LOGISTICS REPORT ON COMBINED HELICOPTER BORNE MAGNETIC, AND VLF-EM SURVEY HEIDI AND TEA AREAS BRITISH COLUMBIA

FOR
BP RESOURCES CANADA LIMITED
BY
AERODAT LIMITED
August 28, 1989

J8943

Diana Bradley
Geophysicist

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(Scale 1:10,000)

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contours on a screened mylar base with flight lines and fiducials.

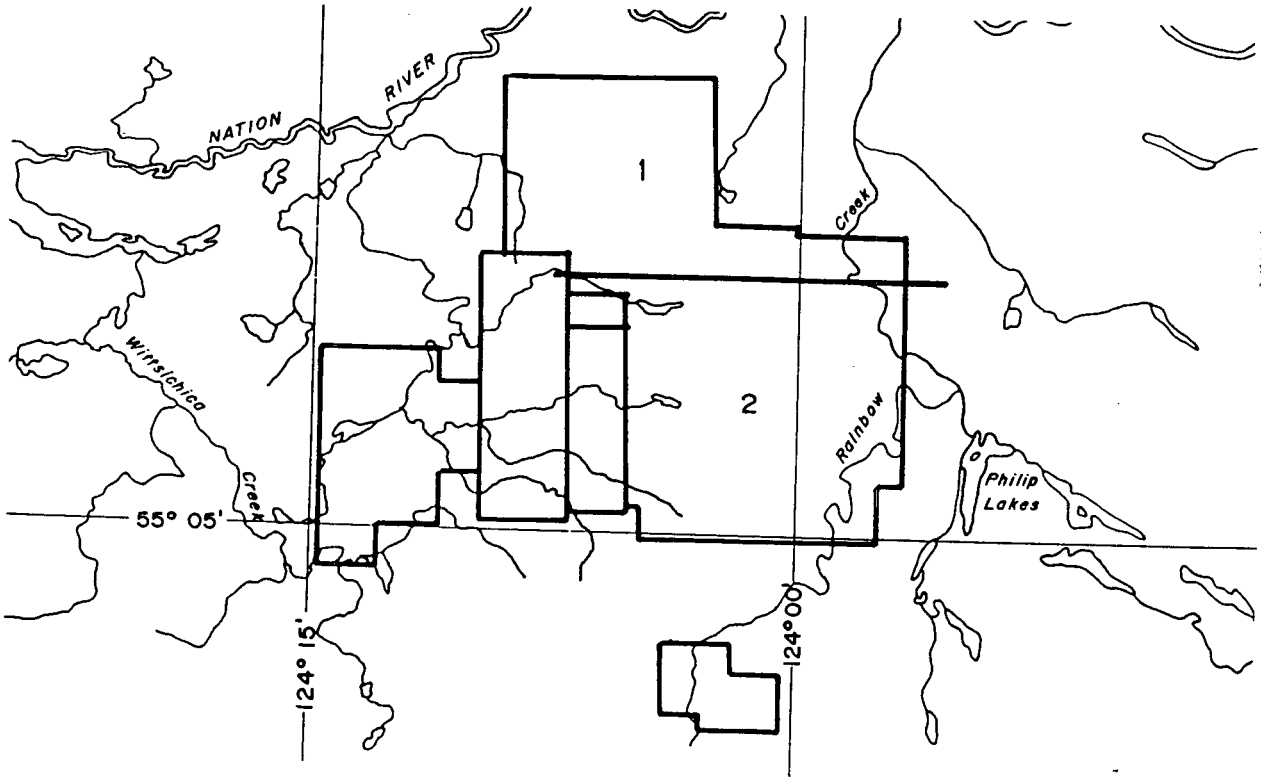
1. INTRODUCTION

This report describes an airborne geophysical survey carried out on behalf of BP Resources Canada Limited by Aerodat Limited. Equipment operated included a high sensitivity cesium vapour magnetometer, a two frequency VLF-EM system, a power line monitor, a video tracking camera and a radar altimeter. Electromagnetic, magnetic and altimeter data were recorded both in digital and analog form. Positioning data were stored in a digital form and encoded on the VHS format video tape, as well as being marked on the flight path map by the operator while in flight.

