

REPORT ON A HELICOPTER BORNE  
TWO FREQUENCY ELECTROMAGNETIC AND MAGNETIC SURVEY  
ON THE  
STEEPLE AND IRON CREEK CLAIMS  
IN THE  
BULL RIVER AREA, BRITISH COLUMBIA

81-1185-10075

FOR OWNER AND OPERATOR  
MR. R.H. STANFIELD

10,075  
PART  
2 of 2

LATITUDE 49° 32' LONGITUDE 115° 23'W  
NTS: 82 G 6 and 11, Fernie and Elko Mapsheets

SURVEY DATES: October 29 - November 5, 1981

November 20, 1981  
Vancouver, B.C.

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

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SUMMARY

A helicopter-borne electromagnetic and magnetic survey was flown over 180 square kilometer block covered by the STEEPLES and IRON CREEK CLAIMS, in the BULL RIVER AREA, BRITISH COLUMBIA. An interpretation of the data has been made and two prospect areas have been identified. Recommendations for follow-up have been made.

## INTRODUCTION

This report describes the results of a helicopter-borne electromagnetic and magnetic survey flown over the STEEPLES and IRON CREEK claims between October 29, 1981 and November 5, 1981.

The purpose of the survey was to locate areas of conductive rock that may be concentrations of metallic mineralization and to provide a pseudo-geological map of the area based on the geophysical parameters.

The survey traverses were flown East-West at interlined spacings of 300 meters and 1000 meters. A total of 380 linear kilometers of survey traverse were required to cover the claims.

The terrain within the survey area was rugged and elevations ranged from 820 meters to above 2700 meters. An Aerospatial Gazelle helicopter was used as a survey platform.

The electromagnetic instrumentation used on this survey utilized both coplanar and coaxial coil configurations, as well as two frequencies.

The system comprises of two sets of receivers and transmitters as follows:

- (1) COAXIAL PAIR - The coaxial transmitter-receiver pair are separated by 6 meters and utilize a "low frequency" signal of 950 hz. This configuration couples best with vertical dike-like targets that have substantial strike lengths.

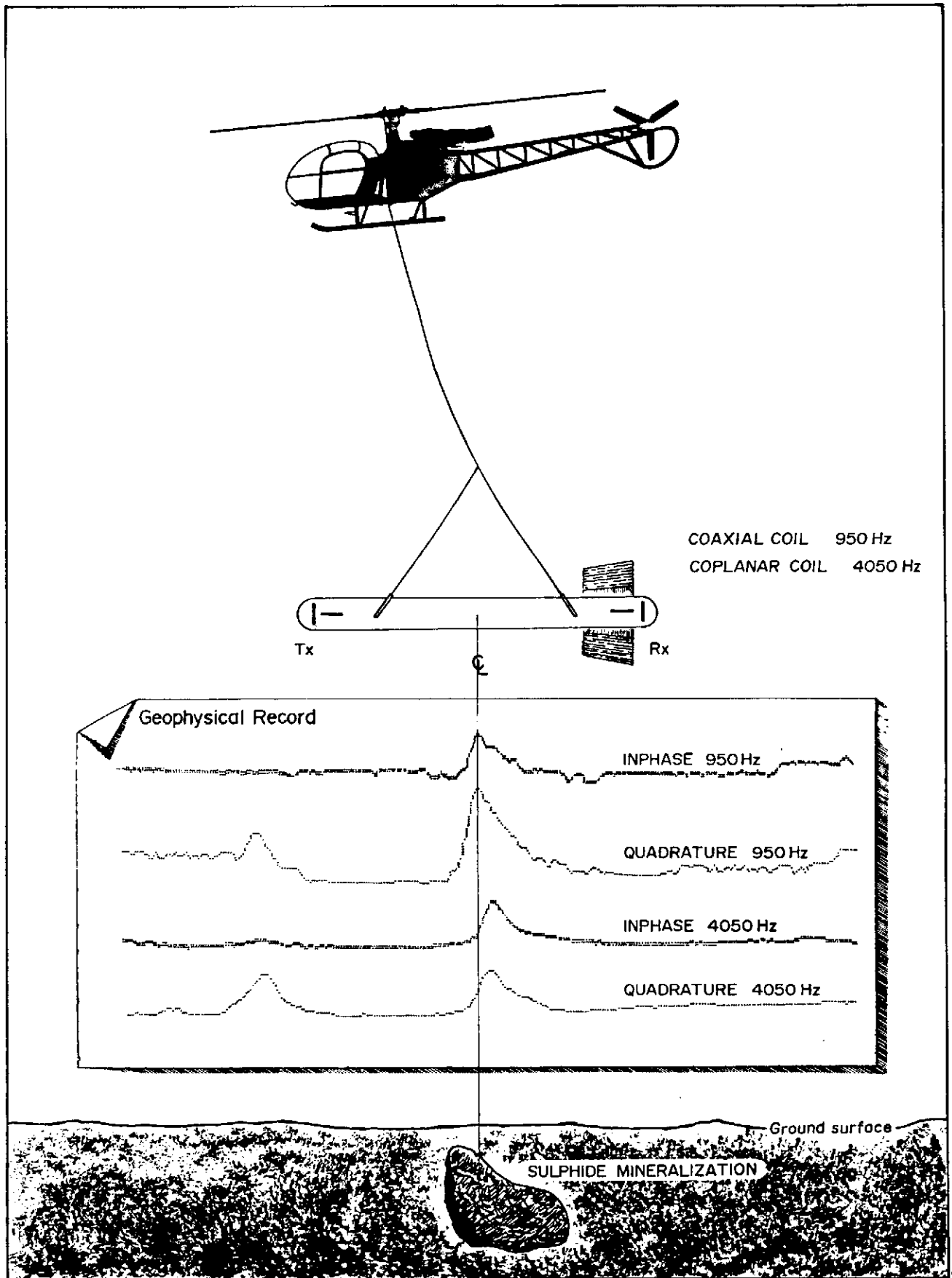


FIGURE 2  
SCHEMATIC OF TWO FREQUENCY-CONFIGURATION  
H.E.M. SYSTEM

APEX AIRBORNE SURVEYS LTD.

