4264

LOCKWOOD GEOPHYSICAL SERVICES

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4264 MAP .....

92P/8W, 9W

N.T.S. 92-P-8, 9

REPORT ON

AN AIRBORNE GEOPHYSICAL SURVEY

LAUREL LAKE AREA, BRITISH COLUMBIA

ON BEHALF OF

RIO TINTO CANADIAN EXPLORATION LIMITED

By

R.K. Watson, B.A.Sc., P.Eng.
April 27/73

CLAIMS:

Names	Record Numbers
Lyn 1 to Lyn 154	121489 - 121642 incl.
Lyn 155 to Lyn 157	122843 - 122845 incl.
Lyn 158	122856
Lyn 159 to Lyn 166	122847 - 122854 incl.
LV 27 to LV 68	115217 - 115258 incl.
LV 69 Fr. to LV 72 Fr.	115259 - 115262 incl.

LOCATION:

Approximately 8 miles northwest of Little Fort, B.C., Kamloops Mining Division

120°22', 51°30'

LOCKWOOD SURVEY CORPORATION LIMITED

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INTRODUCTION

During the period March 28th to March 29th, 1973, Lockwood Survey Corporation Limited carried out an airborne geophysical survey over two groups of claims in southern British Columbia for Rio Tinto Canadian Exploration Limited. A total of 107.6 miles were flown over a 13 square mile area.

The purpose of the survey was to provide information about sub-surface conductors and geological structure.

1.1 AREA DESCRIPTION

The area covered is in the vicinity of Laurel Lake, approximately 8 miles northwest of Little Fort, B.C., Kamloops Mining Division. The position of the area is $51^{\circ}30'N$, $120^{\circ}22'W$.

1.2 TOPOGRAPHY

The area is generally flat lying with small rolling hills. Relief is in the order of 300 feet. Average elevation of the area is about 4300 feet above sea level.

1.3 SURVEY FLIGHT PATTERN

The geophysical survey consisted of traverse lines flown at 660 foot spacing in a $N50^{\circ}E$ heading. All traverses

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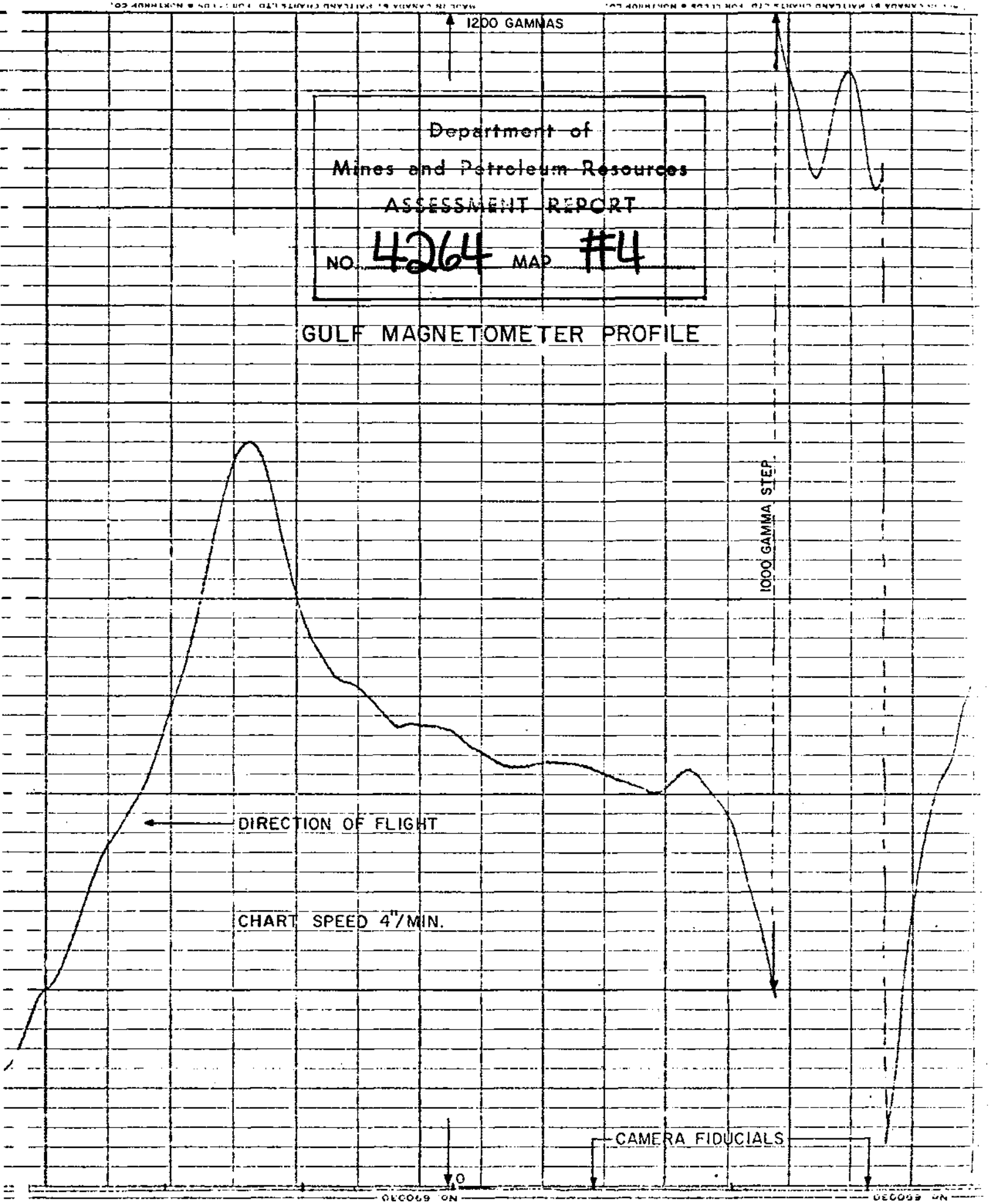

