

REPORT ON A  
HELICOPTER E.M. AND MAGNETOMETER SURVEY  
NATALKUZ LAKE PROJECTS  
OMINECA MINING DIVISION  
BRITISH COLUMBIA

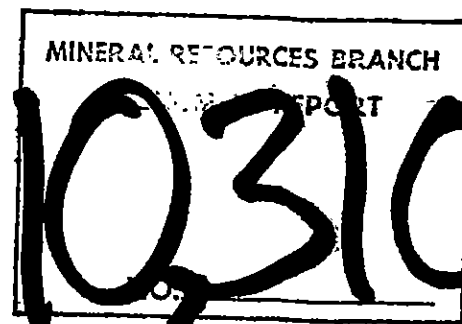
CHUTANLI LAKE  
PROJECT:

93F/7E, 8W

LATITUDE 53° 21'N LONGITUDE 124° 30'W

FOR OWNERS AND OPERATORS  
GRANGES EXPLORATION A.B.

SURVEY DATES: February 14-18, 1981



May 15, 1981  
Vancouver, B.C.

Apex Airborne Surveys Ltd.  
Ronald F. Sheldrake, B.Sc.

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STATEMENT OF COSTS

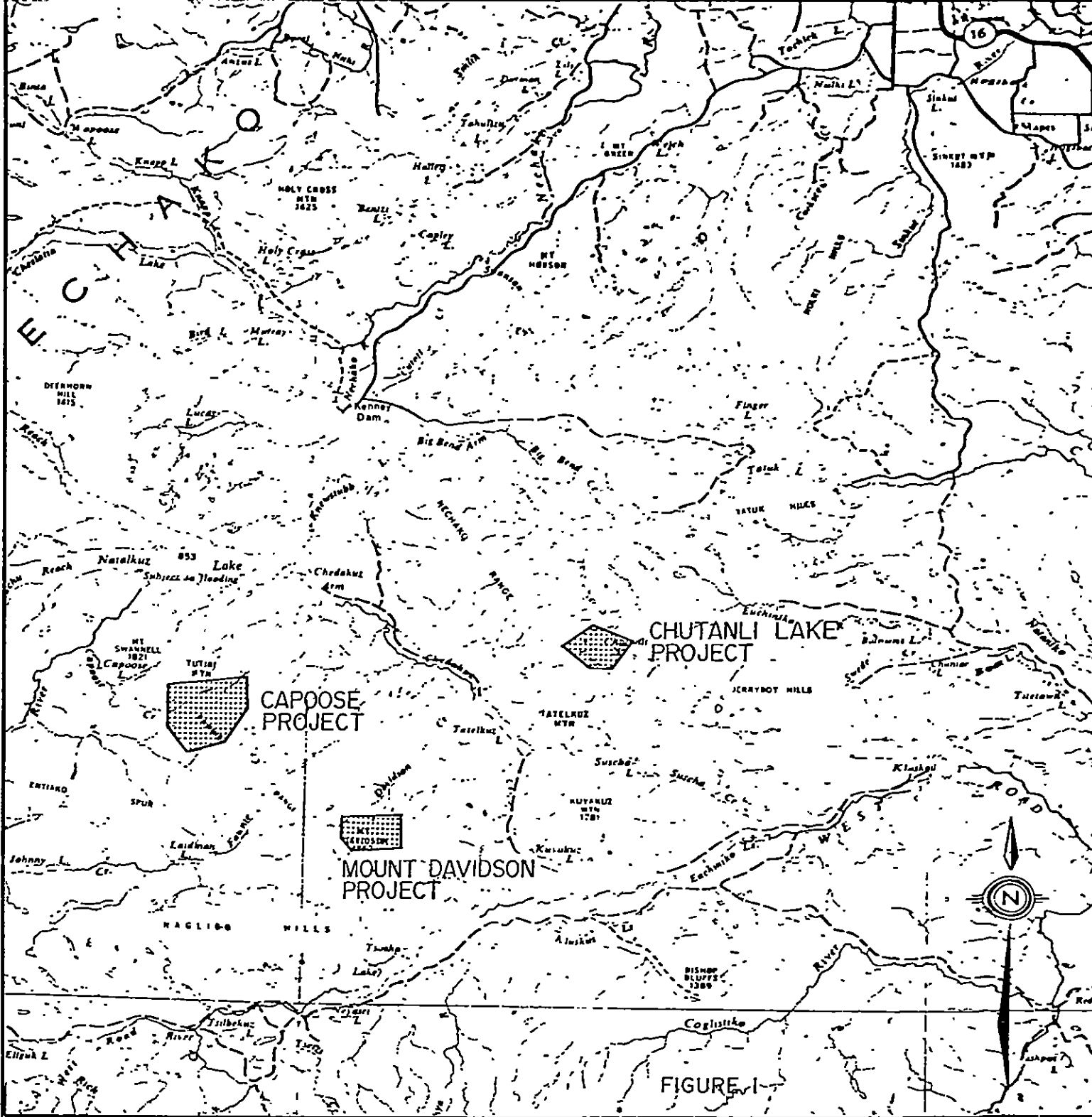


FIGURE 1

PROJECT LOCATION MAP

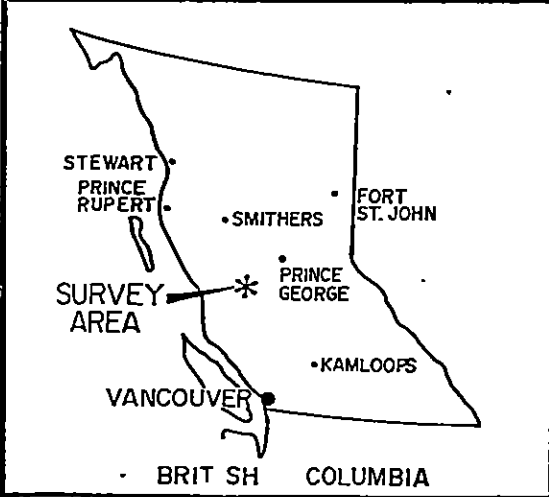
NATALKUZ LAKE AREA  
 OMINECA MINING DIVISION  
 BRITISH COLUMBIA

GRANGES EXPLORATION A.B.