- (2) COPLANAR PAIR - The coplanar transmitter-receiver pair are separated by 5.5 meters and utilize a "high frequency" of 4050 hz. This configuration couples best with flat lying and tabular targets.

The transmitter and receiver coils for the two frequencies are located at the ends of the six meter bird. The bird is towed thirty meters below the helicopter by means of a suitable cable which also carries the electrical signals to and from the bird.

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 (p.p.m.).

The magnetometer used on this survey was a Geometrics Corp. G803. It is a total field nuclear precession instrument which measures the magnetic field strength with a resolution of 1 gamma. The sensor is toroidal and is positioned half way between the helicopter and the E.M. 33-2 bird.

The measuring technique of the proton magnetometer can be understood by making the proton analogous to a tiny bar magnet spinning about its longitudinal axis, which has the properties of both a magnetized needle and a gyroscope. The spinning magnet tries to align itself along the lines of force but the gyroscopic properties oppose this and the spinning magnet gyrates. The essential characteristic of the system is that the rate of gyration is proportional to the ambient magnetic intensity. This rate is measured electronically, multiplied by a suitable factor then displayed on the chart.

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

CLAIMS:

The claims covered by the geophysical survey include the following:

STEEPLES        1 - 30

IRON CREEK    1 - 6

LOCATION AND ACCESS

The STEEPLES and IRON CREEK CLAIMS are located immediately East of the Rocky Mountain Trench and are centered on 49° 32' Latitude 115° 23' W Longitude. They are easily accessible by road near where highway #3 crosses the Bull River.

GEOLOGY

\*The mineral deposits on the R.H. Stanfield properties are located on the west flank of the Rocky Mountains in the Precambrian Aldridge formation.

Normal faults strike northwesterly and dip southwesterly. Subsidiary faults strike northeasterly and dip northwesterly. Extensive displacement produced by the faulting brings Devonian and Mississippian formations in contact with the Precambrian strata.

Sulphide mineralization, discovered to date, contains lead-silver and copper-silver mineralization in strong fissure veins within Aldridge quartzite and argillite.

\*Personal Communication  
Mr. Alfred Allen, P.Eng.

## DATA PRESENTATION

### 3.1 ELECTROMAGNETIC PROFILES MAP (PLATE 1)

The ELECTROMAGNETIC PROFILES MAP shows the low frequency e.m. data plotted along the flight path. The data were transcribed from magnetic tape that was recorded in flight and plotted at a vertical scale of 1 cm = 5 ppm. Anomalous bedrock conductors have been identified with shading. The high frequency e.m. data were not mapped but were used in the interpretation of specific anomalies.

All of the data profiles, including the four e.m. channels, magnetometer, altimeter and power line monitor are processed at optimum sensitivities (at the scale of the maps in this report) for each line. These "playback" records are the most suitable for interpreting the geophysical data and are secured in a binder and submitted with the report.

### 3.2 MAGNETIC CONTOUR AND INTERPRETATION MAP (Plate II)

The MAGNETIC CONTOUR AND INTERPRETATION MAP shows contours of the total magnetic field uncorrected for regional variation. The magnetic maps are hand contoured from computer generated intercept data at an interval of 10 gammas.

Diurnal corrections were made for each line and are recorded on the "playback" records mentioned above. Diurnal variations were less than 25 gammas during the survey period.



The geophysical interpretation has been made on Plate II and provides a summary of the interpreted information including fault zones, formational responses and other significant features.

### 3.3 In-Flight Data

The original in-flight charts which record the data as a function of time, rather than a function of location, are also secured in a binder and submitted with the report. Scales and sensitivities for all data are suitably displayed.

## DISCUSSION OF RESULTS

The electromagnetic data have indicated four areas of increased conductance.

### Area 1 (L1 and L2 extreme west ends)

The electromagnetic responses flank magnetic rocks and indicate a small increase of conductivity over an area about 300 meters by 400 meters. This may be a formational response but it could also arise from disseminated mineralization.

