISION

Latitude 50°04'N
Longitude 120°33'W

on behalf of

TORONADO DEVELOPMENT CORPORATION LTD. (N. P. L.)

<u>Claim Name</u>	<u>Record Number</u>	<u>Anniversary</u>
Me 1 - 8	24324 - 24331	May 19
Tye 1 - 20	52564 - 52583	May 17
<u>Y. T. 1 - 12</u>	56707 - 56718	July 24

by

P. P. Nielsen, B.Sc., Geophysicist

and

G. C. Gutrath, B.Sc., P.Eng., Geologist
Atled Exploration Management Ltd.
Vancouver, B. C.

October, 1973

NTS 921/2

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. **4805** MAP.....

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INTRODUCTION

During the period from July 31 to August 8, 1973, a detailed Induced Polarization Survey was executed on the Me, Tye and Y. T. claims which are owned by Carolin Mines Ltd. (N. P. L.) under option to Toronado Development Corporation Ltd. (N. P. L.).

The purpose of the survey was to delineate further a porphyry-type copper prospect west of Quilchena Creek, about 11 miles south-southeast of Merritt, B. C.

The I. P. survey was executed by Atled Exploration Management incorporating a high-power, sensitive pulse-type instrumentation using the pole-dipole electrode configuration with three separations.

A total of 3.86 line miles, based on first to last readings at the $n = 2$ electrode separation, was carried out. The total profile length ($n = 1, 2$ and 3) was 11.63 line miles.

The Atled crew consisted of an experienced geophysicist-operator and three field assistants aided by a helper supplied by Agilis Engineering Ltd.

LOCATION AND ACCESS

The property is located 11 miles south-southeast of Merritt, B. C. on the west side of Quilchena Creek between Indian Reserve No. 7 and Lundbom Lake.

Access is southeast on Highway No. 5 from Merritt for 12 miles then northeast along logging roads to various parts of the property.

CLAIMS

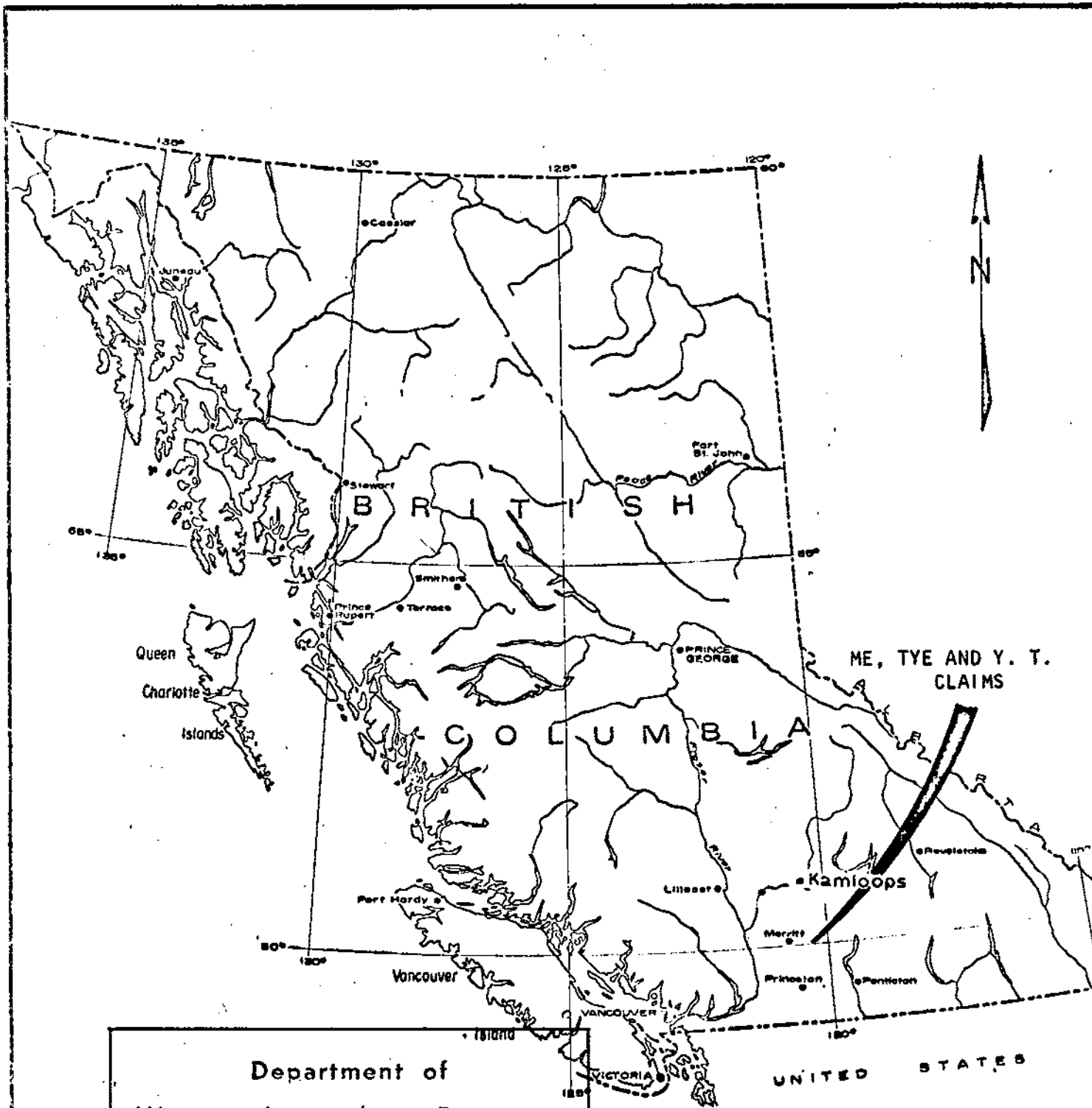
The following list of claims owned by Carolin Mines Ltd. (N. P. L.) under option to Toronado Development Corporation was supplied by Agilis Engineering Ltd. of Vancouver, B. C. They are recorded in the Nicola Mining Division.

<u>Claim Name</u>	<u>Record Number</u>	<u>Anniversary</u>
Me 1 - 8	24324 - 24331	May 19
Tye 1 - 20	52564 - 52583	May 17
Y. T. 1 - 12	56707 - 56718	July 24

GRID AND GROUND CONDITIONS

The I. P. survey grid consisted of chained and flagged lines oriented east-west and spaced 400 feet apart. Station interval along these lines was 200 feet. The property lies on relatively gentle uplands, but the survey grid occurs on a south slope. Elevations on the property vary from 3,500 feet to 4,000 feet above sea level.

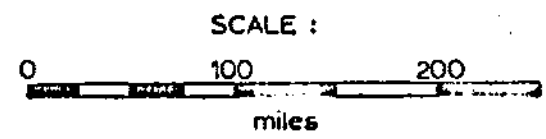
Vegetation consists of open grassland with light timber increasing westerly.



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TORONADO DEVELOPMENT CORPORATION LTD. (N. P. L.)
 CAROLIN MINES LTD. OPTION
 QUILCHENA CREEK PROPERTY
 NICOLA MINING DIVISION

Location Map
 ATLED EXPLORATION
 MANAGEMENT LTD.



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Due to the extremely dry ground surface, it was necessary to use salt water at the electrodes to maintain adequately low contact resistances. This, coupled with some magneto-telluric interference at the beginning of the survey, resulted in slow progress.

GEOLOGY

(See reference)

Regional

The property lies within the extensive Upper Triassic Nicola Group Volcanics of south-central B. C. Intermediate to acidic intrusives of Jurassic-Cretaceous age occur to the north and south of the survey area. A Mesozoic-Lower Tertiary intrusive has been mapped two miles southeast of the property.

Outcrops of Tertiary volcanics are scattered throughout the property area.

Glacial overburden is generally present, but varies in thickness.

Detail

The property is predominantly underlain by Nicola Group green andesites intercalated with tuffs and argillites. Intrusive rocks vary from monzonitic to dioritic composition.

The diorites are dispersed in the form of dike and stringer forms throughout portions of the andesites.

In the mineralized area, the volcanics are altered to hornfels, and are characterized by quartz and calcite stringers not necessarily intimately associated with observed copper mineralization.

The entire property appears to be intensely faulted.

Observed mineralization consists of chalcopyrite, bornite, pyrite and minor values of molybdenum and silver.

Geochemical surveys indicate a good Cu-Mo correlation with the I. P. results to the south of the main showing.

Reference

D. P. Taylor, "Geological and Geochemical Report on the Quilchena Creek Property" (April, 1973).

THE INDUCED POLARIZATION SURVEY

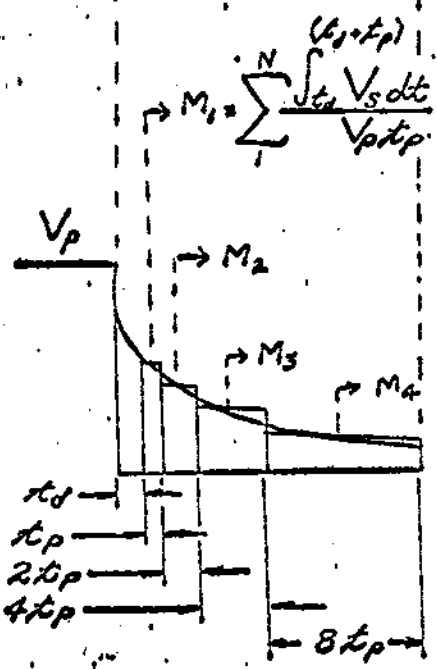
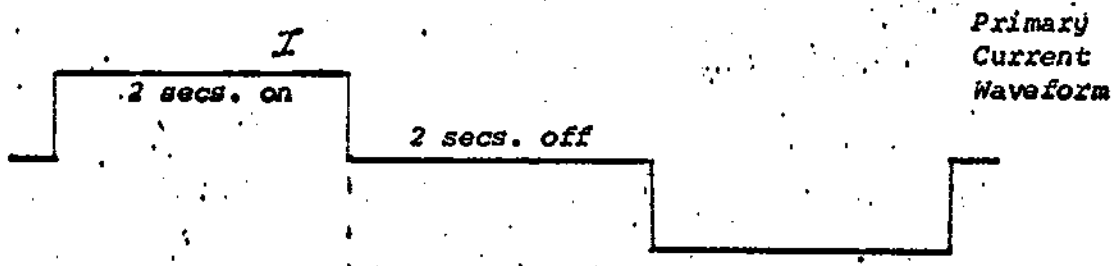
(a) Theory of Method Used

Induced Polarization refers to the polarized distribution of electrical charges throughout a medium to which an electric field has been applied.

When current is passed across an interface between an electrolyte and a metallic conducting body, double layers of charge build up at the interface creating the phenomenon known as "overvoltage" or the "I.P. effect".

This effect can be used for the detection of conducting metallic material such as disseminated sulphides ("porphyry" copper deposits) or massive sulphides containing appreciable amounts of non-conducting sphalerite. Other materials likely to give rise to anomalous responses are pyrite, magnetite, specular hematite, graphite and certain clay-micas such as montmorillonite, vermiculite, saponite and bentonite.

In time-domain (Pulse) I.P., a transmitter injects an alternating square wave signal into the ground at two electrodes C_1 and C_2 . The signal seen by the receiver at two other electrodes P_1 and P_2 provides an indication of the apparent chargeability (M_a). By observing the input current (I) and primary "on-time" voltage, (V_p) the apparent resistivity ρ_a is calculated using Ohm's Law and a geometric factor dependent upon the electrode array used and the units (ohm-meters or ohm-feet) desired.



Transient Voltage Waveform

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The polarization voltages established during the current "on" time decay (discharge) slowly during the current "off" time. The receiver amplifies and integrates the decay curve at four pre-selected positions in time, normalizes these amplitudes with respect to the primary voltage V_p and presents the results as M_1 , M_2 , M_3 , and M_4 readings on digital display for logging.

The times at which the decay curve is sampled, are selected by means of a switch making it possible to obtain up to 56 distinct points on the decay curve.

This allows one to obtain the actual decay curve shape and to better estimate the size, depth and type of the causative source.

A further step which can be taken is to factor the decay curve to separate the unwanted electromagnetic transient coupling effects and background effects from the true overvoltage effects. This extends the usefulness of the I.P. method in areas of high overburden conductivity. It also assists the geophysicist in distinguishing between effects of metallic and nonmetallic conductive material, between oxides and sulphides, between large and fine-grained particules, and between massive and disseminated portions of a polarizable body.

(b) Theory of the Pole-Dipole Electrode Configuration

The I. P. response due to a particular distribution of polarizable material is dependent upon the electrode array employed, the geometry of the polarized body and its location relative to the array, and on the resistivity and polarization contrast between the body and surrounding environment.

Although anomalies are asymmetrical and the anomaly peaks do not always fall directly over the center of the causative source, the advantage of the pole-dipole array more than outweighs this one disadvantage. This array requires only three men on the survey line, has good depth penetration, responds well to both flat-lying and steeply-dipping bodies and maintains good resolution.

The maximum anomaly is obtained for the spacing equal to the depth to the center of an idealized sphere, although spacings of $3/4$ to $1\ 1/2$ times the depth give at least 90% of the maximum likely anomaly.