APEX AIRBORNE  
 SURVEYS LTD.

DATE: MAY 1981

SCALE: 1 : 600,000



BRITISH COLUMBIA

1. SUMMARY

The geophysical survey did not outline any E. M. anomaly on the Chutanli Lake project. Several magnetic trends were located and should be evaluated whether these trends are caused by mineralization of changes in rock types.

## 2. INTRODUCTION

This report describes the results of a combined helicopter-borne electromagnetic and magnetic survey that was flown over three prospects in the NATALKUZ LAKE area, Central British Columbia, on behalf of Granges Exploration A.B.

The survey was flown between the dates of February 14 to February 18, 1981. The survey traverses over the three areas totalled 510 kilometres in rugged terrain ranging in elevation from 1060 metres to 1860 metres. A mean terrain clearance of 30 to 40 metres (for the E.M. sensor) was maintained where possible.

The Geonics 33-1 Electromagnetometer is a solid state system especially designed for helicopter transport.

It consists of two coaxial coils, one serving as a transmitter and the other as a receiver, which are mounted 6 metres apart, in a rigid "bird" with their axes horizontal and in the direction of flight. The bird is towed 30 metres below the helicopter by means of a suitable cable which also carries the electrical signals and power to and from the bird.

The system operates at 918 hertz. Changes in the alternating magnetic field at the receiver coil, caused by eddy currents in the subsurface rock, are recorded. These changes are expressed in ratios of the normal undistorted primary field. They are so small as to be expressed in parts per million or p.p.m.

The magnetometer used on this survey was a Geometrics 803. It is a total field nuclear precession instrument which measures the magnetic field strength with a sensitivity of one gamma. The sensor is toroidal and is positioned half way between the helicopter and the E.M. 33-1 bird.

Appendix I gives details of the geophysical equipment used for this survey. Appendix II describes the flight record and flight path recovery process.

CHUTANLI LAKE PROJECT

CLAIM  
NAME

RECORD  
NUMBER

APRIL  
MAY

2720  
3057



### 3. DATA PRESENTATION

#### 3.1 Electromagnetics (Plate I)

The Electromagnetic Survey Profiles Map shows the profiles of inphase and quadrature E.M. responses along the flight lines. The E.M. profiles are transcribed and plotted from the digital chart recorded in flight, after assigning a suitable base level value.

#### 3.2 Magnetics (Plate II)

The Total Field Magnetic Map shows contours of the total magnetic field uncorrected for regional variation. The maps are plotted from the digital chart recorded in flight, and contoured at an interval of 25 gammas. The 100 gamma contours are "weighted" for clarity.

3.3 Interpretation Map (Plate III)

The Interpretation Map provides a summary of the interpreted information. Formational responses, rock types, contact zones and photo-lineaments are displayed as well as target conductors that may be suitable for massive sulphide exploration.

#### 4. INTERPRETATION

Both Magnetic and Electromagnetic Maps can be interpreted to reveal areas underlain by different rock types and lineaments which could indicate contact or fault zones. Magnetic Maps can reveal the location of orebodies which contain higher percentages of magnetite or pyrrhotite than the surrounding rocks.

Conductivity thickness is the "parameter-pair" measured with the electromagnetometer. Materials which conduct electronically, metallic sulphides and graphite, have higher conductivity-thickness values than electrolytic conductors such as clays (in overburden) and ion-rich sloughs or creeks, however, there is considerable overlap.

In general, the electromagnetic responses encountered by an electromagnetic survey are of four main types.

1. Bedrock conductors: including formational graphitic responses and massive sulphide targets. . . .
2. Surficial conductors: overburden and lake responses.

3. A combination of 1 and 2: when a conductive material overlays a bedrock conductor the response due to the bedrock is superimposed on the response of the overburden or lake response. Depending upon the conductivity contrasts, and the thickness of the overburden, some bedrock conductors can be recognized through the surficial layer.
  
4. "Negative" magnetic effects: When conductors are also magnetic, the electromagnetic responses can become distorted. The distortion tends to decrease the inphase response, often reversing the sign of the E.M. anomaly. Apparent depths and conductivity-thickness products, in this case, are generally not representative.

CHUTANLI PROJECT

No electromagnetic anomalies were distinguishable as targets for mineralization on the main grid of this survey (see PLATE I). However, a small response was detected on a test line (100 W) located to the north of the main grid. This response has an indicated conductance of 3 to 5 mhos. Depth to the top of the conductor is 0 to 3 metres.

The magnetic map PLATE III for this area was contoured at 25 gamma interval and indicates a rather convoluted distribution of magnetic minerals in the underlying rocks. PLATE III highlights some of the predominant magnetic features, photo lineaments and interpreted faults.