### Area 2 (Bull River Mine Area, L1 to L5)

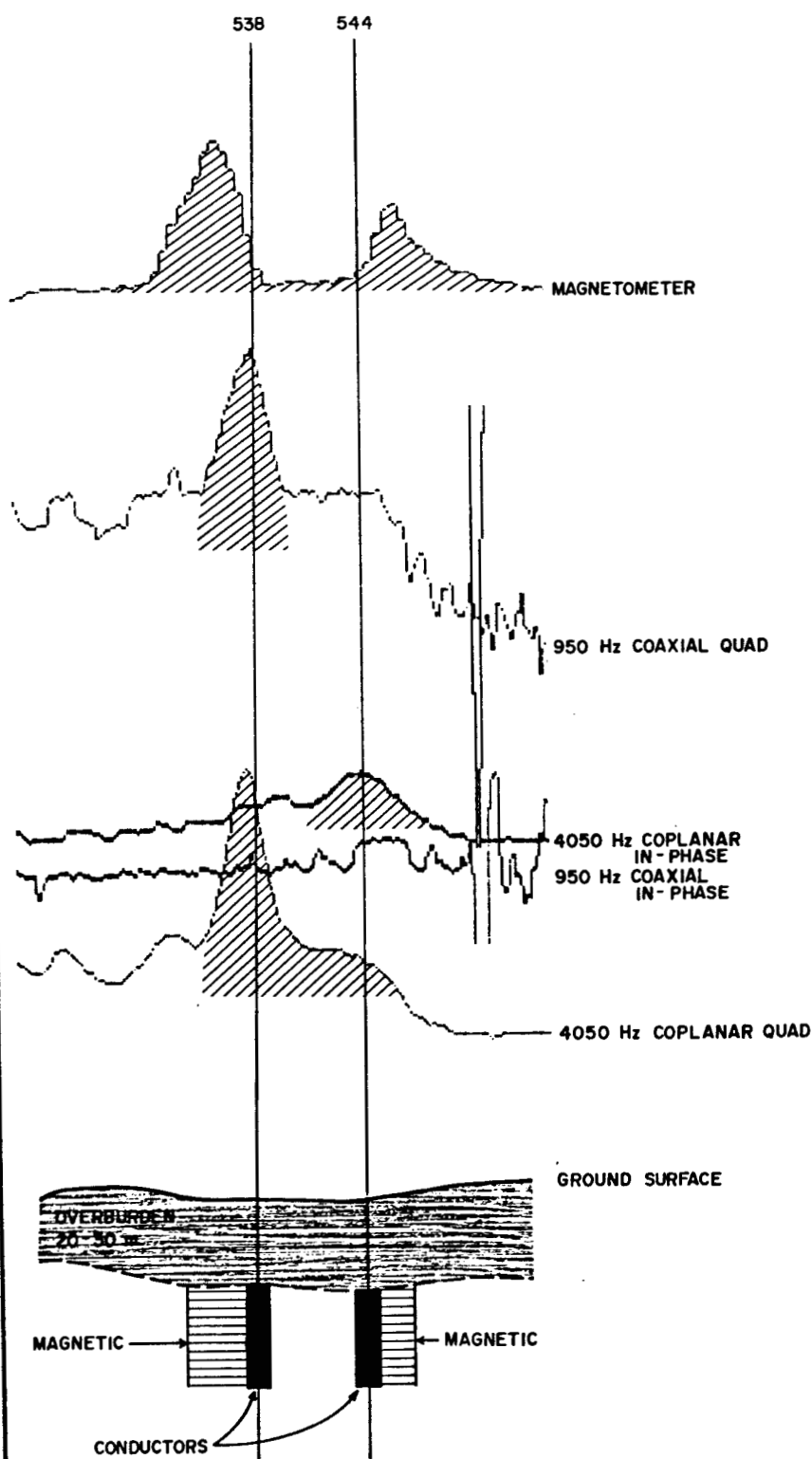
The geophysical responses recorded on the BULL RIVER MINE workings indicate a multitude of low conductance anomalies. In general, they appear formational in nature, however two anomalies are flanking magnetic features and may be due to sulphide mineralization.

The geophysical responses on L1 at FIDUCIALS 538 and 544 have been detailed on FIGURE 4 and are described below.

### ANOMALY L1 FIDUCIAL 538

The geophysical data on this traverse (and on traverse Line C) indicate the conductor is contiguous to a near vertical, tabular magnetic body that strikes E - W. The depth to the top of the conductor and magnetic body is in the range of 20 - 30 meters.

Although the apparent conductance is very low for this target the conductor locally may exhibit higher true conductivities, particularly if the zone



ANOMALY 538

APPARENT CONDUCTANCE < 3.0 mhos  
APPARENT DEPTH 20-30 metres

ANOMALY 544

APPARENT CONDUCTANCE < 3.0 mhos  
APPARENT DEPTH 20-30 metres

NOTES: Horizontal Scale 1: 20,000

Vertical Scales:

Magnetometer - 1 cm = 50 Gammas

950 Hz EM - 1 cm = 5 ppm

4050 Hz EM - 1 cm = 20 ppm

Schematic Not To Scale

FIGURE 4

DETAIL ANOMALY  
LINE I

has been fractured and it is not continuously conductive throughout. This anomaly is a first priority target.

ANOMALY L1 FIDUCIAL 544

This anomaly indicates a very weak conductance and is adjacent to distortions in the record that were caused by power line interference. However the response is associated with a concentration of magnetic minerals, similar to the anomaly at FIDUCIAL 538 (L1). Depth ranges 20 - 30 meters. This is a first priority target.

Area 3 (East side of Bull River L0 to L6)

These responses appear formational in nature and may be due to a conductive formation that is outcropping the valley bottom. These are tertiary priority targets.

Area 4

This is an isolated anomaly centered at fiducial 752 on L18. This response is an example of those that may be partly or totally due to terrain clearance effect. The response is of the very low conductance variety and is located at an elevation of 4,000 feet. This is a tertiary priority target.

## MAGNETIC DATA

The magnetic data indicate the existence of concentrations of magnetic materials that are not evident from the Federal-Provincial Aeromagnetic data flown at 1000'. (See FIGURE 3 MAGNETIC CONTOUR MAP).

The localized and relatively near surface concentrations of magnetic materials may be markers to zones where geological alteration or enrichment has occurred.

Those magnetic anomalies most similar to the magnetic responses at the BULL RIVER MINE AREA are those recorded near the center of L1, L0, L15 and L25.

The remaining magnetic anomalies at the extreme west end of L 1s, at the center of L6, L9 and L10 and the center of L12, L13 and L14, and at the extreme west end of L 18 appear to be anomalous in these sedimentary formations. They are not as small or localized as those observed at the BULL RIVER MINE AREA, but nonetheless indicate distortions in the underlying rocks that may be the source of mineralizing materials.

