2097

REPORT ON
INDUCED POLARIZATION AND MAGNETOMETER SURVEYS
CHUTANLI LAKE AREA, BRITISH COLUMBIA
EXECUTED BY
RIO TINTO CANADIAN EXPLORATION LTD.

Interpretation and Reporting by
Seigel Associates Limited
November 10, 1969

CLAIMS:

	Names		Record No.
C	1 to 10	10	64044 to 64053
C	13, 15, 21	3	64056, 58, 64
C	36 to 44	9	64079 to 64087
C	50	1	75642
C	52 to 56	5	75644 to 75648

LOCATION:

About 100 miles SW of Prince George, B.C.
Omineca Mining Division
124° 53° SW

DATES:

September 11 to October 6, 1969

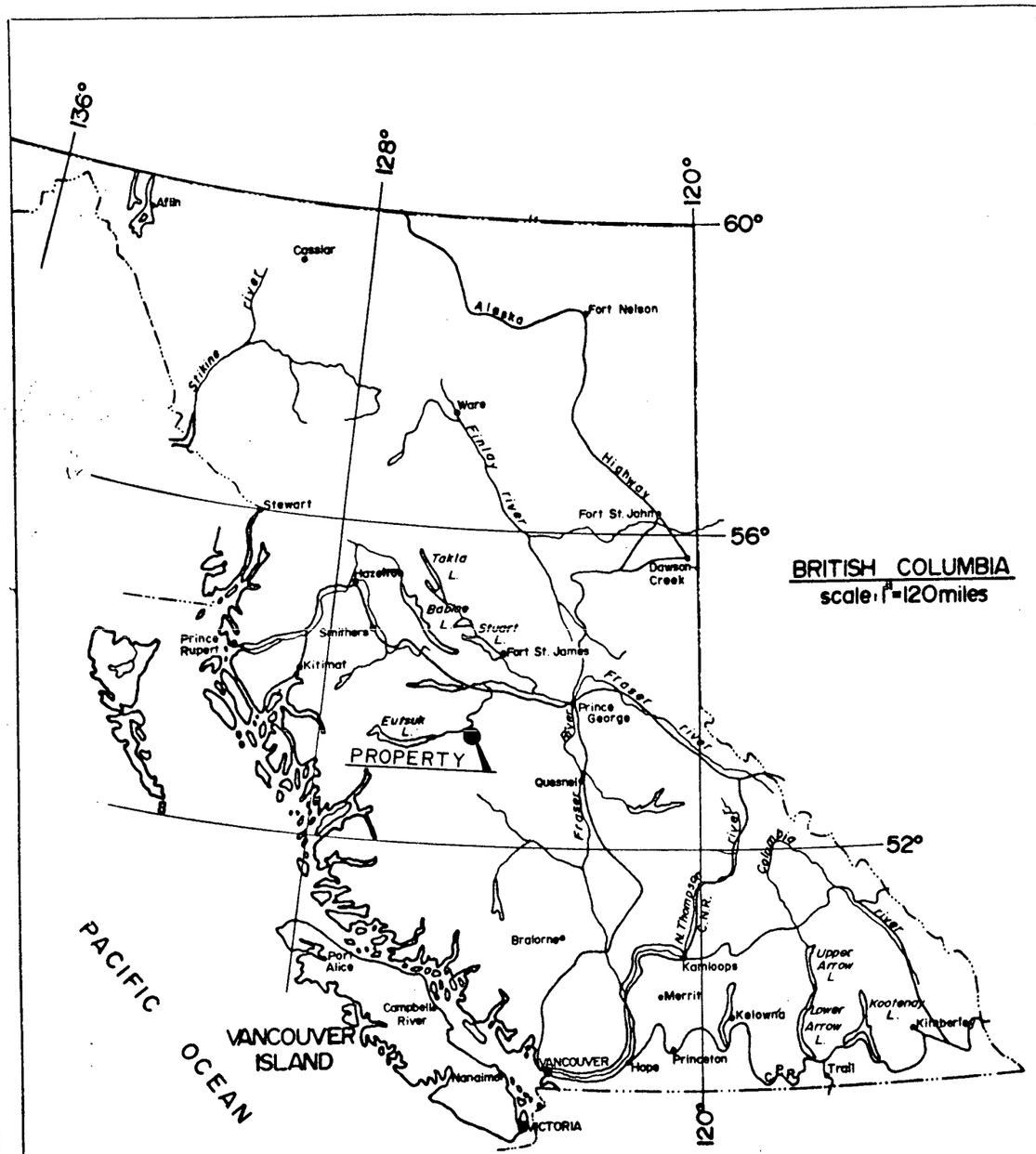
TABLE OF CONTENTS

PLATES

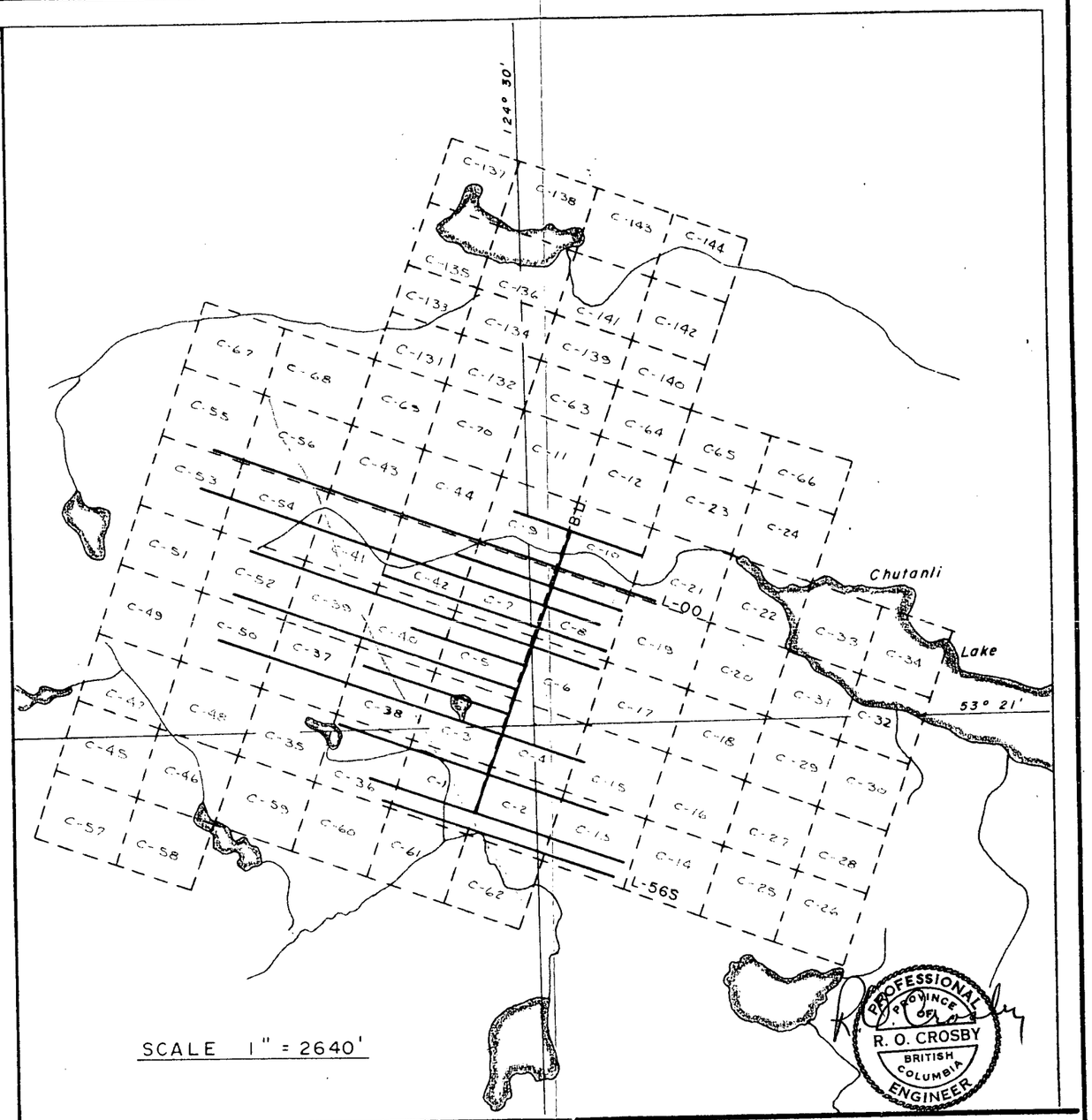
SUMMARY

An induced polarization survey on this property has revealed that much of the area surveyed is underlain by high chargeability material. The observed order of IP responses could be caused by disseminations of up to 10% by volume of polarizable material such as sulphide mineralization, carbonaceous material, magnetite or other polarizable minerals in unknown relative proportions.

