BRITISH COLUMBIA
The Best Place on Earth

**Ministry of Forests, Mines and Lands**
BC Geological Survey

**Assessment Report**
**Title Page and Summary**

TYPE OF REPORT [type of survey(s)]: AIRBORNE RADIOMETRIC AND MAGNETIC SURVEY TOTAL COST: $113,703.99

AUTHOR(S): TOR BRULAND SIGNATURE(S):

NOTICE OF WORK PERMIT NUMBER(S)/DATE(S): NONE, AIRBORNE WORK ONLY YEAR OF WORK: 2010

STATEMENT OF WORK - CASH PAYMENTS EVENT NUMBER(S)/DATE(S):

PROPERTY NAME: CARBO PROJECTS

CLAIM NAME(S) (on which the work was done): CARBO1 (515430), CARBO2 (515432), CARBO3 (515433), CARBO WEST (536347), CARBO EXTENSION (660563)

COMMODITIES SOUGHT: RARE EARTH ELEMENTS

MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN: 093J 014

MINING DIVISION: CARIBOO NTS/BCGS: 93J.050 &93J.060

LATITUDE: 54 ° 31 '03 " LONGITUDE: 122 ° 03 '33 " (at centre of work)

OWNER(S):
1) CANADIAN INTERNATIONAL MINERALS INC. (75%) 2) COMMERCE RESOURCES CORP. (25%)

MAILING ADDRESS:
#1128-789 WEST PENDER STREET
VANCOUVER, BC V6C 1H2

#1450-789 WEST PENDER STREET
VANCOUVER, BC V6C 1H2

OPERATOR(S) [who paid for the work]:
1) CANADIAN INTERNATIONAL MINERALS INC. 2)

MAILING ADDRESS:
#1128-789 WEST PENDER STREET
VANCOUVER, BC V6C 1H2

PROPERTY GEOLOGY KEYWORDS (lithology, age, stratigraphy, structure, alteration, mineralization, size and attitude):
THE WICHEEDA LAKE AREA IS LOCATED IN THE FORELAND BELT, A TREND OF IMBRICATED AND FOLDED MIOGEOCLINAL ROCKS THAT FORM THE EASTERN MOUNTAIN RANGES AND FOOTHILLS OF THE CANADIAN CORDILLERA. THE REGIONAL BEDROCK COMPRISES MAINLY LIMESTONE, MARBLE, SILTSTONE, ARGILLITE AND CALCAREOUS SEDIMENTARY ROCKS OF THE UPPER CAMBRIAN TO LOWER ORDOVICIAN KECHIKA GROUP.

REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSMENT REPORT NUMBERS: AR 15944 (1987) & AR-16246 (1987)

Next Page

| TYPE OF WORK IN THIS REPORT | EXTENT OF WORK (IN METRIC UNITS) | ON WHICH CLAIMS | PROJECT COSTS APPORTIONED (incl. support) |
|---|---|---|---|
| GEOLOGICAL (scale, area) | | | |
| Ground, mapping | | | |
| Photo interpretation | | | |
| GEOPHYSICAL (line-kilometres) | | | |
| Ground | | | |
| Magnetic | | | |
| Electromagnetic | | | |
| Induced Polarization | | | |
| Radiometric | | | |
| Seismic | | | |
| Other | | | |
| Airborne | 566.1 KM | MAGNETIC, RADIOMETRIC, EM | $113,703.99 |
| GEOCHEMICAL (number of samples analysed for...) | | | |
| Soil | | | |
| Silt | | | |
| Rock | | | |
| Other | | | |
| DRILLING (total metres; number of holes, size) | | | |
| Core | | | |
| Non-core | | | |
| RELATED TECHNICAL | | | |
| Sampling/assaying | | | |
| Petrographic | | | |
| Mineralographic | | | |
| Metallurgic | | | |
| PROSPECTING (scale, area) | | | |
| PREPARATORY / PHYSICAL | | | |
| Line/grid (kilometres) | | | |
| Topographic/Photogrammetric (scale, area) | | | |
| Legal surveys (scale, area) | | | |
| Road, local access (kilometres)/trail | | | |
| Trench (metres) | | | |
| Underground dev. (metres) | | | |
| Other | | | |
| | | TOTAL COST: | $113,703.99 |

| Exploration Work type | Comment | Days | | | Totals |
|---|---|---|---|---|---|
| | | | | | |
| **Personnel (Name)* / Position** | **Field Days (list** | **Days** | **Rate** | **Subtotal*** | |
| | | | $0.00 | $0.00 | |
| | | | $0.00 | $0.00 | |
| | | | $0.00 | $0.00 | |
| | | | $0.00 | $0.00 | |
| | | | $0.00 | $0.00 | |
| | | | $0.00 | $0.00 | |
| | | | | $0.00 | **$0.00** |
| **Office Studies** | **List Personnel (note - Office only, do not include field days** | | | | |
| Literature search | | | $0.00 | $0.00 | |
| Database compilation | Tor Bruland | 5.0 | $896.00 | $4,480.00 | |
| Computer modelling | | | $0.00 | $0.00 | |
| Reprocessing of data | | | $0.00 | $0.00 | |
| General research | | | $0.00 | $0.00 | |
| Report preparation | | | $0.00 | $0.00 | |
| Other (specify) | | | | $0.00 | |
| | | | | $4,480.00 | **$4,480.00** |
| **Airborne Exploration Surveys** | **Line Kilometres / Enter total invoiced amount** | | | | |
| Aeromagnetics | 566.1 KM | 1.0 | $109,223.99 | $109,223.99 | |
| Radiometrics | 566.1 KM | | $0.00 | $0.00 | |
| Electromagnetics | 566.1 KM | | $0.00 | $0.00 | |
| Gravity | | | $0.00 | $0.00 | |
| Digital terrain modelling | | | $0.00 | $0.00 | |
| Other (specify) | | | $0.00 | $0.00 | |
| | | | | $109,223.99 | **$109,223.99** |
| **Remote Sensing** | **Area in Hectares / Enter total invoiced amount or list personnel** | | | | |
| Aerial photography | | | $0.00 | $0.00 | |
| LANDSAT | | | $0.00 | $0.00 | |
| Other (specify) | | | $0.00 | $0.00 | |
| | | | | $0.00 | **$0.00** |
| **Ground Exploration Surveys** | **Area in Hectares / List Personnel** | | | | |
| Geological mapping | | | | | |
| Regional | | *note: expenditures here* | | | |
| Reconnaissance | | *should be captured in Personnel* | | | |
| Prospect | | *field expenditures above* | | | |
| Underground | Define by length and width | | | | |
| Trenches | Define by length and width | | | $0.00 | **$0.00** |
| | | | | | |
| **Ground geophysics** | **Line Kilometres / Enter total amount invoiced list personnel** | | | | |
| Radiometrics | | | | | |
| Magnetics | | | | | |
| Gravity | | | | | |
| Digital terrain modelling | | | | | |
| Electromagnetics | *note: expenditures for your crew in the field* | | | | |
| SP/AP/EP | *should be captured above in Personnel* | | | | |
| IP | *field expenditures above* | | | | |
| AMT/CSAMT | | | | | |
| Resistivity | | | | | |
| Complex resistivity | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Seismic reflection | | | | | |
| Seismic refraction | | | | | |
| Well logging | Define by total length | | | | |
| Geophysical interpretation | | | | | |
| Petrophysics | | | | | |
| Other (specify) | | | | | |
| | | | | $0.00 | **$0.00** |
| **Geochemical Surveying** | **Number of Sample** | **No.** | **Rate** | **Subtotal** | |
| | | | | | |
| Drill (cuttings, core, etc.) | | | $0.00 | $0.00 | |
| Stream sediment | | | $0.00 | $0.00 | |
| Soil | *note: This is for assays* | | $0.00 | $0.00 | |
| Rock | *laboratory costs* | | $0.00 | $0.00 | |
| Water | | | $0.00 | $0.00 | |
| Biogeochemistry | | | $0.00 | $0.00 | |
| Whole rock | | | $0.00 | $0.00 | |
| Petrology | | | $0.00 | $0.00 | |
| Other (specify) | | | $0.00 | $0.00 | |
| | | | | $0.00 | **$0.00** |
| **Drilling** | **No. of Holes, Size** | **No.** | **Rate** | **Subtotal** | |
| Diamond | | | $0.00 | $0.00 | |
| Reverse circulation (RC) | | | $0.00 | $0.00 | |
| Rotary air blast (RAB) | | | $0.00 | $0.00 | |
| Other (specify) | | | $0.00 | $0.00 | |
| | | | | $0.00 | **$0.00** |
| **Other Operations** | **Clarify** | **No.** | **Rate** | **Subtotal** | |
| Trenching | | | $0.00 | $0.00 | |
| Bulk sampling | | | $0.00 | $0.00 | |
| Underground development | | | $0.00 | $0.00 | |
| Other (specify) | | | $0.00 | $0.00 | |
| | | | | $0.00 | **$0.00** |
| **Reclamation** | **Clarify** | **No.** | **Rate** | **Subtotal** | |
| After drilling | | | $0.00 | $0.00 | |
| Monitoring | | | $0.00 | $0.00 | |
| Other (specify) | | | $0.00 | $0.00 | |
| | | | | | |
| **Transportation** | | **No.** | **Rate** | **Subtotal** | |
| | | | | | |
| Airfare | | | $0.00 | $0.00 | |
| Taxi | | | $0.00 | $0.00 | |
| truck rental | | | $0.00 | $0.00 | |
| kilometers | | | $0.00 | $0.00 | |
| ATV | | | $0.00 | $0.00 | |
| fuel | | | $0.00 | $0.00 | |
| Helicopter (hours) | | | $0.00 | $0.00 | |
| Fuel (litres/hour) | | | $0.00 | $0.00 | |
| Other | | | | | |
| | | | | $0.00 | **$0.00** |
| **Accommodation & Food** | **Rates per day** | | | | |
| Hotel | | | $0.00 | $0.00 | |
| Camp | | | $0.00 | $0.00 | |

| | | | | | |
|---|---|---|---|---|---|
| Meals | day rate or actual costs-s | | $0.00 | $0.00 | |
| | | | | $0.00 | **$0.00** |
| **Miscellaneous** | | | | | |
| Telephone | | | $0.00 | $0.00 | |
| Other (Specify) | | | | | |
| | | | | $0.00 | **$0.00** |
| **Equipment Rentals** | | | | | |
| Field Gear (Specify) | | | $0.00 | $0.00 | |
| Other (Specify) | | | | | |
| | | | | $0.00 | **$0.00** |
| **Freight, rock samples** | | | | | |
| | | | $0.00 | $0.00 | |
| | | | $0.00 | $0.00 | |
| | | | | $0.00 | **$0.00** |
| | | | | | |
| ***TOTAL Expenditures*** | | | | | **$113,703.99** |

# 2010 Helicopter-Borne AeroTEM System Electromagnetic, Magnetic Survey & Radiometric Survey

## Carboo Property
## Cariboo Mining Division

## BCGS Maps: 093J.050 & 093J.060
## Latitude: 54º31’03”Longitude: 122º03’33”
## UTM: Zone 10; 560,903E; 6,041,509N

For

**Canadian International Minerals Inc.**
Suite #1128 - 789 West Pender Street,
Vancouver, B.C. V6C 1H2

By

Tor Bruland, P.Geo. (B.C.)
Cascade Geological Services
#601-1788 West Georgia Street
Vancouver, B.C. V6G 2V7

March 19, 2011

## TABLE OF CONTENTS



## ILLUSTRATIONS



## TABLES



## APPENDICES

## 1: INTRODUCTION

An Electromagnetic, Magnetic and Radiometric helicopter airborne geophysical survey was completed Canadian International Minerals Inc.'s Carbo property between July 12$^{th}$ and 27$^{th}$ 2010. The survey was performed by Aeroquest International of Mississagua, Ontario utilizing the AeroTEM III time domain helicopter electromagnetic system, which was employed in conjunction with a high-sensitivity caesium vapour magnetometer. Aeroquest's Airborne Gamma Ray Spectrometer (AGRS) sensor was installed in the helicopter cabin. The AGRS system utilizes four (4) downward looking NaI crystals used as the main gamma-ray sensors and one upward looking crystal for monitoring non-geologic sources. Ancillary equipment includes a real-time differential GPS navigation system, radar altimeter, video recorder, and a base station magnetometer. Full-waveform streaming EM data is recorded at 36,000 samples per second. The streaming data comprise the transmitted waveform, and the X component and Z component of the resultant field at the receivers. The streaming EM data along with ancillary data recorded with AeroDAS acquisition system.

## 2: LOCATION, ACCESS & PHYSIOGRAPHY

The Carbo property is located approximately 80 km northeast of Prince George, B.C. (Figure 1) and 40 km east of the community of Bear Lake on Highway 97 from Prince George to Dawson Creek. The property is located at approximately 54°31'N, 120°03'W (UTM: Zone 10; 560,903E; 6,041,509N). Access to the Property is along B.C. Forest Service Road 700 from Bear Lake towards the Chuchinka Forest Service Road and the Arctic Lakes Forest Service Road for 51 km to the Wicheeda Lake turnoff and along the Wicheeda Lake to the east of the property. From there access to the property is by food. Alternative the property can be reached by helicopter charter from Prince George.

The property is located on the west side of the Rocky Mountain Range along Copley Range that extends southeast from Wicheeda Lake with elevation between 900 to 1,520 m above sea level. On the flanks of the ridge are the Parsnip River valley (to the northeast in the Rock Mountain Trench) and Wichika Creek (to the SW). Wicheeda Lake lies just northwest of the property.

The vegetation around the Carbo Property is thick; devil's club and buck brush dominate at lower elevations and on the slopes leading up to the ridge. The ridge is covered by alder and white pine. Exposure of bedrock is limited in many areas, especially at lower elevations. Logging has been done at the lower slopes of Copley Ridge both to the northeast and southwest. Logging roads get to with a couple of hundred metres from the claim boundaries.

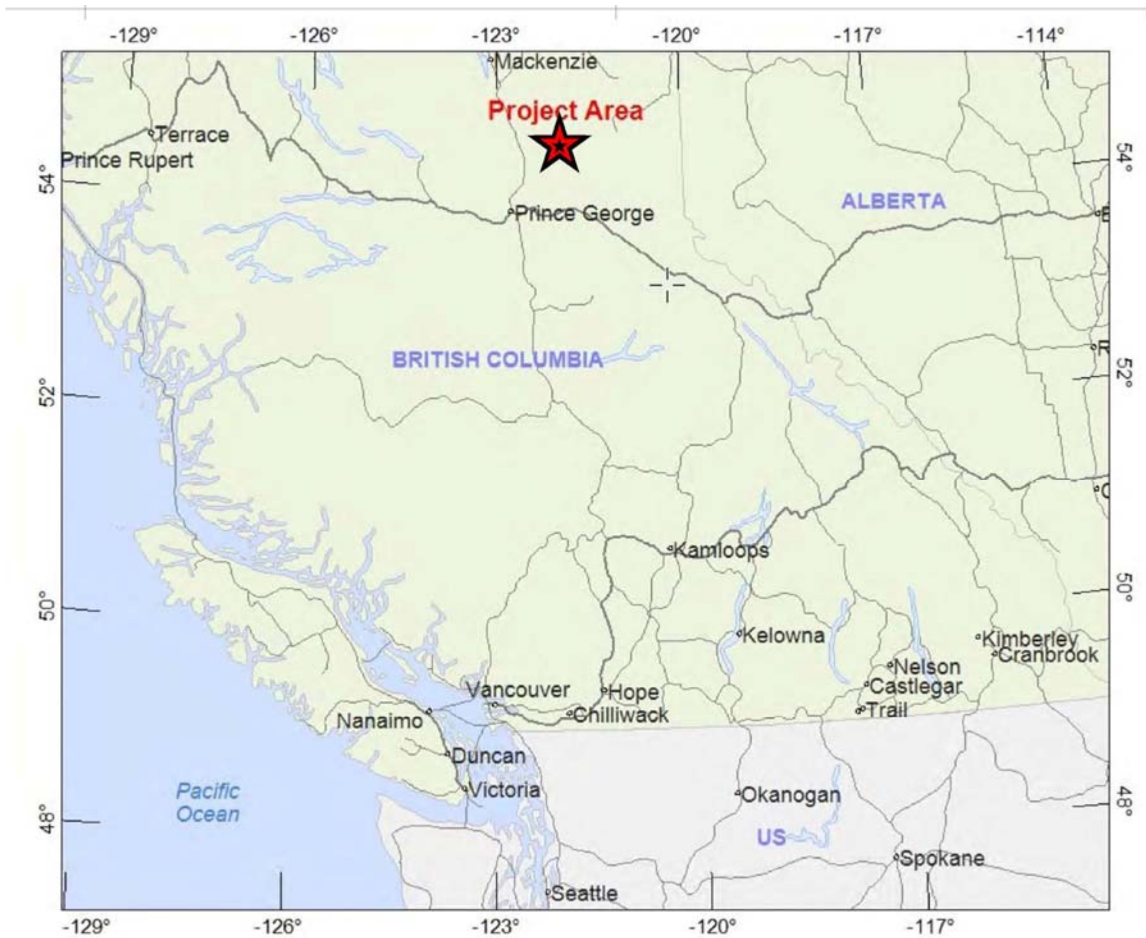



Figure 1: Carbo property Location

## 3: CLAIM INFORMATION

This block comprises five claims (Table 1) covering a total area of 1,840 hectares. The property extends approximately 7 km along the Copley Ridge to the southeast from the east side of the Wicheeda Lake.