## SPURIOUS E.M. ANOMALIES

There are a multitude of responses on the e.m. mapsheet that are caused by man-made features, some of them convincingly similar to geological targets. The majority of them have been discounted either by the 60 HZ monitor, designed for the purpose, or by referring to the flight path film for the cause of the "response".

The broad anomalies caused over agricultural fields (in the area of fiducials 754-772 L3, for example) are probably caused by saline enrichment due to irrigation or by the application of chemical fertilizers.

#### ANOMALY LOCATION

Displacements of anomalous responses (herring-bone) is evident in some areas of the data. The exact position of airborne data is always difficult to establish because of the unavoidable variables (aircraft/camera attitude for example) inherent in the system, hence the necessity of ground geophysical detailing. However it is noteworthy that the best data presentation for airborne data is made using computer corrected photomosaic maps rather than topographic maps.

### CONCLUSIONS AND RECOMMENDATIONS

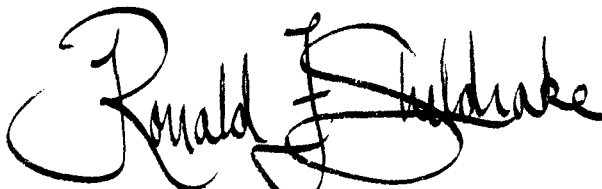
The geophysical survey has identified two e.m.-magnetic anomalies in the BULL RIVER MINE AREA that may be due to sulphide mineralization.

It is recommended that a grid be established over the BULL RIVER MINE AREA and detailed magnetic and electromagnetic readings be taken at an interval of 20 meters. Drill targets should be identifiable from that data.

The remaining anomalous conductive areas should be geologically and geochemically mapped. If positive results are indicated MAX MIN e.m. and magnetic surveys ought to be undertaken.

Each of the magnetic anomalies indicated by the survey may be related to mineralization or structures associated with mineralization and warrant geological investigation. Ground magnetometer profiles should be undertaken as follow-up on these areas. Drill targets should be identifiable from that data.

Respectfully submitted



Ronald F. Shelldrake  
APEX AIRBORNE SURVEYS LTD.

## BIBLIOGRAPHY

- Geonics Ltd. (Toronto) - Tehnical note TN-4 - "Interpretation Aids for E.M. 33 Helicopter Electromagnetic System".
- M.K. Gosh and G.F. West - A.E.M. Analogue Model Studies, produced by Norman Paterson & Associates Limited, Toronto.
- Vacquier V., Steenland, N.C.- and Henderson, R.G. - Interpretation of Aeromagnetic Maps, Geological Society of America, Memoir No. 47.
- Mr. Alfred Allen, P.Eng. - Personal communication, December, 1981.



APPENDIX I

INSTRUMENTATION

Electromagnetic Instrument

Type: Helicopter mounted in-phase - quadrature instrument. Coplanar coils - 4050/hz. Coaxial coils 950 hz.

Type: Helicopter mounted in-phase and quadrature instrument, manufactured by Geonics Ltd. Toronto.

Coils: Coplanar - 5.5 meter separation 4050 hz.

Co-axial - 6.0 meter separation 950 hz.

Noise Level: Less than 2 ppm peak to peak (0.6 sec. time constant)

Magnetometer

Type: Towed sensor type, proton precession model G803 manufactured by Geometrics Corporation, Toronto.

Cycling Time: 1.0 second.

Sensing 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 Air Services Ltd.,  
Calgary, Alberta

## APPENDIX II

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

The in-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 - 10 powerline and spherics monitor
- 0 - 60 Altimeter - 10 feet per dot (0-600 feet)
- 60 - 160 quadrature - high frequency -  $\frac{1}{4}$  ppm/dot
- 160 - 260 in phase - high frequency -  $\frac{1}{4}$  ppm/dot
- 260 - 360 quadrature - low frequency -  $\frac{1}{4}$  ppm/dot
- 360 - 460 in phase - low frequency -  $\frac{1}{4}$  ppm/dot
- 460 - 520 magnetometer 2 gammas/dot

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.

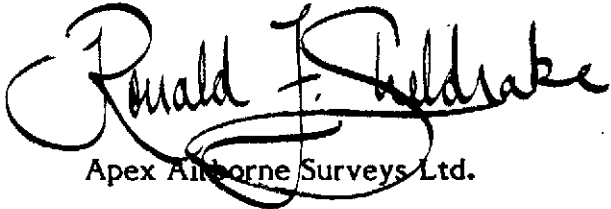
CERTIFICATION

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 the claims or any properties of Mr. R.H. Stanfield 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.