1200 GAMMAS
Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4264 MAP #4
GULF MAGNETOMETER PROFILE
1000 GAMMA STEP
DIRECTION OF FLIGHT
CHART SPEED 4"/MIN.
CAMERA FIDUCIALS
0

Figure 4

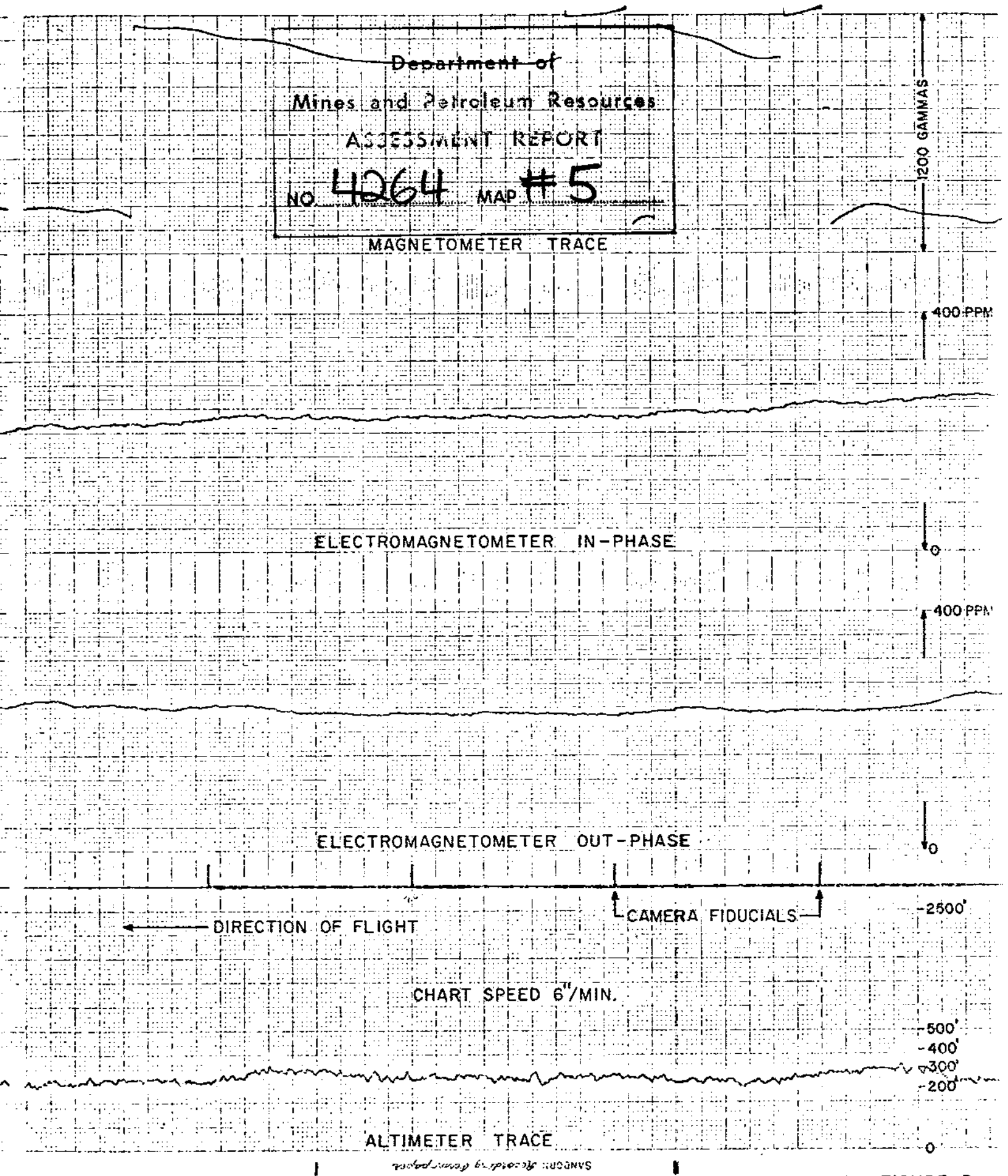
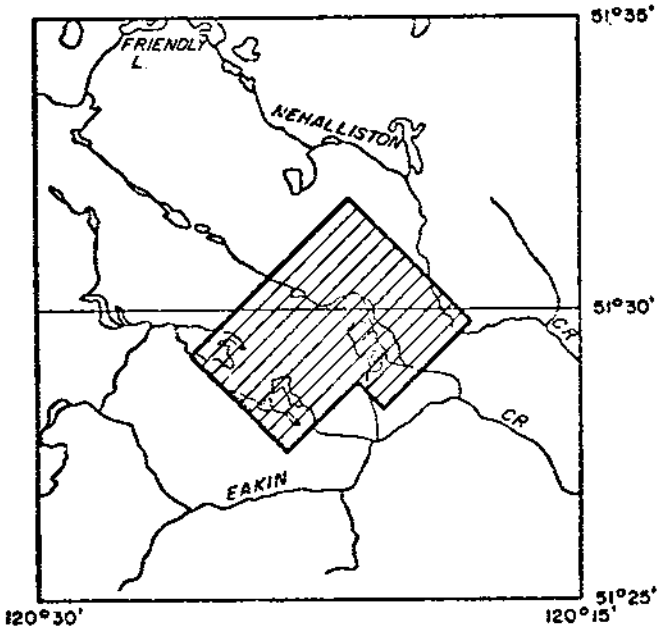