Since the highest IP responses may not necessarily indicate the areas of greatest economic interest, the induced polarization data have been correlated with the resistivity and magnetic data to define four zones exhibiting different geophysical characteristics. Since the geological and geochemical results indicate that the high chargeabilities may be caused by sulphide mineralization, drill testing of each of these geophysical environments may be warranted. As further geological information becomes available from the diamond drilling, additional zones of different geophysical characteristics may become worthy of attention.



BRITISH COLUMBIA
scale: 1"=120miles



SCALE 1" = 2640'

PROFESSIONAL ENGINEER
PROVINCE OF B.C.
R. O. CROSBY
BRITISH COLUMBIA

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2097 MAP #1

SCALE
One Inch =

RIO TINTO CANADIAN EXPLORATION LTD.

CHUTANLI LAKE PROJECT B.C.

LOCATION MAP

Oct., 1969 / r.w.r. DWG. L-6010

REPORT ON
INDUCED POLARIZATION AND MAGNETOMETER SURVEYS
CHUTANLI LAKE AREA, BRITISH COLUMBIA
EXECUTED BY
RIO TINTO CANADIAN EXPLORATION LTD.

INTRODUCTION:

During the period from September 11 to October 6, 1969 induced polarization and magnetometer surveys were executed near Chutanli Lake, British Columbia by Rio Tinto Canadian Exploration Ltd. The surveys were under the direction of Mr. H. Beckman and Mr. D. Sexsmith who are on the staff of Rio Tinto Exploration. The data resulting from the surveys have been submitted to Seigel Associates for interpretation and reporting.

As shown on Plate L 6010, the property lies in central British Columbia about 100 miles southwest of Prince George. The terrain is rolling and treed as is typical for the Interior Plateau area.

The mineral claims covered, in whole or part, by this survey are listed on the title page of this report and are shown on Plate L 6010, on the scale of 1" = 1/2 mile. These claims are held by Rio Tinto Canadian Exploration Ltd.

On the present property a base line was established oriented N 20° E and survey lines were laid out perpendicular to the base lines. As shown on the accompanying plates the interline spacing was in places 400', and in other places 800'. Three lines were run diagonal to the main survey grid in an area of maximum chargeability.

The three electrode array, with electrode spacings of 200' and 400' was employed for reconnaissance purposes. Station intervals were 200'.

Seigel Mk VI time domain (pulse-type) induced polarization equipment was employed on this property. The transmitting unit had a rating of 2.5 kw and equal on and off times of 2.0 seconds. The receiving unit was a remote, ground-pulse type triggered by the rising and falling primary voltages set up in the ground by the transmitter. The integration of the transient polarization voltages takes place for 0.65 seconds after a 0.45 second delay time following the termination of the current-on pulse. The millisecond unit used for the present survey is the total integration for one cycle (two pulses).

INTRODUCTION: (cont'd)

The purpose of an induced polarization survey is to map the subsurface distribution of metallically conducting mineralization beneath the grids covered. In the present area such mineralization could include chalcopyrite, pyrrhotite, pyrite and other metallic sulphide minerals. As well, minerals such as magnetite, serpentine, sericite and graphite can give responses not always distinguishable from responses due to sulphide mineralization.

The magnetometer survey was executed with a sharpe MF-1 vertical force fluxgate magnetometer which has a reading accuracy of $\pm$ 5 gammas on the lowest scale. The purpose of a magnetometer survey is to detect changes in the magnetic susceptibility of the bedrocks to allow interpretation of rock types and fractures. A magnetometer survey may also be used as a direct tool for exploration if ore bodies contain above normal concentrations of minerals of high magnetic susceptibility such as pyrrhotite or magnetite.

GEOLOGY:

The geology of the area including and surrounding the present property is described in GSC Memoir 324 "Nechako River Map-Area, British Columbia" by H. W. Tipper, 1963. Map 1131A on the scale of 1" to 4 miles which accompanies the Memoir is a geological map showing the rock types and geological structures.

The geology and geochemistry of the present property have been studied in detail by Rio Tinto Canadian Exploration Ltd. A geological map prepared from outcrops and boulder till on a scale of 1" = 400' is included in the present report. This map shows the central portion of the grid to be underlain by rhyolite while the northeasterly section is underlain by andesite. A grandioritic rock type is seen in the southwesterly corner of the area. The volcanic rocks most likely belong to the Middle Jurassic Hazelton Group while the intrusives are considered to be Upper Jurassic in age. Pyrite, pyrrhotite and chalcopyrite have been found in float and in place in the volcanic rocks.

The area has been covered as part of the Federal-Provincial aeromagnetic survey program. The results of these surveys are shown on GSC Map 7224 G, Nechako River. This map shows that the area surrounding the survey grid has considerable magnetic relief and that the trends of the magnetic lineaments are NW-SE & NE-SW.

DISCUSSION OF RESULTS:

Plates IP 7007 and IP 7009 are chargeability contour plans for the 400' and 200' electrode spacings respectively. The plan scale is 1" = 400'. The observed chargeability values have been shown in milliseconds and a 10 millisecond contour interval has been adopted.

These plates reveal that approximately 80% of the area surveyed is underlain by rocks exhibiting chargeabilities in excess of 20 milliseconds and that about 60% of the area exhibits chargeabilities in excess of 60 milliseconds, a high level of chargeability by normal standards. The peak chargeability is 140 milliseconds. This order of response is equivalent to a broad dissemination of up to 10% or more by volume of polarizable material in the subsurface.

Care must be taken in using contours to interpret the location of the bodies causing the increased chargeabilities. Because of the asymmetry of the electrode array used, profiles are usually best for interpretive purposes and additional traverses employing differing electrode separations are necessary for good quantitative interpretation. Plates IP 7011 and IP 7012 show the chargeability and resistivity results in profile form. The plan scale is 1" = 400', while the vertical scales are 1" = 50 milliseconds for chargeability and 1" = 1000 ohm-metres for resistivity.

Plates IP 7008 and IP 7010 are resistivity contour plans for the 400' and 200' electrode spacings respectively. The plan scale is 1" = 400'. The resistivity values have been shown in ohm-metres and a 50 ohm-metre contour interval has been adopted.

These two plates reveal that the resistivities range from below 200 ohm-metres to in excess of 600 ohm-metres and that approximately half the area exhibits resistivities of less than 200 ohm-metres. It is noted that the resistivities for the 200' electrode spacings tend to be slightly higher than those for the 400' electrode spacings which may be explained by a high resistivity layer (perhaps overburden) overlying a lower resistivity layer (possibly bedrocks containing sulphides).

DISCUSSION OF RESULTS: (Cont')

Plate 7013 is a contour plan of the results of the magnetometer survey on a scale of 1" = 400'. The contour interval is 100 gammas. Plate M 7014 gives the magnetic results in profile form. The profile scale is 1" = 1000 gammas.

The magnetic intensities are seen to cover a range of approximately 1000 gammas. Broad changes in the magnetic character of the rocks as well as local distortions of the magnetic field are seen. Interpretations by the writer and R. O. Crosby, of the staff of Seigel Associates, indicate that the local distortions are due to steeply dipping structures such as tabular bodies or contacts. It is noted that the contour pattern may be biased by the fact that the line separation was four to eight times greater than the distance between stations along the grid lines. This may tend to overemphasize the northwest trend.