November 25, 1981

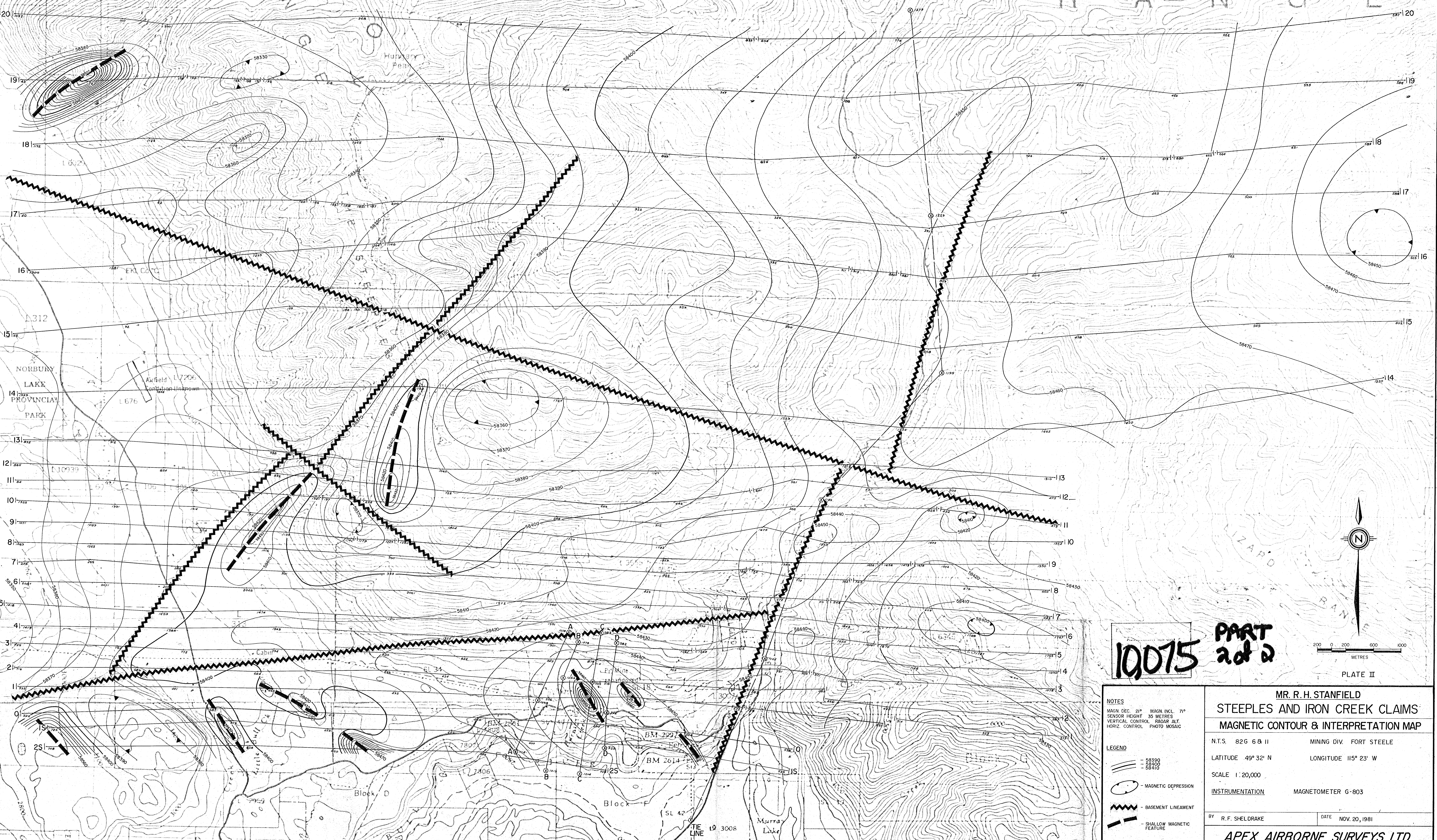
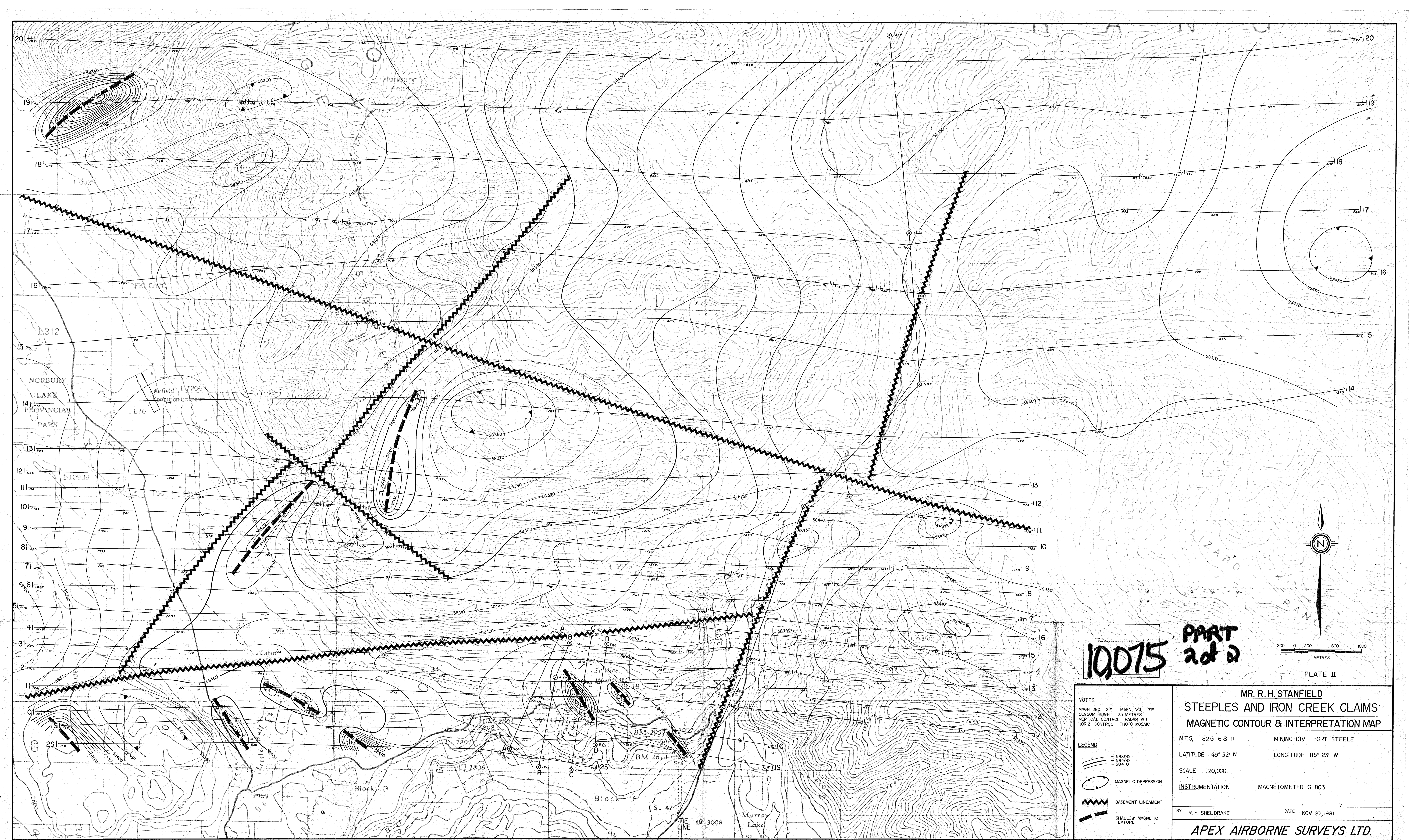
Ronald F. Sheldrake