FIGURE 5



LOCATION MAP

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4264 MAP #1

Figure 1

were flown in drape fashion with the helicopter maintaining a ground clearance of 200 feet.

2.1 AIRCRAFT INSTRUMENTATION AND DATA RECORDING

The following equipment was installed in a Bell Jet Ranger 206A helicopter, registration CF-NMP, operated by Northern Thunderbird Airways of Prince George, B.C.

(a) The Gulf Mk.III Magnetometer

The magnetometer, in a towed bird configuration, is a saturable core fluxgate system which is used to measure the earth's magnetic field intensity in the direction of the main earth's field. It is sensitive to magnetic field intensity variation of about 1 gamma.

The magnetometer head consists of two saturable core orienting fluxgates whose axes are at right angles to each other. The axis of the measuring fluxgate is normal to the plane containing the two orienting fluxgates. In operation, the self-orienting fluxgates are maintained by servometers in a position of minimum coupling with the earth's magnetic field; the measuring fluxgate is then in a position of maximum coupling with the earth's magnetic field.

The output from the magnetometer is recorded in profile form in red ink on a moving chart paper, at an approximate scale of 1 inch to 1,320 feet. The operating range for this survey was 1,200 gammas across a 10 inch chart; the recording pen automatically steps at the side of the chart at 5/6th of the full scale range, i.e. 1,000 gammas. Chart speed was 4 inches per minute. The magnetometer trace is repeated on the MFE chart that records the electromagnetic channels. This record is 1,200 gammas across a 2 inch width. See Fig. 4.

(b) The Lockwood LHEM-200 Electromagnetometer

The helicopter-borne E.M. system used for this survey was developed by Lockwood Survey Corporation. This system measures the in-phase and out-of-phase components of the secondary electromagnetic field, in terms of the primary field at the receiver, viz., in parts per million of the primary field. The frequency of the alternating electromagnetic field is 4,000 cycles per second. Receiving and transmitting coils are held vertical and coaxial in a towed "bird", a distance of 30 feet apart and 100 feet below the helicopter. The sensitivity of the

measuring system is such that the minimum recognizable in-phase anomaly is about 8 parts per million. Noise on the in-phase profile is usually less than 5 parts per million of the primary field.