Plate M 7018 is a compilation plan which shows the chargeability, resistivity and magnetic results in schematic form. The area exhibiting chargeabilities in excess of 20 milliseconds and the location of the 200 ohm-metre resistivity contour have been shown. The magnetic features are as interpreted by R. O. Crosby.

As a means of differentiating between possible sources of high chargeabilities, four zones which exhibit high chargeability but which have different magnetic and resistivity characteristics have been selected. These areas have been designated by the letters A through D on the compilation plate. The geophysical characterisitics of each of these zones are presented in the following table:

ZONE	Chargeability	Resistivity	Magnetics
A	In excess of 100 Ms.	Zone of change from below 200 ohm-metres on south to above 350 on north.	Local peaks of a few hundred gammas (possibly pyrrhotite lenses) within an area of medium magnetic intensities.
B	In excess of 100 Ms. possibly similar to Zone A, particularly if the interpreted magnetic arcuate structure is valid.	On interpreted 'contact'.	Local peak of a few hundred gammas possibly part of an arcuate structure.
C	Up to 70 Ms.	Relatively high resistivity. From 200 to above 500 ohm-metres.	Within an extensive northwesterly trending zone of relatively low magnetic intensities.
D	Up to 80 Ms.	Relatively low and uniform resistivity on the 400' spacing, higher for the 200' spacing.	Local area of high intensities possibly indicative of a circular or cylindrical body such as an intrusive.

CONCLUSIONS AND RECOMMENDATIONS:

The present induced polarization survey has provided a map of the distribution of metallically conducting material in the subsurface of the survey grid. An area approximately 1-1/2 miles in length by 1/2 mile in width is interpreted to be underlain by a large volume of rock containing up to at least 10% by volume of metallically conducting mineralization. The character of this mineralization is not as yet known but geological and geochemical studies indicate that it is most likely composed of sulphide mineralization which will hopefully contain copper-bearing minerals.

CONCLUSIONS AND RECOMMENDATIONS: (Cont')

If the entire high chargeability zone is due to sulphide mineralization it is doubtful whether the whole zone would contain an equal distribution of economic grades of copper mineralization. It may therefore be advisable to test different geological environments within the sulphide zone by diamond drilling. Zones A through D presented above are an attempt to use the geophysical parameters to delineate areas which may have different geological characteristics. As further geological information becomes known it may be possible to determine how the geophysical parameters are linked to such geological factors as changes in rock type, alteration, fracturing, etc.

Since the sulphide zone is interpreted to occupy a large volume of rock which comes quite near the ground surface, there is no need to designate precise drill hole locations based on the geophysical data. Since the magnetic strike is north-westerly and the magnetic dips are nearly vertical, the initial holes may be drilled at a 45° inclination oriented north-easterly or south-westerly. In the writer's opinion an initial drilling program should comprise at least one 500' drill hole in each of Zones A through D.

Respectfully submitted,

SEIGEL ASSOCIATES LIMITED

Jon G. Baird, B.Sc., P. Eng.
Geophysicist

Richard O. Crosby, B.Sc., P.Eng.,
Geophysicist.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA R. O. CROSBY

Vancouver, B.C.
November 10, 1969

APPENDIX

I GEOPHYSICAL SURVEYS INDUCED POLARIZATION

II THE "THREE ELECTRODE ARRAY"

III GEOPHYSICAL SURVEYS - FLUXGATE MAGNETOMETER MF 1 (SCINTREX)

APPENDIX

GEOPHYSICAL SURVEYS INDUCED POLARIZATION

The induced polarization method is a method of detection of metallic conductors, including most sulphides and graphite, in rocks by virtue of double charge layers formed on the surface of these conductors when current is passed.

Direct current is passed through the earth for two seconds, is abruptly intercepted and kept off for two seconds and then reversed for two seconds and so on. Its measurement is made of the residual transient voltage remaining in the ground after the interception of the primary current. This measurement is actually an integration of the transient voltage form, an is expressed in units of millivolt-seconds. It is divided by the existing (steady state) primary voltage to produce the I.P. characteristic Ma or "Apparent Chargeability" of the medium, in milliseconds. The observed value of Ma never drops to zero, even in the absence of metallic conduction. There is always a background chargeability, due to one or more ionic and fluid transport effects, which varies somewhat from rock type to rock type. For the time cycle employed on this survey Ma may range from about 0.5 milliseconds in clay and to as much as 5.0 milliseconds in Precambrian volcanics in the absence of metallic conduction.

The effect of a broad dissemination of 1% sulphide mineralization by volume can increase these figures by as much as 5.0 milliseconds and is therefore readily detectable. The polarization response per percent sulphides is not generally predictable because it depends a great deal on the grain size and the manner in which they enter into the overall conduction; for this reason anomalous zones are evaluated as to their chargeability times the general background readings in milliseconds.

A Scintrex Mark VI Induced Polarization Unit, the IPR-6, Serial No. 301206 and control unit Ser. No. 61 11 01 was used throughout or on part of the survey. This unit has direct read out in chargeabilities. The means of two cycles is normally considered as one reading. It has an output of 2.5 KW powered by a motor generator.

THE "THREE ELECTRODE ARRAY"

The three electrode array consist of three moving and one stationary electrode. The stationary electrode, a current electrode should be placed in an infinate position for any survey, that is it should be 5 to 10 times the distance of any spacing to be used in the survey, removed from the point of reading. The remaining current and two potential electrodes are moved at equal spacing along the lines. The spacing depends largely on the size of the expected target, its depth and the depth of cover. Depth penetration of the system is approximately 2/3 of its spacing. The point of reading is the centre between the current and the first potential electrode. The apparent resistivity is calculated by formula and is expressed in ohm meters. The ratio of secondary over primary voltage times the instrument constant gives the chargeability in milliseconds.

APPENDIX

GEOPHYSICAL SURVEYS

FLUXGATE MAGNETOMETER MF 1 (SCINTREX)

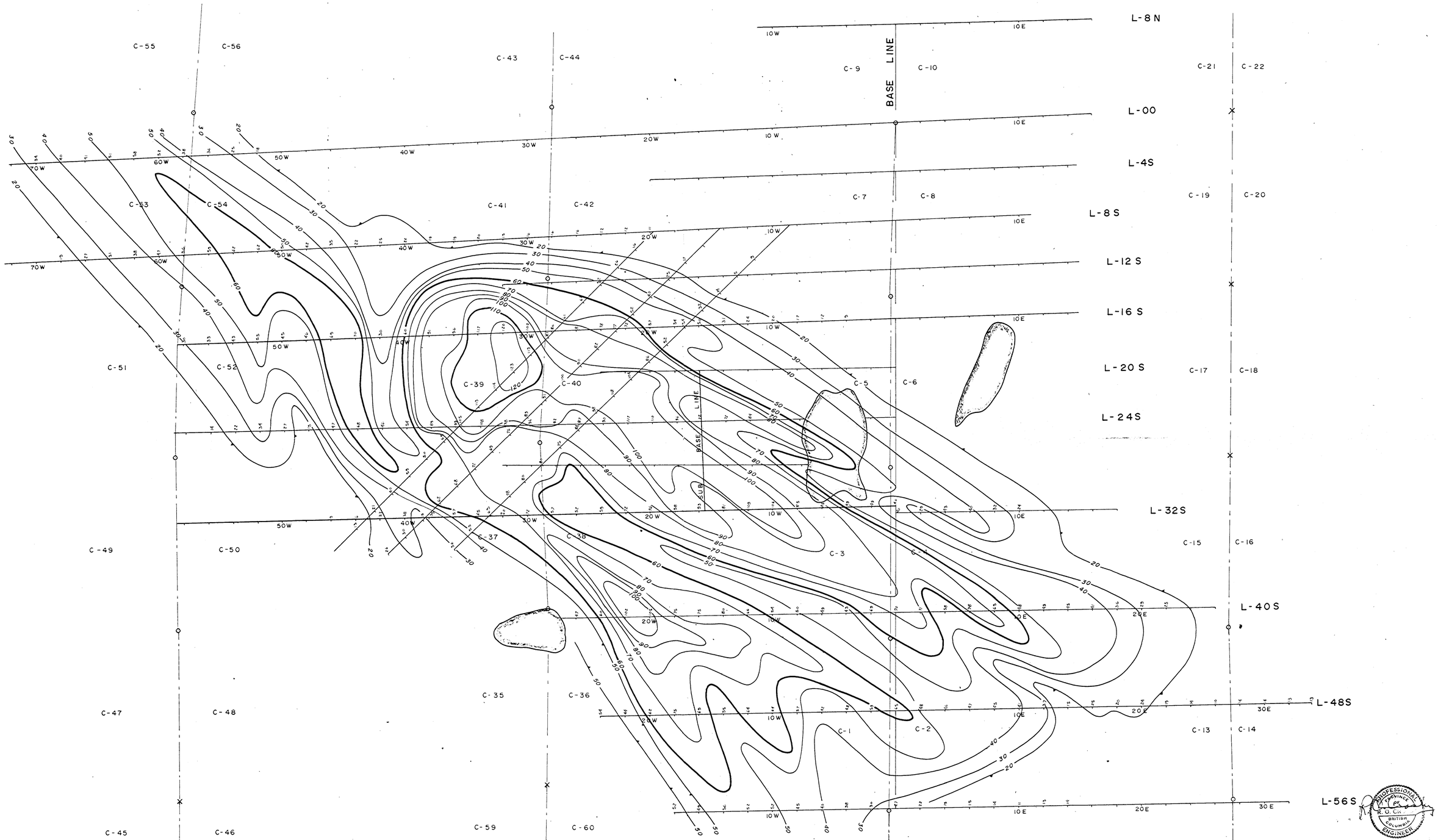
The MF 1 Fluxgate Magnetometer is a hand held instrument.