The use of two or more spacings (na) gives a more reliable estimate of depth, attitude and continuity with depth. An accurate estimate of resistivity and polarization of the body cannot be made since the variables of size, conductivity, and polarizability cannot be separated, hence the term "apparent" chargeability is used.

(c) Field Procedure

(i) Electrode Configuration Used

A pole-dipole electrode array was used whereby the current electrode C_1 and the two potential electrodes P_1 and P_2 were moved in a "leap-frog" manner along the survey lines varying the distance between C_1 and the nearest potential electrode, P_1 , by factors of 1, 2, & 3 (called "n" values) while maintaining the potential electrode separation "a" of 300 feet. Hence, readings were taken with $C_1 - P_1$ separations of 300, 600 and 900 feet.

Specifications

- Sensitivity: $V_p = 10^{-7}$ to 10^{-6} volts for low noise 1% resolution.
 $V_p = 10^{-6}$ to 10 volts for 0.1% resolution.
Total range 30×10^{-6} volts to 10 volts in 11 ranges.
- Self Potential: MAXIMUM ± 1 volt.
- Power consumption: 0.7 ampere at 12 volts.
- Dimensions: 16" x 9" x 5 3/4".
- Weight: 12.5 lbs. (without battery pack).

(ii) Transmitter - Alternator

The Huntec Pulse type transmitter alternator is a high-powered, 7.5 Kilowatt system utilizing the following:

- Solid state power control and switching mechanism.
- Produces high currents into low resistance loads.
- Accurate and adjustable timing using Crystal Clock.
- Voltage regulator with push-button field energizer.
- Dummy Load.
- 2 cylinder ONAN engine driving a Bendix alternator.

Specifications

- Transmitter

- Output: 100 to 3,250 volts in 10 steps
16 amps maximum.
- Cycling Rates: Normally 2 sec. ON, 2 sec. OFF.
- Dimensions: 21 in. x 17 in. x 17 in.
- Weight: 75 lbs.

- Alternator

- Output: 18 K.V.A. 120/208 volts 3 phase 400 Hz.
52 amps/phase.
- Engine: 2 cylinder, 4 cycle, air-cooled 16.5 H.P.
ONAN at 3,600 R.P.M.
- Alternator: 3,600 R.P.M. direct driven Bendix with
sealed bearings and rotating field.
- Dimensions: 42 in. x 17 in. x 26 in.
- Weight: 225 lbs.

The second current electrode C_2 is fixed at "infinity" (∞) which is a minimum distance of $5a$ to the nearest station measured.

The station location is halfway between the current electrode C_1 and the nearest potential electrode P_1 . All lines were surveyed with C_1 to the west of the potential electrodes as the three men moved along the survey lines.

(ii) Measurements taken in the Field

1. The Primary voltage V_p between the measuring (potential) electrodes during "current on".
2. The current flowing through the current electrodes C_1 and C_2 .
3. Four pre-selected gates called M factors (M_1, M_2, M_3 and M_4) using time settings of:
 - (a) delay time t_d ∇ 240 msec.
 - (b) basic integration time t_p ∇ 60 msec.
 - (c) total integration time t_t ∇ 900 msec.
 - (d) basic period t_c ∇ 8 secs.
-(2 secs. on and 2 secs. off)

(d) Equipment Description and Specifications

(i) Receiver

The Huntec MKIII Receiver is a portable, remote sensing pulse-type instrument incorporating the following features:

- Adjustable timing cycle.
- Up to 56 distinct sample points measured on the decay curve.
- Automatic S.P. buck-out.
- Direct digital read out of V_p and M factors including sign.
- High noise rejection allows operation in V_p levels down to 30 micro volts with 0.1 micro-volt resolutions.
- Greater than 10 megohm input impedance.

(e) Data Presentation

1. Calculations

(i) The apparent resistivity ρ_a is calculated by dividing V_p by I and multiplying by a factor appropriate to the electrode array used and the ohm-meter units desired.

(ii) The four M factors were weighted and added to obtain a single apparent chargeability parameter (called M_a) for contouring purposes.

$$M_a \frac{t_f}{t_d} = t_p (M_1 + 2M_2 + 4M_3 + 8M_4) \times .01$$

where M_a = milliseconds

t_d = initial delay time

t_f = final time at end of $M_4 = t_d + 15 t_p$

t_p = integrating time of M_1

2. Profiles ("pseudo-sections")

The M_a and ρ_a readings are plotted in "pseudo-section" for $n = 1, 2, \text{ and } 3$.

The lateral positions of the values are determined by the location along the survey line of the centre point between the current electrode (C_1) and the nearest potential electrode (P_1). The vertical distance of the values from the line is determined by the distance na between C_1 and P_1 and is related to the depth of penetration for that electrode separation at the station measured.

Chargeabilities are shown below the survey line and the resistivities are shown as mirror images above the line.

3. Contour Maps

All apparent resistivity and apparent chargeability values for $C_1 - P_1$ electrode separations of 600 feet ($n = 2$) have been plotted and contoured on the contour maps at a horizontal scale of 1" = 400 feet.

The reader is cautioned as to the errors inherent within this type of data presentation which include:

- (i) Upslope displacement of readings over steep terrain.
- (ii) Grid bias or contour elongation due to rectangular sampling interval used.
- (iii) "Double peaking" phenomenon in which causative source is located between "highs".
- (iv) Some skewness of anomaly peaks due to asymmetrical array used.
- (v) Topographic or terrain effects in resistivity data.

DISCUSSION OF RESULTS AND INTERPRETATION

General Remarks

The I. P. survey was conducted over the main showing to determine typical responses to be expected from the sulphide mineralization present. Adjacent lines to the south were surveyed to define the limits of the showing in this direction and to test the coincident Cu-Mo geochemical anomalies which strike southerly from the showing.

Over the showing and main anomaly area a generalized correlation between contour data available to the author is as follows:

<u>Data Type</u>	<u>Description or Value</u>
Rock type (outcrop)	Diorite, argillite & andesite
Chargeability	> 12 msec
Resistivity (n = 2)	> 230 ohmmeters
Cu (geochemistry)	> 90 ppm
Mo (geochemistry)	> 5 ppm
Ag (geochemistry)	> 1 ppm, but erratic
Mineralization (outcrop)	Chalcopyrite, pyrite (disseminated--weight or volume percent unknown)

A good high Cu-Mo correlation exists south of the small lake at Line 4N, Station 2E which is of smaller areal extent than the main geochem-I. P. anomaly. Here the higher geochemical values are coincident with a chargeability-resistivity gradient.

Apparent Chargeability Values and Contour Map (n = 2)

The apparent chargeability (Ma) values vary from a low of 3.1 milliseconds at Line 16N, Station 3E and at Line 0, Station 3W to a high of 26.0 milliseconds for a total relief of 22.9 milliseconds.

The low Ma's along the creek and baseline appear to be due to increased overburden thicknesses, therefore a bedrock background of 9.0 milliseconds is assigned to the survey area. Hence, the peak anomalous responses are greater than 2.5 times background.

Because of the coincident Cu-Mo anomalies and observed sulphides in outcrops, areas exhibiting chargeabilities greater than 12 milliseconds are considered of interest.

The Ma anomaly is open to the south, but presently strikes north-south for 2,800 feet and averages about 1,300 feet wide.

The n = 2 electrode separation (600 feet) has sampled to a depth in excess of 400. This spacing would detect a large volume of polarizable material up to 600 feet deep. Further information on depth levels is found in the "pseudo-sections" discussed below.

The Ma contours indicate an elongated body of polarized material extending south from the main showing on Line 16N to and beyond Line 128. The major axis of this elongate body occurs roughly along the Ma highs at 13E.

It is not clear from the contours whether the body dips east or if the steeper gradient on the west is due to deeper overburden and/or a change in rock type.

The causative source of the Ma's at $n = 2$ is interpreted as caused by a polarized body of greater than 1.5% by volume equivalent conducting disseminated sulphides.

Observed mineralization within this anomaly and the coincident geochemical anomalies suggest that the chargeability high is caused by pyrite, chalcopyrite and molybdenite in close association with each other.

Apparent Resistivity Contour and Values Map ($n = 2$)

The apparent resistivity (ρ_a) values vary from a low of 116 ohmmeters at Line 4N, Station 27W to a high of 1,380 ohmmeters at Line 12N, Station 12E resulting in a total resistivity relief of 1,264 over the survey grid.

The ρ_a contours exhibit a north-south trend similar to the Ma, Cu, and Mo contours.

The low ρ_a area (less than 200 ohmmeters) along the creek correlates well with low Ma's and is interpreted due to thicker overburden which could be quite moist compared with the rest of the grid area.

The high ρ_a 's west of the creek are thought to be due to a different or more massive rock unit than is observed east of the creek. Green andesites have been mapped west of the baseline.

The many different rock types, some of which are interfingered with each other, and the intense faulting observed by the geologist have no doubt greatly influenced the resistivity data.

In the region of the large Ma anomaly, there is a high ρ a-high Ma coincidence at the north end, but a low ρ a-high Ma correlation to the south. The high ρ a feature on the east half of Line 12N could be due to local intense faulting, or diking and/or silicification. Another possible explanation to the ρ a patterns is that all areas of greater than 600 ohmmeters are due to generally the green andesites, areas between 600 and 400 ohmmeters are primarily caused by argillites and diorites, areas from 400 to 200 ohmmeters are due to hornfels and areas below 200 ohmmeters reflect thicker overburden conditions.

Pseudo-Sections

A study of the pseudo-sections reveal that there is a high a-high Ma correlation only near surface which is probably due to surface weathering, dry top soil or overburden, some thin rock units such as andesite and due to topographic variations all of which have affected the ρ_a readings on the $n = 1$ electrode separation and, to a lesser extent, on the $n = 2$ separation.

The Ma contours on all "sections" indicate a wide, steeply dipping body of polarized material from surface to depths in excess of 900 feet.

The ρ_a pseudosection information in the high Ma regions does not reflect sulphide content per se. If the variations in resistivity in this area are due to overlying andesites and/or argillites and the low ρ_a 's at depth represent another rock type such as diorite or monzonite, then it would appear that all rocks within the Ma anomaly (contour map) are mineralized.

CONCLUSIONS AND RECOMMENDATIONS

The Induced Polarization Survey has delineated a wide, steeply dipping conductive body whose lateral dimensions are over 2,800 feet long by about 1,300 feet wide. Vertically, it is from 0 to 150 feet to the top and extends to depths unknown but definitely exceeding 900 feet.

Combined with very favourable geological and geochemical results coincident with this high chargeability feature, a drill program is definitely warranted to test for possible economic sulphides.

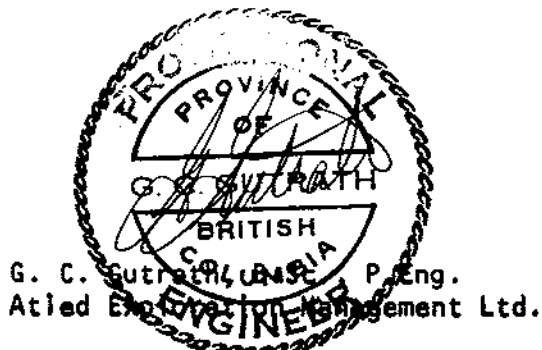
It is not yet known whether there is a zonal or an intimate association between pyrite and Cu-Mo sulphides throughout the chargeability anomaly area.

The drilling program should initially test the areas of high Ma response where there are coincident anomalous geochemical copper values. Should the drill results reveal mainly pyrite, then the drilling should be shifted east or west to test the flanks of the Ma anomaly for possible Cu-Mo sulphides zonally related to the pyrite.

Respectfully submitted,



P. P. Nielsen, B.Sc., Geophysicist



APPENDICES

STATEMENT OF AUTHOR'S QUALIFICATIONS

I DO HEREBY STATE:

1. I am the author of this report.
2. I have been actively and responsibly involved in mining exploration using airborne, ground and computer applied geophysics in Western Canada and the United States for the past seven years.
3. I graduated with a B.Sc. degree in Geophysics from the University of British Columbia in 1969.
4. I am presently Manager, Geophysical Division, Atled Exploration Management Ltd., at #420-475 Howe Street, Vancouver 1, B. C.
5. I am a member of the Society of Exploration Geophysicists, the Canadian Institute of Mining and Metallurgy and the B. C. Geophysical Society.

Signed

P. P. Nielsen

P. P. Nielsen

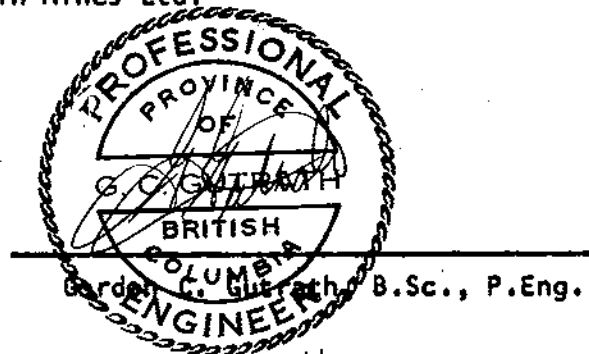
Date

Oct 9/73

ENGINEER'S CERTIFICATE

I, GORDON C. GUTRATH, of 3636 Lakedale Avenue, in the Municipality of Burnaby, in the Province of British Columbia, DO HEREBY CERTIFY:-

1. That I am a consulting geologist with a business address of #420-475 Howe Street, Vancouver 1, B. C.
2. That I am a graduate of the University of British Columbia where I obtained my B.Sc. in geological science in 1960.
3. That I am a Registered Professional Engineer in the Geological Section of the Association of Professional Engineers in the Province of British Columbia.
4. That I have practised my profession as a geologist for the past twelve years, and
5. That I have no interest in the property with which this report is concerned, nor do I expect to receive any such interest. I have no interest in the securities of Toronado Development Corporation or Carolin Mines Ltd.