This equipment is operated at a "bird" height of 100 feet.

Full scale deflection of the in-phase and out-phase channels is 400 parts per million across a distance of 2 inches. Recorder used was an MFE with a chart speed of 6 inches per minute. Scale of the record is 1" = 1040 feet. See Fig. 5.

(c) The C.A.R.L. Mk.VIII Tracking Camera

The camera used for this survey was developed by Canadian Applied Research Limited.

This camera uses a 35 mm. film and is operated in a discrete frame mode. The frame size is 25 mm. laterally and 18 mm. longitudinally. The focal length is 18.5 mm. The resulting lateral coverage is 1.5 times the terrain clearance, the longitudinal coverage is equal to the terrain clearance, i.e. at 200 feet above ground the lateral coverage is

300 feet, the longitudinal coverage 200 feet. Each frame is numbered by a prism system which exposes "veeder" counter numbers on the side of the frame at the moment of exposure. Coincident with every tenth film exposure a fiducial pulse is imprinted on the magnetometer and electromagnetometer recording charts. Exposure interval of this camera for the survey was 1.5 seconds. See Figures 4 and 5.

(d) The Bonzer Altimeter TRN-70

This equipment measures the clearance between the helicopter and the nearest object. It consists of an electronic narrow aperture transmitter operating at 1600 megahertz. Output from the altimeter system was recorded on the bottom trace of the MFE recorder along with the electromagnetometer traces. Operating range was 2,500 feet across a 2 inch chart width. See Fig. 5.

3.1 FIELD SURVEY PERSONNEL

The survey was conducted in the field by the following personnel:

Pilot	:	K. Knight
Navigator/Operator	:	H. Sandau
Data Technician	:	J. Clulow

The address of Mr. Knight is Northern Thunderbirds Airways, Prince George, B.C. The address of Mr. Sandau and Mr. Clulow is 1450 O'Connor Drive, Toronto, Ontario.

4.1 POSITIONING

The positioning of the helicopter was recorded by the vertically mounted tracking camera on 35 mm. film. The developed film was then related to the 1320 feet to 1 inch mosaics to obtain accurate positioning. The related points plotted on the mosaic were then connected in order to produce the flight path recovery.

5.1 DATA COMPILATION AND PRESENTATION

(a) Aeromagnetic Data

The magnetic data is presented as contours of the earth's total magnetic field intensity at a basic contour interval of 20 gammas. The horizontal scale of the map is 1320 feet = 1 inch. As all flights were of very short duration, the diurnal variation is minimal. A common datum was drawn on all the traverse profiles for that particular day. By inspection of adjacent lines flown on different

days, the diurnal variation was removed so that all traverse lines have datums in the same plane.

From this datum magnetic values are read at the predetermined 20 gamma interval and transcribed on the base map with reference to the flight path. Points of equal magnetic intensity are joined to produce the final magnetic contour map. Fig. 2.

(b) Electromagnetic Data

The electromagnetic data is represented as the half wavelength of the in-phase component, being the extent of the heavy line with the dot representing the peak of the anomaly.

The electromagnetic data includes (a) instrument drift and (b) response due to regional variations in ground conductivity. These components were corrected for by fitting to both the in-phase and out-of-phase records, a series of linear datum lines to approximate the broad or regional variations in the records.

The in-phase component records were then read at the anomaly peaks and the half-wave amplitude marked.

The corresponding out-of-phase anomaly peaks were read. The extent and amplitude were then located on the base map with their in and out-of-phase values transcribed beside the peak. See Fig. 3.

6.1 INTERPRETATION

Known Geology

The geology of the area has been mapped in a reconnaissance manner and is shown at a scale of 1 mile per inch in Geology, Mining and Exploration in British Columbia, 1970, Figure 44. The area is occupied by the Thula batholith (Hornblende-Biotite quartz diorite and granodiorite) to the south-west and the Nicola Formation (andesites, argillites and siltstones) to the north-east. Some exposures of grey microdiorite lie in the andesites near the north corner. All rocks are Upper Triassic in age.

A copper-lead showing is located in the argillite-siltstone formation about one mile north of the survey area boundary.