Table 1: Carbo property claim information

| Tenure Number | Issue Date | Expiry Date | Claim Name | Owner | Hectares |
|---|---|---|---|---|---|
| 536347 | 28-Jun-06 | 31-Dec-12 | CARBO WEST | CIM | 338.0 |
| 515430 | 28-Jun-05 | 31-Dec-12 | CARBO1 | CIM | 469.2 |
| 515432 | 28-Jun-05 | 31-Dec-12 | CARBO2 | CIM | 469.4 |
| 515433 | 28-Jun-05 | 31-Dec-12 | CARBO3 | CIM | 187.8 |
| 660563 | 27-Oct-09 | 1-May-11 | CARBO EXTENSION | CIM | 375.8 |

## 4: SURVEY AREA

The total survey coverage is 566.1 line-km, of which 531.8 line-km fell within the defined project area. The survey was made up of one block, named as Carbo, flown at 50 metre line spacing and in 45º/135º flight direction (Figure 2). The survey flying took place from July 12th to July 27th 2010. This report is attached in Appendix II describes the survey logistics, the data processing, presentation, and provides the specifications of the survey.

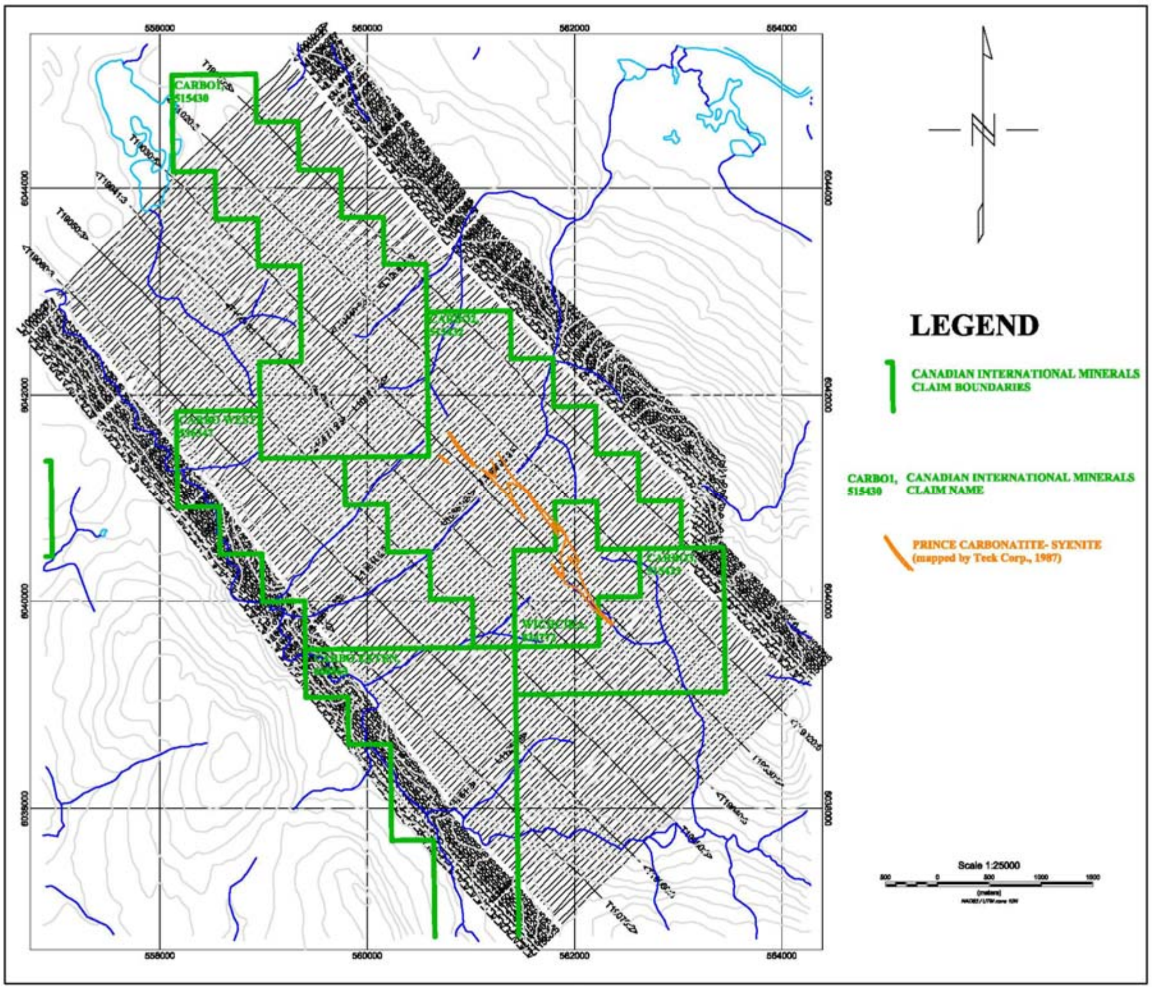



Figure 2: Aeroquest survey flight lines

## 5: GEOLOGY

The wicheeda lake area is located in the foreland belt, a trend of imbricated and folded miogeoclinal rocks that form the eastern mountain ranges and foothills of the Canadian Cordillera. The regional bedrock comprises mainly limestone, marble, siltstone, argillite and calcareous sedimentary rocks of the upper Cambrian to lower Ordovician Kechika Group that generally strike between 120 and 140° with steep dips to the northwest or southeast. To the east the Kechika Group are in fault contact with unassigned carbonates, slates and siltstones of Cambrian to Devonian age. To the west he Kechika Group are in fault contact with quartzitic rocks of the Upper Proterozoic to Permian Gog Group and unassigned Devonian to Permian felsic volcanics (Figure 3).

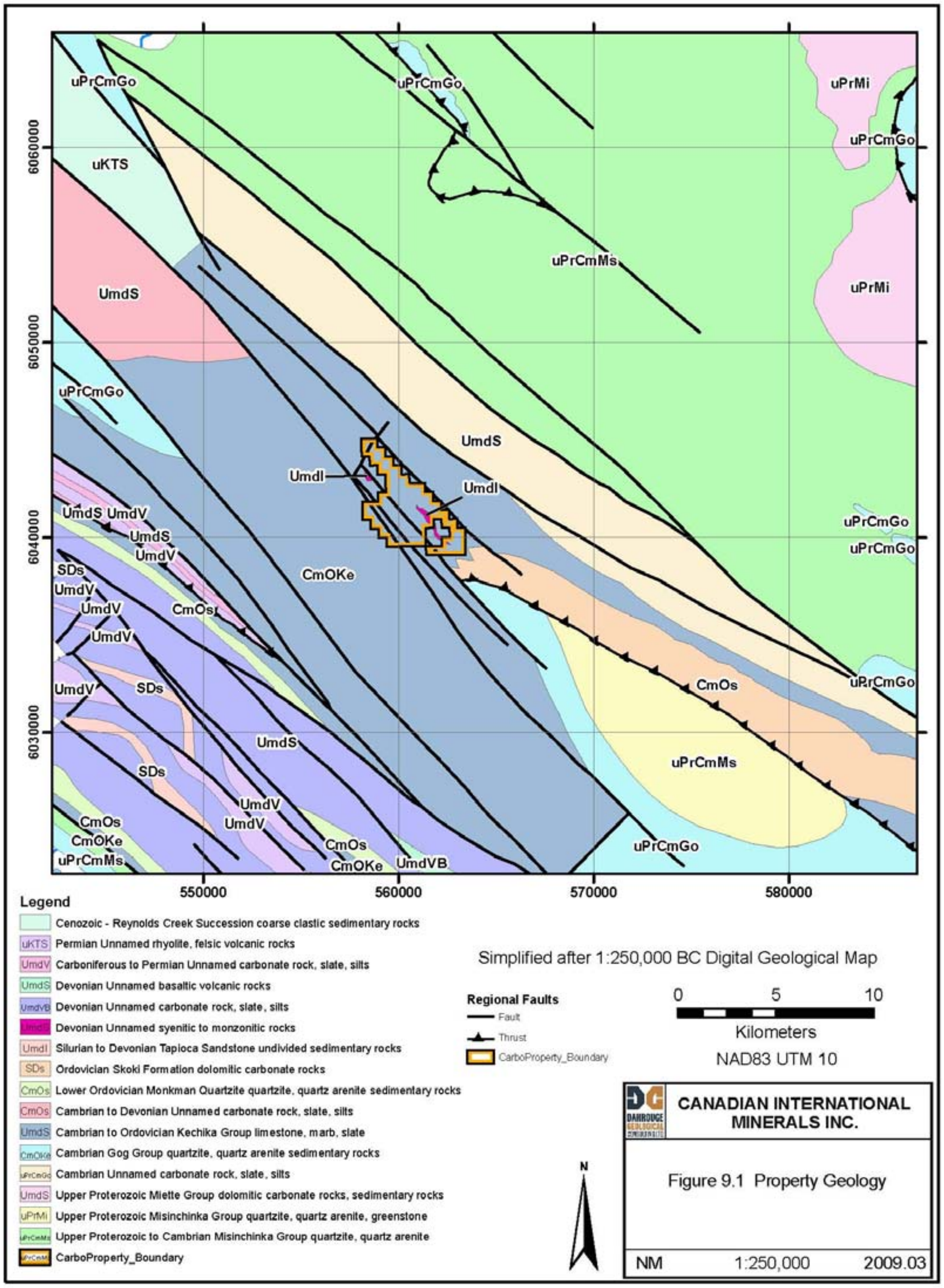



Figure 3: Regional Geology of the Wicheeda area with Carbo property outline

The northwest-trending Rocky Mountain Trench, which likely follows the Parsnip River valley, dominates the structural and geographical setting of the region (Figure 3). A number of major northwest trending faults occur in the area, such as down the Wichcika Creek. A lesser number of northeast trending faults have been mapped and interpreted along the length of the ridge, as well as locally along creek offsets.

The Carbo property covers Kechika Group sedimentary rocks consists mainly of interbedded limestone with calcareous argillite and phyllite; it strikes northwest-southeast (120$^o$ to 140$^o$) and dips subvertically to the northeast and southwest. Dyke and sill-like carbonatite and syenite plugs intrude the Kechika Group.

Carbonatites and associated alkaline intrusive rocks within the Carbo property contain rare earth bearing and niobium minerals.

## 6: SURVEY DETAILS

A Helicopter airborne AeroTEM III System Electromagnetic and Magnetic plus Gamma Ray Spectrometer (AGRS) Radiometric geophysical survey was completed for Canadian International Minerals Inc.'s Carbo property between July 12$^{th}$ and 27$^{th}$ 2010 by Aeroquest Surveys of Mississauga, Ontario. The extent and a detailed description of the work are incorporated in the attached report as Appendix II.

## 7: INTERPRETAION AND RECOMMENDATIONS

The Aeroquest report doesn't include any interpretation or recommendations; it is strictly a description of equipment, data collection, data processing and presentation. The report is attached in equip in Appendix II.

Aeroquest prepared plots of the Total Magnetic (Figure 4) and the Radiometric Th (ppm) (Figure 5).

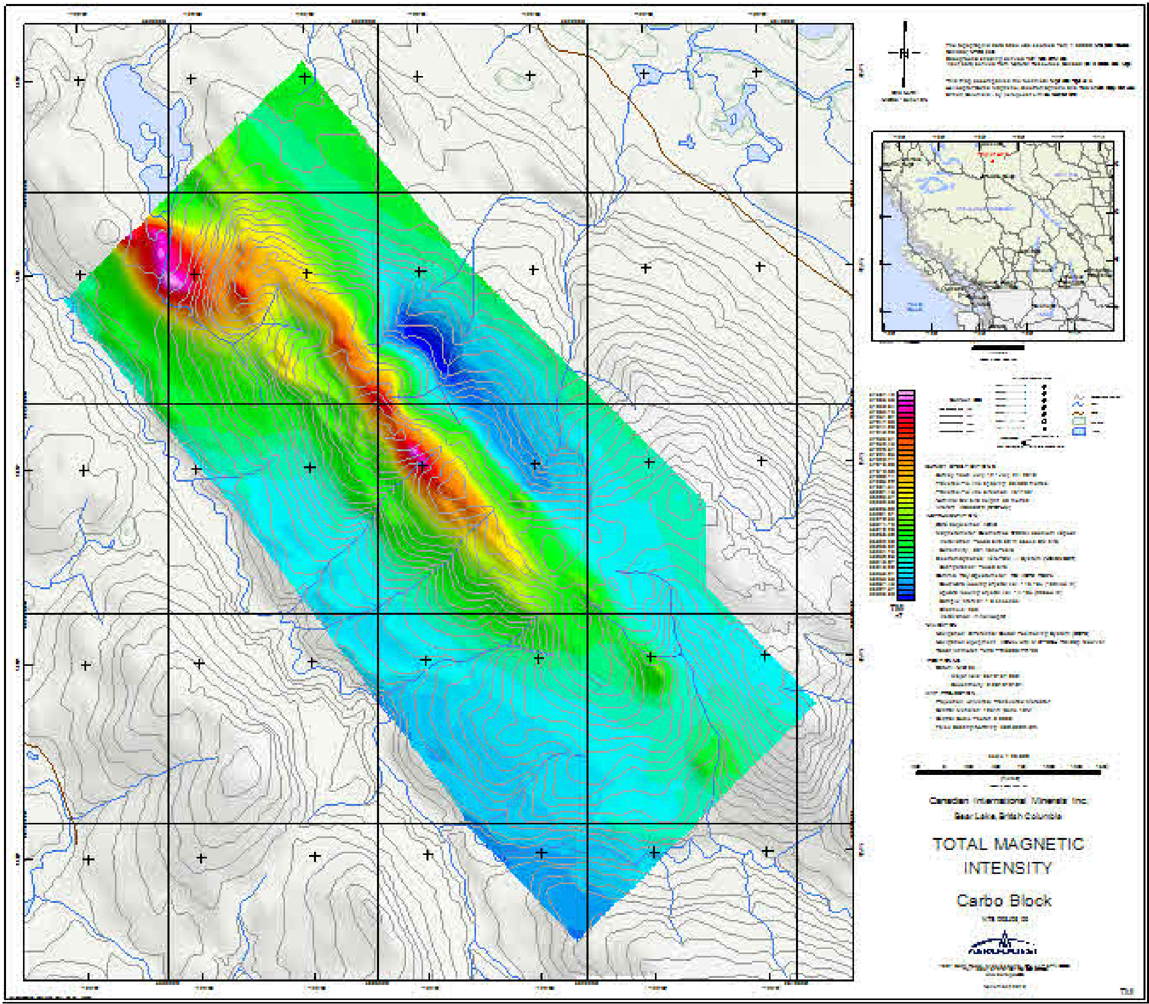



Figure 4: Total Magnetic

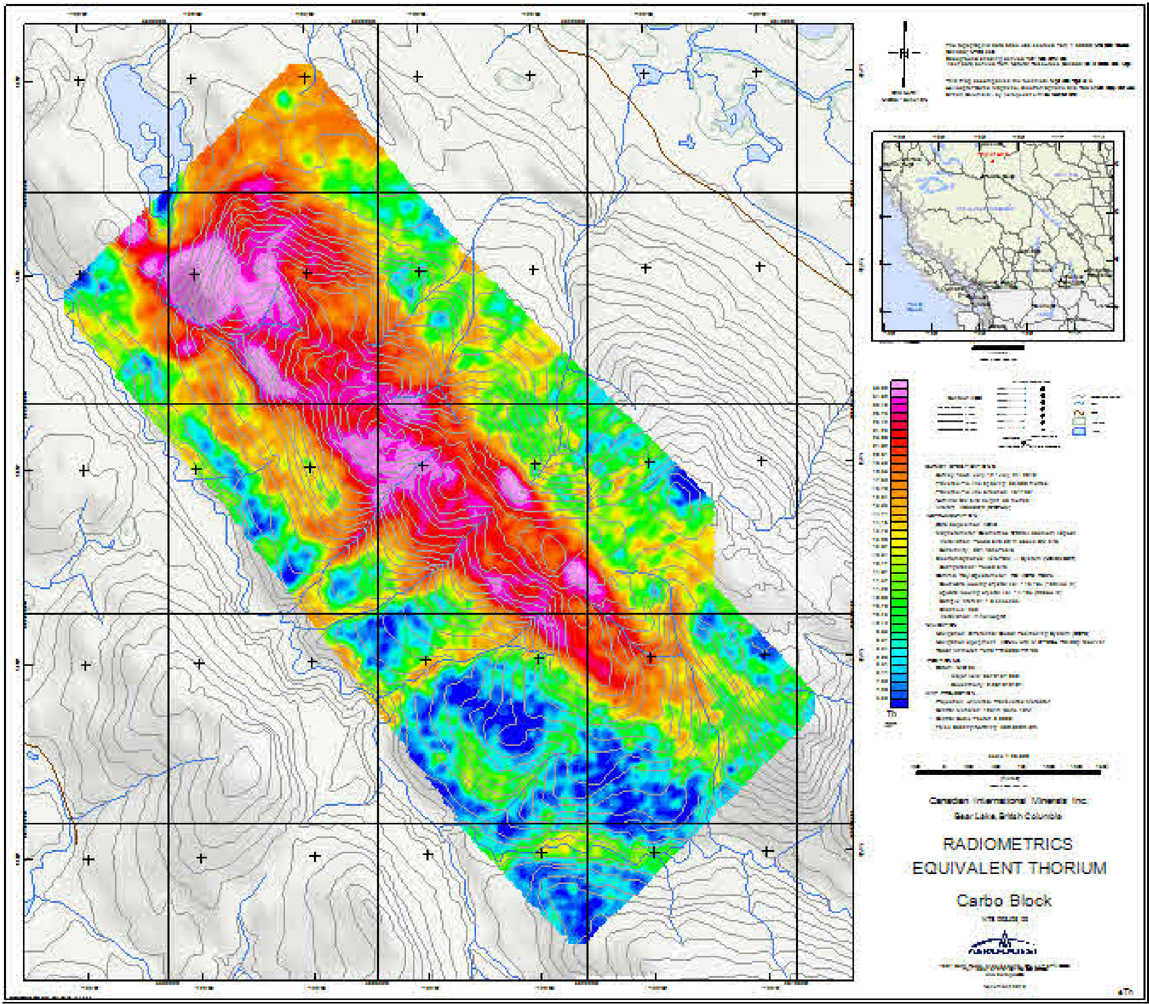



Figure 5: Radiometric Th (ppm)

It appears from known geological information that the Total Magnetic and Radiometric TH (ppm) highs reflect carbonatite and alkaline intrusions.