DATED at the City of Vancouver, Province of British Columbia, this 9th day of October, 1973.

PERSONNEL

Atled Exploration Management Ltd.

P. P. Nielsen, B.Sc. - consultant geophysicist and supervisor
A. Scott, B.Sc. - geophysicist, party-chief and I. P. operator

R. Klansjcek)
H. Huckson) - I. P. crewmen
D. Klatt)

Agilis Engineering

F. Holcapeck, B.Sc. - geologist and supervisor
H. Borsje - field assistant

Declared before me at the *City*
of *Vancouver*, in the
Province of British Columbia, this *20*
day of *December* *1913*, A.D.

J. B. Talbot

Jill Turner
A Commissioner for taking Affidavits within British Columbia or
A Notary Public in and for the Province of British Columbia.
Sub-Mining Recorder

COSTS

The following are Atled's charges for conduction the I. P. survey on the Me, Tye & Y. T. claim group.

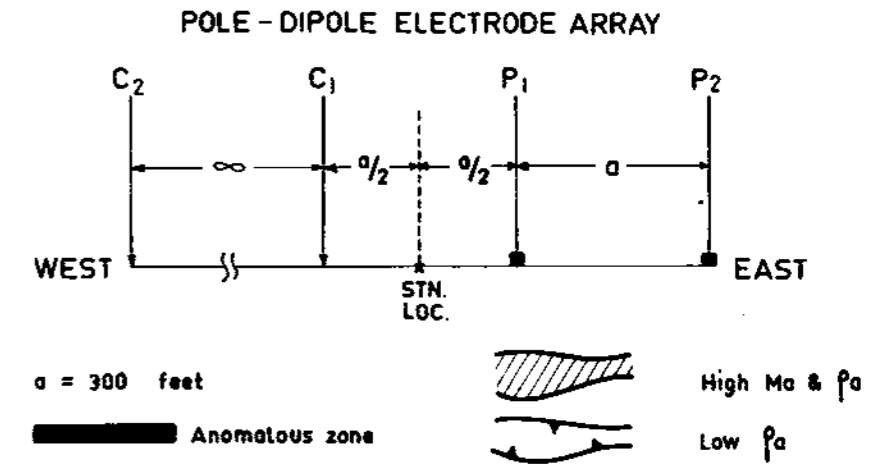
Services including linecutting provided by Agilis Engineering are not included.

1. <u>The Survey</u> : men and equipment 6 days @ \$325.00 per day	\$ 1,950.00
2. <u>Food and Accommodation</u> 24 man days @ \$15.00 per man day	360.00
3. <u>Transportation</u>	
(a) Mobilization-demobilization	250.00
(b) Local Transportation (truck, oil and gas) 6 days @ \$25.00 per day	150.00
4. <u>Report</u> (4 copies)	<u>500.00</u>
	\$ 3,210.00

Total profile cost per mile: $\$3,210 \div 11.63 \text{ miles} = \276.00

INDUCED POLARIZATION SURVEY
 APPARENT CHARGEABILITY & RESISTIVITY
 PSEUDO SECTION
 LINE: 16 N

LEGEND

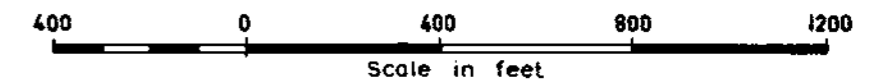


INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

TORONADO DEVELOPMENT CORP. LTD. (N.P.L.)

CAROLIN MINES LTD. OPTION
 QUILCHENA CREEK - MERRIT, B.C. AREA



NICOLA MINING DIVISION

N.T.S. 9212

TO ACCOMPANY REPORT BY:

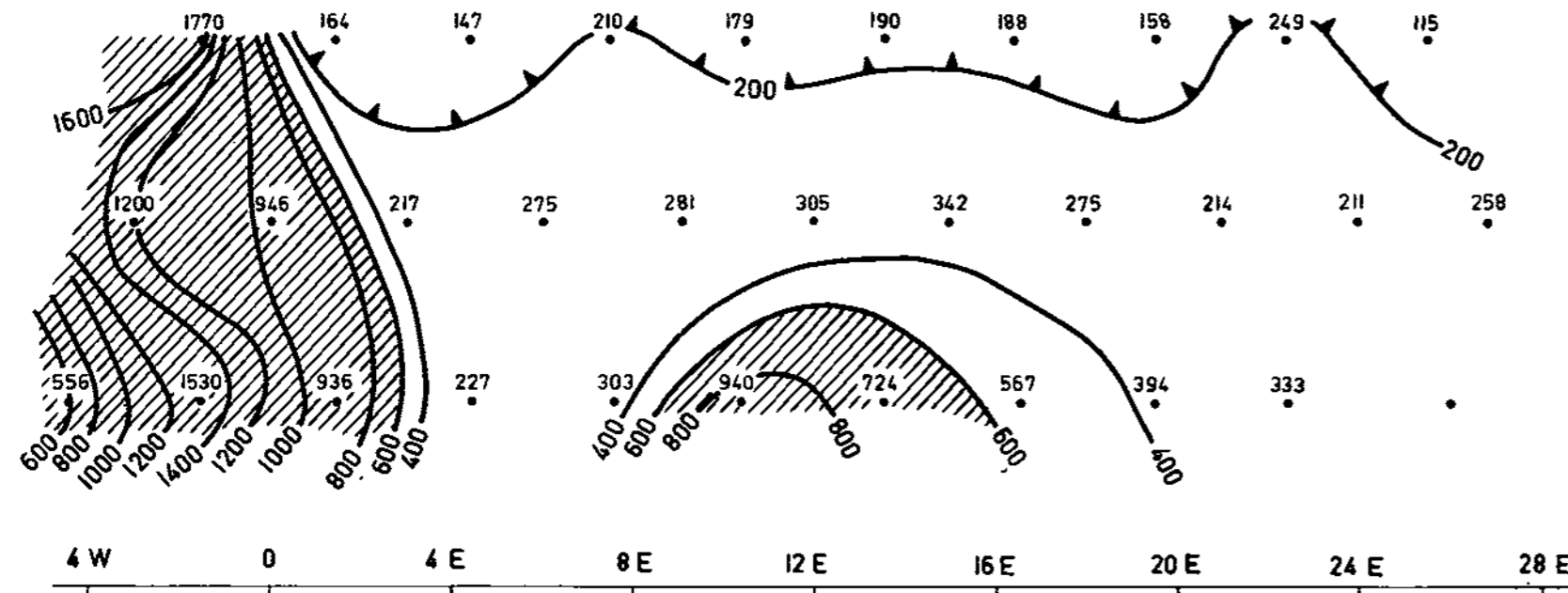
P. P. NIELSEN, B.Sc., GEOPHYSICIST & *P.P. Nielsen*
 G. C. GUTRATH, B.Sc., P. Eng. GEOLOGIST

ATLED EXPLORATION MANAGEMENT LTD.
 VANCOUVER, B.C.

DRAWN BY: NCL

4805

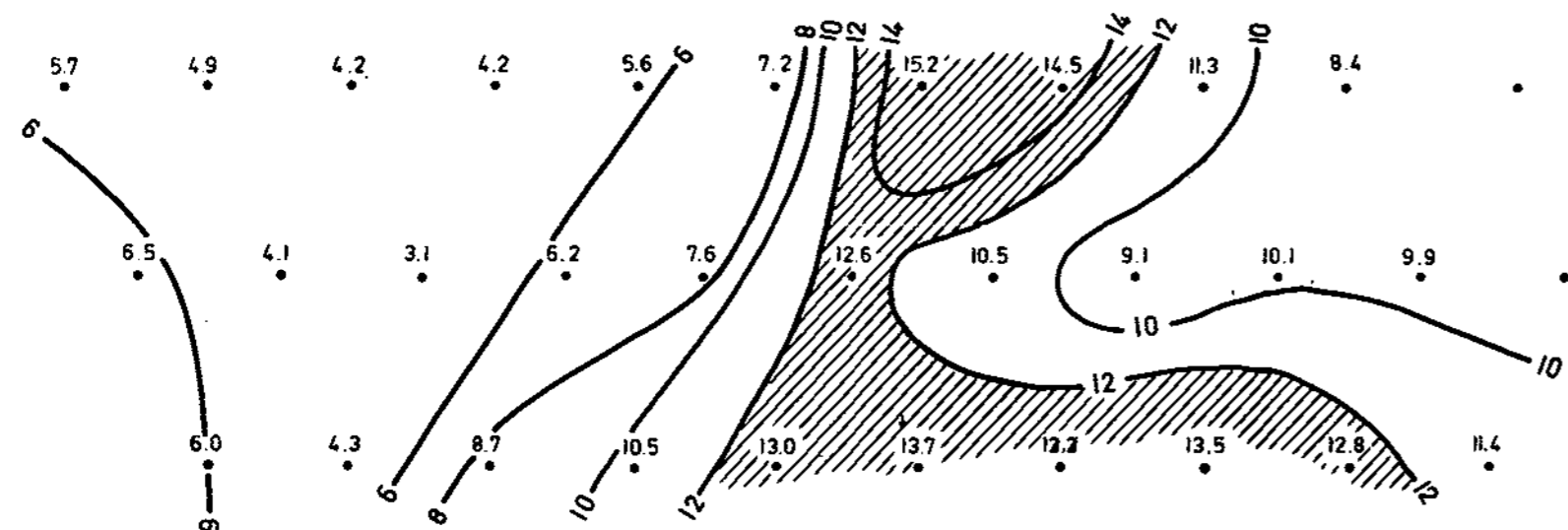
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N = 3

N = 2

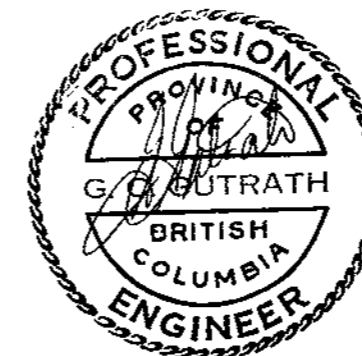
N = 1



N = 1

N = 2

N = 3

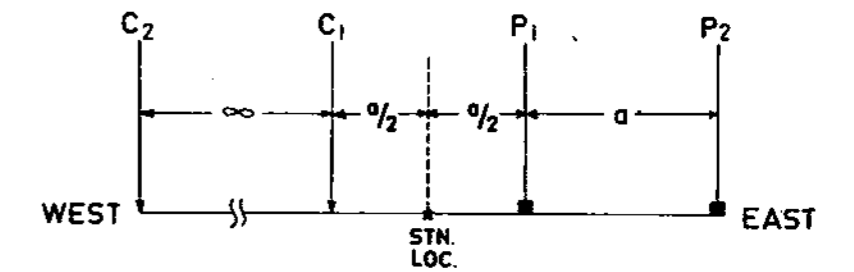


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Mines and Petroleum Resources
ASSESSMENT REPORT
NO. **4805** MAP

INDUCED POLARIZATION SURVEY
 APPARENT CHARGEABILITY & RESISTIVITY
 PSEUDO SECTION
 LINE: 12 N

LEGEND

POLE-DIPOLE ELECTRODE ARRAY



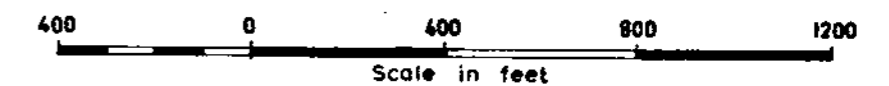
$a = 300$ feet
 Anomalous zone
 High M_a & P_a
 Low P_a

INSTRUMENT PARAMETERS

Tx on 2.0 SECONDS
 Tx off 2.0 SECONDS
 DELAY (td) 240 MILLISECONDS
 INTEGRATE 900 MILLISECONDS

TORONADO DEVELOPMENT CORP. LTD. (N.P.L.)