(a) Magnetic Survey

The magnetic field is active over most of the survey area, showing several hundreds of gammas of magnetic relief over short distances. In a general sense the magnetic relief is greater in the area of the andesites than in the granodiorite although the difference in the texture of the magnetic pattern between the two rock types is not well enough defined to see the position of

the contact. A triangular shaped area of relatively quiet activity appears to continue onto an area mapped as argillite and siltstone and is interpreted as such. Its contact with surrounding rocks is reasonably well defined on its south and east side but poorly defined on the north side.

The magnetic activity is an expression of relatively small amounts of magnetic iron minerals in the bedrock. None of the anomalies are strong enough to indicate an iron deposit of economic interest.

(b) Electromagnetic Survey

The survey revealed a small number of weak anomalies of which all but one group occurred over lakes and are interpreted as conductive lake bottom sediments.

The one group of anomalies that is excepted is on lines T-26 to T-28 about 3/4 mile east of Long Island Lake. The conductivity-width value has been calculated in mhos for the better anomalies in the group and is shown as a circled figure. At several points it is close to, or within, the range of values generally accepted as indicating bedrock conductors. As such they

may have potential as sulphide deposits or could also be conductive argillaceous shales which can reach similar conductivity-width values.

Their strike direction carried north-west coincides with a copper lead showing and so the anomalies are considered worthy of ground follow-up using electromagnetic or induced polarization methods.

Three E.M. anomalies occur on magnetic anomalies which have a negative in-phase response. This is a common characteristic of strongly magnetic areas and does not represent a bedrock conductor.

(c) Summary & Recommendations

An airborne electromagnetic and magnetic survey was conducted over the claims under discussion. The magnetic survey showed considerable magnetic activity in the ground underlain by both the Nicola Andesites and the Thula granodiorite.

A zone of low magnetic activity was interpreted as a band of argillite and siltstone within the Nicola formation.

The electromagnetic survey detected a small group of conductors in the siltstone-argillite formation which could have base metal potential. A ground follow-up program including electromagnetic induced polarization is recommended.

LOCKWOOD SURVEY CORPORATION LIMITED

Roger K. Watson

Roger K. Watson, B.A.Sc., P.Eng.
Consulting Geophysicist.

CURRICULUM VITAE

Roger K. Watson

Present Occupation:	Consulting Geophysicist, Paterson, Grant & Watson Limited, Toronto, Canada.
Born:	March 28, 1936, Toronto, Canada.
Family:	Married, 2 children.
Education:	Elementary and secondary school in Toronto and Ottawa. University of Toronto- Engineering Physics, Geophysics option, B.A.Sc. obtained in 1959.
Experience:	1956-57 McPHAR GEOPHYSICS LTD.-E.M. Magnetometer operator during summer months while at University
	1958- PHELPS DODGE CORP. OF CANADA LTD. -Junior Geophysicist. Operated E.M. and Magnetometer program, Evans Lake, Quebec.
	1958-59 UNIVERSITY OF TORONTO-Research assistant at Geophysics laboratory
	1959-63 HUNTING SURVEY CORP. LTD. Geophysicist Interperetation of airborne magnetic and electromagnetic data for oil and mineral exploration. Underwater seismic (Hydrosonde) surveys for oil exploration (Lake Erie) and for engineering studies. Ground geophysical surveys for mineral exploration including E.M., Turam, Induced polarization- Labrador, Newfoundland, B.C. Yukon Territory.
	1961- Assigned to the Hydrology Division for most of the year to make studies of the irrigation and hydroelectric resources of Ceylon

1963- Began research program at Pine Point N.W.T. which culminated in acceptance of the I.P. method as principal search tool for the lead-zinc deposits of that region

1964-68 HUNTEC LTD.-Senior Geophysicist.

1964- Hydrosonde surveys for engineering and mining studies in Tasmania, Thailand, Scotland, Kuwait. Continuation of Pine Point I.P. program.

1965- I.P. program at Pine Point

1966- Assumed position of Operations Manager for the company in charge of all field operations including a large I.P. program at Pine Point.

1967- Set up and operated branch office for the company in Vancouver. Managed 2-3 crews in B.C., Yukon, Alaska

1968- THE HANNA MINING COMPANY
-Senior Geophysicist
Set specifications and supervised a number of geophysical projects for the company in Cobalt, Idaho, Nevada, and Alaska.

1969- CADESKY GROUP-Based in Uranium City, Saskatchewan, supervised an airborne radiometric spectrometer survey program involving equipping aircraft, training crew, deriving data processing methods and interpretation.

1970-71 Consulting Geophysicist to the mining industry based in Toronto.