  
Apex Airborne Surveys Ltd.

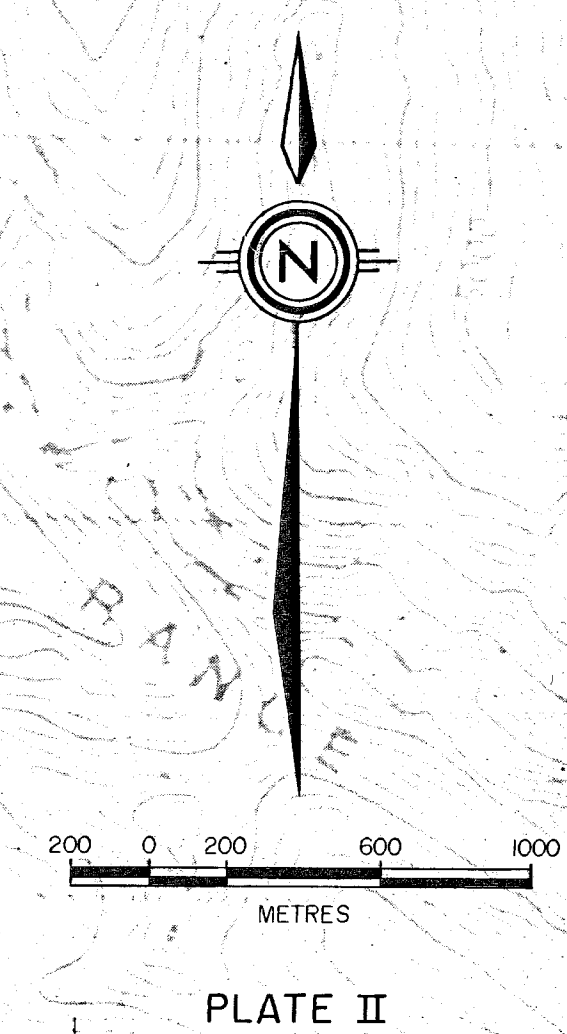
November 25, 1981

STATEMENT OF COSTS

Type of Survey:	Two Frequency/Configuration e.m. and magnetic Helicopter Borne
Date(s) of Fieldwork:	October 29 - November 5, 1981 - 8 days
Survey Kilometres:	380 kilometres
Cost per linear Kilometre:	\$184.21
Additional Charges:	None
Total cost of Survey:	(380 km X 184.21 = \$70,000)



10075 PART 2 of 2



NOTES  
 MAGN. DEC. 21° MAGN. INCL. 71°  
 SENSOR HEIGHT 35 METRES  
 VERTICAL CONTROL RADAR ALT.  
 HORIZ. CONTROL PHOTO MOSAIC

**MR. R. H. STANFIELD**  
**STEEPLES AND IRON CREEK CLAIMS**  
**MAGNETIC CONTOUR & INTERPRETATION MAP**

N.T.S. 826 6 & 11 MINING DIV. FORT STEELE  
 LATITUDE 49° 32' N LONGITUDE 115° 23' W  
 SCALE 1:20,000  
 INSTRUMENTATION MAGNETOMETER G-803