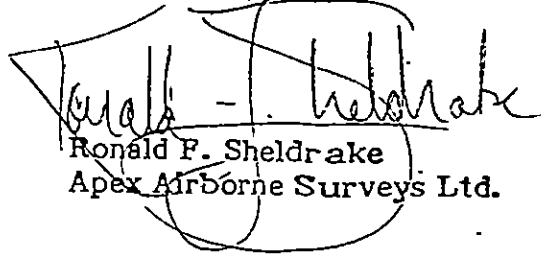
Some of the smaller magnetic anomalies (for example see fiducial 941 on L10 and fiducial 435 on L14) are localized concentrations of magnetite or pyrrhotite and may be associated with sulphide mineralization. It may be productive to assess these areas with geological and geochemical mapping.

6. CONCLUSIONS AND RECOMMENDATIONS

The geophysical data has been useful in delimiting geological structures and identifying conductors that may be targets for massive sulphide mineralization.

Any of the conductors that are deemed worthy of investigation following a geological investigation ought to be detailed with traverses of MAX-MIN E.M. Drill hole locations should be identifiable from that data.

Respectfully Submitted

  
Ronald F. Sheldrake  
Apex Airborne Surveys Ltd.

BIBLIOGRAPHY

Geonics Limited (Toronto) - Technical Note TN-4 - "Interpretation Aids for E.M.  
33 Helicopter Electromagnetic System".

APPENDIX I



## APPENDIX I

### INSTRUMENTATION

#### Electromagnetic Instrument

**Type:** Helicopter mounted in-phase - quadrature instrument manufactured by Geonics Limited, Toronto, Ontario.

**Coils:** The transmitting and receiving coils are co-axial 6 metres apart in a towed bird 30 metres below the helicopter. The coil axis is in the direction of travel.

**Frequency:** 918 Hz

**Noise Level:** Approximately 1/4 ppm (0.6 second time constant).

#### Magnetometer

**Type:** Proton precession model G803 manufactured by Geometrics Corporation, Toronto.

**Cycling Time:** 1.0 second.

**Sending Head Design:** 5 inch diameter Toroid.

APPENDIX I (cont'd)

Ancillary Equipment:

UDAS Digital Acquisition System with recorder.

Geocam 35 mm Flight Path Camera

Bonzer Radio Altimeter

Geometrics G806 Magnetic Base Station and recorder.

Helicopter:

Gazelle Helicopter supplied by Highwood Airservices Ltd.  
Calgary, Alberta.

APPENDIX II

## APPENDIX II

### THE "ANALOGUE" CHART AND FLIGHT PATH RECOVERY

The flight tape is a roll of chart paper which moves through the digital printer at a speed of 5.48 cm per minute.

The digital printer chart facilitates the use of a full alpha-numeric system. All "header" sensitivity and fiducial information is printed automatically.

The chart is 520 dots wide as follows:

#### DOTS:

- 0 - 100 magnetometer fine - 2 gammas per dot.
- 100 - 180 magnetometer coarse - 25 gammas per dot.
- 180 - 320 quadrature 0.6 sec T.C. 1/4 ppm per dot.
- 320 - 460 in phase 0.6 sec T.C. 1/4 ppm per dot.
- 460 - 470 powerline monitor
- 460 - 470 spherics monitor
- 480 - 520 altimeter 10 feet per dot (0 - 400 feet).

The helicopter flight path is recovered from 35 mm film, which is exposed at 2.0 second intervals during the flight traverses. After processing and anotating, recognizable fiducials are pin-pointed on the photomosaic map.

APPENDIX III

FLT NO. 1

Project                       
 Area Chutanli  
 Date February 14, 1981

| L N  | START<br>F I D | END<br>F I D | Production |     | TIME  | C O M M E N T S |
|------|----------------|--------------|------------|-----|-------|-----------------|
|      |                |              | Start      | End |       |                 |
| TEST | 0              | 75           |            |     | 09:27 | -calibration    |
| 18   | 76             | 101          |            |     |       | -scrub no data  |
| 18   | 102            | 113          |            |     |       | -scrub no data  |
| 18   | 114            | 183          |            |     |       | -scrub          |
| 18   | 184            | 250          |            |     |       |                 |
| 17   | 251            | 344          |            |     |       |                 |
| 16   | 345            | 406          |            |     |       |                 |
| 15   | 407            | 502          |            |     |       |                 |
| 14   | 503            | 565          |            |     |       |                 |
| 13   | 566            | 679          |            |     |       |                 |
| 12   | 680            | 744          |            |     |       |                 |
| 11   | 745            | 864          |            |     |       |                 |
| 10   | 865            | 950          |            |     |       |                 |
| 9    | 951            | 1101         |            |     |       |                 |
| 8    | 1102           | 1186         |            |     |       |                 |
| 7    | 1187           | 1243         |            |     |       |                 |
| 7    | 1244           | 1365         |            |     |       |                 |
| 6    | 1366           | 1440         |            |     |       | -scrub no data  |
| 5    | 1441           | 1475         |            |     |       | -scrub no data  |
| 6    | 1476           | 1610         |            |     |       |                 |
| 5    | 1611           | 1668         |            |     |       |                 |
| 4    | 1669           | 1708         |            |     |       | -scrub no data  |
|      |                |              |            |     |       | FILE: MKS 00009 |