1972 Member of Norman Paterson & Associates - General Consulting; analysis and interpretation of geophysical data: Planning and supervising field programs.

1973 Joined with Dr. Paterson in forming Paterson, Grant & Watson Limited, providing management and consulting services to the mining, engineering and petroleum industries.

Societies: Ontario and Manitoba Associations of Professional Engineers
Society of Exploration Geophysicists
European Association of Exploration Geophysicists
Canadian Exploration Geophysicists Society.

Holder of Canadian Private Pilots license #YZP-15295 - single engine, wheels and floats.

APPENDIX

RIO TINTO CANADIAN EXPLORATION LTD.

AIRBORNE GEOPHYSICAL SURVEY

4264 M-4

A 5786

CONTOUR INTERVAL ..... 20 GAMMA
MEAN FLIGHT LINE SPACING ..... 660 FEET
MEAN TERRAIN CLEARANCE ..... 200 FEET
500 GAMMA CONTOUR .....
100 GAMMA CONTOUR .....
20 GAMMA CONTOUR .....
MAGNETIC LOW .....
FIDUCIAL POINTS O3690
FLIGHT LINES .....

TO ACCOMPANY GEOLOGICAL REPORT BY ROGER K. WATSON, B.A.Sc., P.Eng. ON LAUREL LAKE, KAMLOOPS MINING DIVISION DATED APRIL 27th, 1973

TOTAL MAGNETIC INTENSITY

LAUREL LAKE AREA

BRITISH COLUMBIA

SCALE : 1 Inch to 1320 Feet

1000 0 1000 2000 3000 4000 5000
FEET FEET

Flown and Compiled by
LOCKWOOD SURVEY CORPORATION LIMITED
TORONTO, CANADA
1973

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4264 MAP #2

REGISTERED PROFESSIONAL ENGINEER
R. K. WATSON
PROVINCE OF ONTARIO

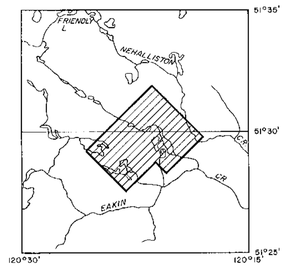
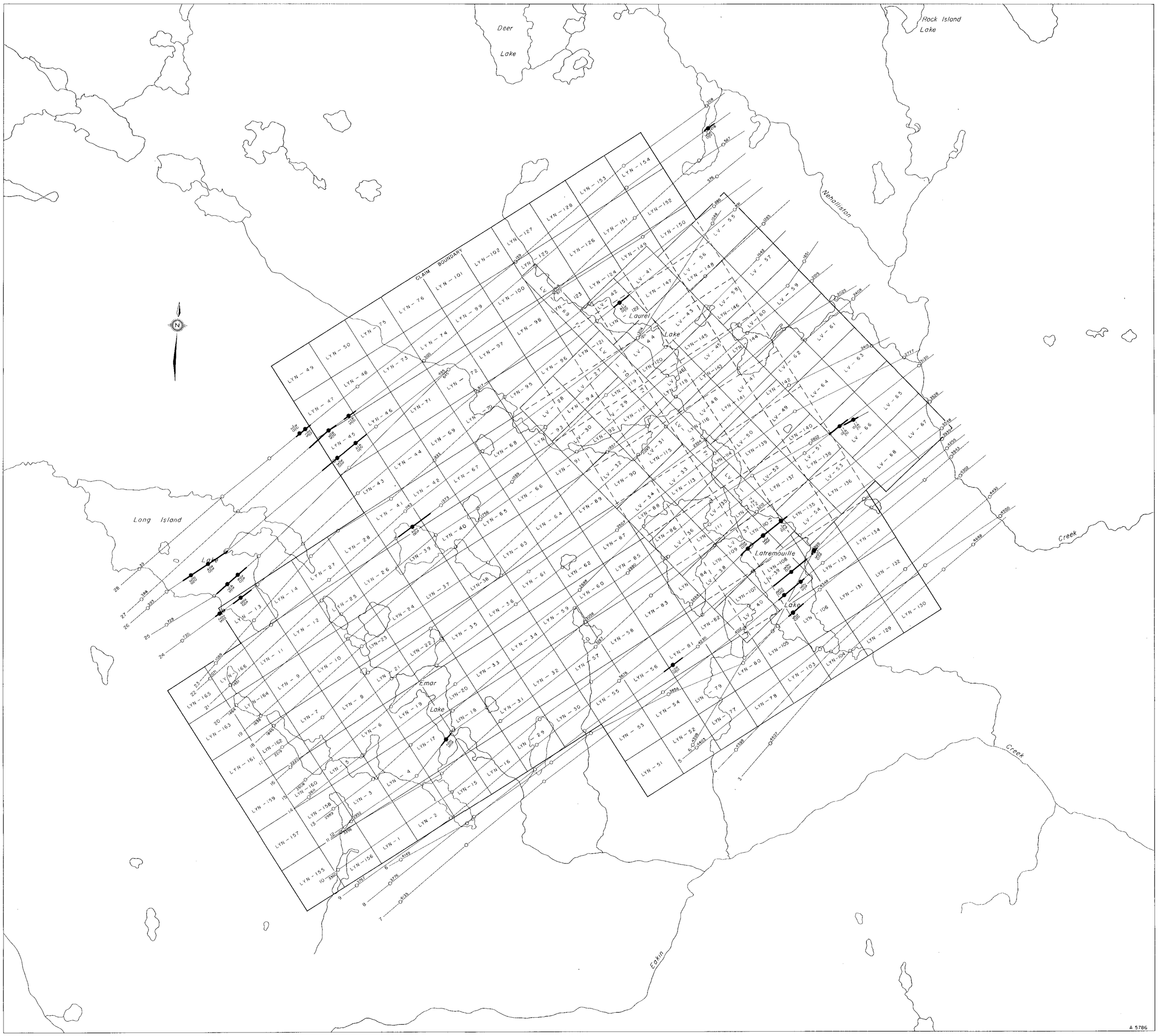