The survey area is located approximately 200 km northwest of Prince George in Central British Columbia. The grid was flown on June 15 to June 24, 1989. Nine flights were required to complete the survey of approximately 425 km. The flight lines were spread 100 m apart and oriented in an east-west direction. Coverage and data quality were considered to be well within the specifications described in the service contract.

2. SURVEY AREA LOCATION

The survey area is depicted on the index map shown below.



3. AIRCRAFT AND EQUIPMENT

3.1 Aircraft

An Aerospatiale A-Star 350B helicopter, (CG-JVU), owned and operated by Canadian Helicopters Ltd., was used for the survey. Installation of the geophysical and ancillary equipment was carried out by Aerodat. The survey aircraft was flown at a mean terrain clearance of 60 metres.

3.2 Equipment

3.2.1 VLF-EM System

The VLF-EM System was a Herz Totem 2A. This instrument measures the total field and quadrature components of two selected transmitters, preferably oriented at right angles to one another. The sensor was towed in a bird 12 metres below the helicopter. The transmitters monitored were NSS, Annapolis, Maryland, broadcasting at 21.4 kHz for the Line station and NLK, Jim Creek, Washington broadcasting at 24.8 kHz for the Line station.

3.2.2 Magnetometer

The magnetometer employed was a Scintrex Model VIW-2321 H8 cesium, optically pumped magnetometer sensor. The sensitivity of this instrument was 0.1 nanoTeslas at a 0.2 second sampling rate. The sensor was towed in a bird 12 metres below the helicopter.

3.2.3 Magnetic Base Station

An IFG-2 proton precession magnetometer was operated at the base of operations to record diurnal variations of the earth's magnetic field. The clock of the base station was synchronized with that of the airborne system to facilitate later correlation.

3.2.4 Radar Altimeter

A Hoffman HRA-100 radar altimeter was used to record terrain clearance. The output from the instrument is a linear function of altitude for maximum accuracy.

3.2.5 Tracking Camera

A Sony video tracking camera was used to record flight path on VHS video tape. The camera was operated in continuous mode. Fiducial numbers and time reference marks, for cross reference to the analog and digital data were encoded on the video tape.

3.2.6 Analog Recorder

An RMS dot-matrix recorder was used to display the data during the survey. In addition to manual and time fiducials, the following data were recorded:

Channel	Input	Scale
VLT	VLF-EM Total Field, Line	2.5%/mm
VLQ	VLF-EM Quadrature, Line	2.5%/mm
VOT	VLF-EM Total Field, Ortho	2.5%/mm
VOQ	VLF-EM Quadrature, Ortho	2.5%/mm
RALT	Altimeter (150 m at top of chart)	3 m/mm
MAGF	Magnetometer, fine	2.5 nT/mm
MAGC	Magnetometer, coarse	25 nT/mm
MAGN	Magnetometer, noise	0.025 nT/mm

3.2.7 Digital Recorder

Equipment	Recording Interval
VLF-EM	0.2 seconds
Magnetometer	0.2 seconds
Altimeter	0.2 seconds

3.2.8 Radar Positioning System

Motorola Mini-Ranger (MRS III) radar navigation system was used for both navigation and flight path recovery. Transponders sited at fixed locations were interrogated several times per second and the ranges from these points to the helicopter measured to a high degree of accuracy. A navigational computer triangulates the position of the helicopter and provides the pilot with navigation information. The range/range data was recorded on magnetic tape for subsequent flight path determination.

4. DATA PRESENTATION

4.1 Base Map

A topographic base map at a scale of 1:10,000 was prepared from a photo lay down map, supplied by Aerodat, on a screened mylar base.

4.2 Flight Path Map

The flight path map was derived from the Mini-Ranger radar positioning system. The distance from the helicopter to two established reference locations was measured several times per second and the position of the helicopter calculated by triangulation. It is estimated that the flight path is generally accurate to about 10 metres with respect to the topographic detail of the base map.

The flight path map showing all flight lines, is presented on a Cronaflex copy of the photomosaic base map, with time and navigator's manual fiducials for cross reference to both the analog and digital data.

4.3 Total Field Magnetic Contours

The aeromagnetic data were corrected for diurnal variations by adjustment with the digitally recorded base station magnetic values. The corrected profile data were interpolated onto a regular grid at a 25 metre true scale interval using an Akima spline technique. The grid provided the basis for threading the presented contours at a 5 nanoTesla interval.