The airborne results should be correlated with the historic and present geochemical soil results to develop priority areas for following up by geological mapping, trenching and diamond drilling to identify the source of the airborne highs.

## 8: STATEMENT OF QUALIFICATIONS

I, TOR BRULAND, Consulting Geologist, and proprietor of Cascade Geological Services and President of 681874 B.C. Ltd., with residence and business address at #601-1788 West Georgia Street, Vancouver, B.C. V6G 2V7 does hereby certify that:

1. I am a graduate of the University of Bergen, Norway with a Cand. Mag. (B.Sc. equivalent) in 1977 and Cand. Real. (M.Sc. equivalent) in 1980.

2. I have practiced my profession as a geologist, within the private sector, and as a consulting geologist in the Canadian Cordillera and in parts of Bolivia, Chile, China, Ecuador, Mexico, Mongolia, Norway, Peru and the United States for 34 years. Work has included detailed geological investigations, examinations, exploration, underground bulk sampling, processing of bulk samples in a 150 tpd grinding and flotation plant and reporting on a broad spectrum of mineral prospects and properties. I am presently practicing as an independent Consulting Geologist through my proprietorship Cascade Geological Services and incorporated company 681874 B.C. Ltd.

3. I have been registered with the Association of Professional Engineers and Geoscientists of British Columbia as a Professional Geoscientist since 1992, and I am in good standing with the association for the 2011 calendar year.

4. I have relevant experience with regard to the foregoing report includes M.Sc. Thesis in Lillebukt Alkaline Complex, Norway.

5. I am familiar with the project and have reviewed all available exploration reports and historic data in the Company's files as well as other relevant data in the public domain for this region.

6. I personally examined Carbo Property on numerous occasions between September and November 2010 on behalf of Canadian International Minerals Inc.

7. This certificate applies to "2010 Helicopter-Borne AeroTEM System Electromagnetic, magnetic Survey & Radiometric Survey", dated November 30, 2010. I am responsible for preparation of all sections of the report utilizing data summarized in the reference section of this report and data collected during the November and June 2009 site visits.

8. As of the date of this certificate, to the best of my knowledge, information and belief, the technical report contains all scientific and technical information that is required to ensure the technical report is not misleading.

9. I am a director of Canadian International Minerals Inc.

Dated at Vancouver, B.C., this 19th day of March 2011:

Signed and sealed by:

/s/ *"Tor Bruland"*

Tor Bruland, M.Sc., P.Geo. (B.C.)
Geological Consultant

# APPENDIX I

# STATEMENT OF COSTS

| Exploration Work type | Comment | Days | Rate | Subtotal* | Totals |
|---|---|---|---|---|---|
| | | | | | |
| **Office Studies** | **List Personnel (note - Office only, do not include field days** | | | | |
| Literature search | | | $0.00 | $0.00 | |
| Database compilation | Tor Bruland | 5.0 | $896.00 | $4,480.00 | |
| Computer modeling | | | $0.00 | $0.00 | |
| Reprocessing of data | | | $0.00 | $0.00 | |
| General research | | | $0.00 | $0.00 | |
| Report preparation | | | $0.00 | $0.00 | |
| Other (specify) | | | | $0.00 | |
| | | | | $4,480.00 | **$4,480.00** |
| **Airborne Exploration Surveys** | **Line Kilometres / Enter total invoiced amount** | | | | |
| Aeromagnetics | 566.1 Km | 1.0 | $109,223.99 | $109,223.99 | |
| Radiometrics | 566.1 km | | $0.00 | $0.00 | |
| Electromagnetics | 566.1 km | | $0.00 | $0.00 | |
| Gravity | | | $0.00 | $0.00 | |
| Digital terrain modeling | | | $0.00 | $0.00 | |
| Other (specify) | | | $0.00 | $0.00 | |
| | | | | $109,223.99 | **$109,223.99** |
| ***TOTAL Expenditures*** | | | | | **$113,703.99** |

# APPENDIX II

# AEROQUEST'S 2010 HELICOPTER-BORNE AEROTEM III SYSTEM ELECTROMAGNETIC AND MAGNETIC SURVEY PLUS GAMMA RAY SPECTROMETER (AGRS) RADIOMETRIC SURVEY

# Report on a Helicopter-Borne AeroTEM System Electromagnetic Magnetic & Radiometrics Survey

**Aeroquest Job # 10043**

## Carbo Project

Bear Lake, B.C., Canada

For

## Canadian International Minerals Inc.

Suite 950 – 789 West Pender,
Vancouver, B.C., Canada
V6C 1H2

by


AEROQUEST

7687 Bath Road,
Mississauga, ON, L4T 3T1
Tel: (905) 672-9129
Fax: (905) 672-7083
www.aeroquest.ca


Report date: November 2010

# Report on a Helicopter-Borne AeroTEM System Electromagnetic, Magnetic & Radiometrics Survey

**Aeroquest Job # 10043**

## Carbo Project

Bear Lake, B.C., Canada

For

## Canadian International Minerals Inc.

Suite 950 – 789 West Pender,
Vancouver, B.C., Canada
V6C 1H2

by

7687 Bath Road,
Mississauga, ON, L4T 3T1
Tel: (905) 672-9129
Fax: (905) 672-7083
www.aeroquest.ca

Report date: Novmeber 2010

# TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF MAPS (1:20,000)

- TMI – Total Magnetic Intensity (TMI) colour grid with contours and EM anomaly symbols.
- ZOFF1– AeroTEM Z1 Off-time colour grid with contours, and EM anomaly symbols.
- EM – AeroTEM off-time profiles Z1 – Z11 and EM anomaly symbols.
- eTh - Radiometrics Equivalent Thorium colour grid with contours
- K% - Radiometrics Potassium Percentage colour grid with contours

# 1. INTRODUCTION

This report describes a helicopter-borne geophysical survey carried out on behalf of Canadian International Minerals Inc. for Carbo project, near Bear Lake, B.C.

The principal geophysical sensor is Aeroquest's exclusive AeroTEM III (November) time domain helicopter electromagnetic system which is employed in conjunction with a high-sensitivity caesium vapour magnetometer. The secondary sensor was Aeroquest's Airborne Gamma Ray Spectrometer (AGRS) system, which is installed in the helicopter cabin. The AGRS system utilizes four (4) downward looking NaI crystals used as the main gamma-ray sensors and one upward looking crystal for monitoring non-geologic sources. Ancillary equipment includes a real-time differential GPS navigation system, radar altimeter, video recorder, and a base station magnetometer. Full-waveform streaming EM data is recorded at 36,000 samples per second. The streaming data comprise the transmitted waveform, and the X component and Z component of the resultant field at the receivers. The streaming EM data along with ancillary data recorded with AeroDAS acquisition system.

The total survey coverage is 566.1 line-km, of which 531.8 line-km fell within the defined project area (Appendix 1). The survey was made up of one block, named as Carbo, flown at 50 metre line spacing and in 45º/135º flight direction (Table 1). The survey flying described in this report took place from July 12th to July 27th 2010. This report describes the survey logistics, the data processing, presentation, and provides the specifications of the survey.

# 2. SURVEY AREA

The Project area (Figure 1) is located in B.C. approximately 84 kms North East of Price George. The survey consisted of one block, Carbo (24 km²), and can be located on NTS map sheet 093J08 & 09. The base of survey operations was at Bear Lake B.C..

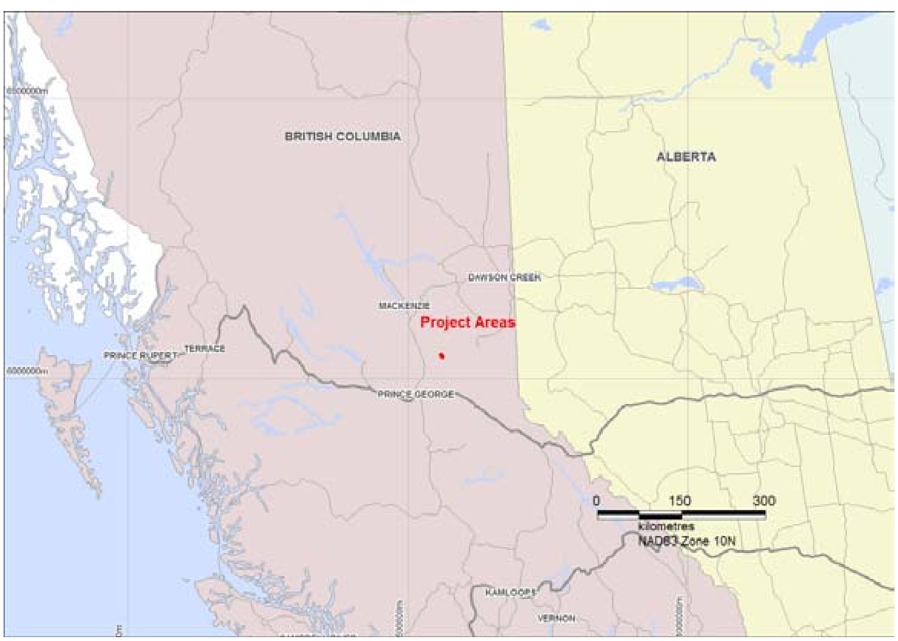



Figure 1. Project Area

# 3. SURVEY SPECIFICATIONS AND PROCEDURES

The survey specifications are summarised in the following table:

| Project Name | Line Spacing (metres) | Line Direction | Survey Coverage (line-km) | Date flown |
|---|---|---|---|---|
| Carbo | 50 | 45º/135º | 566.1 | July 12th – July 27th |

Table 1. Survey specifications summary

The survey coverage was calculated by adding up the along-line distance of the survey lines and control (tie) lines as presented in the final Geosoft database. The survey was flown with a line spacing of 50 metres. The control (tie) lines were flown perpendicular to the survey lines with 500 metre, tie line spacing.

The nominal EM bird terrain clearance is 30 metres, but can be higher in more rugged terrain due to safety considerations and the capabilities of the aircraft. The magnetometer sensor is mounted in a smaller bird connected to the tow rope 34 metres above the EM bird and 18 metres below the helicopter. Nominal survey speed over relatively flat terrain is 75 km/hr and is generally lower in rougher terrain. Scan rates for ancillary data acquisition is 0.1 second for the magnetometer and altimeter, and 0.2 second for the GPS determined position. The EM data is acquired as a data stream at a sampling rate of 36,000 samples per second and is processed to generate final data at 10 samples per second. The 10 samples per second translate to a geophysical reading about every 1.5 to 2.5 metres along the flight path.

## 3.1. NAVIGATION

Navigation is carried out using a GPS receiver, an AGNAV2 system for navigation control, and AeroDAS data acquisition system which records the GPS coordinates. The x-y-z position of the aircraft, as reported by the GPS, is recorded at 0.2 second intervals. The system has a published accuracy of less than 3 metres. A recent static ground test of the Mid-Tech WAAS GPS yielded a standard deviation in x and y of less than 0.6 metres and for z less than 1.5 metres over a two-hour period.

## 3.2. SYSTEM DRIFT

Unlike frequency domain electromagnetic systems, the AeroTEM III system has negligible drift due to thermal expansion. The operator is responsible for ensuring the instrument is properly warmed up prior to departure and that the instruments are operated properly throughout the flight. The operator maintains a detailed flight log during the survey noting the times of the flight and any unusual geophysical or topographic features. Each flight included at least two high elevation 'background' checks. During the high elevation checks, an internal 5 second wide calibration pulse in all EM channels was generated in order to ensure that the gain of the system remained constant and within specifications.

## 3.3. FIELD QA/QC PROCEDURES

On return of the pilot and operator to the base, usually after each flight, the AeroDAS streaming EM and ancillary (magnetic, GPS, radiometrics, radar altimeter) data are carried on removable hard drives and transferred to the data processing work station. At the end of each day, the base station magnetometer data on FlashCard is retrieved from the base station unit.

Data verification and quality control includes a comparison of the acquired GPS data with the flight plan; verification and conversion of the magnetic data to an ASCII format XYZ data file; verification of the base station magnetometer data and conversion to ASCII format XYZ data; and loading, processing and conversion of the steaming EM data from the removable hard drive. All data is then merged to an ASCII XYZ format file which is then imported to an Oasis database for further QA/QC and for the production of preliminary EM, magnetic, radiometrics, and flight path maps.

Survey lines which show excessive deviation from the intended flight path are re-flown. Any line or portion of a line on which the data quality did not meet the contract specification was noted and reflown.

# 4. AIRCRAFT AND EQUIPMENT

## 4.1. AIRCRAFT

A Eurocopter (Aerospatiale) SA315B "Lama" helicopter - registration C-GLOV was used as survey platform. The helicopter was owned and operated by Hi-Wood Helicopters Ltd. Installation of the geophysical and ancillary equipment was carried out by Aeroquest Limited personnel in conjunction with a licensed aircraft. The survey aircraft was flown at a nominal terrain clearance of 331 ft (101 metres).

Figure 2 Helicopter of the type used during the survey

## 4.2. MAGNETOMETER

The AeroTEM III airborne survey system employs the Geometrics G-823A caesium vapour magnetometer sensor installed in a two metre towed bird airfoil attached to the main tow line, 34 metres above EM bird (Figure 3). The sensitivity of the magnetometer is 0.001 NanoTesla at a 0.1 second sampling rate. The nominal ground clearance of the magnetometer bird is 83 metres (272 ft.). The magnetic data is recorded at 10 Hz by the ADAS.

### 4.3. ELECTROMAGNETIC SYSTEM

The electromagnetic system is an Aeroquest AeroTEM III time domain towed-bird system (Figure 3). The current AeroTEM III transmitter dipole moment is 183 kNIA. The AeroTEM bird is towed 56 metres (184 ft) below the helicopter. More technical details of the system may be found in Appendix 5.

The wave-form is triangular with a symmetric transmitter on-time pulse of 1.10 ms and a base frequency of 90 Hz (Figure 4). The current alternates polarity every on-time pulse. During every Tx on-off cycle (180 per second), 200 contiguous channels of raw X and Z component (and a transmitter current monitor, itx) of the received waveform are measured. Each channel width is 27.78 microseconds starting at the beginning of the transmitter pulse. This 200 channel data is referred to as the raw streaming data. The AeroTEM system has one EM data recording streams, the newly designed AeroDAS system which records the full waveform (Figure 4).