CAROLIN MINES LTD. OPTION
 QUILCHENA CREEK - MERRIT, B.C. AREA



NICOLA MINING DIVISION

N.T.S. 92 I 2

TO ACCOMPANY REPORT BY:

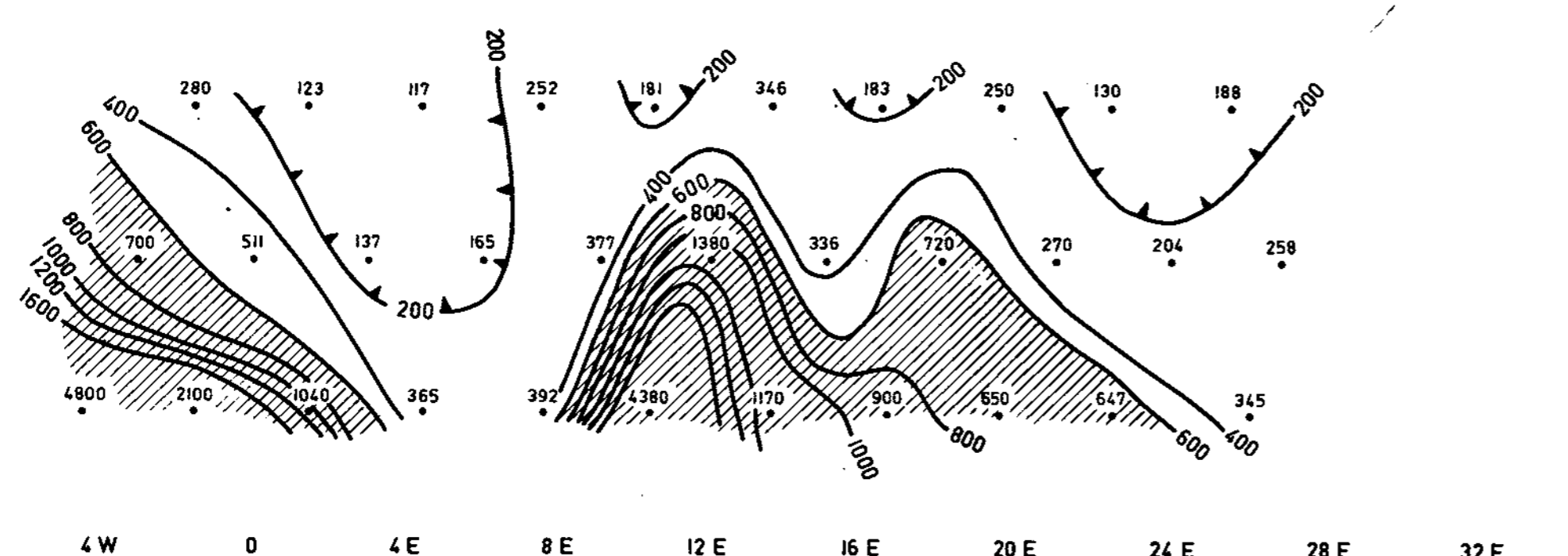
P. P. NIELSEN, B.Sc., GEOPHYSICIST
 G. C. GUTRATH, B.Sc., P. Eng. GEOLOGIST

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4805

DATE - AUGUST 1973

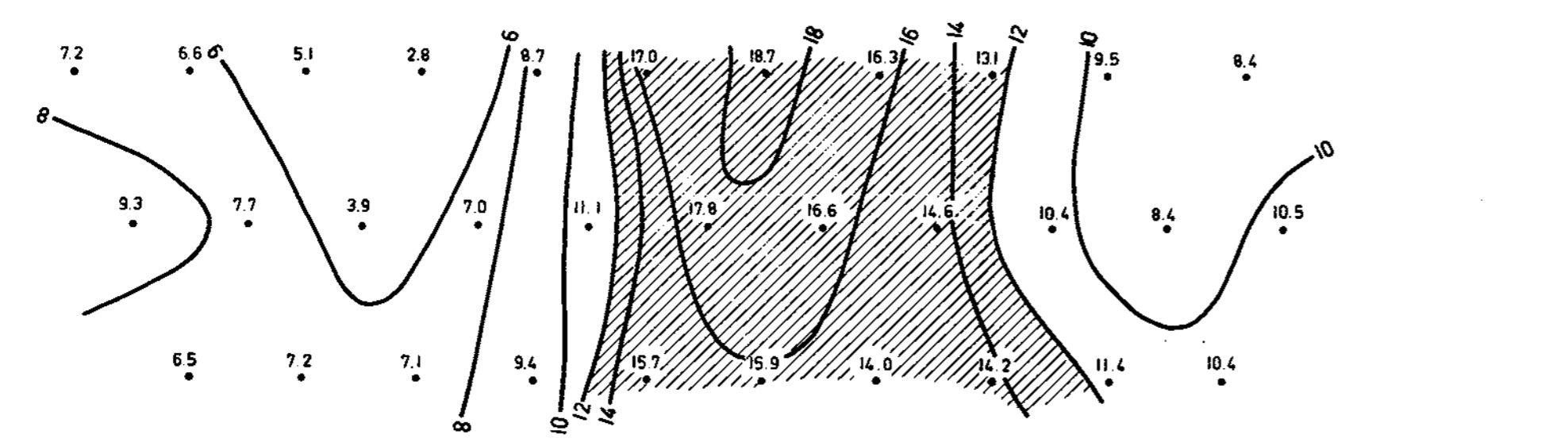


N = 3
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 N = 1

P_a
 (OHM-METRES)

4 W 0 4 E 8 E 12 E 16 E 20 E 24 E 28 E 32 E

LINE 12 N



N = 1
 N = 2
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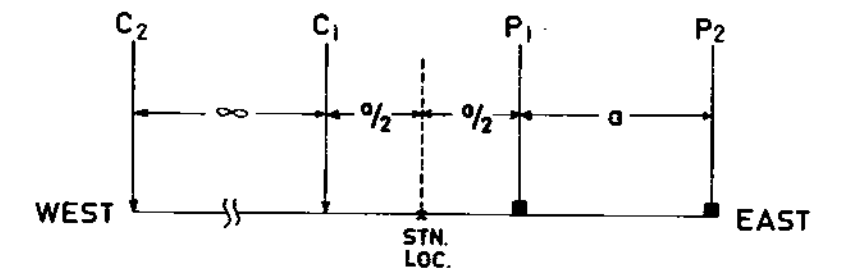
M_a
 (MILLISECONDS)

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4805

INDUCED POLARIZATION SURVEY
 APPARENT CHARGEABILITY & RESISTIVITY
 PSEUDO SECTION
 LINE: 8 N

LEGEND

POLE-DIPOLE ELECTRODE ARRAY



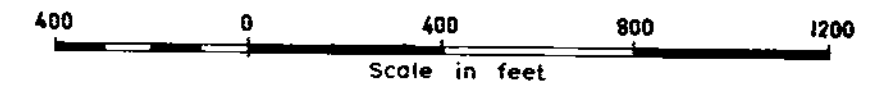
$a = 300$ feet
 Anomalous zone
 High M_a & ρ_a
 Low ρ_a

INSTRUMENT PARAMETERS

Tx on 2.0 SECONDS
 Tx off 2.0 SECONDS
 DELAY (td) 240 MILLISECONDS
 INTEGRATE 900 MILLISECONDS

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CAROLIN MINES LTD. OPTION
 QUILCHENA CREEK - MERRIT, B.C. AREA



NICOLA MINING DIVISION

N.T.S. 9212

TO ACCOMPANY REPORT BY:

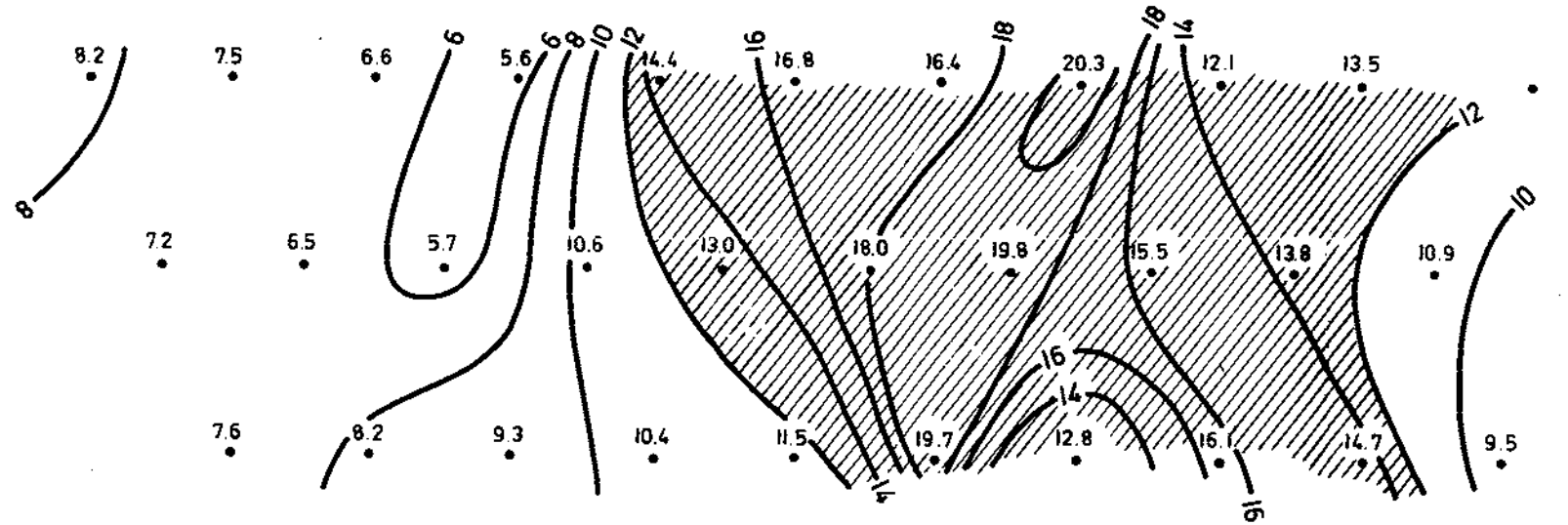
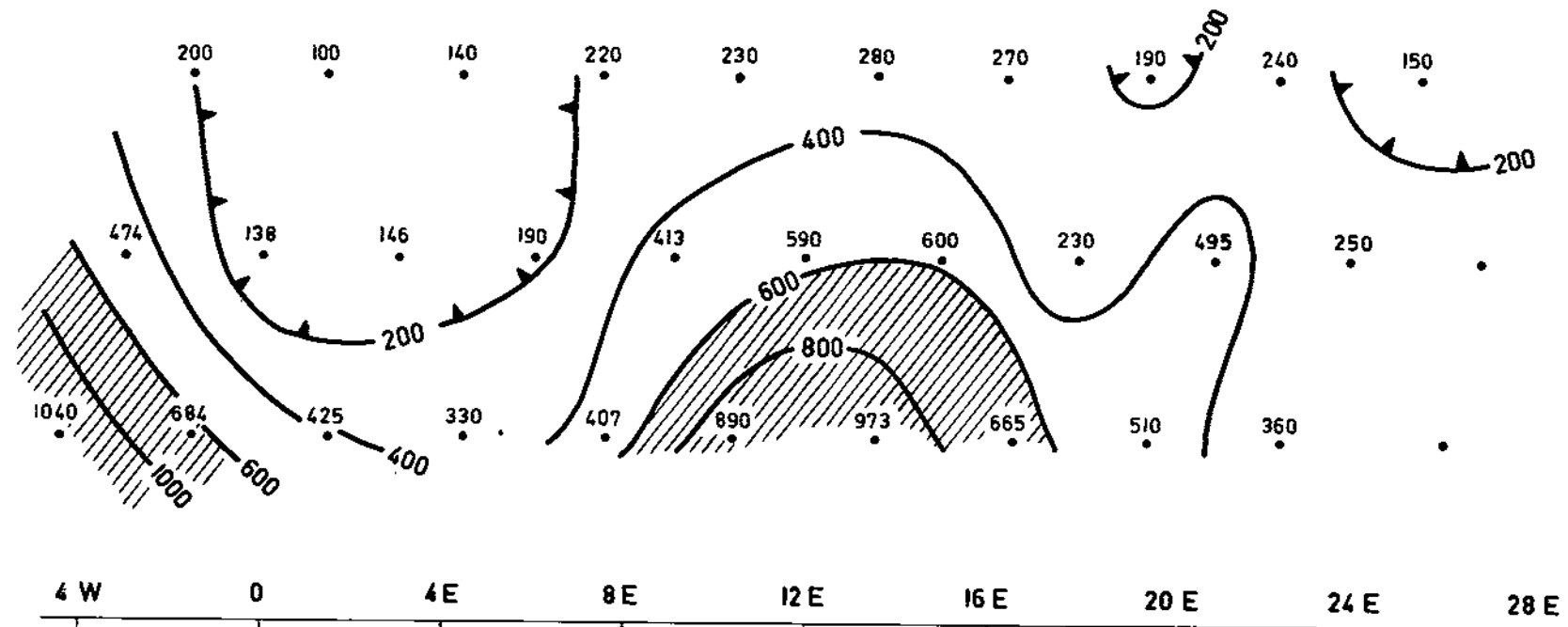
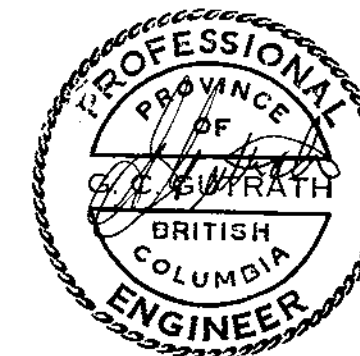
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 G. C. GUTRATH, B.Sc., P. Eng. GEOLOGIST

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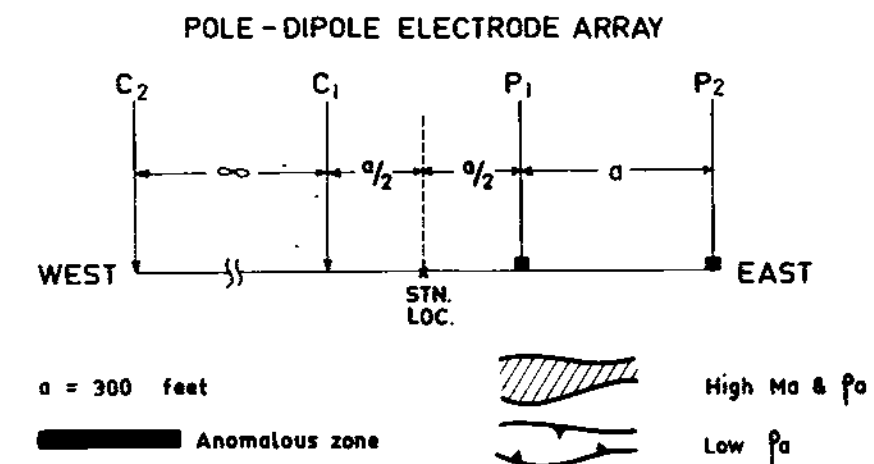
DATE - AUGUST 1973.