BY R. F. SHELDRAKE DATE NOV. 20, 1981

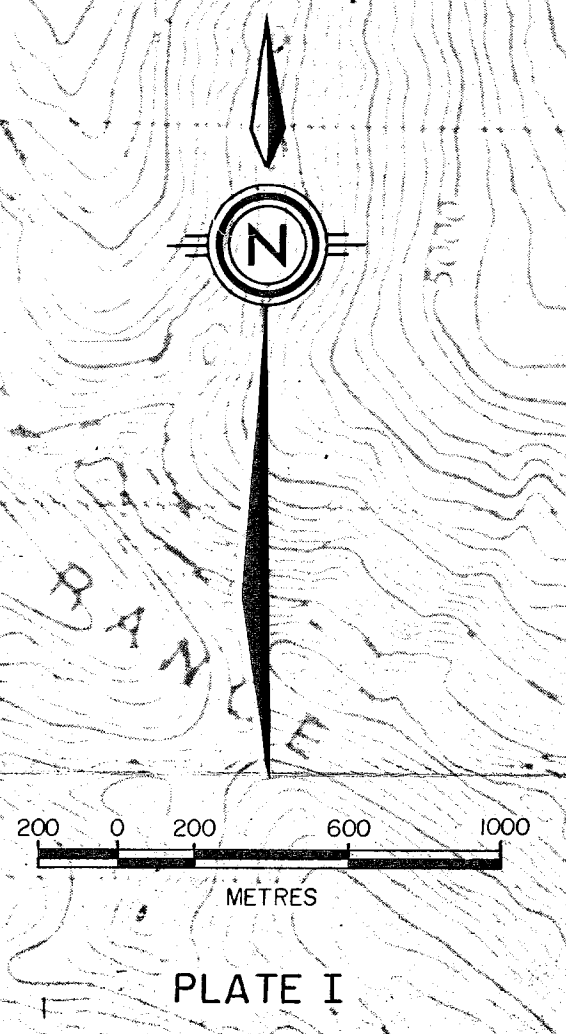
**APEX AIRBORNE SURVEYS LTD.**

LEGEND

- 58390
- 58400
- 58410
- - MAGNETIC DEPRESSION
- - BASEMENT LINEAMENT
- - - SHALLOW MAGNETIC FEATURE



10,015 PART 2 of 2



**NOTES**  
 MAGN. DEC. 21° MAGN. INCL. 71°  
 SENSOR HEIGHT 35 METRES  
 VERTICAL CONTROL RADAR ALT.  
 HORIZ. CONTROL PHOTO MOSAIC

**LEGEND**

CONTROL POINT (CAMERA FIDUCIAL)  
 BEEROCK CONDUCTOR  
 IN-PHASE  
 QUADRATURE

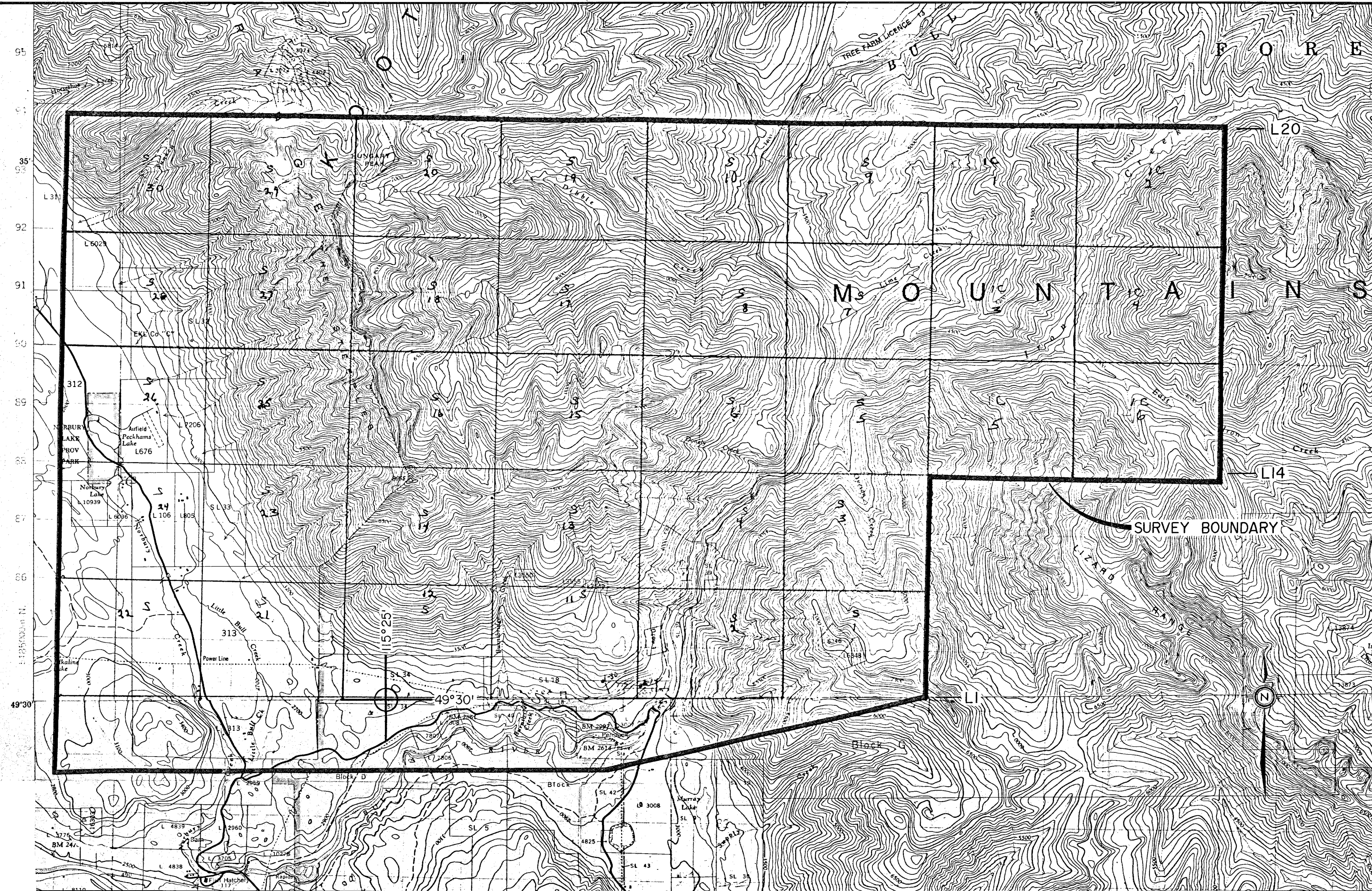
Vertical scale 1cm = 5ppm

**MR. R. H. STANFIELD**  
**STEEPLES AND IRON CREEK CLAIMS**  
**ELECTROMAGNETIC PROFILES MAP**

N.T.S. 82G 6 & II MINING DIV. FORT STEELE  
 LATITUDE 49° 32' N LONGITUDE 115° 23' W  
 SCALE 1:20,000  
 INSTRUMENTATION ELECTROMAGNETOMETER EM 33-2 FREQ. 950 HZ.