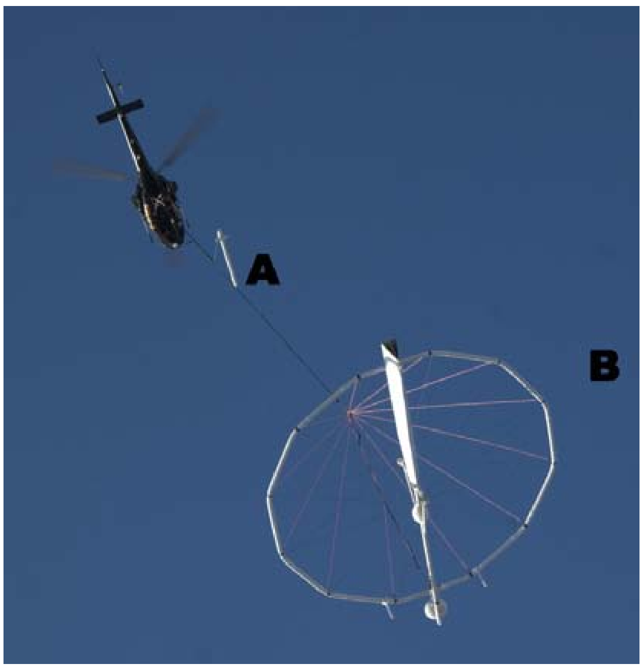



Figure 3. The magnetometer bird (A) and AeroTEM III EM bird (B)

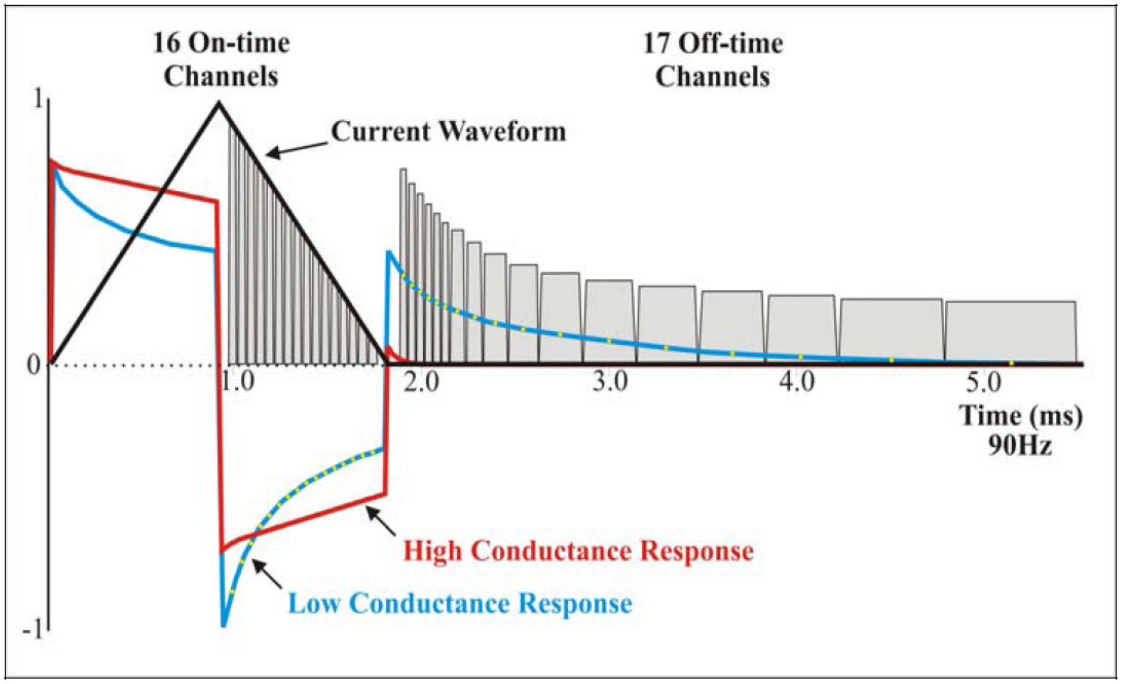



Figure 4. Schematic of Transmitter and Receiver waveforms

### 4.4. AIRBORNE GAMMA RAY SPECTROMETER (AGRS) SYSTEM

The Aeroquest AGRS system consists of an RSX-5 sensor pack, which is installed on the floor of the helicopter cabin and an acquisition system designed and manufactured by Radiation Solutions Inc. (RSI).

The system has 4 downward looking NaI crystals (16.75 L) used as the main sensors and 1 upward looking crystal (4.18 L) for monitoring non-geologic sources. The system features automatic peak detection and real-time calibration to ensure spectrum stability and a high quality final product. The full spectrum is recorded (256 or 512 channels) to allow for subsequent noise reduction processing such as NASVD. The data are processed to produce the standard IAGA ROI channels – Total Count, Potassium, Uranium and Thorium. The potassium, and equivalent uranium and thorium concentrations are also derived and ratios of these concentrations are computed to enhance the interpretation of the survey results.

### 4.5. AERODAS ACQUISITION SYSTEM

The 200 channels of raw streaming data are recorded by the AeroDAS acquisition system (Figure 55) onto a removable hard drive. In addition the magnetic, altimeter and position data are also recorded in it, six channels of real time processed off-time EM decay in the Z direction and one in the X direction can be viewed on a color monitor on board, these channels are derived by a binning, stacking and filtering procedure on the raw streaming data.

The primary use of the displayed EM data (Z1 to Z6, X1), magnetic and altimeter is to provide for real-time QA/QC on board.

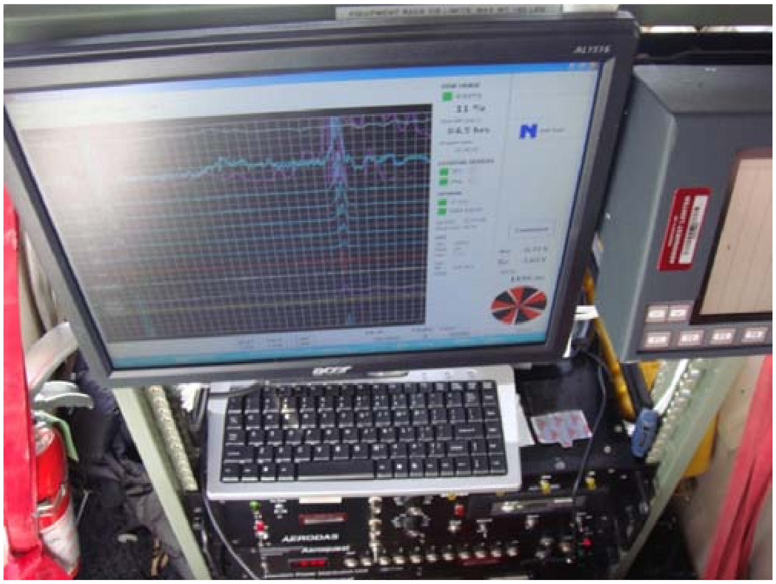


Figure 5. AeroTEM III Instrument Rack

The streaming data are processed post-survey to yield 33 stacked and binned on-time and off-time channels at a 10 Hz sample rate. The timing of the final processed EM channels is described in the following table:

| Channel | Sample Range | Time Width (us) | Time Center (us) | Time After TxOn (us) |
|---|---|---|---|---|
| On1 | 5 - 5 | 27.8 | 125.0 | 132.6 |
| On2 | 6 - 6 | 27.8 | 152.8 | 160.3 |
| On3 | 7 - 7 | 27.8 | 180.6 | 188.1 |
| On4 | 8 - 8 | 27.8 | 208.3 | 215.9 |
| On5 | 9 - 9 | 27.8 | 236.1 | 243.7 |
| On6 | 10 - 10 | 27.8 | 263.9 | 271.5 |
| On7 | 11 - 11 | 27.8 | 291.7 | 299.2 |
| On8 | 12 - 12 | 27.8 | 319.4 | 327.0 |
| On9 | 13 - 13 | 27.8 | 347.2 | 354.8 |
| On10 | 14 - 14 | 27.8 | 375.0 | 382.6 |
| On11 | 15 - 15 | 27.8 | 402.8 | 410.3 |
| On12 | 16 - 16 | 27.8 | 430.6 | 438.1 |
| On13 | 17 - 17 | 27.8 | 458.3 | 465.9 |
| On14 | 18 - 18 | 27.8 | 486.1 | 493.7 |
| On15 | 19 - 19 | 27.8 | 513.9 | 521.5 |
| On16 | 20 - 20 | 27.8 | 541.7 | 549.2 |

| Channel | Sample Range | Time Width (us) | Time Center (us) | Time After TxOff (us) |
|---|---|---|---|---|
| Off0 | 64 - 64 | 27.8 | 1763.9 | 38.9 |
| Off1 | 65 - 65 | 27.8 | 1791.7 | 66.6 |
| Off2 | 66 - 66 | 27.8 | 1819.4 | 94.4 |
| Off3 | 67 - 67 | 27.8 | 1847.2 | 122.2 |
| Off4 | 68 - 68 | 27.8 | 1875.0 | 150.0 |
| Off5 | 69 - 69 | 27.8 | 1902.8 | 177.8 |
| Off6 | 70 - 72 | 83.3 | 1958.3 | 233.3 |
| Off7 | 73 - 75 | 83.3 | 2041.7 | 316.6 |
| Off8 | 76 - 78 | 83.3 | 2125.0 | 400.0 |
| Off9 | 79 - 81 | 83.3 | 2208.3 | 483.3 |
| Off10 | 82 - 86 | 138.9 | 2319.4 | 594.4 |
| Off11 | 87 - 91 | 138.9 | 2458.3 | 733.3 |
| Off12 | 92 - 98 | 194.4 | 2625.0 | 900.0 |
| Off13 | 99 - 108 | 277.8 | 2861.1 | 1136.1 |
| Off14 | 109 - 123 | 416.7 | 3208.3 | 1483.3 |
| Off15 | 124 - 147 | 666.7 | 3750.0 | 2025.0 |
| Off16 | 148 - 185 | 1055.6 | 4611.1 | 2886.1 |

### 4.6. MAGNETOMETER BASE STATION

The base magnetometer was a Geometrics G-859 caesium vapour magnetometer system with integrated GPS. Data logging and UTC time synchronisation was carried out within the magnetometer, with the GPS providing the timing signal. The data logging was configured to measure at 1.0 second intervals. Digital recording resolution was 0.001 nT. The sensor was placed on a tripod in an area of low magnetic gradient and free of cultural noise sources. A continuously updated display of the base station values was available for viewing and regularly monitored to ensure acceptable data quality and diurnal variation.

### 4.7. RADAR ALTIMETER

A Terra TRA 3500/TRI-30 radar altimeter is used to record terrain clearance. The antenna was mounted on the outside of the helicopter beneath the cockpit. Therefore, the recorded data reflect the height of the helicopter above the ground. The Terra altimeter has an altitude accuracy of +/- 1.5 metres.

### 4.8. VIDEO TRACKING AND RECORDING SYSTEM

A high resolution digital colour 8 mm video camera is used to record the helicopter ground flight path along the survey lines. The video is digitally annotated with GPS position and time and can be used to verify ground positioning information and cultural causes of anomalous geophysical responses.

Figure 6. Digital video camera typical mounting location.

### 4.9. GPS NAVIGATION SYSTEM

The navigation system consists of an Ag-Nav Incorporated AG-NAV2 GPS navigation system comprising a PC-based acquisition system, navigation software, a deviation indicator in front of the aircraft pilot to direct the flight, a full screen display with controls in front of the operator, a Mid-Tech RX400p WAAS-enabled GPS receiver mounted on the instrument rack and an antenna mounted on the magnetometer bird. WAAS (Wide Area Augmentation System) consists of approximately 25 ground reference stations positioned across the United States that monitor GPS satellite data. Two master stations located on the east and west coasts collect data from the reference stations and create a GPS correction message. This correction accounts for GPS satellite orbit and clock drift plus signal delays caused by the atmosphere and ionosphere. The corrected differential message is then broadcast through one of two geostationary satellites, or satellites with a fixed position over the equator. The corrected position has a published accuracy of less than 3 metres.

Survey co-ordinates are set up prior to the survey and the information is fed into the airborne navigation system. The co-ordinate system employed in the survey design was WGS84 [World] using the UTM zone 10N projection. The real-time differentially corrected GPS positional data was recorded by AeroDAS system in geodetic coordinates (latitude and longitude using WGS84) at 0.2 s intervals.

### 4.10. DIGITAL ACQUISITION SYSTEM

The AeroTEM received waveform sampled during on and off-time at 200 channels per decay, 180 times per second, was logged by the proprietary AeroDAS data acquisition system. The channel sampling commences at the start of the Tx cycle and the width of each channel is 27.78 seconds. In addition the positional and secondary geophysical data, (i.e. magnetic, radar altimeter, GPS position, and UTC time) was recorded on a removable hard-drive and later backed-up onto DVD-ROM from the field-processing computer.

## 5. PERSONNEL

The following Aeroquest personnel were involved in the project:

- Project Manager of Operations: Lee Harper
- Field Data Processors: Josh Porier
- Field Operator: Viktor Shevchenko
- Data Processing and Reporting: Doug Garrie, Dak Darbha

The survey pilot, Chad Goddyn, was employed directly by the helicopter operator – Hi Wood Helicopters Ltd.

## 6. DELIVERABLES

### 6.1. HARDCOPY DELIVERABLES

The report includes a set of two 1:20,000 maps and the following three geophysical data products are delivered:

- TMI – Total Magnetic Intensity (TMI) colour grid with contours and EM anomaly symbols.
- ZOFF1– AeroTEM Z1 Off-time colour grid with contours, and EM anomaly symbols.
- EM – AeroTEM off-time profiles Z1 – Z11 and EM anomaly symbols.
- eTh - Radiometrics Equivalent Thorium colour grid with contours
- K% - Radiometrics Potassium Percentage colour grid with contours

The coordinate/projection system for the maps is NAD83 – UTM Zone 10N. For reference, the latitude and longitude in WGS84 are also noted on the maps.

All the maps show flight path trace, skeletal topography, and conductor picks represented by an anomaly symbol classified according to calculated off-time conductance. The anomaly symbol is accompanied by postings denoting the calculated off-time conductance, a thick or thin classification and an anomaly identifier label. The anomaly symbol legend and survey specifications are displayed on the left margin of the maps.

## 6.2. Digital Deliverables

### 6.2.1. Final Database of Survey Data (.GDB)

The geophysical profile data is archived digitally in a Geosoft GDB binary format database. A description of the contents of the individual channels in the database can be found in Appendix 2. A copy of this digital data is archived at the Aeroquest head office in Mississauga.

### 6.2.2. Geosoft Grid files (.GRD)

Levelled Grid products used to generate the geophysical map images. All grids have 10 m cell size.

- Total Magnetic Intensity from Mag sensor on the tow cable (*10_043_cim_TMI.grd*)
- AeroTEM Z Off time Channel 1 (*10_043_cim_Zoff1.grd*)
- Digital Terrain Model (*10_043_cim_DTM.grd*)

**AGRS products**

- Dose Rate (*10_043_cim__Dose Rate.grd*)
- Total Counts in cps (*10_043_cim_TC_CNT.grd)*
- Potassium Percentage (*10_043_cim__K_percentage.grd*)
- Potassium in cps (*10_043_cim__K_CNT.grd)*
- Thorium in cps (*10_043_cim_Th_CNT.grd)*
- Equivalent Thorium (*10_043_cim_Th_ppm.grd)*
- Uranium in cps (*10_043_cim_U_CNT.grd)*
- Equivalent Uranium (*10_043_cim_U_ppm.grd)*
- Uranium ratio Thorium (*10_043_cim_U_Th_Ratio.grd)*
- Uranium ratio Potassium (*10_043_cim_U_K_Ratio.grd)*
- Thorium ratio Potassium (*10_043_cim_Th_K_Ratio.grd)*

### 6.2.3. Digital Versions of Final Maps (.MAP, .PDF)

Map files in Geosoft .map and Adobe PDF format.

### 6.2.4. Google Earth Files (.kmz)

Flight navigation lines, EM Anomalies and geophysical grids in Google earth kmz format. Double click to view in Google Earth.

### 6.2.5. Free Viewing Software (.EXE)

- Geosoft Oasis Montaj Viewing Software
- Adobe Acrobat Reader
- Google Earth Viewer

### 6.2.6. Digital Copy of this Document (.PDF)

Adobe PDF format of this document.

# 7. DATA PROCESSING AND PRESENTATION

All in-field and post-field data processing was carried out using Aeroquest proprietary data processing software and Geosoft Oasis Montaj software. Maps were generated using 36-inch and 42-inch wide Hewlett Packard ink-jet plotters.