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. **4805** M.P.

INDUCED POLARIZATION SURVEY
 APPARENT CHARGEABILITY & RESISTIVITY
 PSEUDO SECTION
 LINE: 4 N

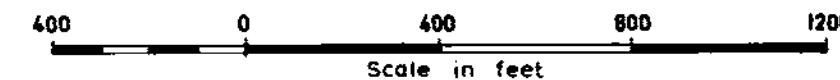
LEGEND



INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

TORONADO DEVELOPMENT CORP. LTD. (N.P.L.)
 CAROLIN MINES LTD. OPTION
 QUILCHENA CREEK - MERRIT, B.C. AREA



NICOLA MINING DIVISION

N.T.S. 9212

TO ACCOMPANY REPORT BY:

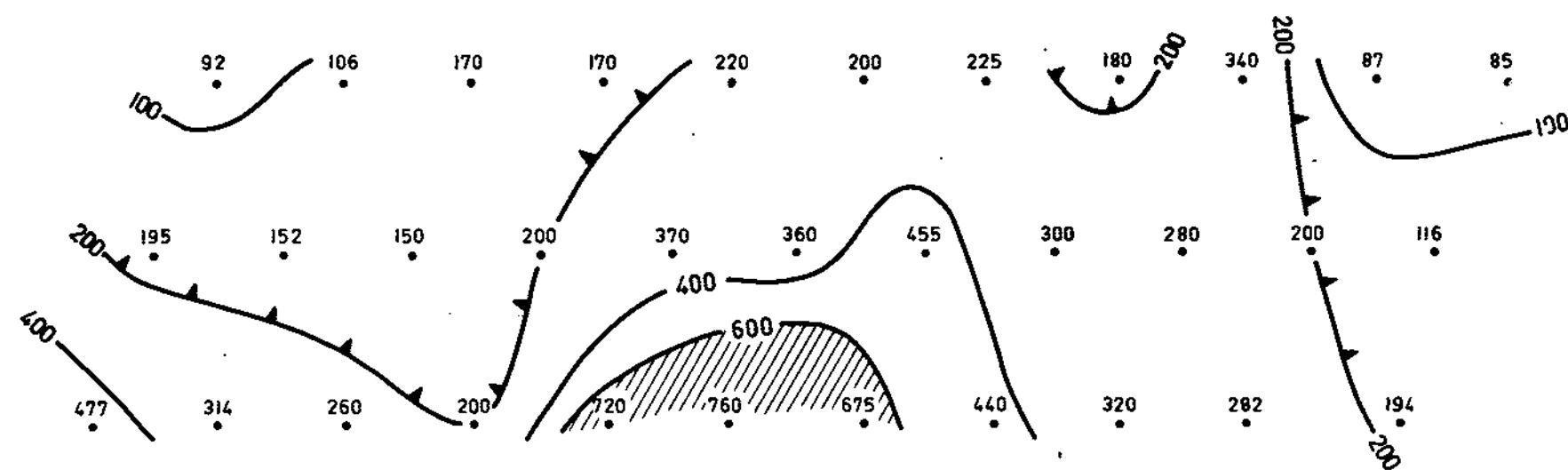
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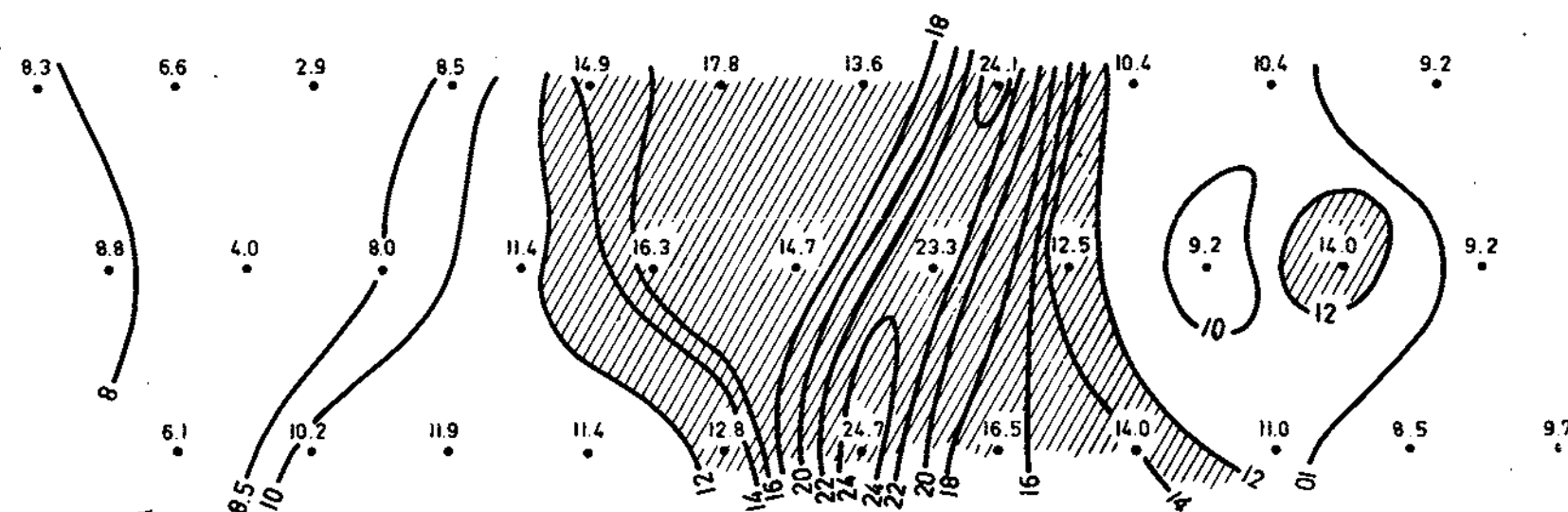
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N = 1

ρ_a
 (OHM-METRES)

4 W 0 4 E 8 E 12 E 16 E 20 E 24 E 28 E 32 E

LINE 4 N



N = 1

N = 2

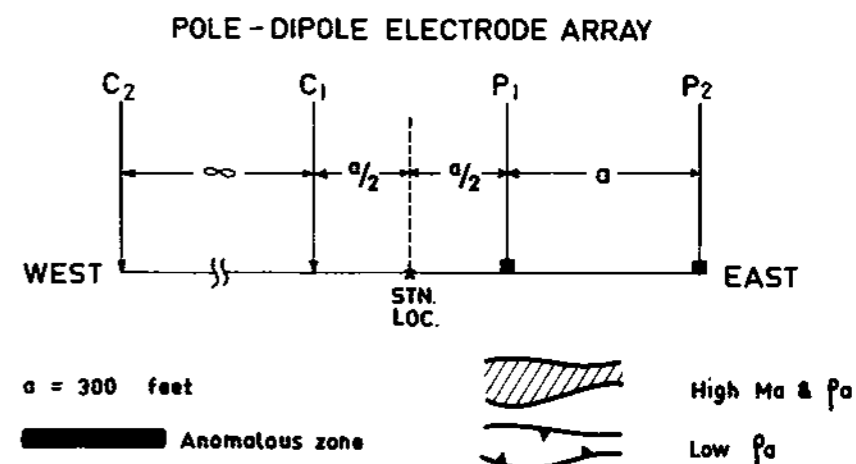
N = 3

M_a
 (MILLISECONDS)

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. **4805** M.P.

INDUCED POLARIZATION SURVEY
 APPARENT CHARGEABILITY & RESISTIVITY
 PSEUDO SECTION
 LINE: 0

LEGEND

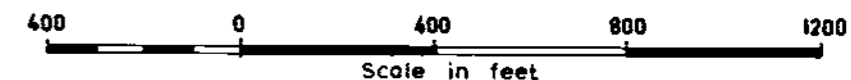


INSTRUMENT PARAMETERS

Tx on 2.0 SECONDS
 Tx off 2.0 SECONDS
 DELAY (td) 240 MILLISECONDS
 INTEGRATE 900 MILLISECONDS

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CAROLIN MINES LTD. OPTION
 QUILCHENA CREEK - MERRIT, B.C. AREA



NICOLA MINING DIVISION

N.T.S. 92 I 2

TO ACCOMPANY REPORT BY:

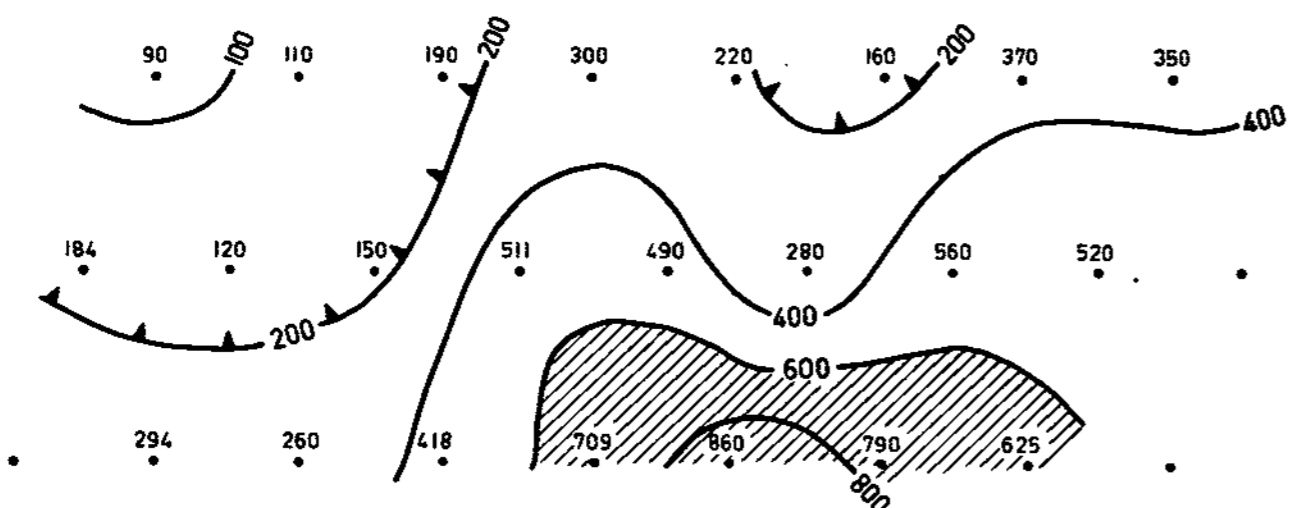
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DATE - AUGUST 1973.



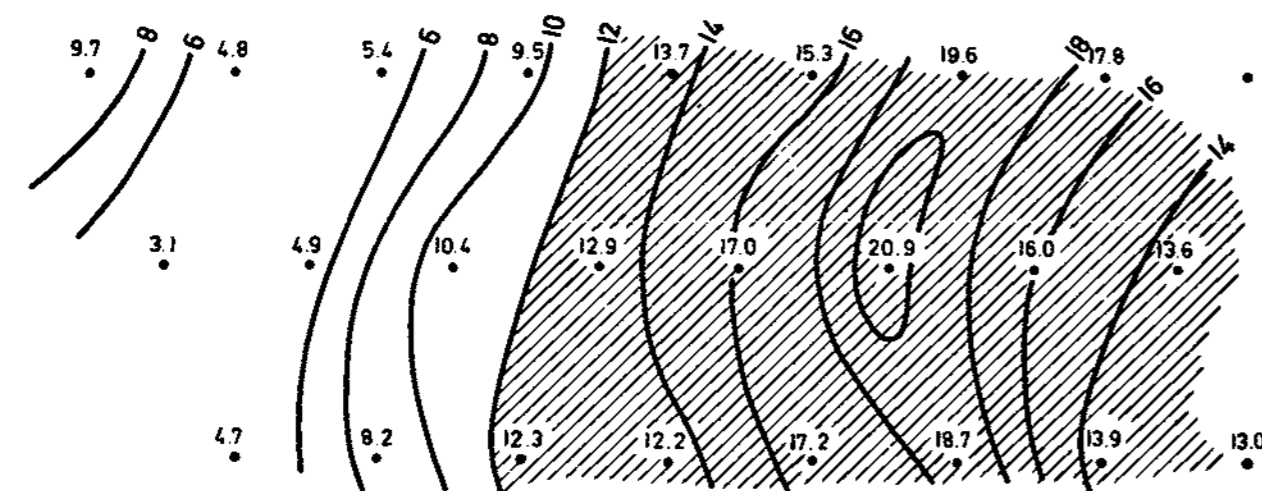
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N=2

N=1

LINE 0

4 W 0 4 E 8 E 12 E 16 E 20 E 24 E 28 E



N=1

N=2

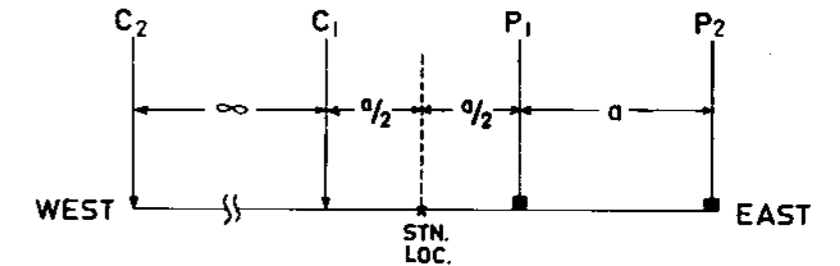
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Department of
Mines and Petroleum Resources
ACCESS AND CONTROL REPORT
NO. **4805** M.P.