BY R. F. SHELDRAKE DATE NOV. 20, 1981

**APEX AIRBORNE SURVEYS LTD.**



10,075

SURVEY & CLAIM  
LOCATION  
MAP  
**PART  
2 of 2**  
STEEPLES  
&  
IRON CREEK  
CLAIMS

1:50,000  
METRES 1000 500 0 1000 METRES

CONTOUR INTERVAL 100 FEET

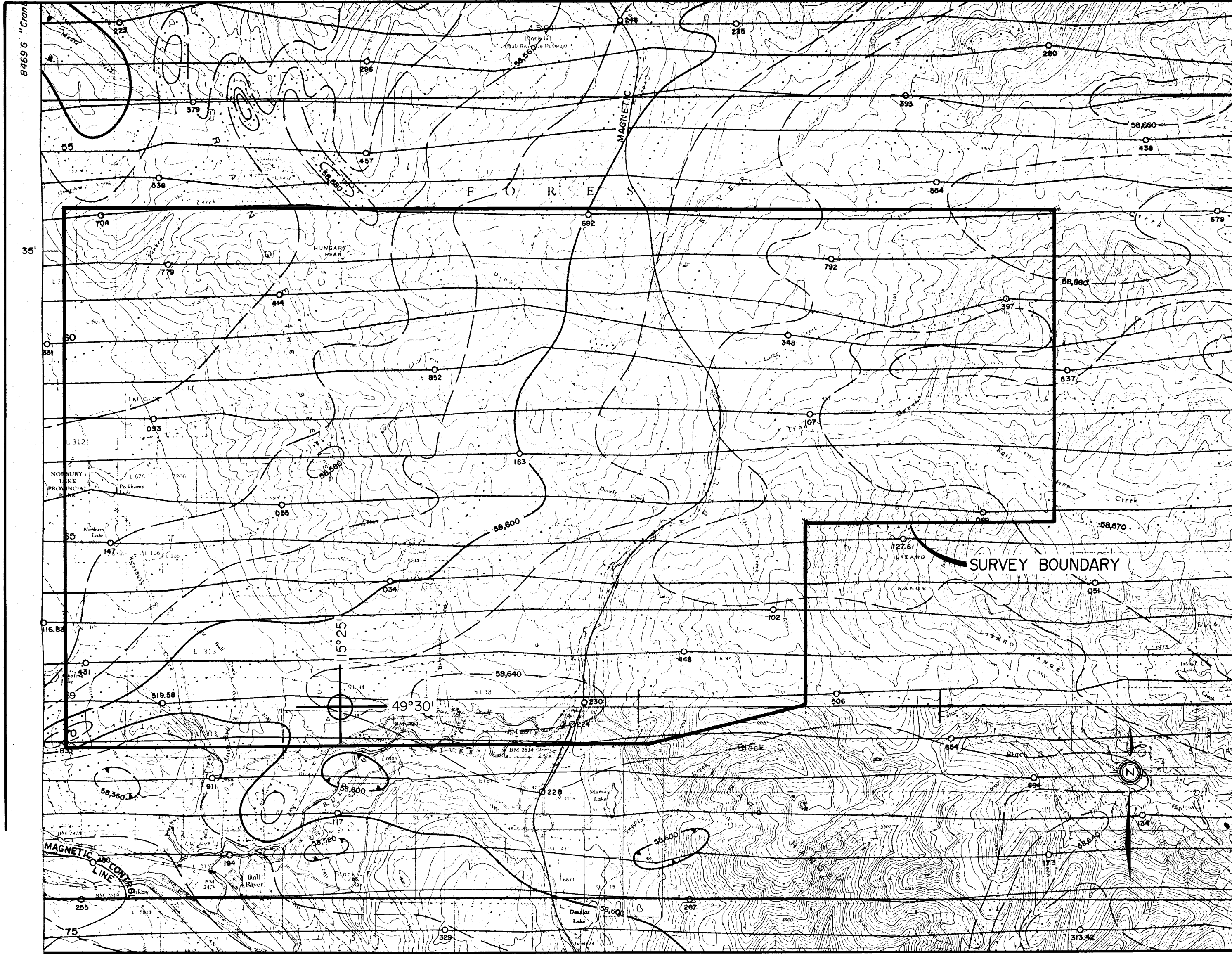
Mr. R.H. STANFIELD  
BULL RIVER PROJECT

FIGURE 1

N.T.S. 82 G6, 82 G11

REPRODUCED FROM NATIONAL, N.T.S. SERIES


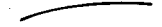
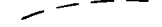



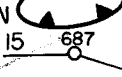
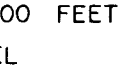


10,075

MAGNETIC CONTOUR  
MAP  
PART  
2 of 2  
BULL RIVER AREA  
BRITISH COLUMBIA

ISOMAGNETIC LINES  
(absolute total field)

500 gammas   
 100 gammas   
 20 gammas   
 10 gammas 

MAGNETIC DEPRESSION   
 FLIGHT LINES   
 FLIGHT ALTITUDE 1000 FEET  
 ABOVE GROUND LEVEL



SCALE 1" = 1 Mile  
(1:63,360)

FIGURE 3

MAP SHEETS  
82 G6 & 82 G11

REPRODUCED FROM FEDERAL AND PROVINCIAL  
AEROMAGNETIC SERIES FLOWN 1969-1970