## 7.1. BASE MAP

The geophysical maps accompanying this report are based on positioning in the NAD83 datum. The survey geodetic GPS positions have been projected using the Universal Transverse Mercator projection in Zone 10 North. A summary of the map datum and projection specifications is given following:

- Ellipse: GRS 1980
- Ellipse major axis: 6378137m eccentricity: 0.081819191
- Datum: North American 1983 - Canada Mean
- Datum Shifts (x,y,z) : 0, 0, 0 metres
- Map Projection: Universal Transverse Mercator Zone 10 (Central Meridian 123ºW)
- Central Scale Factor: 0.9996
- False Easting, Northing: 500,000m, 0m

For reference, the latitude and longitude in WGS84 are also noted on the maps.

The background vector topography was sourced from Natural Resources Canada 1:50000 National Topographic Data Base data and the background shading were derived from NASA Shuttle Radar Topography Mission (SRTM) 90 metre resolution DEM data.

## 7.2. FLIGHT PATH & TERRAIN CLEARANCE

The position of the survey helicopter was directed by use of the Global Positioning System (GPS). Positions were updated five times per second (5 Hz) and expressed as WGS84 latitude and longitude calculated from the raw pseudo range derived from the C/A code signal. The instantaneous GPS flight path, after conversion to UTM co-ordinates, is drawn using linear interpolation between the x/y positions. The terrain clearance was maintained with reference to the radar altimeter. The raw Digital Terrain Model (DTM) was derived by taking the GPS survey elevation and subtracting the radar altimeter terrain clearance values. The calculated topography elevation values are relative and are not tied in to surveyed geodetic heights.

Each flight included at least two high elevation ‘background’ checks. These high elevation checks are to ensure that the gain of the system remained constant and within specifications.

## 7.3. ELECTROMAGNETIC DATA

The raw streaming data, sampled at a rate of 36,000 Hz (200 channels, 180 times per second) was reprocessed using a proprietary software algorithm developed and owned by Aeroquest Limited. Processing involves the compensation of the X and Z component data for the primary field waveform. Coefficients for this compensation for the system transient are determined and applied to the stream data. The stream data are then pre-filtered, stacked, binned to the 33 on and off-time channels and checked for the effectiveness of the compensation and stacking processes. The stacked data is then filtered, levelled and split up into the individual line segments. Further base level adjustments may be carried out at this stage. The filtering of the stacked data is designed to remove or minimize high frequency noise that cannot be sourced from the geology.

The final field processing step was to merge the processed EM data with the other data sets into a Geosoft GDB file. The EM fiducial is used to synchronize the two datasets. The processed channels are merged into ‘array format; channels in the final Geosoft database as Zon, Zoff, Xon, and Xoff.

Apparent bedrock EM anomalies were interpreted with the aid of an auto-pick from positive peaks and troughs in the off-time Z channel responses correlated with X channel responses. The auto-picked anomalies were reviewed and edited by a geophysicist on a line by line basis to discriminate between thin and thick conductor types. Anomaly picks locations were migrated and removed as required. This process ensures the optimal representation of the conductor centres on the maps.

At each conductor pick, estimates of the off-time conductance have been generated based on a horizontal plate source model for those data points along the line where the response amplitude is sufficient to yield an acceptable estimate. Some of the EM anomaly picks do not display a Tau value; this is due to the inability to properly define the decay of the conductor usually because of low signal amplitudes. Each conductor pick was then classified according to a set of seven ranges of calculated off-time conductance values. For high conductance sources, the on-time conductance values may be used, since it provides a more accurate measure of high-conductance sources. Each symbol is also given an identification letter label, unique to each flight line. Conductor picks that did not yield an acceptable estimate of off-time conductance due to a low amplitude response were classified as a low conductance source. Please refer to the anomaly symbol legend located in the margin of the maps.

## 7.4. Radiometric Data

### 7.4.1. Equipment and General Adherence to IAEA Standards

Aeroquest Limited generally adopts the standards for airborne gamma-ray spectrometry (the radiometric method) as laid out in the IAEA Technical Report 323 – Airborne Gamma-Ray Spectrometry Surveying.

### 7.4.2. Spectral Calibration

When calibrated (with thorium source about once a year) linearity of the each detector is measured and linearity correction coefficients are calculated. When operating in real time (collecting data), the linearity of each detector is mathematically corrected for each measurement. Individual detector tracking (tuning) and linearity correction provide better fit of the individual spectra that are being summed and therefore a sharper (better resolution) spectrum is obtained.

***Results from Calibration Pad Test***

Calibrations were performed by RSI at their Mississauga facility on April 22, 2010.

| Stripping Ratios | Spectrometer Unit | Ideal Values |
|---|---|---|
| Th into U (alpha) | 0.273 | 0.250 |
| Th into K (beta) | 0.412 | 0.400 |
| U into K (gamma) | 0.796 | 0.810 |
| U into Th (a ) | 0.041 | 0.060 |

### 7.4.3. Data Quality Assurance and Control

The spectrometer data are referenced to the other ancillary data sets using the RSI data acquisition system (Figure 4). After each flight, preliminary ROI channels are generated and profiles are then plotted from the digital data to check for any missing data, spikes or data corrupted by other noise sources. Where necessary, the data are corrected or flagged for re-flight depending on the severity or duration of the noise.

### 7.4.4. Dead-time Correction

Generally, the first data reduction step for radiometric data is dead-time correction. Because the RSX-5 dead time is virtually nil, this correction is only applied where the total count rates are extremely high. Dead-time correction is made to each window using the expression $N=n/(1-T)$ where N is the corrected count; n is the raw recorded count; and T is the dead-time.

### 7.4.5. Filtering to Prepare for Background Corrections

The radar altimeter data are filtered in order to ensure that no noise sources from the altimeter data are introduced to the radiometric data processing. The upward looking data are also filtered to improve the count statistics. A typical filter width ranges from 10 to 20s. In order to establish radon background levels from the upward-looking detector data, temporary heavily filtered upward and downward looking uranium and downward looking thorium data are utilized. The original unfiltered data are, of course, retained. All filtering will be carried out in consultation with the Client Representative if requested by the Client.

### 7.4.6. Cosmic and Aircraft Background

Cosmic and aircraft background expressions are determined for each spectral window as described in chapter 4 of the IAEA Technical Report 323. The general form of these expressions is $N = a + bC$, where N is the combined cosmic and aircraft background for each window; a is the aircraft background in the window; C is the cosmic channel count; and b is the cosmic stripping factor for the window.

The expressions are evaluated for each ROI window for each sample and used as a subtractive correction for the data.

| COEFFICIENTS | | |
|---|---|---|
| | **Cosmic Stripping Factor** (b) | **Aircraft Background Value** (a) |
| **TC** | 1.131 | 68.02 |
| **K** | 0.067 | 12.56 |
| **U** | 0.052 | 2.18 |
| **Th** | 0.068 | 0.25 |

### 7.4.7. Radon Background

Correction of the data for variations in background due to radon is a multi-step process. First, test flights at various elevations over water are carried out in the field to establish the contribution of atmospheric radon to the ROI windows. A least squares analysis of the data from these test flights yields the constants for equations 4.9 to 4.12 (IAEA Report 323). Second, the response of the upward looking detector to radiation from the ground is established. Here a departure from the IAEA Report has been recommended by Grasty and Hovgaard (1996). The expression for the radon component in the downward looking uranium window is given by Ur =( u – a1U – a2T + a2bT – bu)/(au – a1 – a2aT) (see Eq. 4.3 – IAEA 323) where, Ur is the radon background detected in the downward U window; u is the measured count in the upward uranium window; U is the measured count in the downward uranium window; T is the measured count in the downward thorium window; a1, a2, au and aT are proportionality factors; and bu and bT are constants determined experimentally. Using a1 or a2 (see above) in this equation will result in a good estimate of Ur permitting correction of the other ROI windows.

Survey altitude test data will be collected and used to establish atmospheric background and calibrate the upward and downward looking detector systems. Variations in count rates due to soil moisture content and altimeter variations can largely be overcome by a normalization procedure using the thorium count. The procedure correlates the thorium count to the uranium count assuming the contribution to each ROI from the ground is proportional.

### 7.4.8. Computation of Effective Height Above Ground Level

Radar altimeter data are used in adjusting the stripping ratios for altitude and to carry out the height attenuation corrections. They are then converted to effective height (he) at STP by the expression he = (h * 273.15)/(T + 273.15)* (P/1013), where h is the observed radar altitude; T is the temperature in degrees C; and P is the barometric pressure in mbars

### 7.4.9. Compton Stripping Correction

The stripping ratios $\alpha$, $\beta$, $\gamma$, a, b and g are determined during tests over calibration pads. The principal ratios a, $\beta$ and g should be adjusted for temperature, pressure and altitude (above ground) before stripping is carried out. These stripping ratios are used to remove the contribution in each of the three ROI windows from higher energy sources, leaving only the contribution from potassium, uranium and thorium.

### 7.4.10. Altitude Attenuation Correction

The altitude attenuation correction corrects the data in each of the ROI windows for the effects of altitude. The count rates decrease exponentially with altitude and therefore the counts are corrected to a constant altimeter datum at the nominal survey height of 100m.

| COEFFICIENTS | |
|---|---|
| **Element** | **Attenuation Coeff.** |
| **TC** | 0.007161 |
| **K** | 0.009088 |
| **U** | 0.008628 |
| **Th** | 0.0069180 |

### 7.4.11. Apparent Radioelement Concentrations

The corrected count rate data can be converted to estimate the ground concentrations of each of the three radioelements, potassium, uranium and thorium. The procedure assumes an infinite horizontal slab source geometry with a uniform radioelement concentration. The calculation assumes radioactive equilibrium in the U and Th decay series. Therefore the U and Th concentrations are assigned as equivalent concentrations using the nomenclature eU and eTh.

An estimate of the air absorbed dose rate can be made from the apparent concentrations, K%, eU ppm and eTh ppm using the following formula:

$$E = 13.08 * K + 5.43 * eU + 2.69 * eTh$$

where: E is the absorption dose rate in nG/h
K is the concentration of potassium (%)
eU is the equivalent concentration of uranium (ppm)
eTh is the equivalent concentration of thorium (ppm)

A description of how most of the constants were determined can be found in: Exploranium, I.A.E.A. Report, Airborne Gamma-Ray Spectrometer Surveying, Technical Report No. 323, 1991.

| Sensitivity Factors | |
|---|---|
| Element | Sensitivity Factor at 50 m STP Height |
| K | 81.488 cps/% |
| U | 9.01 ppm cps / eU |
| Th | 4.21 ppm cps/eTh |
| Dose rate | 0.0473157437 nGy/h/cps |

### 7.4.12. Computation of Radioelement Ratios

Standard ratioing of the three radioelements (eU/eTh, eU/K and eTh/K) can be carried out and presented in profile or plan map form. In order to ensure statistical confidence in generating these ratios, we generally take the following precautions:

- Reject all data point where the apparent potassium concentration is less than 0.25% as these measurements are likely taken over water.

- Carry out cumulative summing along the survey line of each radioelement, rejecting areas where the summation does not exceed a certain threshold value (usually 10 counts for both numerator and denominator).
- Compute the ratios using the cumulative sums.

### 7.5. Magnetic Data

Prior to any levelling the magnetic data was subjected to a lag correction of -0.1 seconds and a spike removal filter. The filtered aeromagnetic data were then corrected for diurnal variations using the magnetic base station and the intersections of the tie lines. No corrections for the regional reference field (IGRF) were applied. The corrected profile data were interpolated on to a grid using a bi-directional grid technique with a grid cell size of 10 metres. The final levelled grid provided the basis for threading the presented contours which have a minimum contour interval of 5 nT.

## 8. GENERAL COMMENTS

The survey was successful in mapping the magnetic and conductive properties of the geology throughout the survey area. Below is a brief interpretation of the results. For a detailed interpretation please contact Aeroquest Limited.

### 8.1. Magnetic Response

The magnetic data provide a high resolution map of the distribution of the magnetic mineral content of the survey area. This data can be used to interpret the location of geological contacts and other structural features such as faults and zones of magnetic alteration. The sources for anomalous magnetic responses are generally thought to be predominantly magnetite because of the relative abundance and strength of response (high magnetic susceptibility) of magnetite over other magnetic minerals such as pyrrhotite.

### 8.2. EM Anomalies

The EM anomalies on the maps are classified by conductance (as described earlier in the report) and also by the thickness of the source. A thin, vertically orientated source produces a double peak anomaly in the z-component response and a positive to negative crossover in the x-component response (Figure 7). For a vertically orientated thick source (say, greater than 10 metres), the response is a single peak in the z-component response and a negative to positive crossover in the x-component response (Figure 8). Because of these differing responses, the AeroTEM system provides discrimination of thin and thick sources and this distinction is indicated on the EM anomaly symbols (N = thin and K = thick). Where multiple, closely spaced conductive sources occur, or where the source has a shallow dip, it can be difficult to uniquely determine the type (thick vs. thin) of the source (Figure 9). In these cases both possible source types may be indicated by picking both thick and thin response styles. For shallow dipping conductors the 'thin' pick will be located over the edge of the source, whereas the 'thick' pick will fall over the downdip 'heart' of the anomaly.

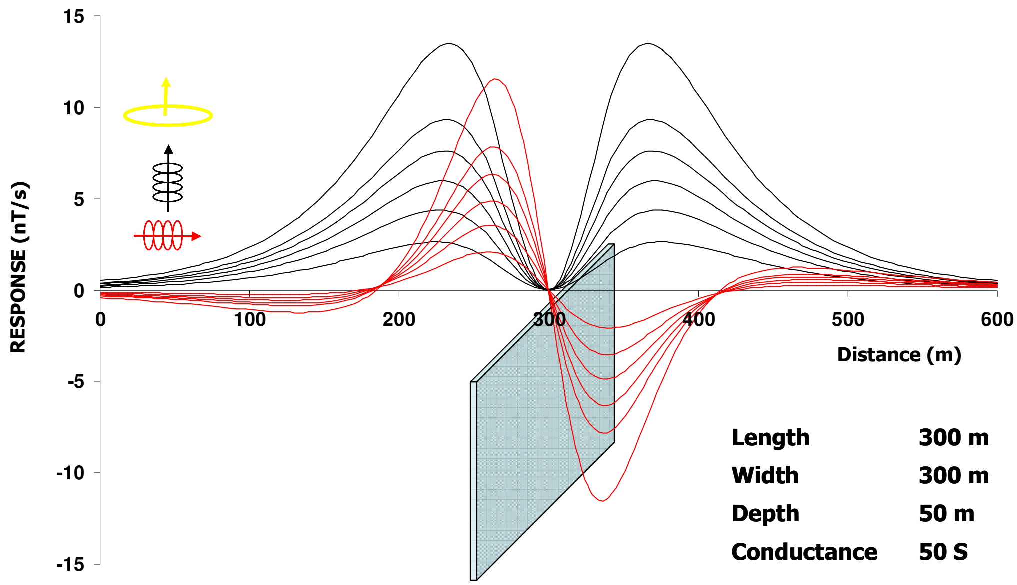



Figure 7. AeroTEM response to a 'thin' vertical conductor.

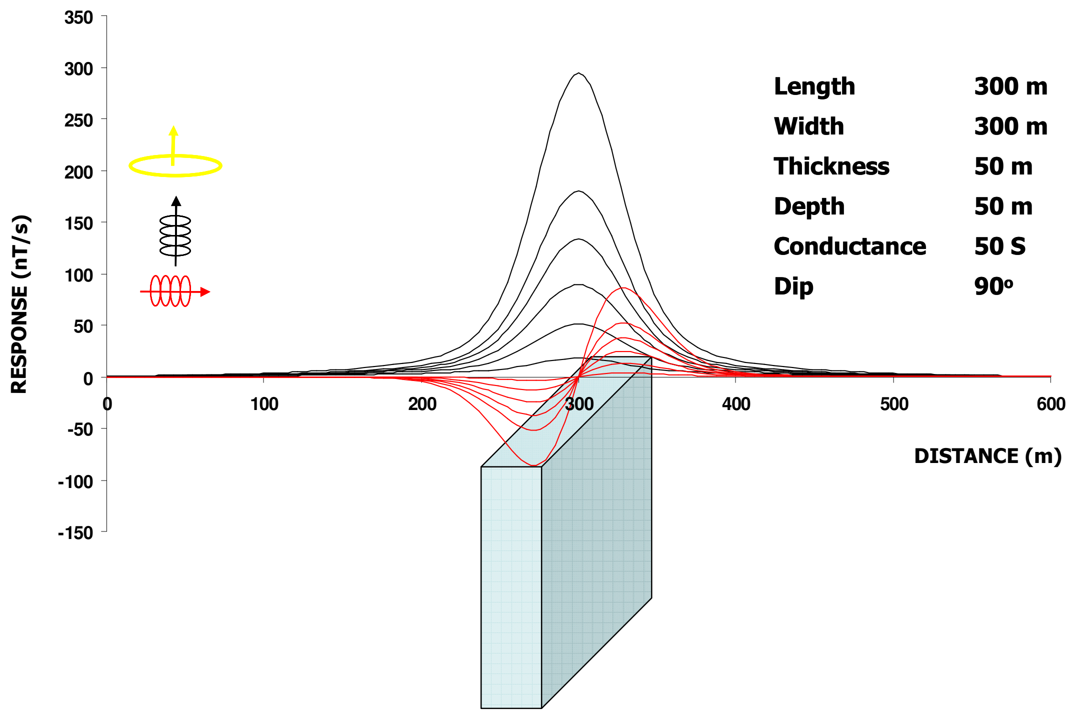



Figure 8. AeroTEM response for a 'thick' vertical conductor.