It is orientation independent, measures the vertical component of the earths magnetic field directly in gammas over a range of ± 1000 to 1000,000 gammas with an accuracy of better than 1%.

Readings are taken and recorded from a top mounted meter after levelling the magnetometer.

Periodic checks are made to base stations for diurnal drift.

Corrections for drift and day to day changes have been applied to the presented data.



N M.N. 26°

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2097 MAP #2

Legend:

54 Value in Milliseconds

Contour interval 10 Milliseconds

20 Millisecond contour interval
30 " " "
40 " " "
50 " " "
60 " " "
70 " " "

Chargeability low

NOTES: Three electrode array
400' Electrode separation
. Moving current electrode WEST

O, X Claim post located, projected

N.T.S
93-F-7

2097

SCALE
400' 0' 400' 800' 1200' 1600'
One Inch = 400 Feet

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA R.O.C.H.

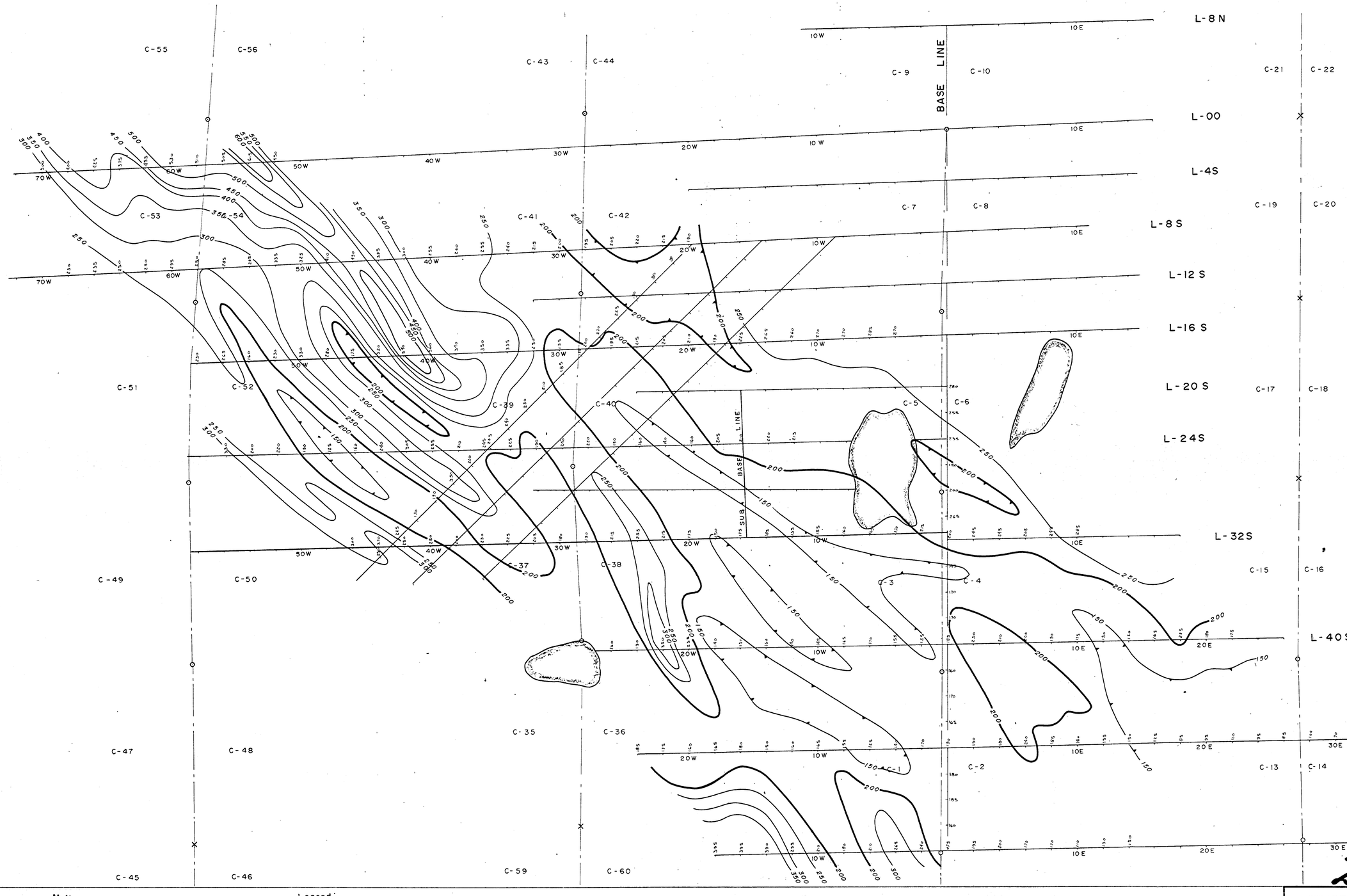
RIO TINTO CANADIAN EXPLORATION LIMITED

CHUTANLI LAKE PROJECT B.C

CHARGEABILITY CONTOUR PLAN

400' SPACING

OCT., 69 | H.B./r.w.r. | DWG. I.P.-7007



N. M.N.

26°

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2097 MAP #3

Legend:

- 355 Value in Ohm-meters
- Contour interval 50 Ohm-meters
- 150 Ohm-meter contour interval
- 200 " " "
- 250 " " "
- 300 " " "
- 300 " " "
- Resistivity low
- NOTE: Three electrode array
  400' Electrode separation
  Moving current electrode WEST
- ⊙, × Claim post located, projected

N.T.S
93-F-7

SCALE
400' 0' 400' 800' 1200' 1600'
One Inch = 400 Feet

R. O. CROSS
PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA

2097

RIO TINTO CANADIAN EXPLORATION LIMITED

CHUTANLI LAKE PROJECT B.C

RESISTIVITY CONTOUR PLAN

400' SPACING

OCT., 69 | H.B./rwr. | DWG. I.P.-7008

L-8N

L-00

L-4S

L-8S

L-12S

L-16S

L-20S

L-24S

L-32S

L-40S

L-48S

L-56S

BASE LINE

SUB BASE LINE

C-55 C-56 C-43 C-44 C-9 C-10 C-21 C-22

C-53 C-54 C-41 C-42 C-7 C-8 C-19 C-20

C-51 C-52 C-39 C-40 C-5 C-6 C-17 C-18

C-49 C-50 C-37 C-38 C-3 C-4 C-15 C-16

C-47 C-48 C-35 C-36 C-1 C-2 C-13 C-14

C-45 C-46 C-59 C-60

2097

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA

N. M.N 26°

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2097 MAP #4

Legend:

44 Value in Milliseconds

Contour interval 10 Milliseconds

20 Millisecond contour interval

30 " " "

40 " " "

50 " " "

60 " " "

70 " " "

Chargeability low

NOTE: Three electrode array
200' electrode separation
Moving current electrode WEST

O , X Claim post located, projected

N.T.S
93-F-7

SCALE

400' 0' 400' 800' 1200' 1600'

One Inch = 400 Feet

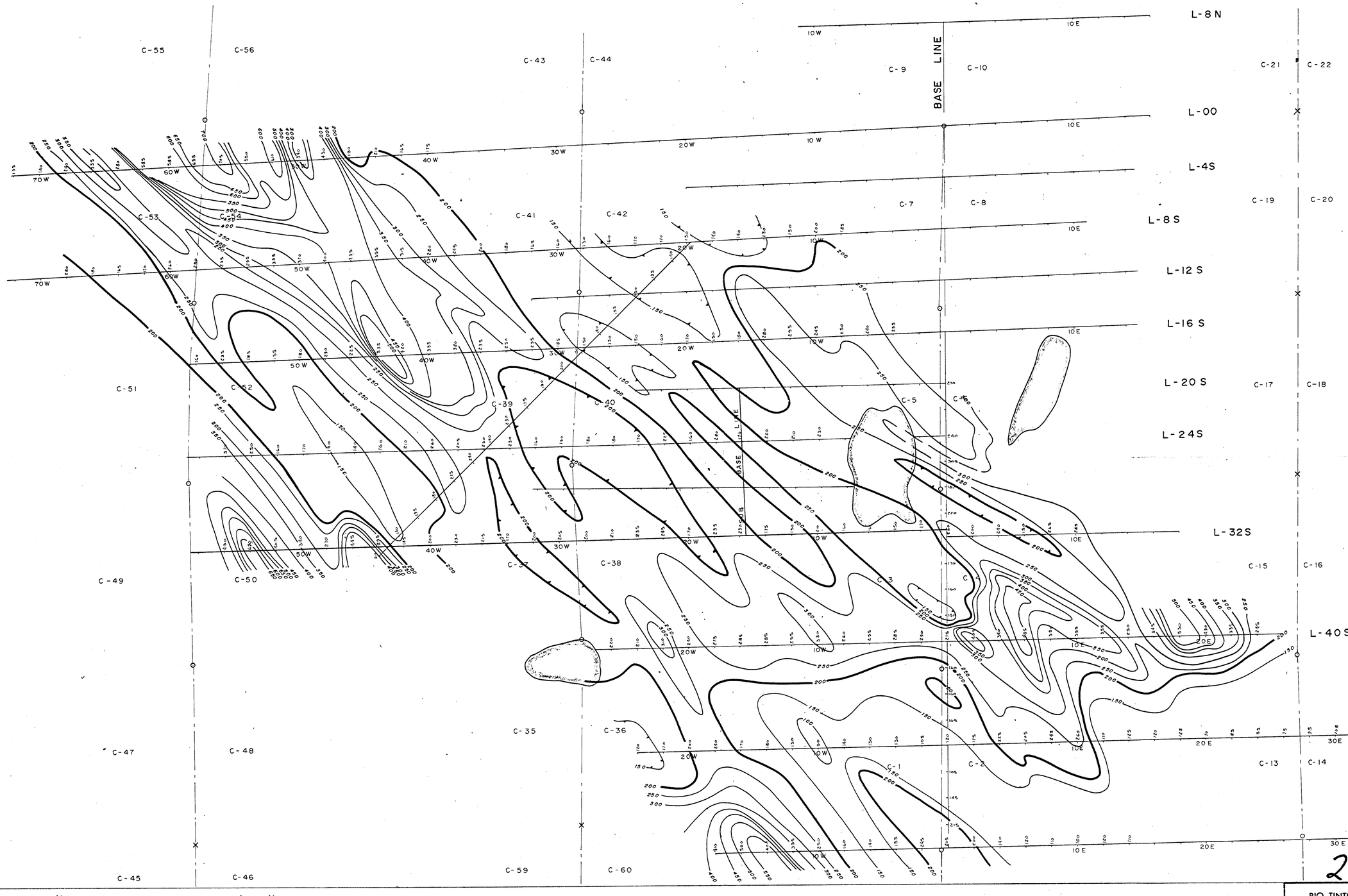
RIO TINTO CANADIAN EXPLORATION LIMITED

CHUTANLI LAKE PROJECT B.C

CHARGEABILITY CONTOUR PLAN

200' SPACING

OCT., 69	H.B./r.w.r.	DWG. IP-7009



Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2097 MAP #5

N. M.N. 26°

Legend:

- 410 Value in Ohm-meters
- Contour interval 50 Ohm-meters
- 150 Ohm-meter contour interval
- 200 " " "
- 250 " " "
- 300 " " "
- 350 " " "

Resistivity low

NOTE: Three electrode array
200' Electrode separation
Moving current electrode WEST

O , X Claim posts located, projected

N.T.S.
93-F-7

SCALE
400' 0' 400' 800' 1200' 1600'
One Inch = 400 Feet

2097

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA R. O. CROSBY

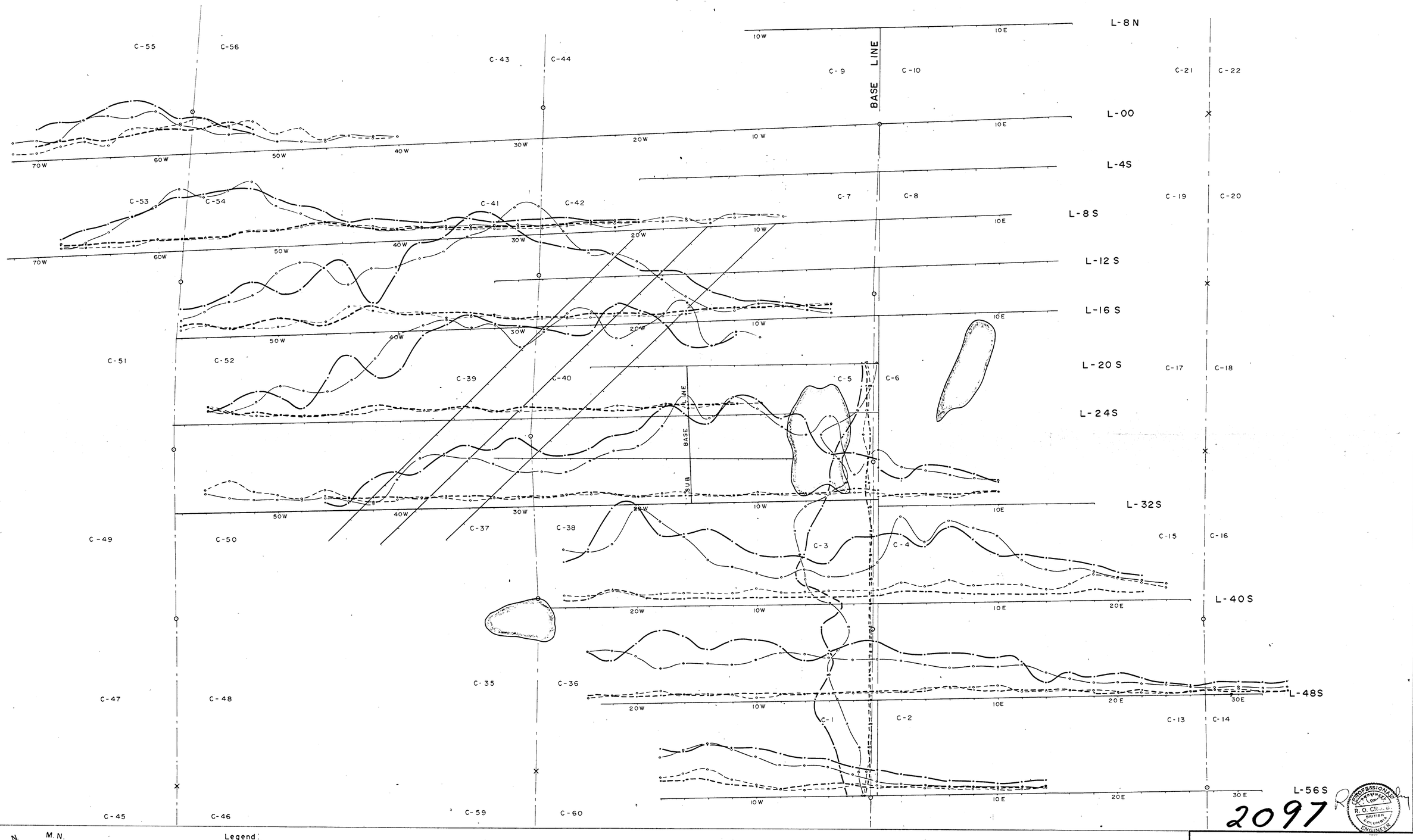
RIO TINTO CANADIAN EXPLORATION LIMITED

CHUTANLI LAKE PROJECT B.C

RESISTIVITY CONTOUR PLAN

200' SPACING

OCT., 69 | H.B./r.w.r. | DWG. IP.-7010



N. M.N.

26°

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2097 MAP #6

Legend:

Chargeability Profile Scale 1" = 50 milliseconds
Electrode Spacing a = 400'
a = 200'

Resistivity Profile Scale 1" = 1000 ohm-meters
Electrode Spacing a = 400'
a = 200'

NOTE: Three Electrode Array
Moving current electrode WEST

O, X Claim post located, projected

N.T.S
93-F-7

SCALE
400' 0' 400' 800' 1200' 1600'
One Inch = 400 Feet

2097

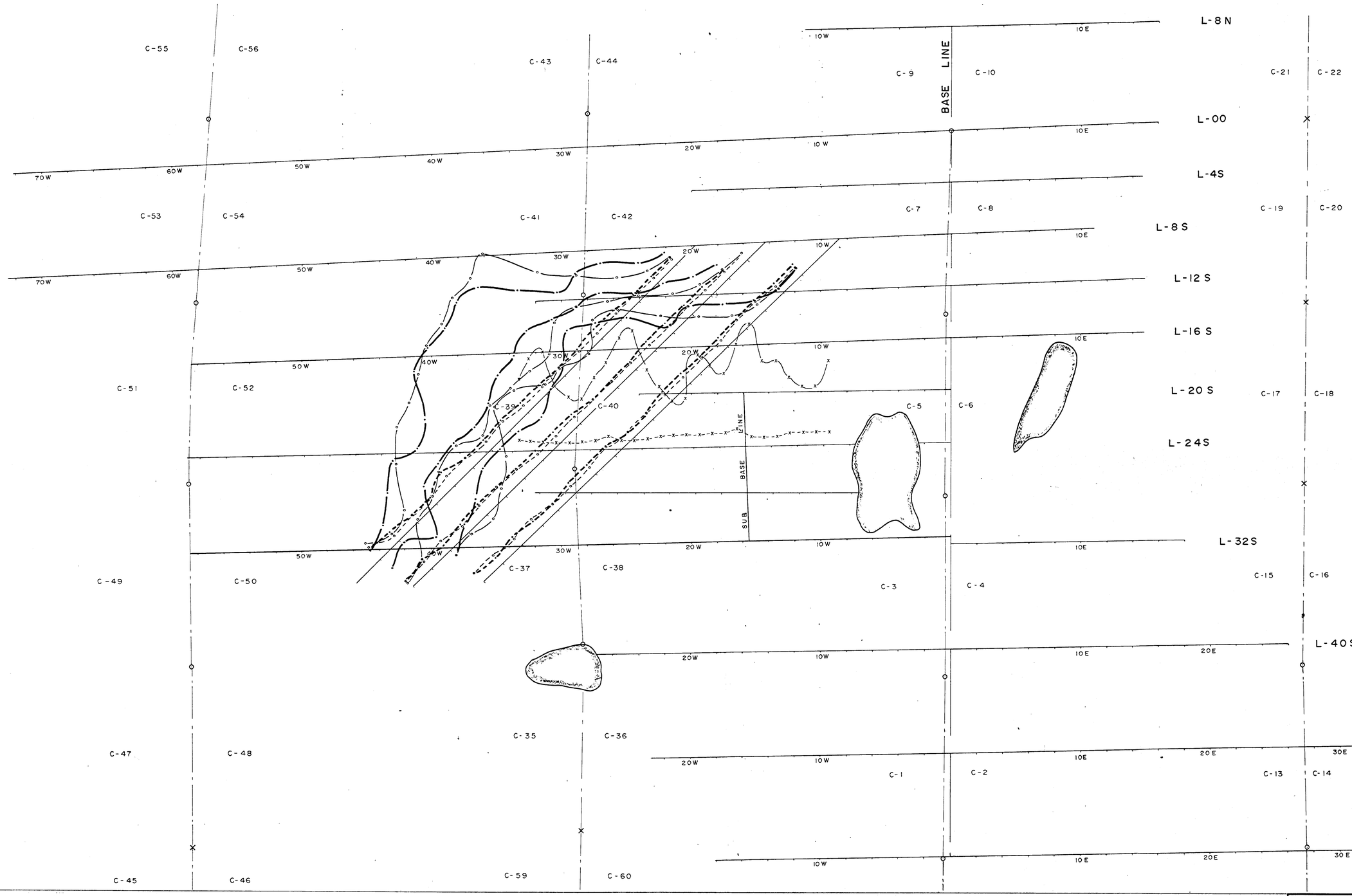
PROFESSIONAL ENGINEER
R. O. CHAMBERLIST
BRITISH COLUMBIA

RIO TINTO CANADIAN EXPLORATION LIMITED

CHUTANLI LAKE PROJECT B.C

CHARGEABILITY & RESISTIVITY PROFILE PLAN

OCT., 69	H.B./r.w.r.	DWG. I.P. - 7011



N. M.N.

26°

Department of Mines and Petroleum Resources

NO. 2097 Map #7

Legend:

Chargeability Profile Scale 1" = 50 milliseconds
Electrode Spacing a = 400'
a = 200'
a = 100'

Resistivity Profile Scale 1" = 1000 ohm-meters
Electrode Spacing a = 400'
a = 200'
a = 100'