Figure 2

RIO TINTO CANADIAN EXPLORATION LTD.

AIRBORNE GEOPHYSICAL SURVEY



MEAN FLIGHT LINE SPACING ..... 660 FEET
MEAN TERRAIN CLEARANCE ..... 200 FEET
FIDUCIAL POINTS ..... O 3690
FLIGHT LINES .....
20/40 ← WIDTH AT 1/2 PEAK AMPLITUDE
REPRESENTS IN PHASE COMPONENT / OUT OF PHASE COMPONENT
OF SECONDARY FIELD IN PARTS PER MILLION

TO ACCOMPANY GEOLOGICAL REPORT BY ROGER K. WATSON, B.A.Sc., P.Eng.
ON LAUREL LAKE, KAMLOOPS MINING DIVISION DATED APRIL 27th, 1973

ELECTROMAGNETIC RESPONSE

LAUREL LAKE AREA

BRITISH COLUMBIA

SCALE : 1 Inch to 1320 Feet

1000 0 1000 2000 3000 4000 5000
FEET FEET

Flown and Compiled by
LOCKWOOD SURVEY CORPORATION LIMITED
TORONTO, CANADA
1973

Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 4264 MAP #3

REGISTERED PROFESSIONAL ENGINEER
R. K. WATSON
PROVINCE OF ONTARIO

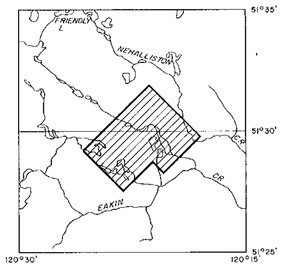
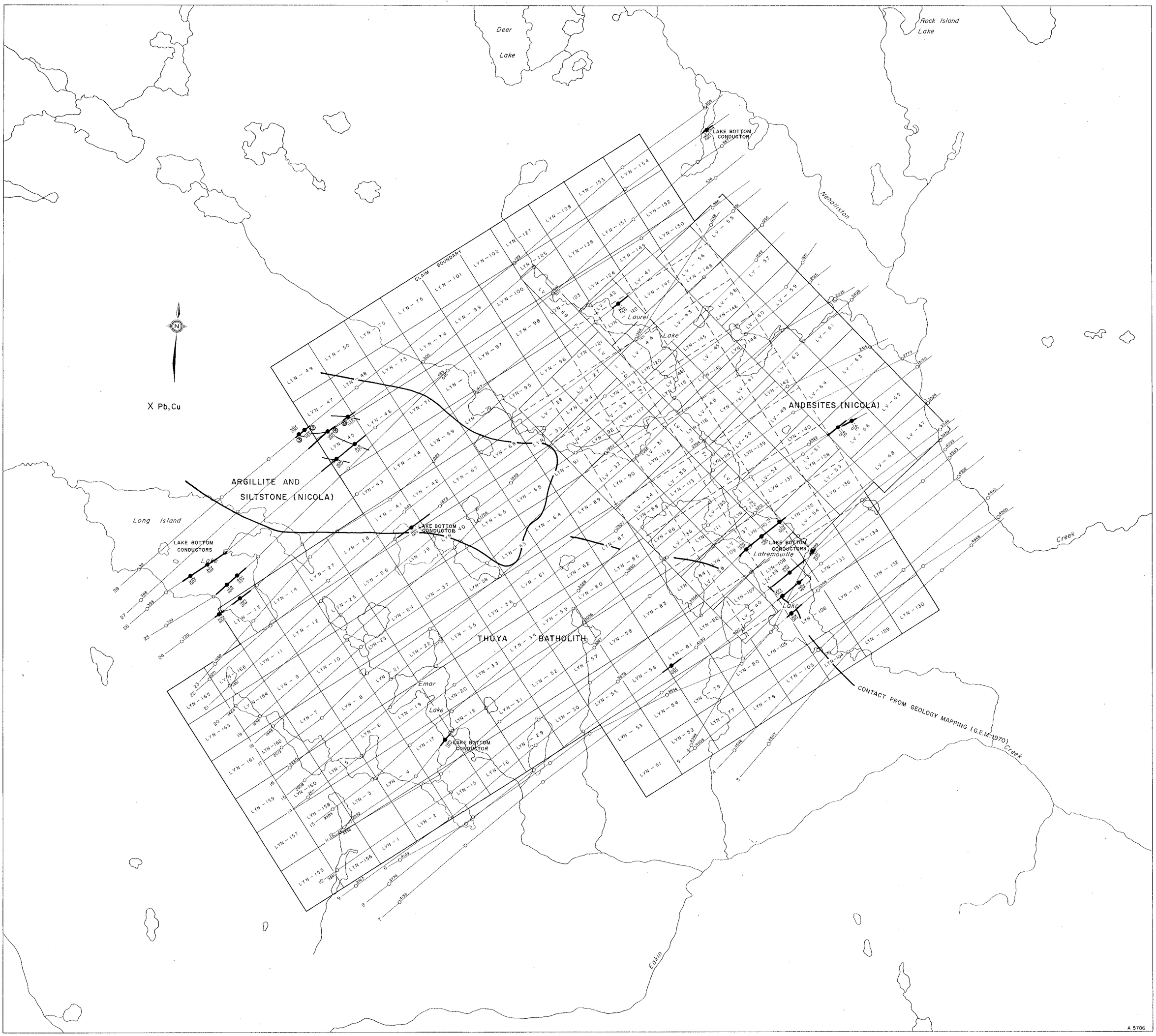


Figure 3

RIO TINTO CANADIAN EXPLORATION LTD.