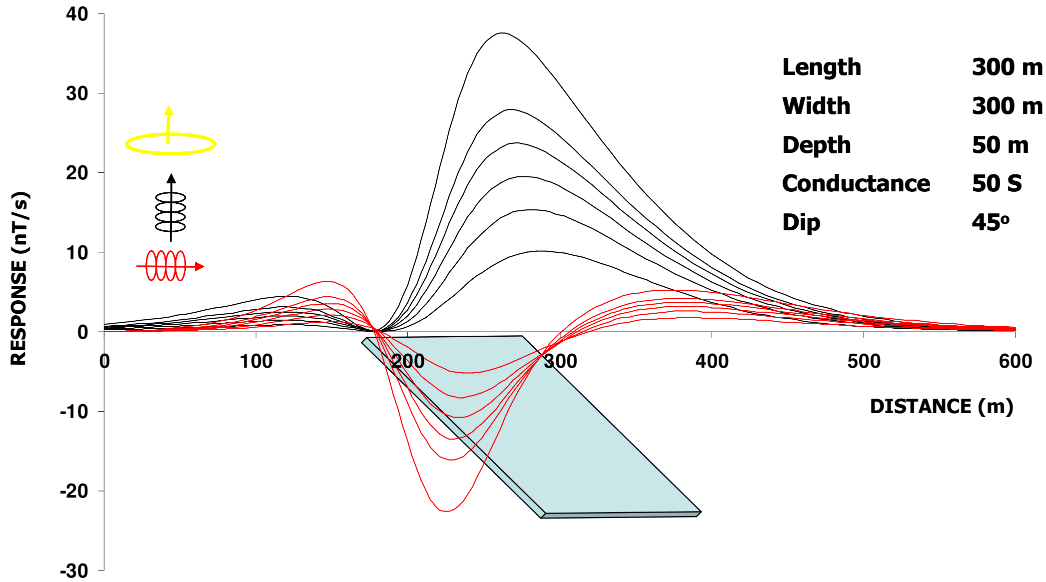



Figure 9. AeroTEM response over a 'thin' dipping conductor.

All cases should be considered when analyzing the interpreted picks and prioritizing for follow-up. Specific anomalous responses which remain as high priority should be subjected to numerical modeling prior to drill testing to determine the dip, depth and probable geometry of the source.

# APPENDIX 1: SURVEY BOUNDARIES

The following table presents the Carbo property boundaries. All geophysical data presented in this report have been windowed to 100m outside of these boundaries. X and Y positions are in metres: NAD83 UTM Zone 10N.

Carbo:

| X | Y |
|---|---|
| 557071.8 | 6043039.9 |
| 559178.3 | 6045176.0 |
| 560576.9 | 6043464.9 |
| 560592.0 | 6043410.0 |
| 563000.0 | 6041000.0 |
| 563001.0 | 6040233.0 |
| 563026.4 | 6040187.4 |
| 564078.3 | 6039071.9 |
| 561957.0 | 6036950.6 |
| 560904.6 | 6038066.6 |
| 560900.0 | 6038131.0 |
| 558506.0 | 6041324.0 |
| 558455.1 | 6041344.1 |

# APPENDIX 2: DESCRIPTION OF DATABASE FIELDS

The GDB file is a Geosoft binary database. In the database, the Survey lines and Tie Lines are prefixed with an "L" for "Line" and "T" for "Tie".

EM/MAG database: (*10-043_CIM_Carbo.gdb*).

| COLUMN | UNITS | DESCRIPTOR |
|---|---|---|
| Line | | Line number |
| flight | | Flight # |
| emfid | | AERODAS Fiducial |
| utctime | hh:mm:ss.ss | UTC time |
| x | m | UTM Easting (NAD83, Zone 10) |
| y | m | UTM Northing (NAD83, Zone 10) |
| galt | m | GPS elevation of magnetometer bird |
| Ralt | m | Helicopter radar altimeter (height above terrain) |
| bheight | m | Terrain clearance of EM bird |
| basemag | nT | Base station total magnetic intensity |
| magU | nT | Final levelled total magnetic intensity from upper magnetometer sensor (installed on the tail of the EM bird). |
| dtm | m | Digital Terrain Model |
| Zon | nT/s | EM On-Time Z component Channels 1-16 |
| Zoff | nT/s | EM Off-Time Z component Channels 0-16 |
| Xon | nT/s | EM On-Time X component Channels 1-16 |
| Xoff | nT/s | EM Off-Time X component Channels 0-16 |
| pwrline | | powerline monitor data channel |
| Grade | | Classification from 1-7 based on conductance of conductor pick |
| Anom_Labels | | Letter label of conductor pick (Unique per flight line) |
| Off_Con | S | Off-time conductance at conductor pick |
| Off_Tau | µs | Off-time decay constant at conductor pick |
| Anom_ID | | EM Anomaly response style (K= thicK, N = thiN) |
| Off_AllCon | S | Off-time conductance |
| Off_AllTau | µs | Off-time decay constant |
| TranOff | µs | Transmitter turn off time |
| TranOn | µs | Transmitter turn on time |
| TranPeak | A | Transmitter peak current |
| TranSwitch | µs | Transmitter peak current time |
| Off_Pick | | Anomaly pick channel |

AGRS database: (*10-043_CIM_Carbo_Spectrometer.gdb*).

| Column | Units | Description |
|---|---|---|
| utctime | hh:mm:ss.ss | UTC time |
| Line | | Line number |
| X | m | UTM Easting (NAD83, 10N) |
| Y | m | UTM Northing (NAD83, 10N) |
| Galt | | GPS elevation |
| Ralt | m | radar altitude of aircraft |

| | | |
|---|---|---|
| KPERCENT | % | Radiometrics – potassium (%K) |
| Th_ppm | ppm | Radiometrics – equivalent Thorium |
| U_ppm | ppm | Radiometrics – equivalent Uranium |
| DOSE_rate | uR/hr | Radiometrics – exposure rate |
| potcnt | Cps | Radiometrics – Corrected Potassium |
| thocnt | Cps | Radiometrics – Corrected Thorium |
| uracnt | Cps | Radiometrics – Corrected Uranium |
| totcnt | Cps | Radiometrics – Corrected Total Counts |
| UpU | Cps | Radiometrics - Corrected Uranium upward looking counts |
| Cosmic | Cps | Radiometrics – Cosmic |
| K_raw | Cps | Radiometrics – Potassium |
| Th_raw | Cps | Radiometrics – Thorium |
| U_raw | Cps | Radiometrics – Uranium |
| TC_raw | Cps | Radiometrics – Total Counts |
| UpU_raw | Cps | Radiometrics - Uranium upward looking counts |
| Th_K_Ratio | | Thorium – Potassium Ratio |
| U_K_Ratio | | Uranium – Potassium Ratio |
| U_Th_Ratio | | Uranium – Thorium Ratio |
| down256 | counts per second | 256 channel spectral data (Downward looking) |
| up256 | counts per second | 256 channel spectral data (Upward looking) |
| Fid | | Fiducial |
| Date | yy/mm/dd | Date |
| Latitude | degrees | WGS84-latiude |
| Longitude | degrees | WGS84-longitude |
| Baro_Pres | milibars | Barometric Pressure |
| Temp_C | degrees | Temperature in C° |

# APPENDIX 3: AEROTEM ANOMALY LISTING

Carbo:

| Line | Anom | ID | Cond (S) | Tau (µs) | Flight # | UTC Time | Bird Height (m) | Easting (m) | Northing (m) |
|---|---|---|---|---|---|---|---|---|---|
| 10010 | A | K | 0.01 | 7.66 | 27 | 1:32:03 | 49.44 | 557953.3 | 6043927 |
| 10310 | A | K | 0.42 | 64.49 | 26 | 23:09:00 | 30.62 | 558101 | 6041925 |
| 10330 | A | K | 1.96 | 139.82 | 26 | 23:02:34 | 48.54 | 558043.5 | 6041733 |
| 10340 | A | K | 0.03 | 16.67 | 26 | 23:01:53 | 43.59 | 558174 | 6041814 |
| 10750 | A | K | 2.65 | 162.77 | 24 | 19:23:11 | 25.23 | 559491.1 | 6040210 |
| 10760 | A | K | 1.78 | 133.38 | 24 | 19:20:50 | 40.62 | 559503.1 | 6040177 |
| 10770 | A | K | 58.27 | 763.34 | 23 | 18:19:53 | 35.36 | 559518.3 | 6040118 |
| 10780 | A | K | 1.16 | 107.82 | 23 | 18:19:04 | 35.25 | 559574.9 | 6040109 |
| 10790 | A | K | 21.77 | 466.63 | 23 | 18:12:52 | 60.9 | 559531.5 | 6039990 |
| 10800 | A | K | 2.17 | 147.13 | 23 | 18:12:01 | 49.11 | 559563.9 | 6039952 |
| 10820 | A | K | 2.65 | 162.92 | 23 | 18:02:41 | 44.66 | 559647.7 | 6039904 |
| 10830 | A | K | 21.92 | 468.15 | 23 | 17:55:31 | 37.09 | 559587.1 | 6039756 |
| 10840 | A | K | 11.11 | 333.34 | 23 | 17:54:28 | 36.41 | 559870.2 | 6039977 |
| 10840 | B | K | 5.15 | 226.88 | 23 | 17:54:36 | 43.93 | 559732.7 | 6039842 |
| 10850 | A | K | 1.82 | 135.06 | 23 | 17:47:13 | 34.76 | 559908.4 | 6039932 |
| 10860 | A | K | 20.12 | 448.57 | 23 | 17:45:48 | 50.96 | 559995.2 | 6039960 |
| 10860 | B | K | 9.87 | 314.09 | 23 | 17:45:57 | 40.71 | 559838.1 | 6039799 |
| 10870 | A | K | 0.35 | 59.59 | 23 | 17:38:56 | 39.77 | 559836.6 | 6039718 |
| 10890 | A | K | 0.24 | 48.56 | 23 | 17:30:48 | 54.84 | 560092.5 | 6039842 |
| 10900 | A | K | 25.51 | 505.04 | 18 | 22:05:31 | 24.94 | 560004.1 | 6039659 |
| 10910 | A | K | 2.38 | 154.39 | 18 | 22:04:12 | 23.91 | 560173.3 | 6039781 |
| 10910 | B | K | 5.62 | 236.98 | 18 | 22:04:21 | 26.62 | 560031.3 | 6039632 |
| 10920 | A | K | 19.8 | 444.94 | 18 | 21:58:03 | 24.82 | 560049.8 | 6039577 |
| 10930 | A | K | 7.32 | 270.54 | 18 | 21:56:46 | 28.85 | 560180.6 | 6039646 |
| 10940 | A | K | 129.79 | 1139.26 | 18 | 21:50:39 | 31.17 | 560134.5 | 6039528 |
| 10950 | A | K | 2.46 | 156.92 | 18 | 21:49:04 | 25.37 | 560318 | 6039640 |
| 10950 | B | K | 27.73 | 526.63 | 18 | 21:49:14 | 30.39 | 560169.7 | 6039489 |
| 10960 | A | K | 15.06 | 388.03 | 18 | 21:42:58 | 31.3 | 560215.7 | 6039463 |
| 10970 | A | K | 27.65 | 525.83 | 18 | 21:41:55 | 73.23 | 560013.4 | 6039192 |
| 10980 | A | K | 39.34 | 627.22 | 18 | 21:35:12 | 61.35 | 560067.9 | 6039175 |
| 10980 | B | K | 9.1 | 301.62 | 18 | 21:35:27 | 39.78 | 560269.8 | 6039380 |
| 10990 | A | K | 2.37 | 154.08 | 18 | 21:33:49 | 41.73 | 560468.5 | 6039512 |
| 11000 | A | K | 4.39 | 209.53 | 18 | 21:26:59 | 34.78 | 560381.1 | 6039347 |
| 11000 | B | K | 2.19 | 148.16 | 18 | 21:27:09 | 35.57 | 560571.9 | 6039524 |
| 11010 | A | K | 20.58 | 453.63 | 18 | 21:25:39 | 46.41 | 560348.2 | 6039243 |
| 11020 | A | K | 28.58 | 534.58 | 18 | 21:19:09 | 68.45 | 560223.5 | 6039049 |

| Line | Anom | ID | Cond (S) | Tau (µs) | Flight # | UTC Time | Bird Height (m) | Easting (m) | Northing (m) |
|---|---|---|---|---|---|---|---|---|---|
| 11030 | A | K | 41.05 | 640.67 | 18 | 21:18:01 | 45 | 560309.2 | 6039067 |
| 11040 | A | K | 12.96 | 359.98 | 18 | 21:09:50 | 42.54 | 560332.6 | 6039008 |
| 11050 | A | K | 70.25 | 838.17 | 18 | 21:08:44 | 40.81 | 560387.4 | 6038999 |
| 11061 | A | K | 12.57 | 354.61 | 28 | 1:56:38 | 57.18 | 560375.1 | 6038930 |
| 11070 | A | K | 8.38 | 289.51 | 16 | 17:45:12 | 39.16 | 560460.1 | 6038923 |
| 11070 | B | N | 8.38 | 289.51 | 16 | 17:45:35 | 35.46 | 560866.4 | 6039331 |
| 11080 | A | N | 9.34 | 305.6 | 16 | 17:44:13 | 43.75 | 560473.5 | 6038880 |
| 11090 | A | N | 3.13 | 176.95 | 16 | 17:38:17 | 30.83 | 560508.3 | 6038828 |
| 11100 | A | N | 3.12 | 176.58 | 16 | 17:37:17 | 32.31 | 560522.9 | 6038786 |
| 11110 | A | K | 2 | 141.56 | 16 | 17:30:37 | 27.49 | 560580.2 | 6038763 |
| 11120 | A | N | 15.21 | 390.02 | 16 | 17:29:17 | 30.6 | 560696.2 | 6038820 |
| 11120 | B | N | 115.68 | 1075.56 | 16 | 17:29:28 | 32.47 | 560547.6 | 6038674 |
| 11130 | A | N | 1.82 | 134.87 | 16 | 17:22:55 | 30.88 | 560601.9 | 6038648 |
| 11130 | B | K | 2.04 | 142.83 | 16 | 17:23:06 | 29.98 | 560757.4 | 6038804 |
| 11140 | A | K | 2.25 | 150.08 | 16 | 17:21:39 | 33.66 | 560818.9 | 6038798 |
| 11140 | B | K | 2.6 | 161.15 | 16 | 17:21:52 | 33.34 | 560638.1 | 6038622 |
| 11150 | A | K | 3.61 | 189.91 | 16 | 17:15:23 | 34.13 | 560667.8 | 6038574 |
| 11150 | B | K | 1.84 | 135.68 | 16 | 17:15:37 | 27.94 | 560854.6 | 6038760 |
| 11160 | A | K | 10.69 | 326.92 | 16 | 17:13:59 | 43.02 | 560881.3 | 6038719 |
| 11160 | B | K | 8.41 | 289.98 | 16 | 17:14:15 | 33.34 | 560685.5 | 6038521 |
| 11170 | A | K | 2.22 | 148.91 | 16 | 17:07:53 | 46.31 | 560706.5 | 6038469 |
| 11170 | B | K | 0.91 | 95.15 | 16 | 17:08:09 | 26.92 | 560911.7 | 6038670 |
| 11180 | A | K | 1.41 | 118.62 | 16 | 17:06:30 | 37.2 | 560973.7 | 6038667 |
| 11180 | B | K | 1.51 | 122.71 | 16 | 17:06:50 | 44.35 | 560728 | 6038428 |
| 11190 | A | K | 0.16 | 39.97 | 16 | 17:00:19 | 27.37 | 560989.2 | 6038615 |
| 11190 | B | K | 0.38 | 61.91 | 16 | 17:00:43 | 38.56 | 561057.8 | 6038676 |
| 11200 | A | N | 1.33 | 115.28 | 16 | 16:58:23 | 41.43 | 561065.2 | 6038622 |
| 11200 | B | K | 1.88 | 137.1 | 16 | 16:58:50 | 38.68 | 560767 | 6038324 |
| 11210 | A | K | 0.34 | 58.03 | 16 | 16:52:53 | 39 | 561150.2 | 6038631 |
| 11220 | A | N | 60.98 | 780.87 | 8 | 1:35:30 | 38.87 | 561167.7 | 6038576 |
| 11230 | A | N | 1.53 | 123.87 | 8 | 1:29:46 | 54.23 | 561225.1 | 6038562 |
| 11240 | A | N | 0.83 | 91.13 | 8 | 1:26:34 | 49.95 | 561274.3 | 6038552 |
| 11240 | B | N | 3.27 | 180.81 | 8 | 1:27:14 | 57.16 | 560818.9 | 6038084 |
| 11251 | A | N | 12.23 | 349.75 | 8 | 1:20:46 | 48.34 | 561358.3 | 6038554 |
| 11260 | A | N | 5.77 | 240.3 | 6 | 23:29:33 | 48.75 | 561468.6 | 6038603 |
| 11270 | A | K | 10.59 | 325.47 | 6 | 23:24:36 | 72.5 | 560938.6 | 6038007 |
| 11270 | B | N | 1.44 | 119.81 | 6 | 23:25:08 | 45.1 | 561497.4 | 6038551 |
| 11280 | A | K | 5.49 | 234.25 | 6 | 23:22:59 | 52.52 | 561722.3 | 6038712 |
| 11280 | B | N | 4.41 | 209.94 | 6 | 23:23:10 | 50.08 | 561561.9 | 6038552 |