FLT NO. 6

Project GRANGES  
 Area Chutanli  
 Date February 18, 1981

| LN  | START<br>F I D | END<br>F I D | Production |     | TIME | C O M M E N T S        |
|-----|----------------|--------------|------------|-----|------|------------------------|
|     |                |              | Start      | End |      |                        |
| Cal | 0              | 17           |            |     |      |                        |
| 4   | 18             | 134          |            |     |      |                        |
| 3   | 135            | 226          |            |     |      |                        |
| 2   | 227            | 344          |            |     |      |                        |
| 1   | 345            | 407          |            |     |      |                        |
| 13  | 408            | 466          |            |     |      | -Scrub                 |
| 13  | 467            | 513          |            |     |      | -OK reflight port line |
| Tie | 514            | 617          |            |     |      |                        |
| A   | 618            | 696          |            |     |      |                        |
| B   | 697            | 742          |            |     |      |                        |
| C   | 743            | 810          |            |     |      |                        |
| Cal | 811            | 862          |            |     |      |                        |

CERTIFICATION

I, RONALD F. SHELDRAKE, of the City of Vancouver, Province of British Columbia, hereby certify as follows:

1. I am President of Apex Airborne Surveys Ltd. a company incorporated under the laws of the Province of British Columbia.
2. The Vancouver Office of Apex Airborne Surveys Ltd. is located at Suite 512 -625 Howe Street, Vancouver, British Columbia.
3. I received my B.Sc., in Geophysics from the University of British Columbia in May 1974.
4. I have practised my profession since that date.
5. I did not examine the claims area, but I am not aware of any claim conflict and believe that the data presented herein is reliable.
6. I have no interest, direct or indirect, in GRANGES EXPLORATION A.B. or its affiliates, nor do I expect to receive any.
7. I consent to the use of this report in or in connection with a Prospectus or in a Statement of Material Facts.

Ronald F. Shel Drake

Apex Airborne Surveys Ltd.

May 15, 1981



May 15, 1981

STATEMENT OF COSTS

Type of Survey: Helicopter Electromagnetic and Magnetic

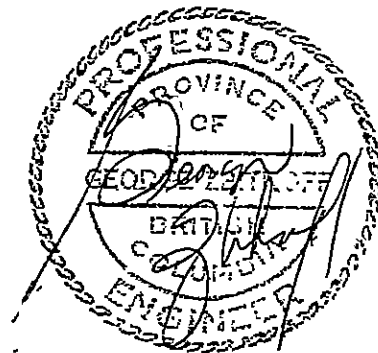
Date(s) of Fieldwork: February 14-18, 1981 - 5 days

Survey Kilometres:

Chutanli Lake Area - 94

Cost per linear  
Kilometre: \$70

Total cost of Survey:  $(70. \times 94) = \$6,580.00$



STATEMENT OF QUALIFICATIONS

Name: Zbitnoff, George Wm.

Profession: Geologist

Professional Associations: Member of the Association of Professional Engineers of the Province of Manitoba since 1969.

Member of the Association of Professional Engineers of the Province of British Columbia since 1973.

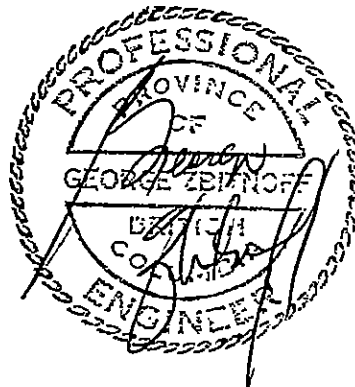
Experience: Pre graduation experience in geology with the Department of Mineral Resources of Saskatchewan.

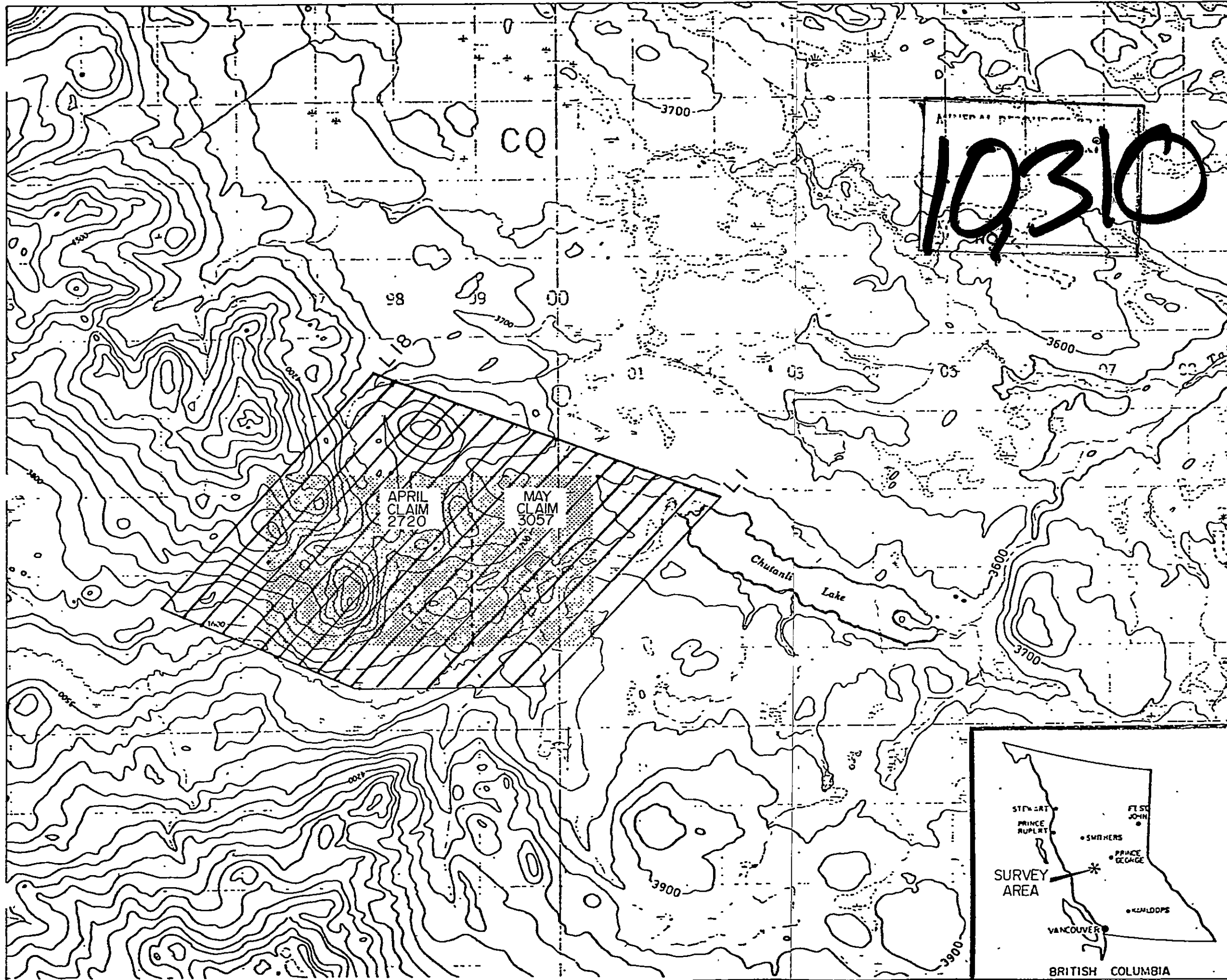
Two and one half years, field geologist with Hudson Bay Exploration and Development, Central Canada.