INDUCED POLARIZATION SURVEY
 APPARENT CHARGEABILITY & RESISTIVITY
 PSEUDO SECTION
 LINE: 4S

LEGEND

POLE-DIPOLE ELECTRODE ARRAY



$a = 300$ feet
 Anomalous zone
 High M_a & ρ_a
 Low ρ_a

INSTRUMENT PARAMETERS

Tx on 2.0 SECONDS
 Tx off 2.0 SECONDS
 DELAY (td) 240 MILLISECONDS
 INTEGRATE 900 MILLISECONDS

TORONADO DEVELOPMENT CORP. LTD. (N.P.L.)

CAROLIN MINES LTD. OPTION
 QUILCHENA CREEK - MERRIT, B.C. AREA

400 0 400 800 1200
 Scale in feet

NICOLA MINING DIVISION

N.T.S. 9212

TO ACCOMPANY REPORT BY:

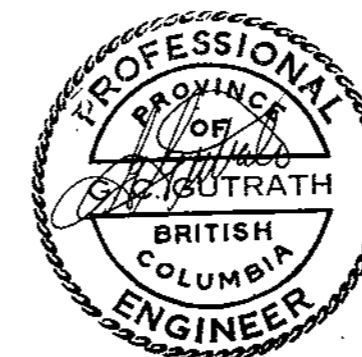
P. P. NIELSEN, B.Sc., GEOPHYSICIST & *P.P. Nielsen*
 G. C. GUTRATH, B.Sc., P. Eng. GEOLOGIST

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DATE - AUGUST 1973



N = 3

N = 2

N = 1

ρ_a
 (OHM-METRES)

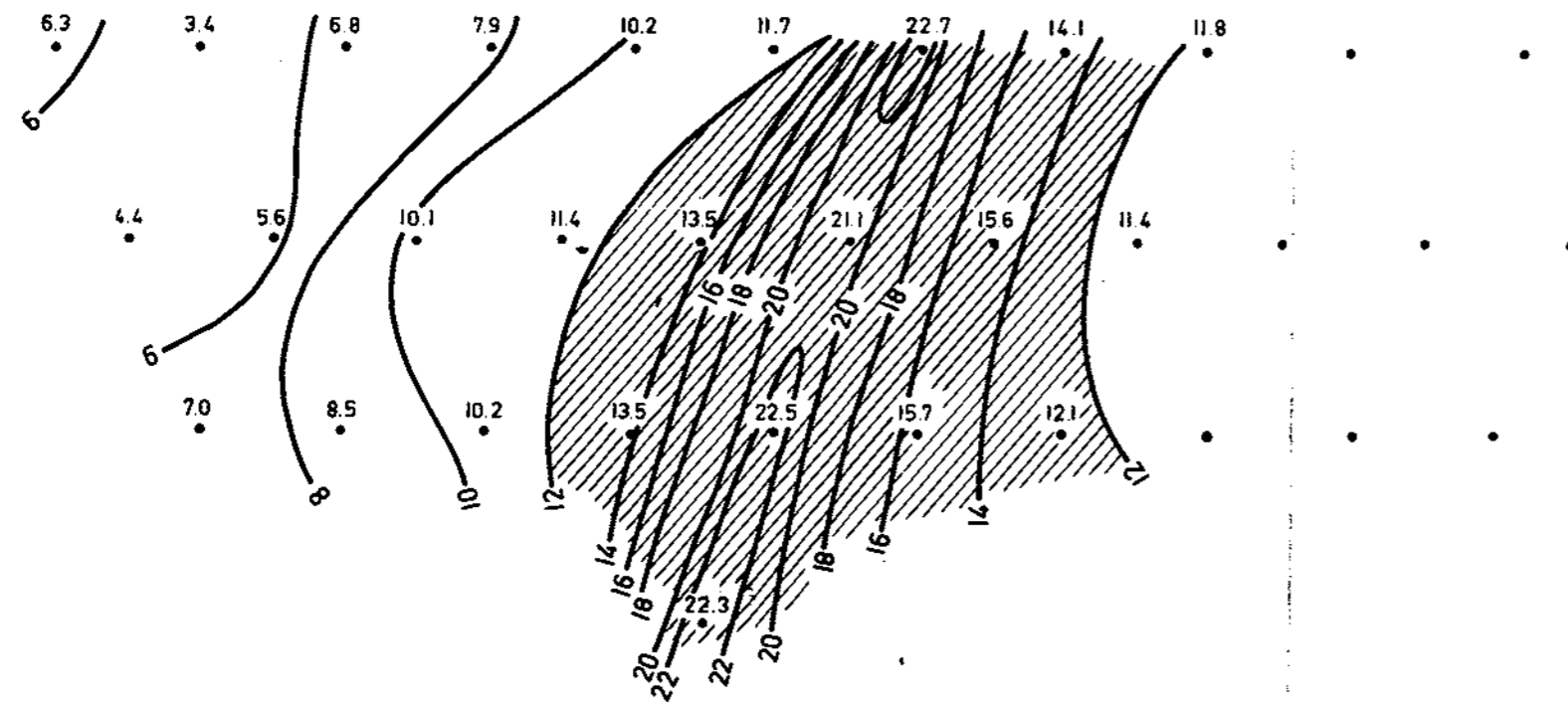
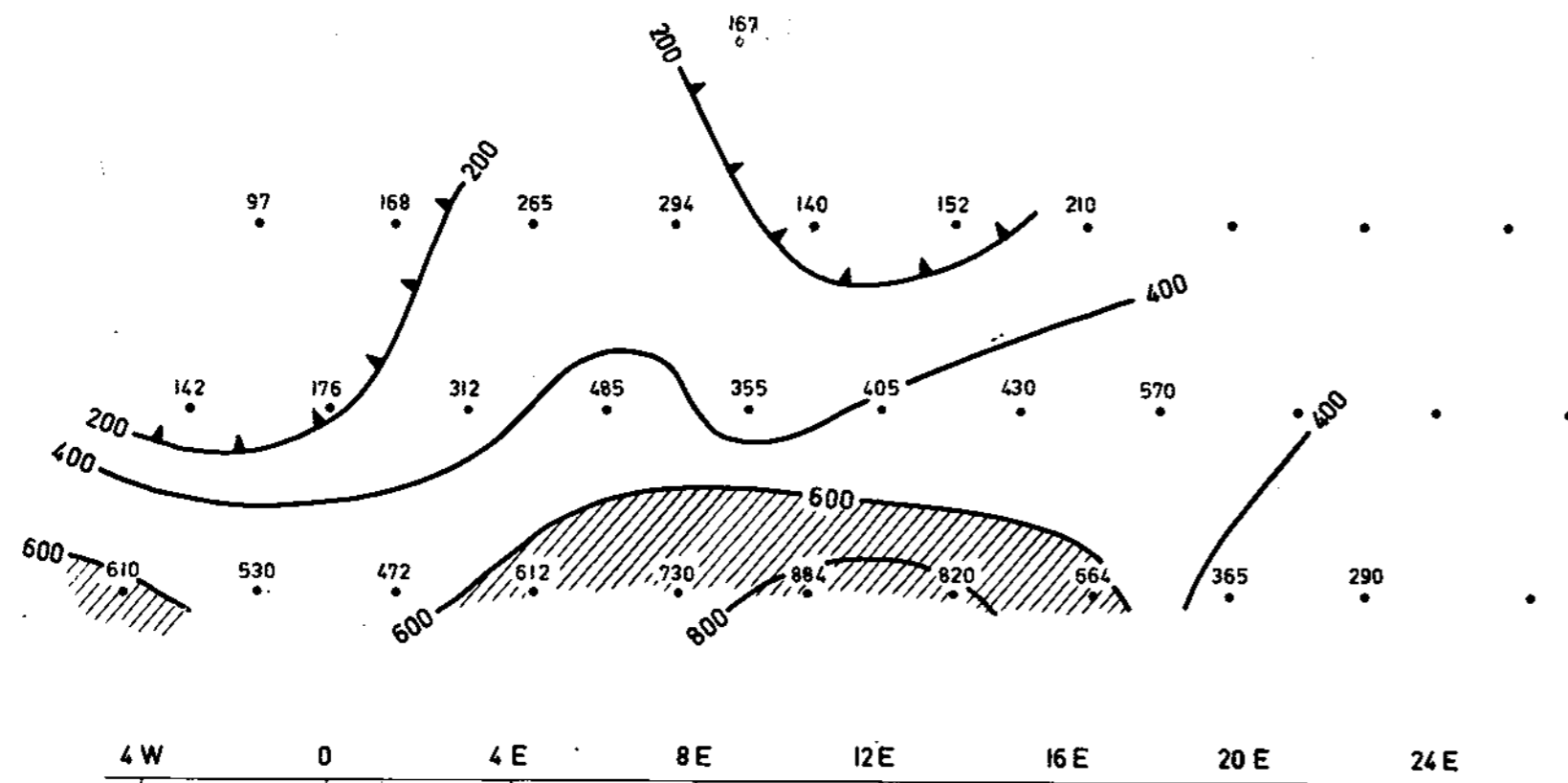
LINE 4 S

N = 1

N = 2

N = 3

M_a
 (MILLISECONDS)

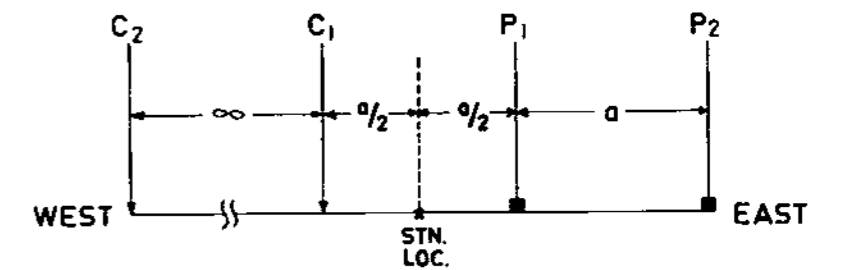


Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. **4805** MAP _____

INDUCED POLARIZATION SURVEY
 APPARENT CHARGEABILITY & RESISTIVITY
 PSEUDO SECTION
 LINE: 8 S

LEGEND

POLE-DIPOLE ELECTRODE ARRAY

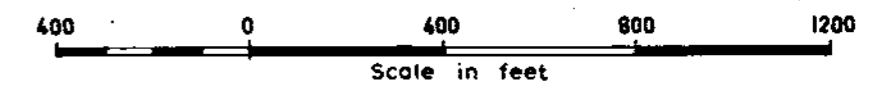


$a = 300$ feet
 Anomalous zone
 High M_a & ρ_a
 Low ρ_a

INSTRUMENT PARAMETERS

Tx on 2.0 SECONDS
 Tx off 2.0 SECONDS
 DELAY (td) 240 MILLISECONDS
 INTEGRATE 900 MILLISECONDS

TORONADO DEVELOPMENT CORP. LTD. (N.P.L.)
 CAROLIN MINES LTD. OPTION
 QUILCHENA CREEK - MERRIT, B.C. AREA



NICOLA MINING DIVISION

N.T.S. 9212

TO ACCOMPANY REPORT BY:

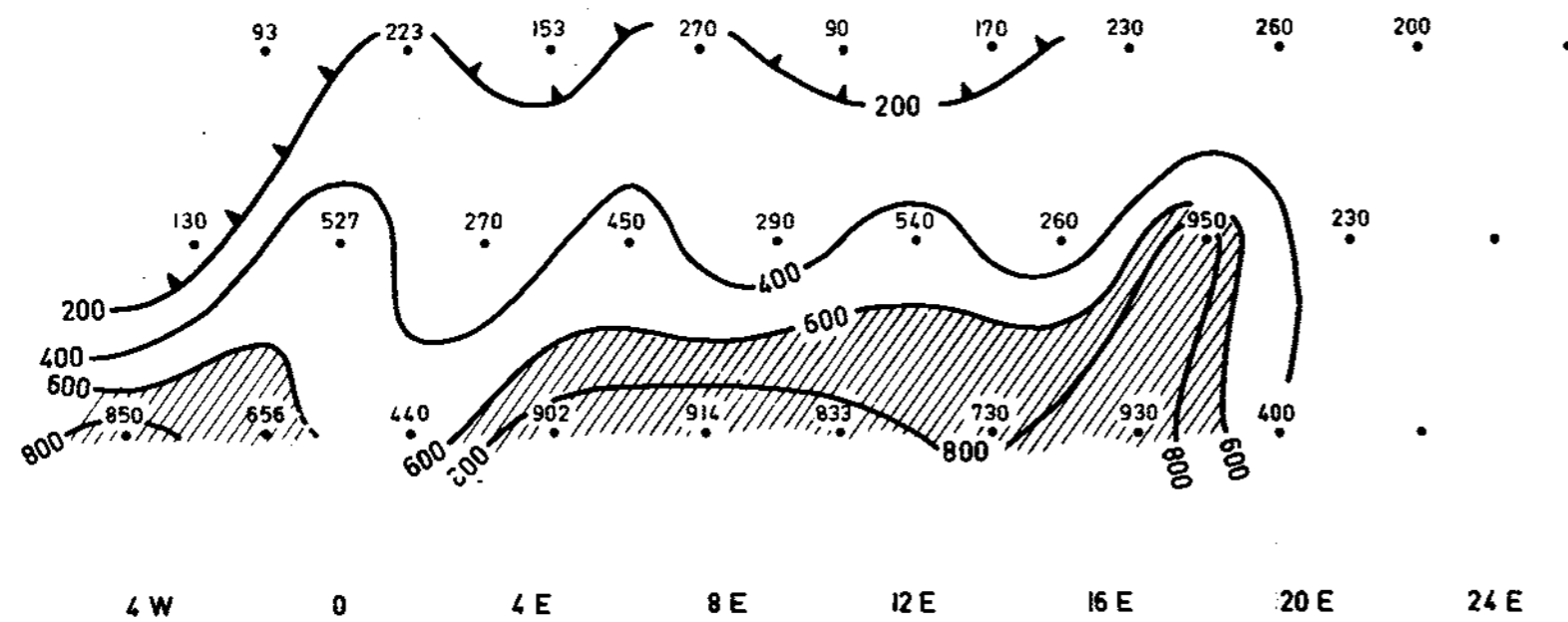
P. P. NIELSEN, B.Sc., GEOPHYSICIST & *P.P. Nielsen*
 G. C. GUTRATH, B.Sc., P. Eng. GEOLOGIST

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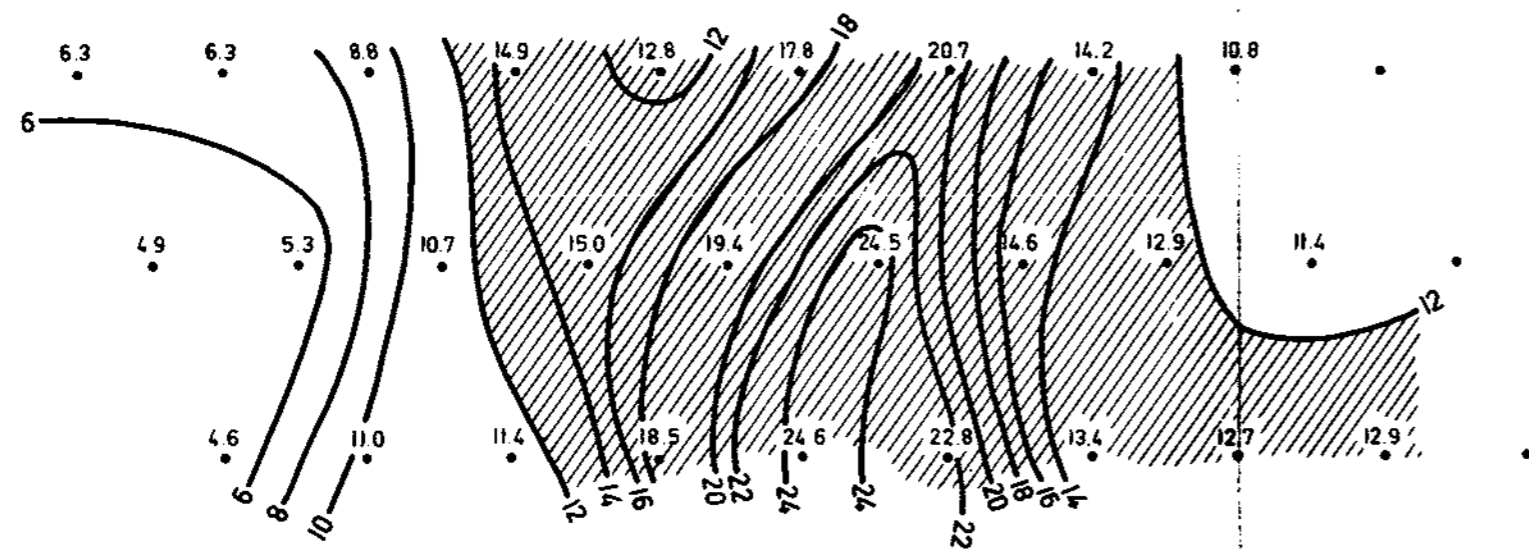
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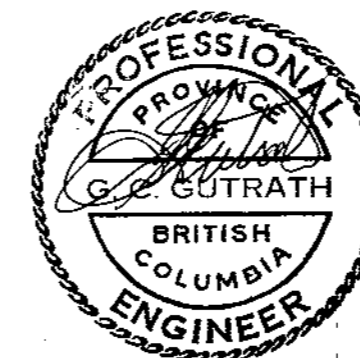
DATE - AUGUST 1973.



ρ_a
 (OHM-METRES)



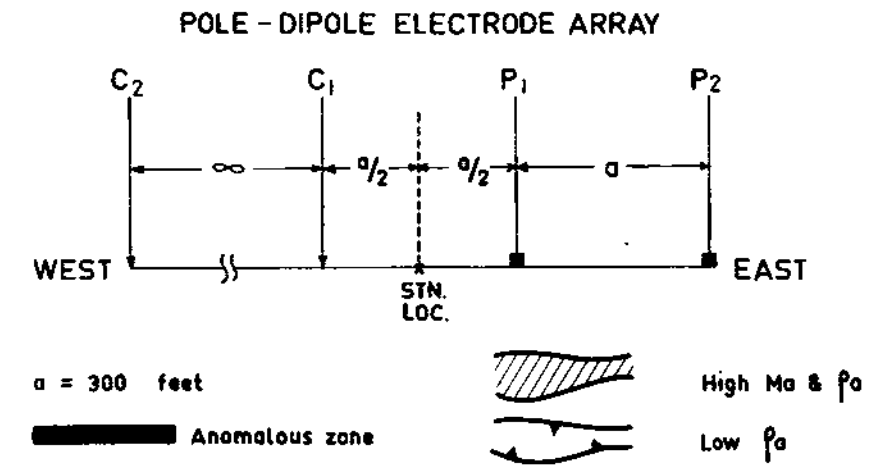
M_a
 (MILLISECONDS)



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. **4805** MAP

INDUCED POLARIZATION SURVEY
 APPARENT CHARGEABILITY & RESISTIVITY
 PSEUDO SECTION
 LINE: 12 S

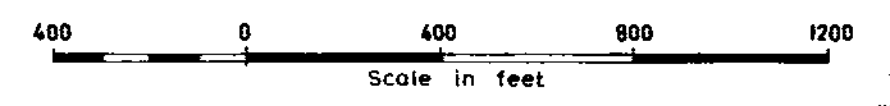
LEGEND



INSTRUMENT PARAMETERS

Tx on	2.0 SECONDS
Tx off	2.0 SECONDS
DELAY (td)	240 MILLISECONDS
INTEGRATE	900 MILLISECONDS

TORONADO DEVELOPMENT CORP. LTD. (N.P.L.)
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 QUILCHENA CREEK - MERRIT, B.C. AREA



NICOLA MINING DIVISION

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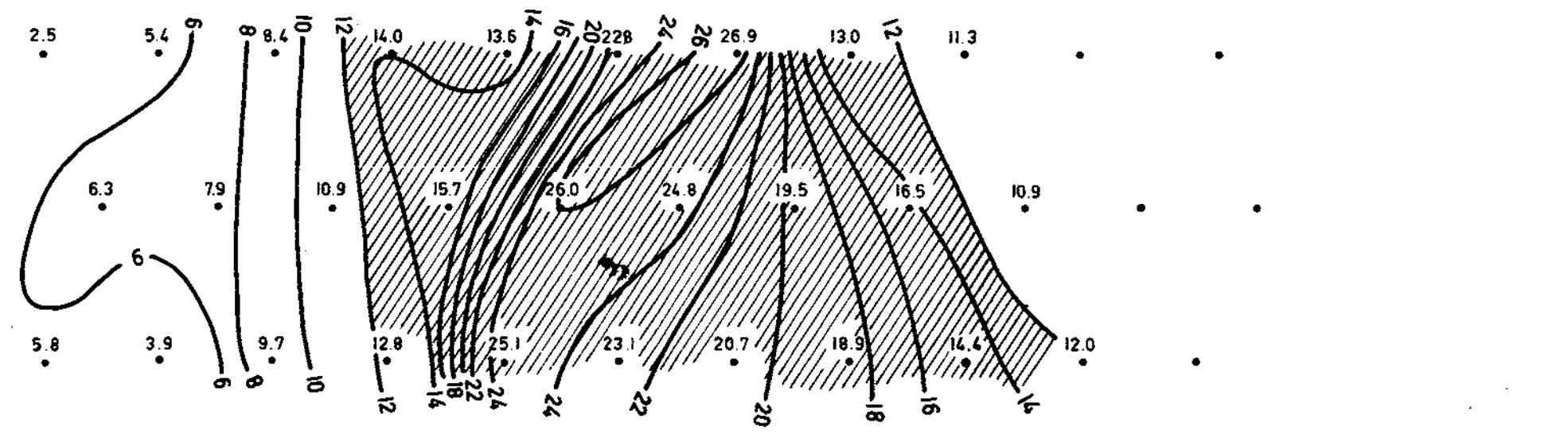
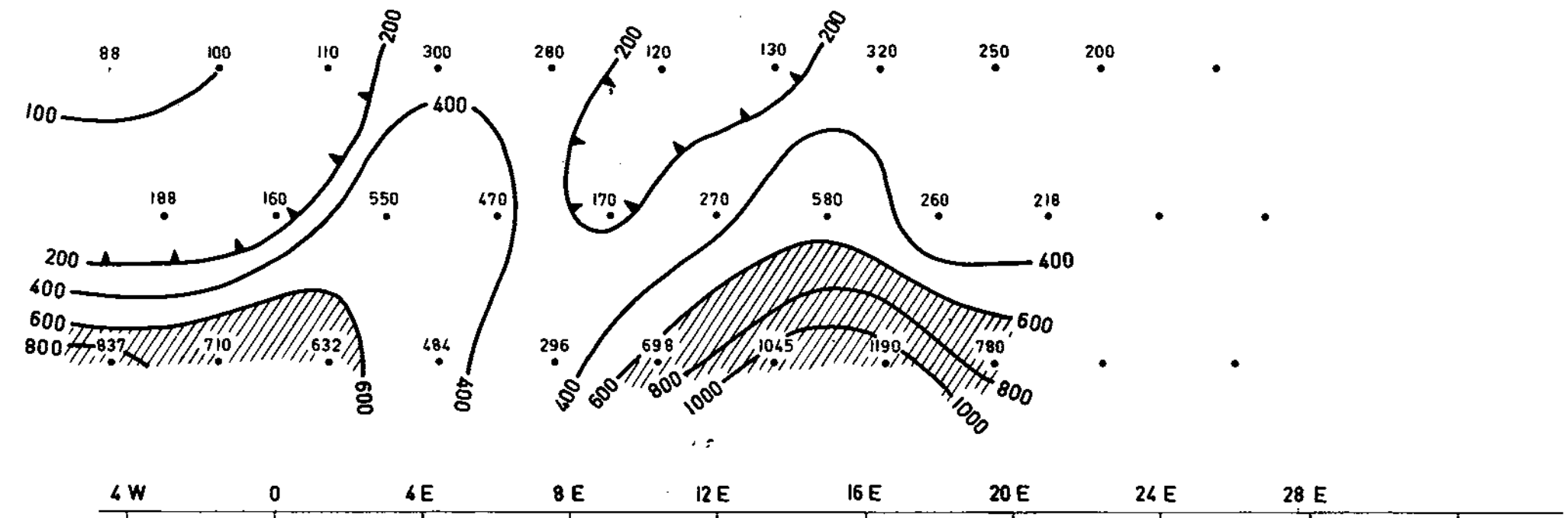
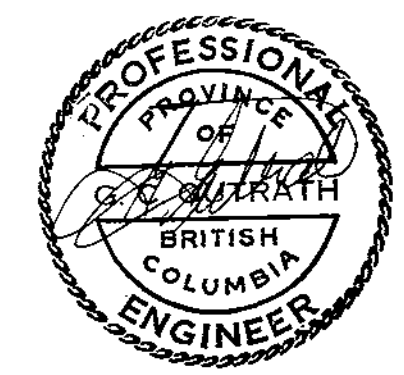
P. P. NIELSEN, B.Sc., GEOPHYSICIST & *P.P. Nielsen*
 G. C. GUTRATH, B.Sc., P. Eng. GEOLOGIST