| Line | Anom | ⍰D | Cond (S) | Tau (µs) | Flight # | UTC Time | Bird Height (m) | Easting (m) | Northing (m) |
|---|---|---|---|---|---|---|---|---|---|
| 11280 | C | K | 13.02 | 360.86 | 6 | 23:23:47 | 53.72 | 560964.2 | 6037952 |
| 11290 | A | K | 1.96 | 140.15 | 6 | 23:18:40 | 78.72 | 560979.5 | 6037891 |
| 11290 | B | N | 6.14 | 247.85 | 6 | 23:19:14 | 44.63 | 561560.2 | 6038493 |
| 11300 | A | N | 2.44 | 156.23 | 6 | 23:17:14 | 50.28 | 561629 | 6038477 |
| 11300 | B | K | 3.7 | 192.3 | 6 | 23:17:53 | 70.02 | 561019 | 6037864 |
| 11310 | A | N | 4.11 | 202.81 | 6 | 23:12:53 | 42.82 | 561663 | 6038451 |
| 11320 | A | N | 3.19 | 178.54 | 6 | 23:10:27 | 41.89 | 561958.3 | 6038667 |
| 11320 | B | N | 2.08 | 144.28 | 6 | 23:10:44 | 35.48 | 561723 | 6038426 |
| 11330 | A | N | 4.13 | 203.28 | 6 | 23:06:08 | 40.79 | 561774.1 | 6038406 |
| 11340 | A | N | 1.09 | 104.3 | 6 | 23:03:37 | 42.13 | 561796.6 | 6038370 |
| 11340 | B | K | 3.32 | 182.22 | 6 | 23:04:22 | 62.9 | 561121.4 | 6037697 |
| 11350 | A | K | 4.53 | 212.74 | 6 | 22:58:11 | 62.17 | 561167.5 | 6037653 |
| 11350 | B | N | 1.05 | 102.5 | 6 | 22:59:07 | 44.16 | 561857 | 6038343 |
| 11350 | C | K | 3.91 | 197.78 | 6 | 22:59:24 | 38.32 | 562155.7 | 6038656 |
| 11360 | A | K | 1.29 | 113.81 | 6 | 22:56:10 | 41.86 | 562095.1 | 6038513 |
| 11360 | B | N | 1.9 | 137.66 | 6 | 22:56:21 | 50.73 | 561926 | 6038347 |
| 11370 | A | K | 1.09 | 104.51 | 6 | 22:51:13 | 36.46 | 561724.5 | 6038074 |
| 11370 | B | K | 6.63 | 257.43 | 6 | 22:51:41 | 31.1 | 561916.3 | 6038285 |
| 11370 | C | K | 1.75 | 132.1 | 6 | 22:51:55 | 39.08 | 562028.5 | 6038399 |
| 11380 | A | K | 4.89 | 221.05 | 6 | 22:48:43 | 39.84 | 562152.5 | 6038434 |
| 11380 | B | N | 0.45 | 67.2 | 6 | 22:48:51 | 44.02 | 562038 | 6038323 |
| 11390 | A | N | 1.69 | 129.94 | 6 | 22:43:46 | 45.28 | 562093.7 | 6038303 |
| 11390 | B | N | 1.51 | 122.83 | 6 | 22:43:55 | 40.04 | 562261.2 | 6038475 |
| 11400 | A | N | 1.13 | 106.28 | 6 | 22:40:28 | 57.45 | 562154 | 6038297 |
| 11400 | B | K | 1.13 | 106.2 | 6 | 22:40:32 | 52.08 | 562106.8 | 6038248 |
| 11410 | A | N | 0.81 | 90.12 | 6 | 22:35:08 | 49.82 | 562225.6 | 6038280 |
| 11420 | A | N | 4.62 | 214.96 | 6 | 22:31:21 | 42.84 | 562292.3 | 6038286 |
| 11420 | B | N | 2.12 | 145.65 | 6 | 22:32:03 | 49.05 | 561772.2 | 6037764 |
| 11430 | A | N | 6.87 | 262.11 | 6 | 22:25:16 | 40.37 | 562333.2 | 6038258 |
| 11440 | A | N | 1.85 | 135.86 | 6 | 22:20:16 | 56.31 | 562411 | 6038256 |
| 11440 | B | K | 0.07 | 26.91 | 6 | 22:20:50 | 51.17 | 561937.6 | 6037795 |
| 11450 | A | N | 3.73 | 193.24 | 5 | 21:14:35 | 50.76 | 562430.9 | 6038208 |
| 11460 | A | N | 10.88 | 329.84 | 5 | 21:11:24 | 43.31 | 562490.8 | 6038202 |
| 11470 | A | N | 3.67 | 191.47 | 5 | 21:07:00 | 50.38 | 562497.1 | 6038148 |
| 11480 | A | N | 0.72 | 85.13 | 5 | 21:03:42 | 42.04 | 562581.7 | 6038158 |
| 11490 | A | N | 4.39 | 209.43 | 5 | 20:59:24 | 55.38 | 562607.5 | 6038118 |
| 11500 | A | N | 1.41 | 118.83 | 5 | 20:56:28 | 47.63 | 562670.9 | 6038117 |
| 11510 | A | N | 2.75 | 165.84 | 5 | 20:52:33 | 37.21 | 562691.2 | 6038072 |
| 11520 | A | N | 14.19 | 376.64 | 5 | 20:49:38 | 41.57 | 562782.7 | 6038069 |

| Line | Anom | ID | Cond (S) | Tau (µs) | Flight # | UTC Time | Bird Height (m) | Easting (m) | Northing (m) |
|---|---|---|---|---|---|---|---|---|---|
| 11530 | A | N | 2.19 | 148.13 | 5 | 20:45:34 | 39.57 | 562807.7 | 6038035 |
| 11540 | A | N | 115.61 | 1075.2 | 5 | 20:42:26 | 48.45 | 562880.5 | 6038037 |
| 11540 | B | N | 0.28 | 52.53 | 5 | 20:43:15 | 42.09 | 562151.2 | 6037310 |
| 11550 | A | N | 33.99 | 583.02 | 5 | 20:37:48 | 49.06 | 562937.9 | 6038012 |
| 11560 | A | N | 16.05 | 400.68 | 5 | 20:33:20 | 47.89 | 562968.1 | 6037981 |
| 11560 | B | N | 0.06 | 25.38 | 5 | 20:34:10 | 42.25 | 562222 | 6037238 |
| 19050 | A | K | 1.83 | 135.17 | 3 | 17:12:23 | 46.85 | 562587.7 | 6038230 |
| 19050 | B | K | 13.27 | 364.26 | 3 | 17:12:45 | 57.38 | 562947.9 | 6037895 |
| 19060 | A | K | 0.29 | 54.16 | 3 | 17:00:47 | 42.55 | 561670.3 | 6038442 |
| 19060 | B | K | 7.61 | 275.81 | 3 | 17:00:55 | 58.15 | 561525.9 | 6038590 |
| 19060 | C | K | 0.82 | 90.84 | 3 | 17:02:06 | 33.98 | 560352.6 | 6039757 |
| 19060 | D | K | 2.54 | 159.47 | 3 | 17:02:27 | 29.78 | 559964.1 | 6040159 |
| 19070 | A | K | 38.5 | 620.46 | 2 | 16:48:27 | 30.16 | 560577.9 | 6038825 |

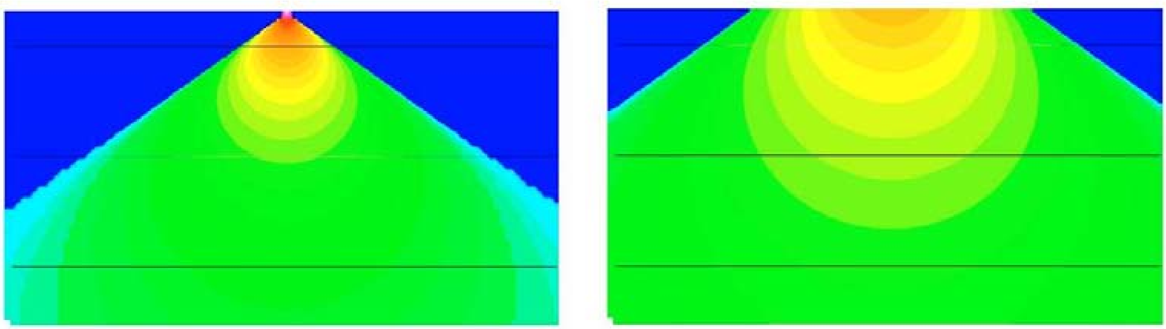
# APPENDIX 4: AEROTEM DESIGN CONSIDERATIONS

Helicopter-borne EM systems offer an advantage that cannot be matched from a fixed-wing platform. The ability to fly at slower speed and collect dat

3a with high spatial resolution, and with great accuracy, means the helicopter EM systems provide more detail than any other EM configuration, airborne or ground-based. Spatial resolution is especially important in areas of complex geology and in the search for discrete conductors. With the advent of helicopter-borne high-moment time domain EM systems the fixed wing platforms are losing their *only* advantage – depth penetration.

***Advantage 1 – Spatial Resolution***

The AeroTEM system is specifically designed to have a small footprint. This is accomplished through the use of concentric transmitter-receiver coils and a relatively small diameter transmitter coil (5 m). The result is a highly focused exploration footprint, which allows for more accurate "mapping" of discrete conductors. Consider the transmitter primary field images shown in Figure 1, for AeroTEM versus a fixed-wing transmitter.



The footprint of AeroTEM at the earth's surface is roughly 50m on either side of transmitter

The footprint of a fixed-wing system is roughly 150 m on either side of the transmitter

***Figure 1. A comparison of the footprint between AeroTEM and a fixed-wing system, highlights the greater resolution that is achievable with a transmitter located closer to the earth's surface. The AeroTEM footprint is one third that of a fixed-wing system and is symmetric, while the fixed-wing system has even lower spatial resolution along the flight line because of the separated transmitter and receiver configuration.***

At first glance one may want to believe that a transmitter footprint that is distributed more evenly over a larger area is of benefit in mineral exploration. In fact, the opposite is true; by energizing a larger surface area, the ability to energize and detect discrete conductors is reduced. Consider, for example, a comparison between AeroTEM and a fixed-wing system over the Mesamax Deposit (1,450,000 tonnes of 2.1% Ni, 2.7% Cu, 5.2 g/t Pt/Pd). In a test survey over three flight lines spaced 100 m apart, AeroTEM detected the Deposit on all three flight lines. The fixed-wing system detected the Deposit only on two flight lines. In exploration programs that seek to expand the flight line spacing in an effort to reduce the cost of the airborne survey, discrete conductors such as the Mesamax Deposit can go undetected. The argument often put forward in favour of using fixed-wing systems is that because of their larger footprint, the flight line spacing can indeed be widened. Many fixed-wing surveys are flown at 200 m or 400 m. Much of the survey work performed by Aeroquest has been to survey in areas that were previously flown at these wider line spacings. One of the reasons for AeroTEM's impressive discovery record has been the strategy of flying closely spaced lines and finding all the discrete near-surface conductors. These higher resolution surveys are being flown within existing mining camps, areas that improve the chances of discovery.

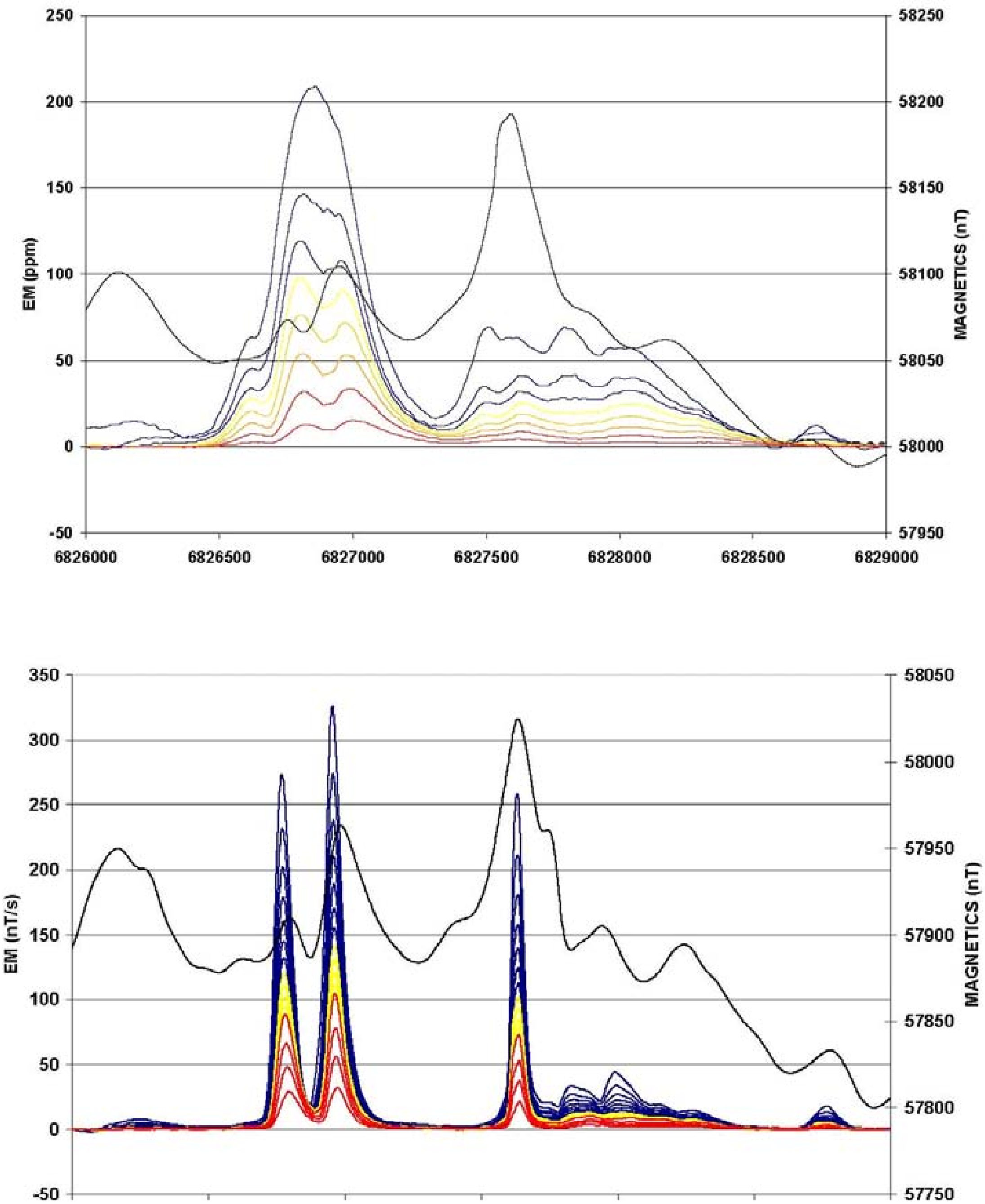



***Figure 2. Fixed-wing (upper) and AeroTEM (lower) comparison over the eastern limit of the Mesamax Deposit, a Ni-Cu-PGE zone located in the Raglan nickel belt and owned by Canadian Royalties. Both systems detected the Deposit further to the west where it is closer to surface.***

The small footprint of AeroTEM combined with the high signal to noise ratio (S/N) makes the system more suitable to surveying in areas where local infrastructure produces electromagnetic noise, such as power lines and railways. In 2002 Aeroquest flew four exploration properties in the Sudbury Basin that were under option by FNX Mining Company Inc. from Inco Limited. One such property, the Victoria Property, contained three major power line corridors.