The contoured aeromagnetic data have been presented on a Cronaflex copy of the photomosaic base map.

4.4 Vertical Magnetic Gradient Contours

The vertical magnetic gradient was calculated from the gridded total field magnetic data. Contoured at a 0.1 nT/m interval, the gradient data were presented on a Cronaflex clear overlay base map.

4.5 VLF-EM Total Field Contours

The VLF-EM signals from NSS, Annapolis, Maryland broadcasting at 21.4 kHz. for the Line Station were compiled in contour map form and presented on a Cronaflex copy of the photomosaic base map.

5. GENERAL INTERPRETIVE CONSIDERATIONS

5.1 Total Field Magnetics

The total field magnetic values in the survey area vary over a range from 57,805 to 59,715 nT.

The survey area is magnetically active, with magnetic highs and lows typically 300 to 400 m wide. The edge of a large (1000 m or more in width) magnetic high is evident to the northwest. Its centre would be located several hundred metres outside the survey boundary.

General magnetic trends are intensly variable. No distinct direction of trending is apparent.

5.2 Calculated Vertical Gradient Contours

The vertical magnetic gradient calculation has the effect of removing the regional background and of emphasizing and providing greater resolution of shallow, closely spaced features. The zero contour level roughly corresponds to the contact between rocks of differing magnetic susceptibilities. The above characteristics make the vertical gradient data useful in evaluating and mapping geologic structure.

Careful evaluation of this data with the total field magnetics and VLF-EM data will doubtless further aid geologic mapping in the area.

5.3 VLF-EM Total Field Contours

Examination of the VLF-EM contours reveals a general north-south striking trend. The transmitting station NSS, Annapolis, Maryland would be maximum coupled with conductors striking is approximately this direction.

Conductor amplitudes are quite small, over the survey area, generally being less than 8 percent.

APPENDIX I

PERSONNEL

FIELD	
Flown	June, 1989
Pilot	D. Evans
Operator	M. Pelletier
OFFICE	
Processing	D. Bradley G. McDonald
Report	D. Bradley

APPENDIX II

CERTIFICATE OF QUALIFICATIONS

I, DIANA BRADLEY, certify that: -

1. I hold a B. Sc. in Geophysics from the University of Toronto.

2. I reside at 25 William Street in the City of Weston, Ontario.

3. I have been engaged in a professional role in the minerals industry in Canada for the past six years.

4. I have been a member of the Prospectors & Developers Association since 1984.

5. The accompanying report was prepared from a review of the proprietary airborne geophysical survey flown by Aerodat Limited for BP Resources Canada Limited I have not personally visited the property.

6. I have no interest, direct or indirect, in the property described nor do I hold securites in BP Resources Canada Limited

Signed,

Diana Bradley
Project Supervisor/
Geophysicist

Mississauga, Ontario
August 28, 1989

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1250

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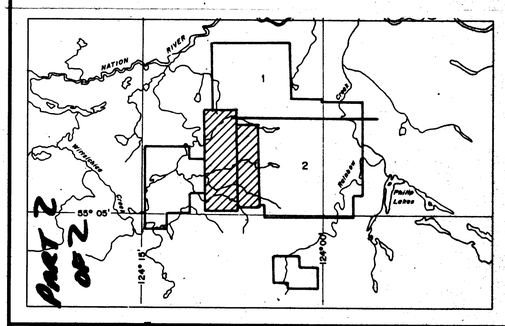


GEOLOGICAL BRANCH
ASSESSMENT REPORT

9211

BP RESOURCES CANADA LTD.

BASE MAP

HEIDI AND TEA AREAS

BRITISH COLUMBIA

SCALE 1:10,000

0 330 660 1320 2640 Feet

0 100 200 500 1000 Metres

AERODAT LIMITED

DATE: JUNE 89

NTS No: 9304, 93N1

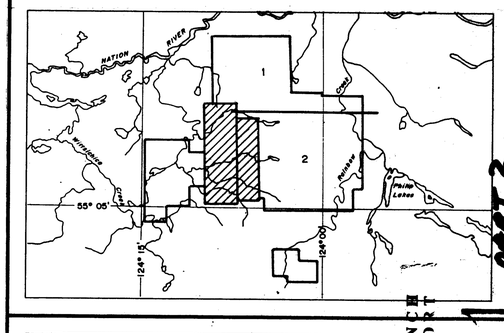
MAP No: 1 J8943

N

Flight Path

Navigation and recovery using Motorola Mini-Ranger (MRS III) radar navigation system.