NOTES: Three Electode Array
Moving current electrode SOUTH-WEST

O , X Claim post located , projected

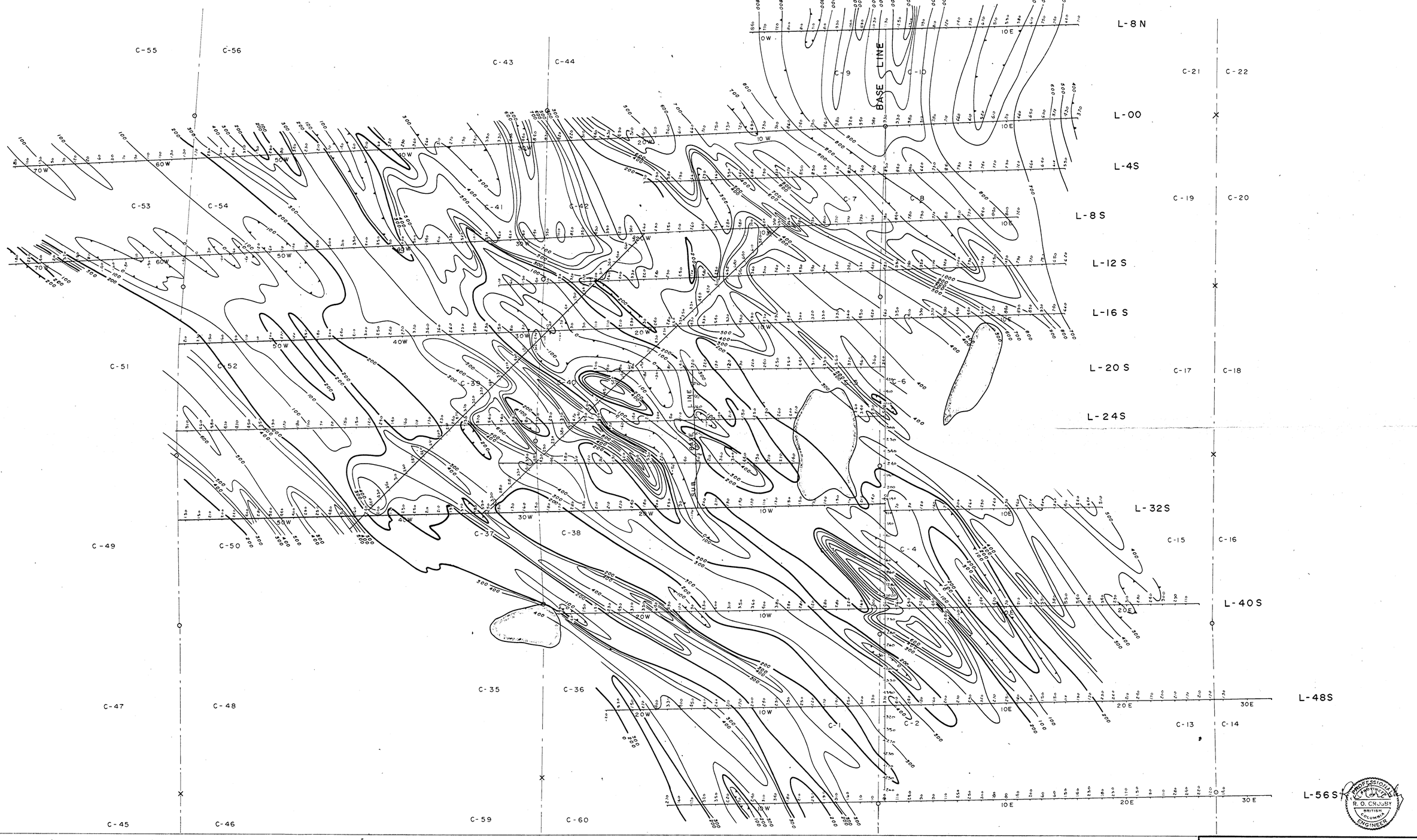
N.T.S
93-F-7

SCALE
400' 0' 400' 800' 1200' 1600'
One Inch = 400 Feet

2097

PROFESSIONAL ENGINEER R. O. CH. BRITISH COLUMBIA

RIO TINTO CANADIAN EXPLORATION LIMITED		
CHUTANLI LAKE PROJECT B.C		
(CROSS LINES) CHARGEABILITY & RESISTIVITY PROFILE PLAN		
OCT., 69	H.B./r.w.r.	DWG. I.P.-7012



N. M. N.

26°

Legend:

130 Value in gammas

Contour interval 100 gammas

0 Gamma contour interval
100 " " "
200 " " "
300 " " "
400 " " "
500 " " "

Magnetometer low

NOTE: Instrument used SHARPE MF-1 Magnetometer

O , X , Claim post located , projected

Department of Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2097 MAP #8

N.T.S. 93-F-7

SCALE
400' 0' 400' 800' 1200' 1600'
One Inch = 400 Feet

2097

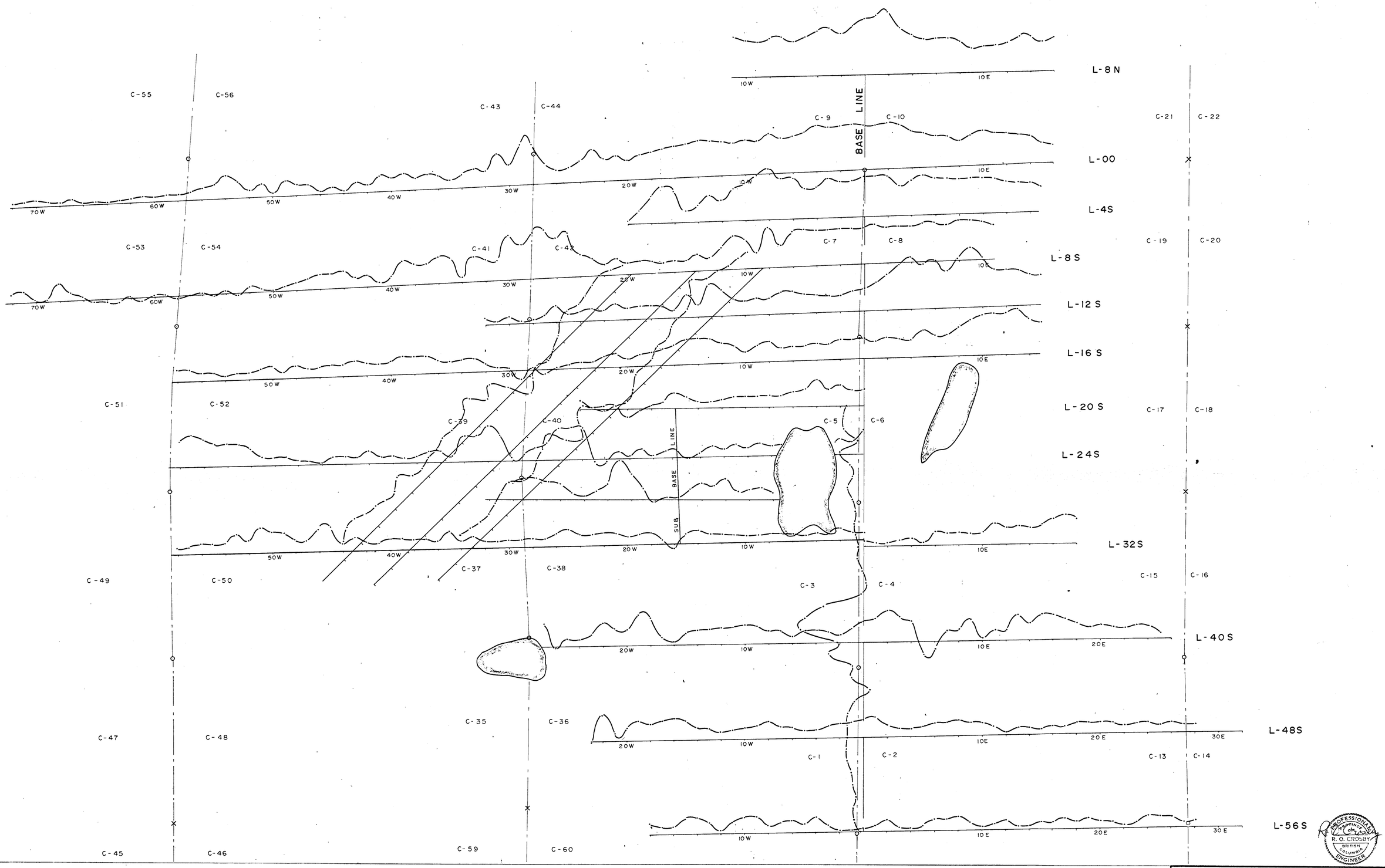
RIO TINTO CANADIAN EXPLORATION LIMITED

CHUTANLI LAKE PROJECT B.C

MAGNETOMETER CONTOUR PLAN

OCT., 69 | H.B./r.w.r. | DWG. M-7013

PROFESSIONAL ENGINEER R. O. CRUSH BRITISH COLUMBIA ENGINEER



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 2097 MAP #9

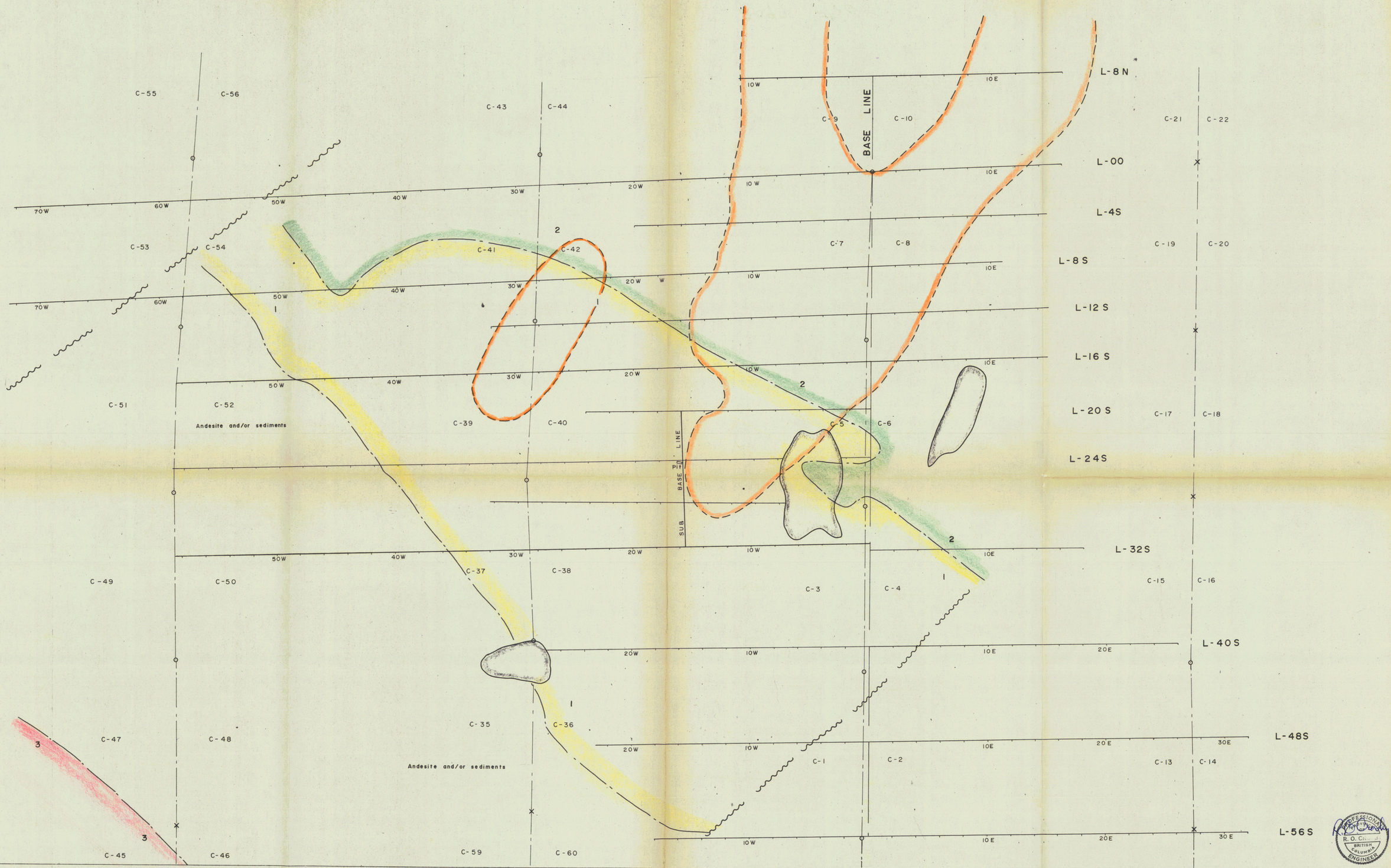
2097

RIO TINTO CANADIAN EXPLORATION LIMITED

CHUTANLI LAKE PROJECT B.C

MAGNETOMETER PROFILE PLAN

OCT., 69	H.B./r.w.r.	DWG. M-7014



N

26°

Legend;

- 1 Rhyolite
- 2 Andesite
- 3 Granodiorite
- Geochem anomaly

Note: very little outcrop, interpretation from Till mapping.

N.T.S
93-F-7

SCALE

400' 0' 400' 800' 1200' 1600'

One Inch = 400 Feet

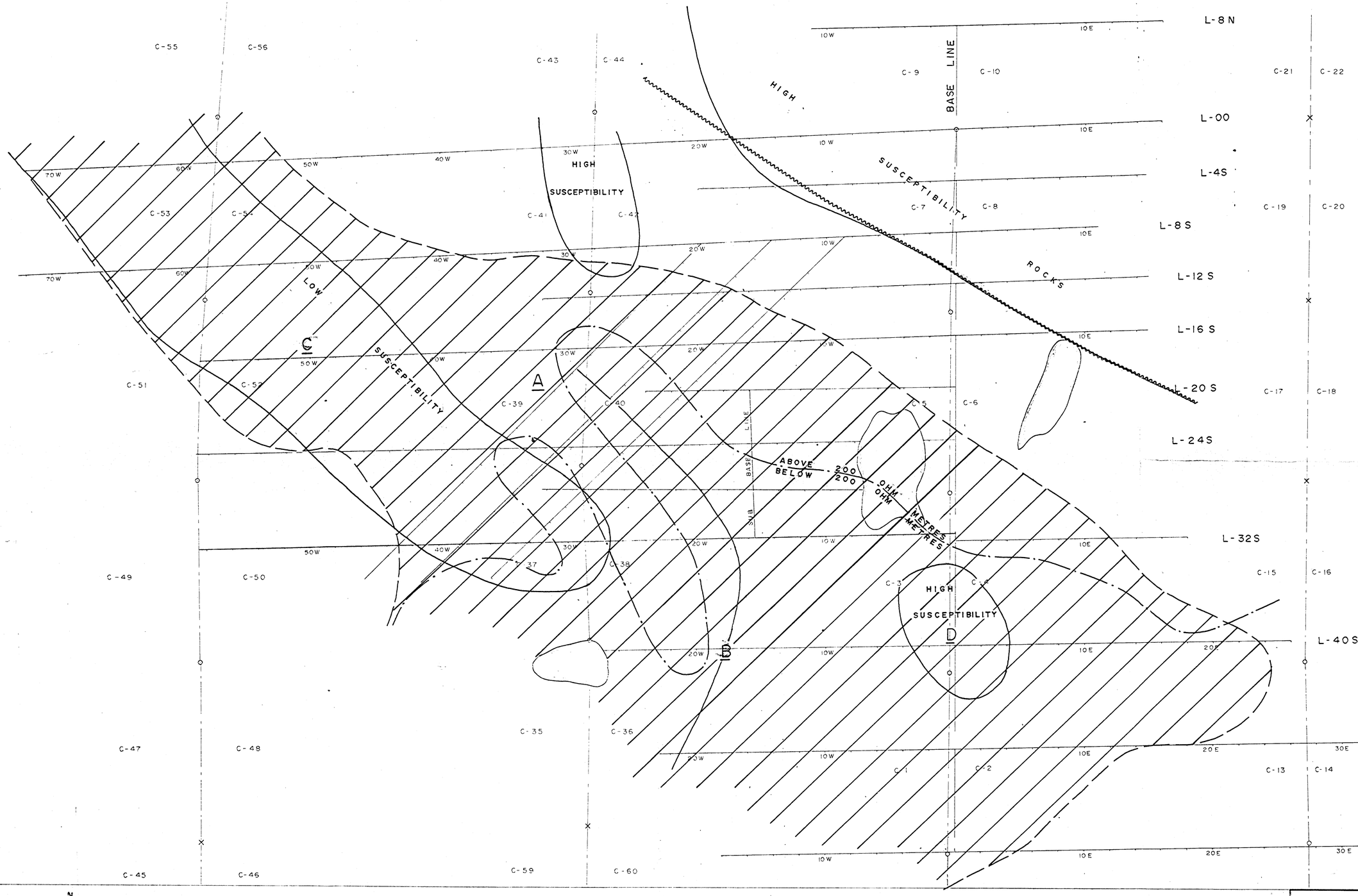
2097

RIO TINTO CANADIAN EXPLORATION LIMITED

CHUTANLI LAKE PROJECT B.C

GEOLOGY MAP

OCT., 69 | R.H/r.w.r. | DWG. G - 7019



N

26°

Legend:

- Chargeability in excess of 20 milliseconds
- Contact based on magnetics
- Fault based on magnetics
- Contact based on resistivity

N.T.S.
93-E-7

2097

SCALE

400' 0' 400' 800' 1200' 1600'

One Inch = 400 Feet

RIO TINTO CANADIAN EXPLORATION LIMITED

CHUTANLI LAKE PROJECT B.C

COMPILATION MAP

OCT., 69 | J.B./d.c. | DWG.M - 7018