AIRBORNE GEOPHYSICAL SURVEY



MEAN FLIGHT LINE SPACING ..... 660 FEET
MEAN TERRAIN CLEARANCE ..... 200 FEET
FIDUCIAL POINTS ..... O 3690
FLIGHT LINES .....
WIDTH AT 1/2 PEAK AMPLITUDE
20/40 REPRESENTS IN PHASE COMPONENT / OUT OF PHASE COMPONENT
OF SECONDARY FIELD IN PARTS PER MILLION

E.M. ANOMALY; POSITION OF PEAK, HALF AMPLITUDE WIDTH, CONDUCTANCE IN MHOS

GEOLOGIC CONTACT INTERPRETED FROM MAGNETICS

TO ACCOMPANY GEOLOGICAL REPORT BY, ROGER K. WATSON, B.A.Sc., P.Eng.
ON LAUREL LAKE, KAMLOOPS MINING DIVISION DATED APRIL 27th, 1973

INTERPRETATION
ELECTROMAGNETIC RESPONSE
LAUREL LAKE AREA
BRITISH COLUMBIA

SCALE : 1 Inch to 1320 Feet

1000 FEET 0 1000 2000 3000 4000 5000 FEET

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TORONTO, CANADA
1973

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ASSESSMENT REPORT
NO. 4264 MAP #3A

REGISTERED PROFESSIONAL ENGINEER
R. K. WATSON
PROVINCE OF ONTARIO

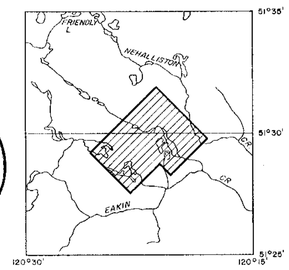

Figure 3