Average terrain clearance 60m
Average line spacing 100m



BP RESOURCES CANADA LTD.

FLIGHT PATH

HEIDI AND TEA AREAS

BRITISH COLUMBIA

SCALE 1:10,000

0 330 660 1320 2640 Feet

0 100 200 500 1000 Metres

AERODAT LIMITED

DATE: JUNE 89

NTS No: 9304, 93N1

MAP No: 2 J8943

GEOLOGICAL BRANCH ASSESSMENT REPORT

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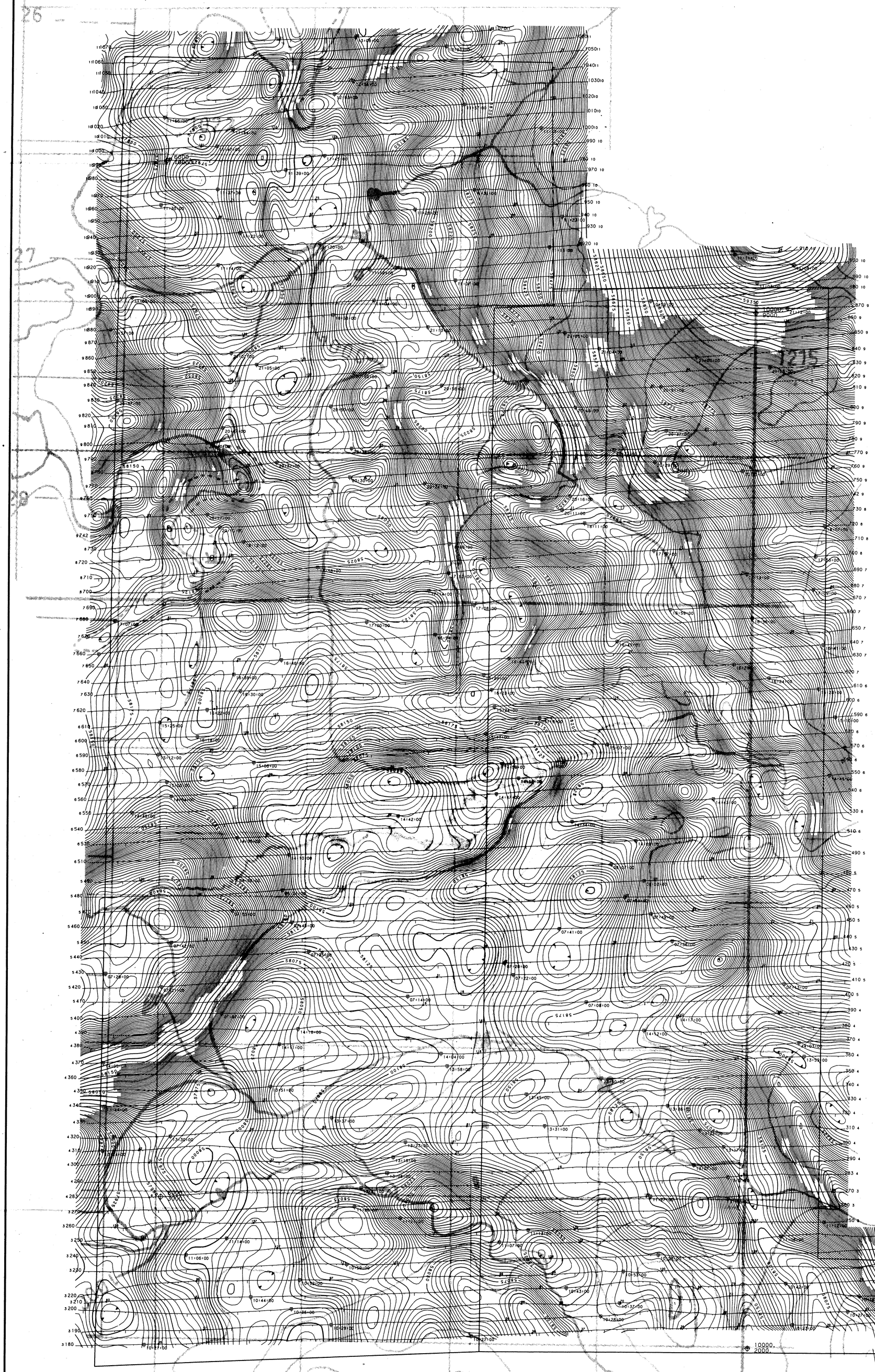
PART 2 OF 2