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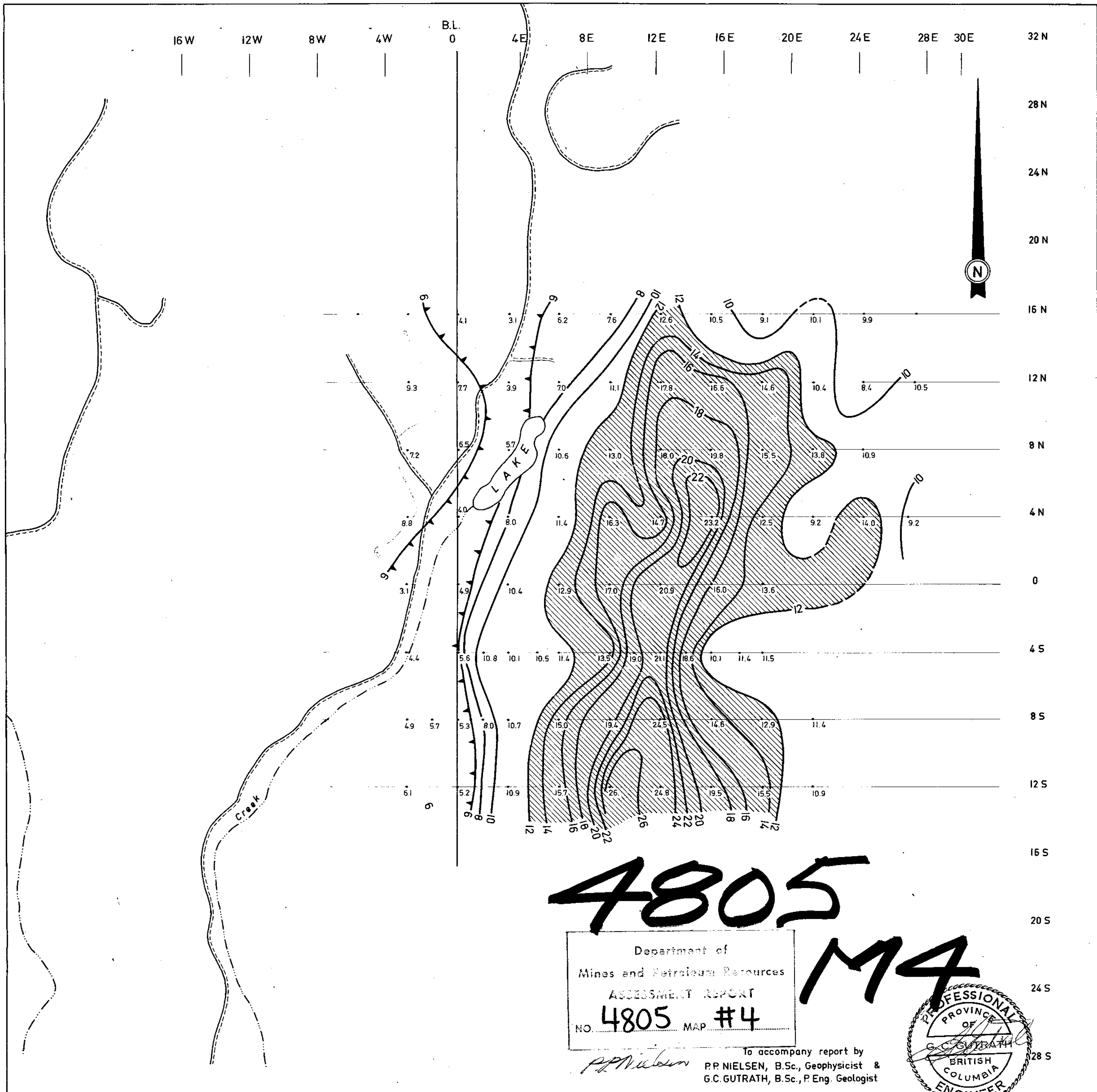
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Department of
Mines and Metallurgical Resources
ASSESSMENT REPORT
NO. **4805** MAP _____

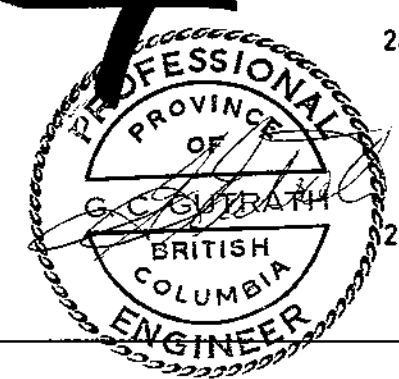


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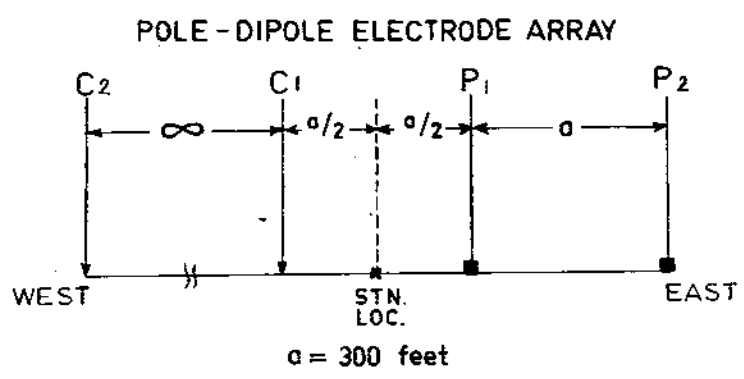
M4

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. **4805** MAP #4

To accompany report by
P.P. Nielsen P.P. NIELSEN, B.Sc., Geophysicist &
G.C. GUTRATH, B.Sc., P. Eng. Geologist



INSTRUMENT PARAMETERS
INSTRUMENT USED
HUNTEC MK III R WITH
75 KW POWER SOURCE
SPECIFICATION
TRANSMITTER TIMING: 2 secs. ON & 2 secs. OFF
RECEIVER DELAY TIME: 240 msec.
BASIC INTEGRATING PERIOD: 60 msec.
TOTAL INTEGRATING TIME: 900 msec.

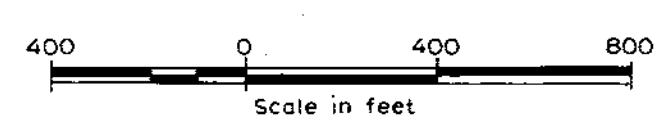


LEGEND
 HIGH CHARGEABILITY AREA,
 LOW CHARGEABILITY AREA
CONTOUR INTERVAL: 2 msec.

N=2

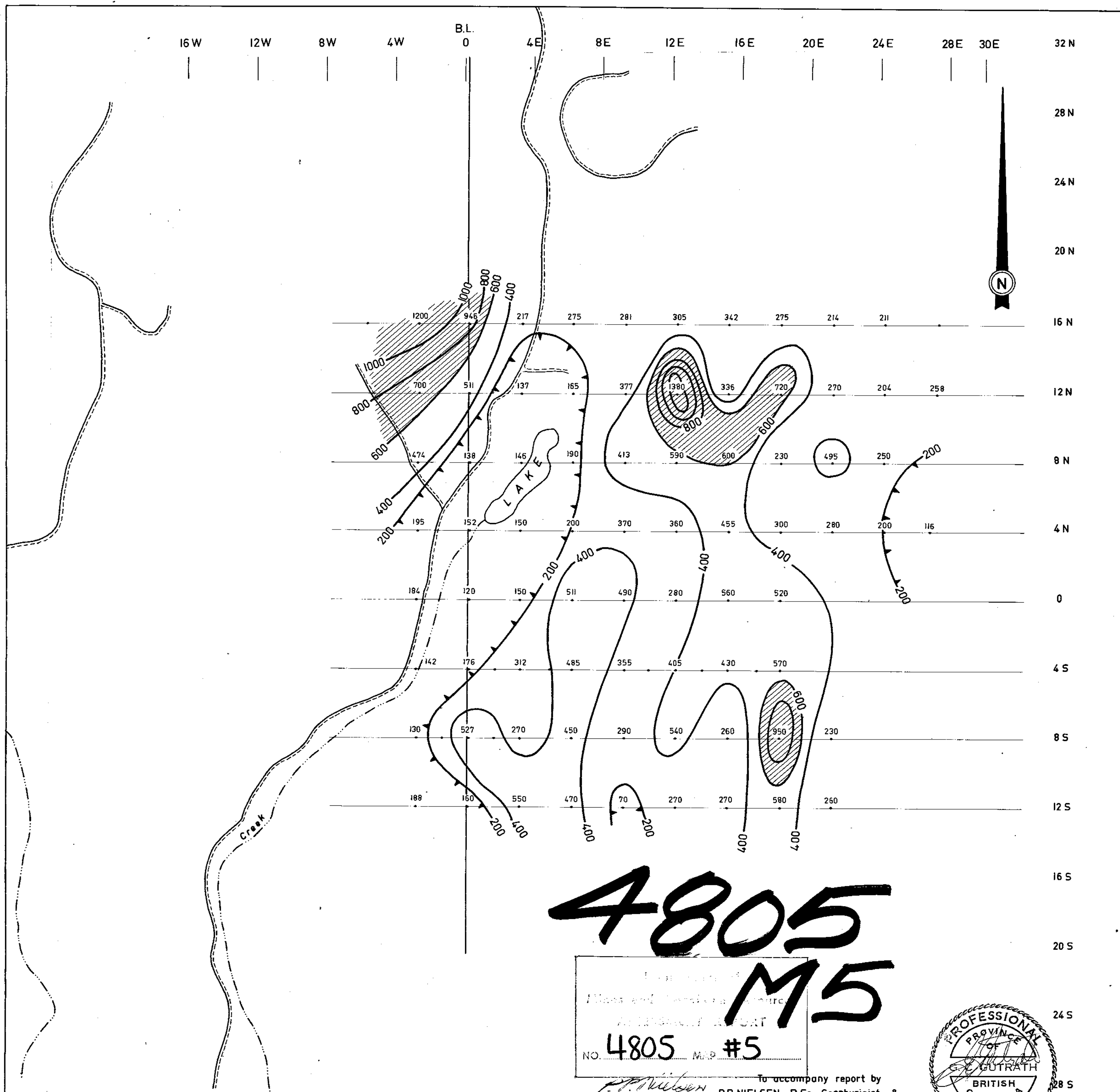
TORONADO DEVELOPMENT CORP. LTD. (N.P.L.)
CAROLIN MINES LTD. OPTION
QUILCHENA CREEK - MERRIT, B.C. AREA
**INDUCED POLARIZATION SURVEY
APPARENT CHARGEABILITY
VALUES & CONTOUR MAP**

NICOLA MINING DIVISION N.T.S. 9212
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VANCOUVER, B.C.



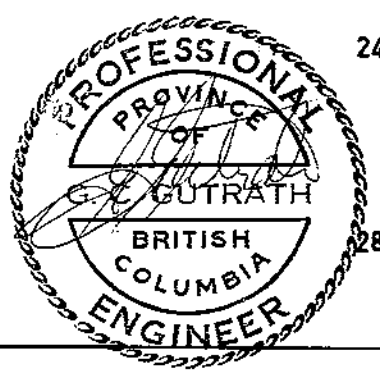
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**4805
M5**

Map No. **4805** MAP #5



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P.P. NIELSEN, B.Sc., Geophysicist &
G.C. GUTRATH, B.Sc., P. Eng. Geologist

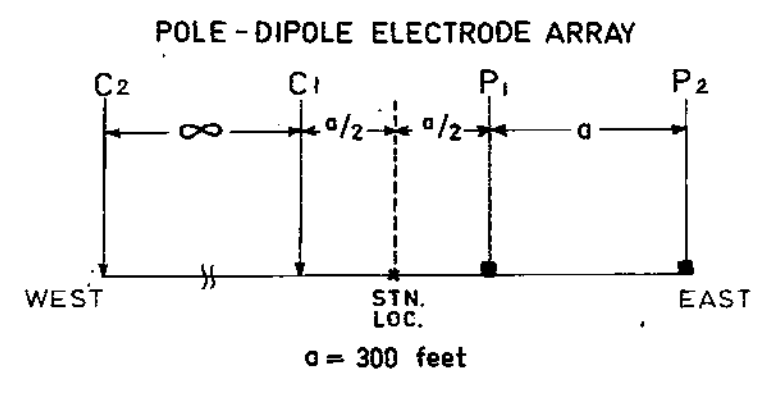
INSTRUMENT PARAMETERS
INSTRUMENT USED
 HUNTEC MK III R WITH
 7.5 KW POWER SOURCE
SPECIFICATION
 TRANSMITTER TIMING: 2 secs. ON & 2 secs. OFF
 RECEIVER DELAY TIME: 240 msec.
 BASIC INTEGRATING PERIOD: 60 msec.
 TOTAL INTEGRATING TIME: 900 msec.

LEGEND

- HIGH RESISTIVITY AREA
- LOW RESISTIVITY AREA

CONTOUR INTERVAL: 200 OHM-METRES

N = 2



TORONADO DEVELOPMENT CORP. LTD. (N.P.L.)

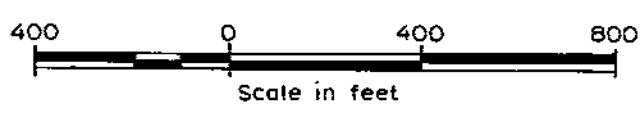
CAROLIN MINES LTD. OPTION
 QUILCHENA CREEK - MERRIT, B.C. AREA
INDUCED POLARIZATION SURVEY
APPARENT RESISTIVITY
VALUES & CONTOUR MAP

NICOLA MINING DIVISION

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