Six years, field and resident geologist with Noranda Exploration Ltd., Central Canada.

Eleven years geologist and Assistant Manager with Granges Exploration Aktiebolag, Canadian Division.

Active experience in all geologic provinces of Canada and parts of the United States and Mexico.





SURVEY AND CLAIM.  
LOCATION  
MAP



GRANGES  
EXPLORATION  
A.B.

1 : 50,000

METRES 1000 500 0 1000 METRES

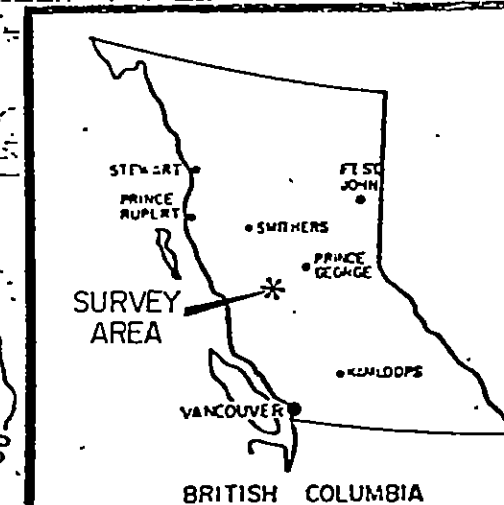
CONTOUR INTERVAL 100 FEET

CHUTANLI  
LAKE  
PROJECT

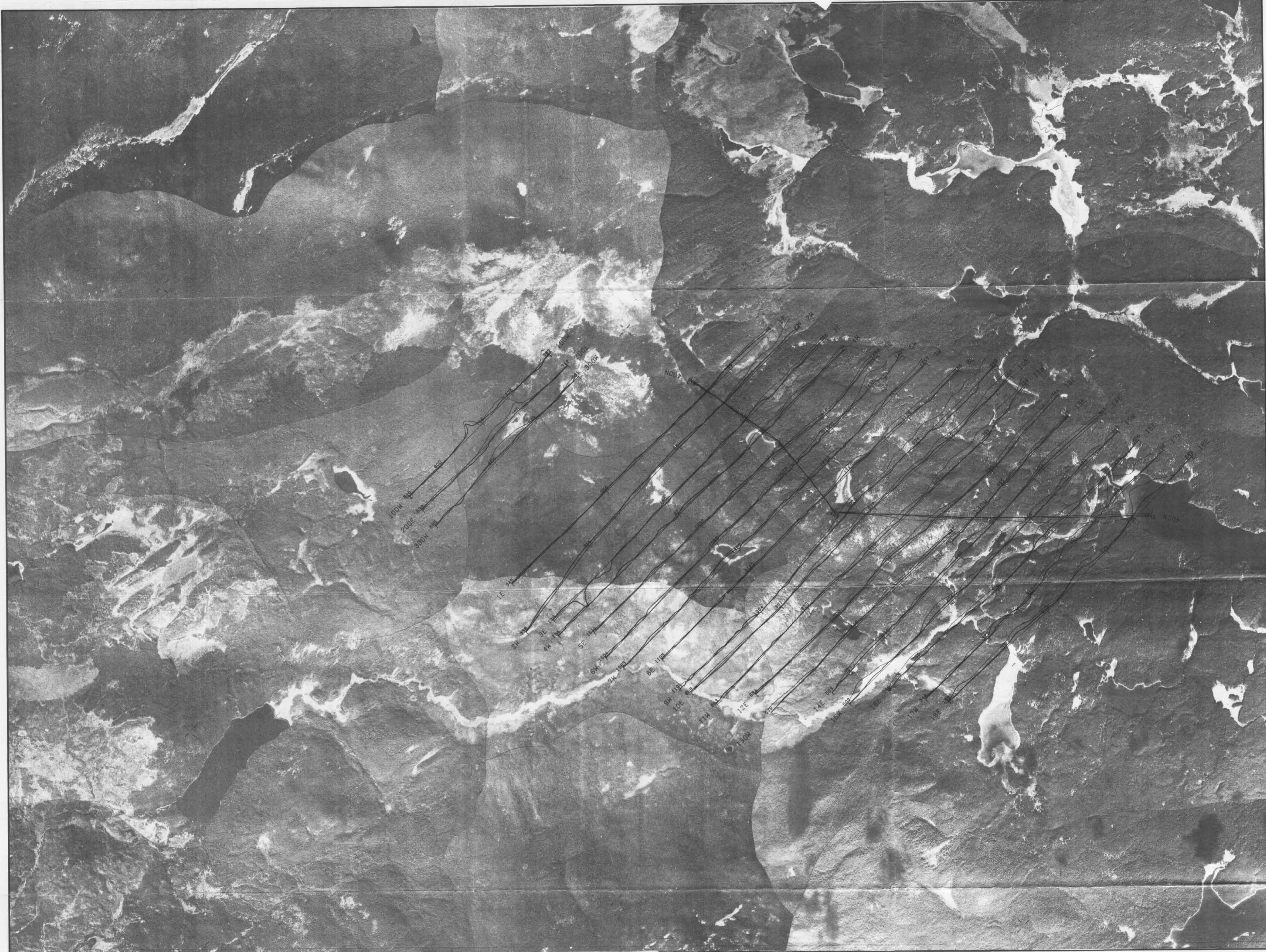
OMINECA MINING DIVISION  
BRITISH COLUMBIA

FIGURE 4

N.T.S. 93 F/7  
93 F/8



PRODUCED FROM NATIONAL N.T.S. SERIES



**NOTES:**

- INSTRUMENTATION GEONICS 35-1
- COIL SEPARATION 6 METRES - COAXIAL
- FREQUENCY 918 HRTZ
- NOISE LEVEL LESS THAN 1/2 PPM
- SENSOR TERRAINE CLEARANCE 35 METRES
- HORIZONTAL CONTROL 35 MM FILM  
FLIGHT PATH RECOVERY FROM PHOTO MOSAICS
- VERTICAL CONTROL RADAR ALTIMETER