Magnetics

Total Field Magnetic Intensity
Contours in nT.

Cesium high sensitivity
magnetometer.

Sensor elevation 45m

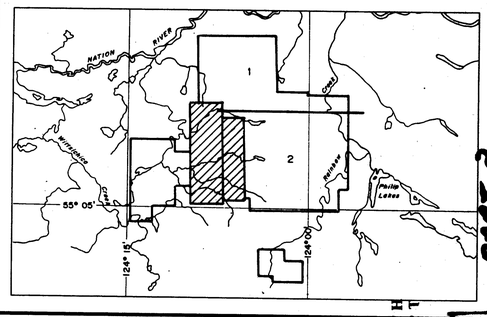
Map contours are multiples of
those listed below

5 nT
25 nT
100 nT
500 nT
2000 nT

Flight Path

Navigation and recovery using
Motorola Mini-Ranger (MRS III)
radar navigation system.

Average terrain clearance 60m
Average line spacing 100m



BP RESOURCES CANADA LTD.

TOTAL FIELD MAGNETIC CONTOURS

HEIDI AND TEA AREAS

BRITISH COLUMBIA

SCALE 1:10,000

0 330 660 1320 2640 Feet
0 100 200 500 1000 Metres

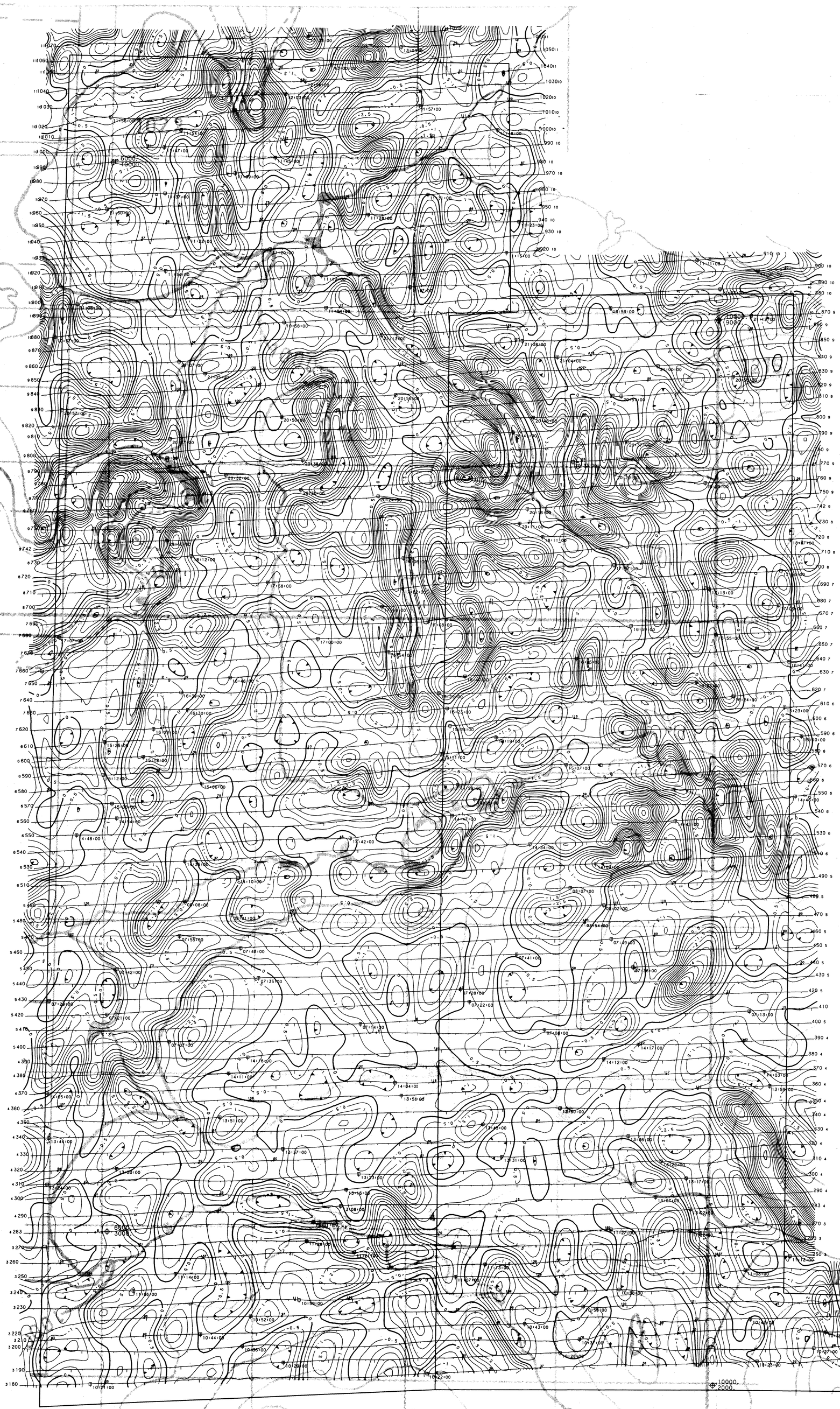
AERODAT LIMITED

DATE: JUNE 89
NTS No: 9304, 93N1
MAP No: 3 J8943

GEOLOGICAL BRANCH
ASSESSMENT REPORT

19,621

part 2 of 2



Vertical Gradient

Vertical Magnetic Gradient calculated from the total field magnetic intensity in nT/m.

Cesium high sensitivity magnetometer.

Sensor elevation 45m

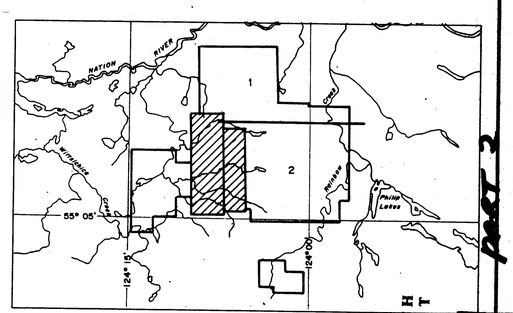
Map contours are multiples of those listed below

- .50 nT/m
- 2.50 nT/m
- 10 nT/m
- 50 nT/m
- 250 nT/m

Flight Path

Navigation and recovery using Motorola Mini-Ranger (MRS III) radar navigation system.

Average terrain clearance 60m
Average line spacing 100m



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CALCULATED VERTICAL MAGNETIC GRADIENT

HEIDI AND TEA AREAS

BRITISH COLUMBIA

SCALE 1:10,000

0 330 660 1320 2640 Feet

0 100 200 500 1000 Metres

AERODAT LIMITED

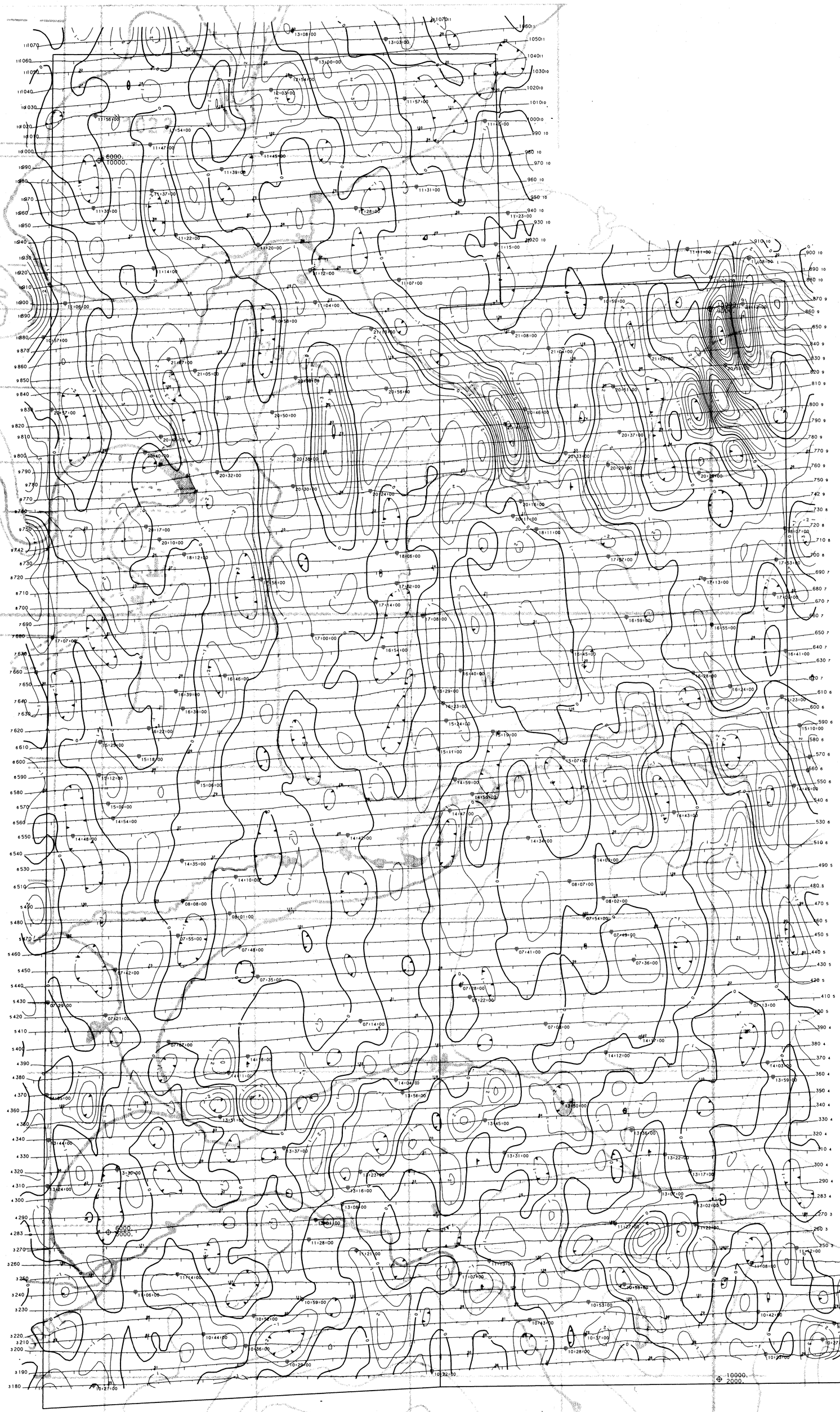
DATE: JUNE 89

NTS No: 9304, 93N1

MAP No: 4 J8943

GEOLOGICAL BRANCH
ASSESSMENT REPORT

19,921
pt 2
of 2



N

VLF-EM

VLF-EM Total Field Intensity in percent.

Station: NSS
Annapolis, Maryland
21.4 kHz

Sensor elevation 45m

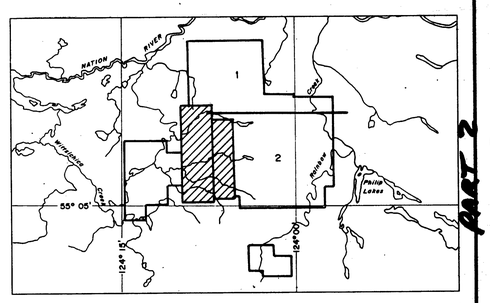
Map contours are multiples of those listed below

- 2 %
- 10 %
- 50 %
- 100 %

Flight Path

Navigation and recovery using Motorola Mini-Ranger (MRS III) radar navigation system.

Average terrain clearance 60m
Average line spacing 100m



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VLF-EM TOTAL FIELD CONTOURS

HEIDI AND TEA AREAS

BRITISH COLUMBIA

SCALE 1:10,000

0 330 660 1320 2640 Feet
0 100 200 500 1000 Metres

AERODAT LIMITED

DATE: JUNE 89
NTS No: 9304, 93N1
MAP No: 5 J8943

GEOLOGICAL BRANCH
ASSESSMENT REPORT

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PART 2 of 2