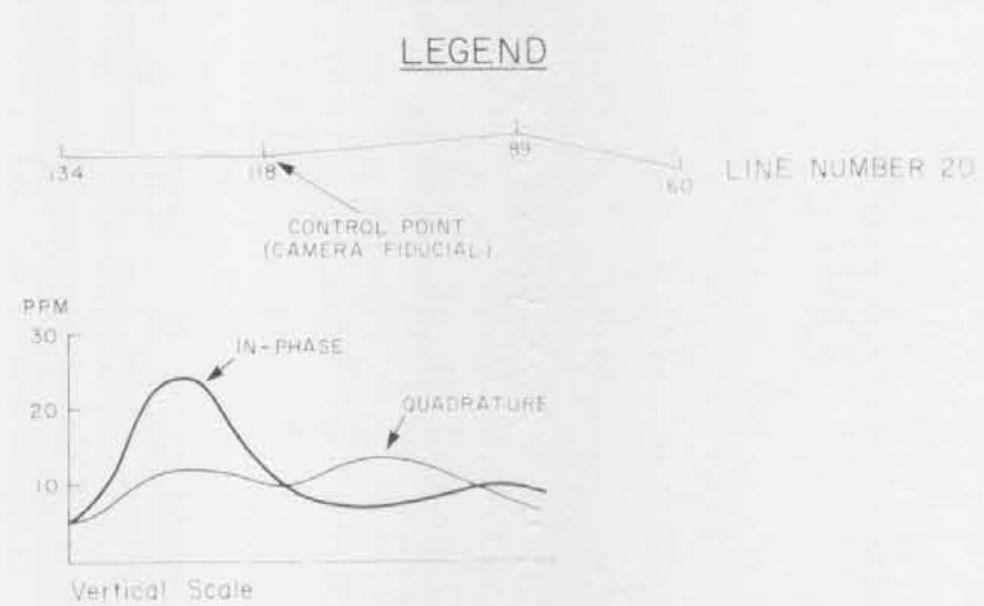
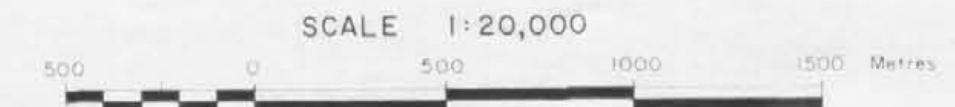
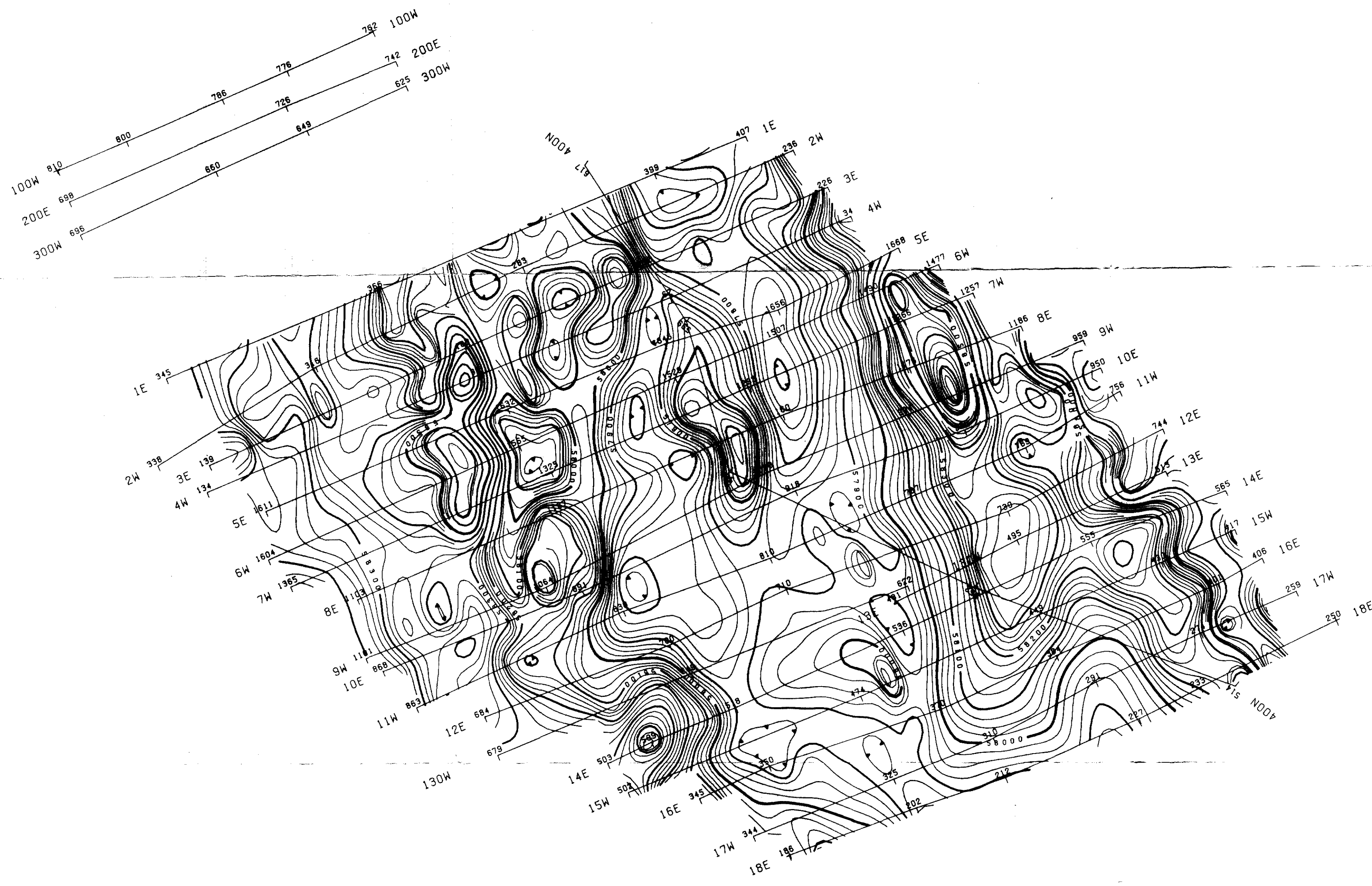


PLATE I-B  
**ELECTROMAGNETIC PROFILES MAP**  
 NATALKUZ LAKE AREA  
 CHUTANLI LAKE PROJECT  
 OMINECA MINING DIVISION  
 BRITISH COLUMBIA  
**GRANGES EXPLORATION A.B.**



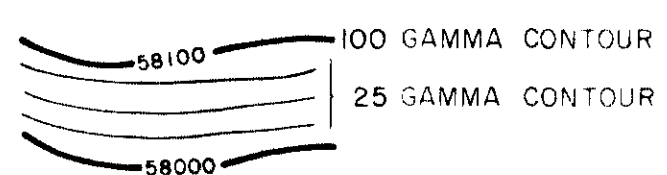
NTS 93F/7, 93F/8  
 To accompany a report by Ronald F. Sheidrake dated May 15, 1981



**NOTES:**

- VERTICAL CONTROL - RADAR ALTIMETER  
(mean sensor height 50 metres)
- HORIZONTAL CONTROL - 35mm FILM,  
RECOVERY ON PHOTO MOSAICS
- REGIONAL TOTAL FIELD VALUE  
58,000 GAMMAS
- MAGNETIC DECLINATION 27°E
- MAGNETIC INCLINATION 74°
- CONTOURS UNCORRECTED FOR  
REGIONAL GRADIENT

**LEGEND**



MINERAL RESOURCES BRANCH  
ASSESSMENT REPORT  
**10310**  
NO.

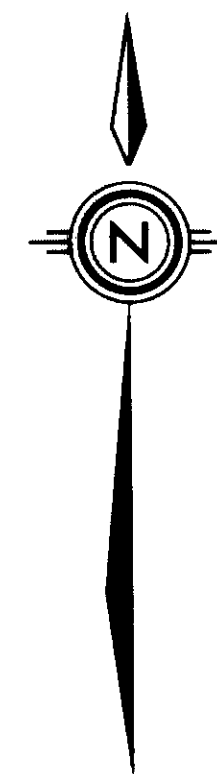
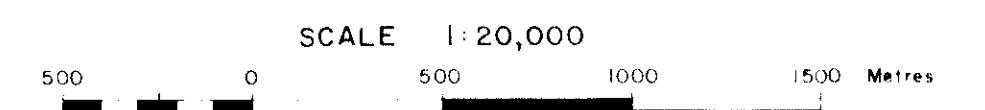


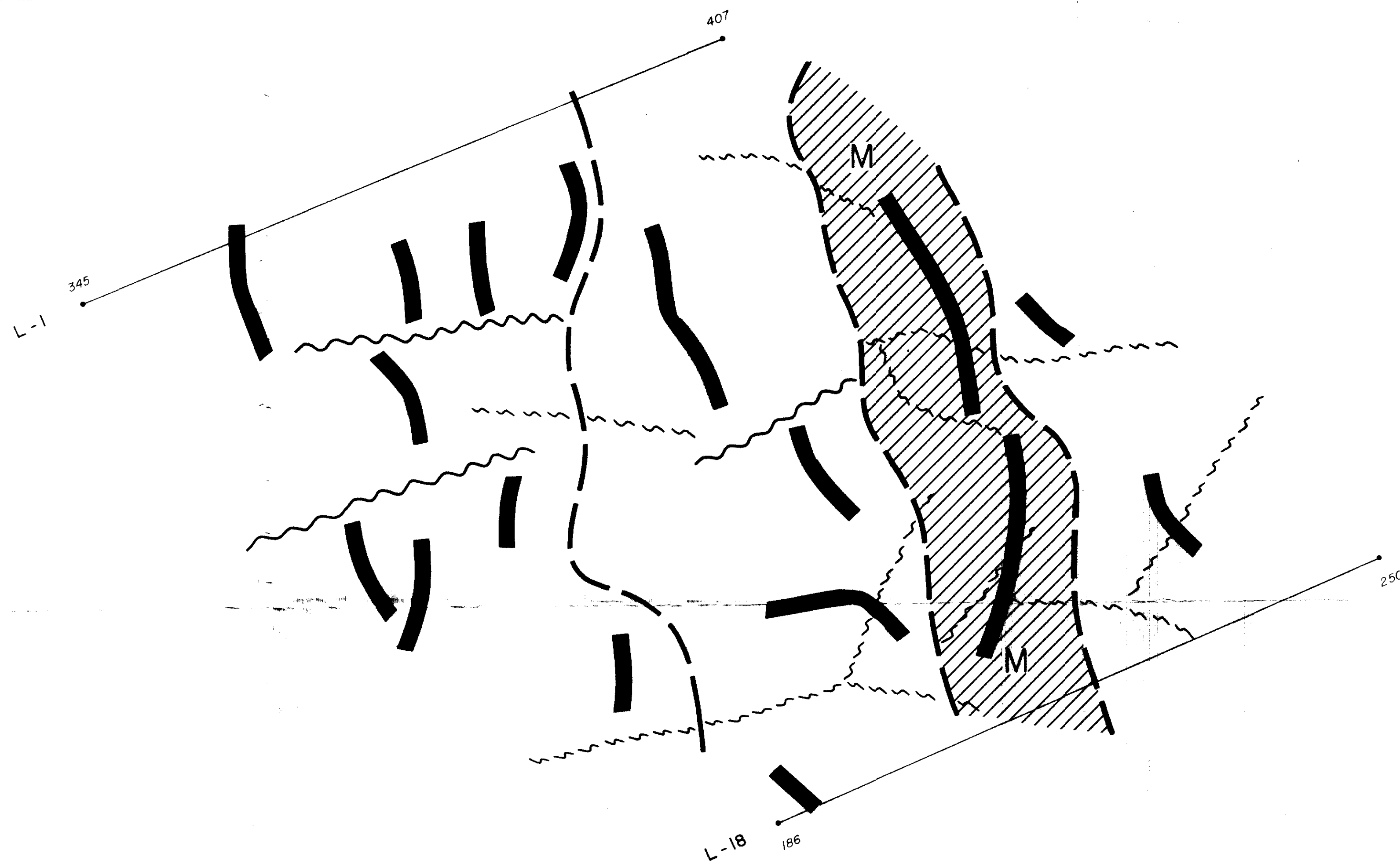
PLATE II B  
**TOTAL FIELD MAGNETIC MAP**  
NATALKUZ LAKE AREA  
CHUTANLI LAKE PROJECT  
OMINECA MINING DIVISION  
BRITISH COLUMBIA  
**GRANGES EXPLORATION A.B.**







SCALE 1:20,000

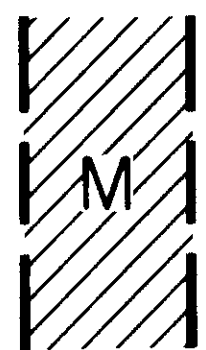
NTS 93F/2

To accompany a report by Ronald F. Sheldrake dated May 15, 1981



**LEGEND**

-  INTERPRETED CONTACT
-  PHOTO LINEAMENT
-  GEOPHYSICAL LINEAMENT
-  MAGNETIC AXIS



MAGNETIC ROCKS

MINERAL RESOURCES BRANCH  
ASSESSMENT REPORT  
**10,310**



PLATE III - B  
INTERPRETATION MAP  
NATALKUZ LAKE AREA  
CHUTANLI LAKE PROJECT  
OMINECA MINING DIVISION  
BRITISH COLUMBIA  
GRANGES EXPLORATION A.B.

SCALE 1:20,000  
500 0 500 1000 1500 Metres

NTS 93 F/3, 93 F/6  
To accompany a report by Ronald F. Sheldrake dated May 15, 1981