The resulting AeroTEM survey identified all the known zones of Ni-Cu-PGE mineralization, and detected a response between two of the major power line corridors but in an area of favourable geology. Three boreholes were drilled to test the anomaly, and all three intersected sulphide. The third borehole encountered 1.3% Ni, 6.7% Cu, and 13.3 g/t TPMs over 42.3 ft. The mineralization was subsequently named the Powerline Deposit.

The success of AeroTEM in Sudbury highlights the advantage of having a system with a small footprint, but also one with a high S/N. This latter advantage is achieved through a combination of a high-moment (high signal) transmitter and a rigid geometry (low noise). Figure 3 shows the Powerline Deposit response and the response from the power line corridor at full scale. The width of power line response is less than 75 m.

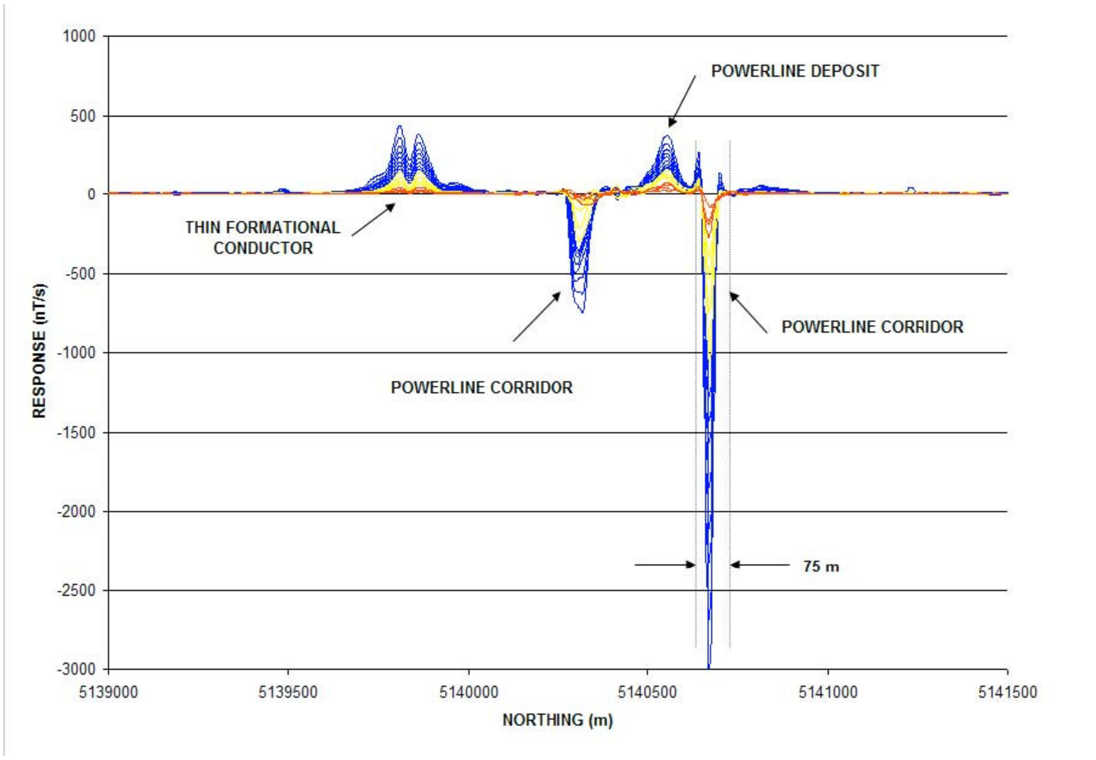



***Figure 3. The Powerline Deposit is located between two major power line corridors, which make EM surveying problematic. Despite the strong response from the power line, the anomaly from the Deposit is clearly detected. Note the thin formational conductor located to the south. The only way to distinguish this response from that of two closely spaced conductors is by interpreting the X-axis coil response.***

***Advantage 2 – Conductance Discrimination***

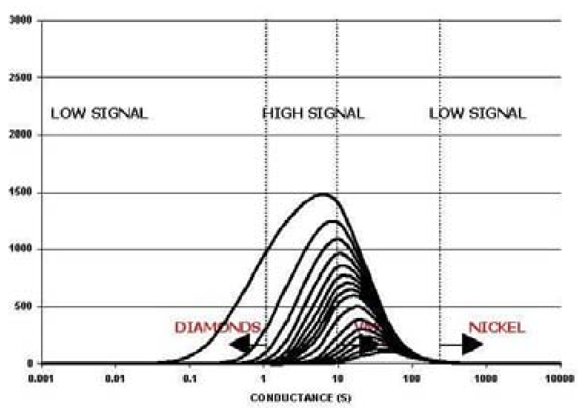
The AeroTEM system features full waveform recording and as such is able to measure the on-time response due to high conductance targets. Due to the processing method (primary field removal), there is attenuation of the response with increasing conductance, but the AeroTEM on-time measurement is still superior to systems that rely on lower base frequencies to detect high conductance targets, but do not measure in the on-time.

The peak response of a conductive target to an EM system is a function of the target conductance and the EM system base frequency. For time domain EM systems that measure only in the off-time, there is a drop in the peak response of a target as the base frequency is lowered for all conductance values below the peak system response. For example, the AeroTEM peak response occurs for a 10 S conductor in the early off-time and 100 S in the late off-time for a 150 Hz base frequency. Because base frequency and conductance form a linear relationship when considering the peak response of any EM system, a drop in base frequency of 50% will double the conductance at which an EM system shows its peak response. If the base frequency were lowered from 150 Hz to 30 Hz there would be a fivefold increase in conductance at which the peak response of an EM occurred.

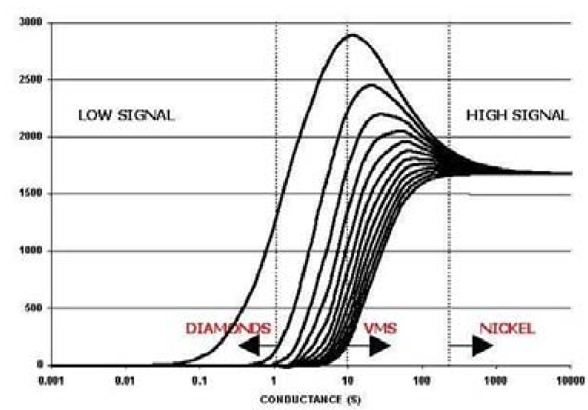
However, in the search for highly conductive targets, such as pyrrhotite-related Ni-Cu-PGM deposits, a fivefold increase in conductance range is a high price to pay because the signal level to lower conductance targets is reduced by the same factor of five. For this reason, EM systems that operate with low base frequencies are not suitable for general exploration unless the target conductance is more than 100 S, or the target is covered by conductive overburden.

Despite the excellent progress that has been made in modeling software over the past two decades, there has been little work done on determining the optimum form of an EM system for mineral exploration. For example, the optimum configuration in terms of geometry, base frequency and so remain unknown. Many geophysicists would argue that there is no single ideal configuration, and that each system has its advantages and disadvantages. We disagree.

When it comes to detecting and discriminating high-conductance targets, it is necessary to measure the pure in phase response of the target conductor. This measurement requires that the measured primary field from the transmitter be subtracted from the total measured response such that the secondary field from the target conductor can be determined. Because this secondary field is in-phase with the transmitter primary field, it must be made while the transmitter is turned on and the transmitter current is changing. The transmitted primary field is several orders of magnitude larger than the secondary field. AeroTEM uses a bucking coil to reduce the primary field at the receiver coils. The only practical way of removing the primary field is to maintain a rigid geometry between the transmitter, bucking and receiver coils. This is the main design consideration of the AeroTEM airframe and it is the only time domain airborne system to have this configuration.




The off-time AeroTEM response for the 16 channel configuration.




The on-time response assuming 100% removal of the measured primary field.

***Figure 4. The off-time and on-time response nomogram of AeroTEM for a base frequency of 150 Hz. The on-time response is much stronger for higher conductance targets and this is why on-time measurements are more important than lower frequencies when considering high conductance targets in a resistive environment.***

***Advantage 3 – Multiple Receiver Coils***

AeroTEM employs two receiver coil orientations. The Z-axis coil is oriented parallel to the transmitter coil and both are horizontal to the ground. This is known as a maximum coupled configuration and is optimal for detection. The X-axis coil is oriented at right angles to the transmitter coil and is oriented along the line-of-flight. This is known as a minimum coupled configuration, and provides information on conductor orientation and thickness. These two coil configurations combined provide important information on the position, orientation, depth, and thickness of a conductor that cannot be matched by the traditional geometries of the HEM or fixed-wing systems. The responses are free from a system geometric effect and can be easily compared to model type curves in most cases. In other words, AeroTEM data is very easy to interpret. Consider, for example, the following modeled profile:

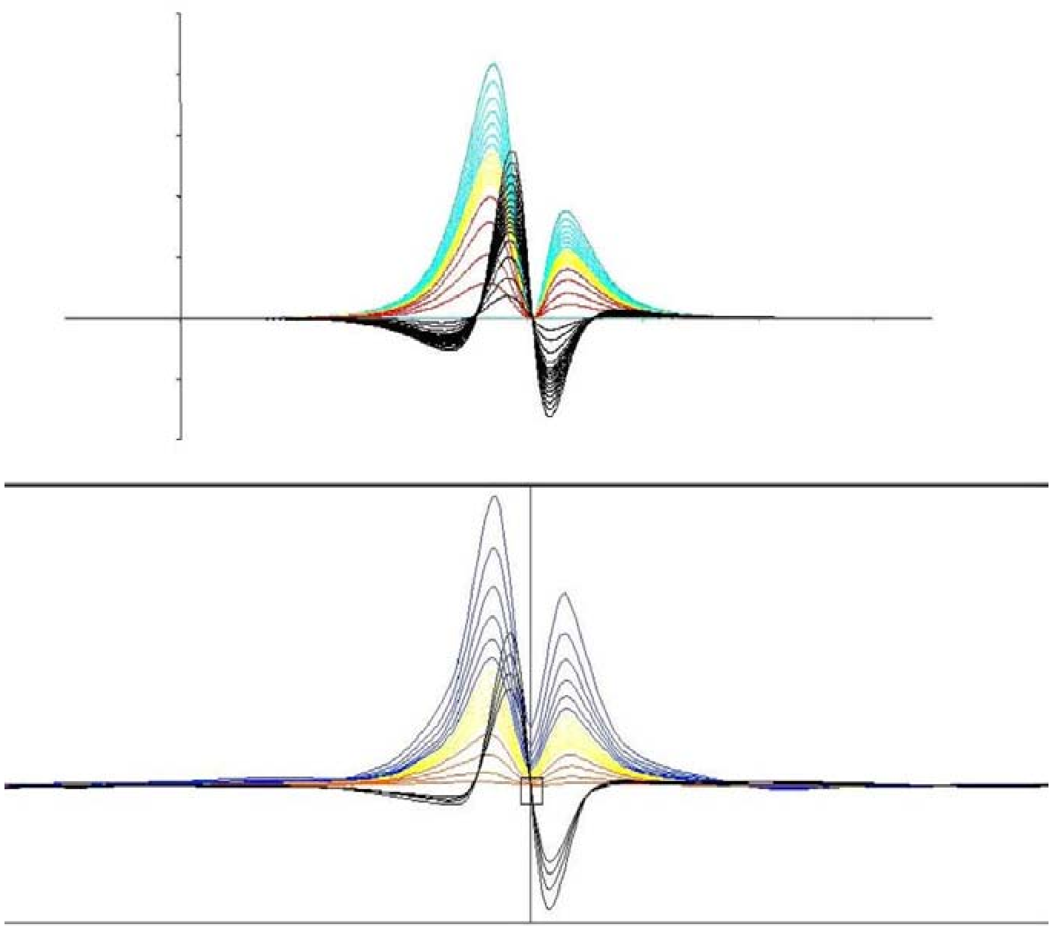


***Figure 5. Measured (lower) and modeled (upper) AeroTEM responses are compared for a thin steeply dipping conductor. The response is characterized by two peaks in the Z-axis coil, and a cross-over in the X-axis coil that is centered between the two Z-axis peaks. The conductor dips toward the higher amplitude Z-axis peak. Using the X-axis cross-over is the only way of differentiating the Z-axis response from being two closely spaced conductors.***

***HEM versus AeroTEM***

Traditional helicopter EM systems operate in the frequency domain and benefit from the fact that they use narrowband as opposed to wide-band transmitters. Thus all of the energy from the transmitter is concentrated in a few discrete frequencies. This allows the systems to achieve excellent depth penetration (up to 100 m) from a transmitter of modest power. The Aeroquest Impulse system is one implementation of this technology.

The AeroTEM system uses a wide-band transmitter and delivers more power over a wide frequency range. This frequency range is then captured into 16 time channels, the early channels containing the high frequency information and the late time channels containing the low frequency information down to the system base frequency. Because frequency domain HEM systems employ two coil configurations (coplanar and coaxial) there are only a maximum of three comparable frequencies per configuration, compared to 16 AeroTEM off-time and 12 AeroTEM on-time channels.

Figure 6 shows a comparison between the Dighem HEM system (900 Hz and 7200 Hz coplanar) and AeroTEM (Z-axis) from surveys flown in Raglan, in search of highly conductive Ni-Cu-PGM sulphide. In general, the AeroTEM peaks are sharper and better defined, in part due to the greater S/N ratio of the AeroTEM system over HEM, and also due to the modestly filtered AeroTEM data compared to HEM. The base levels are also better defined in the AeroTEM data. AeroTEM filtering is limited to spike removal and a 5-point smoothing filter. Clients are also given copies of the raw, unfiltered data.

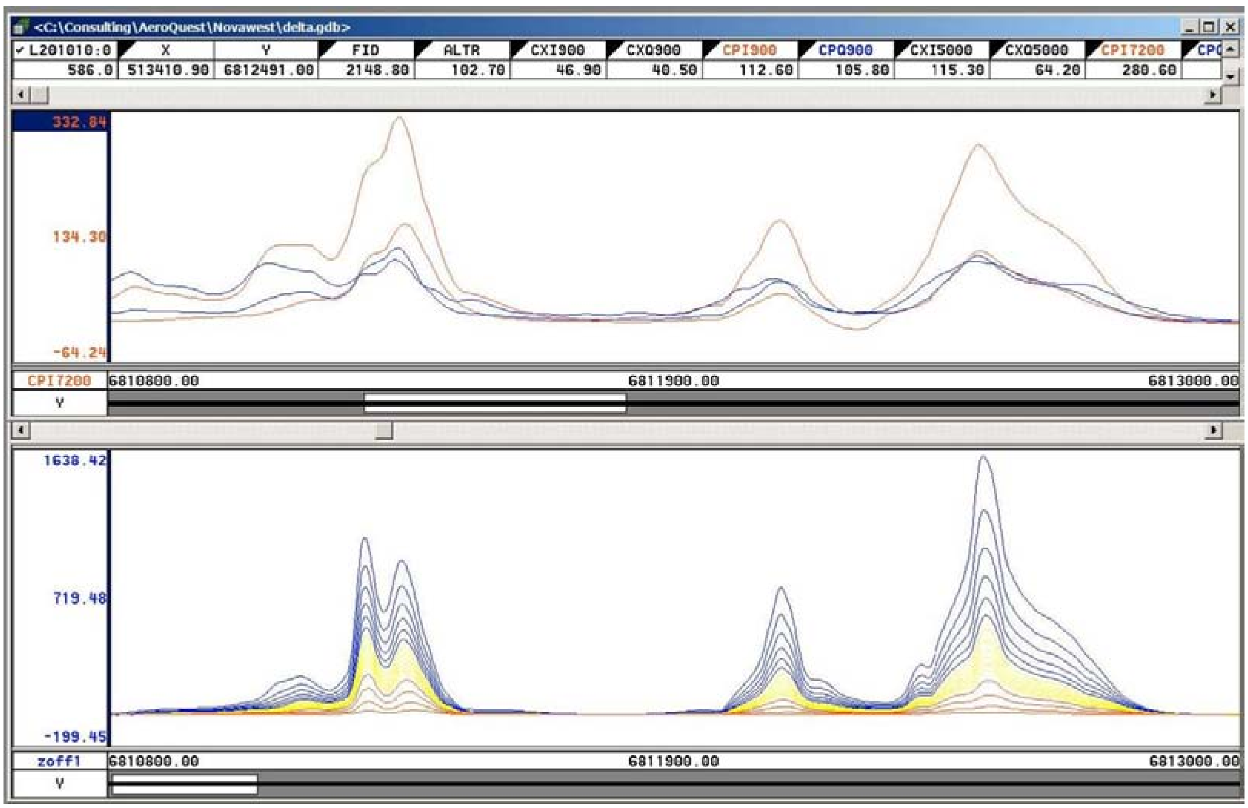



***Figure 6. Comparison between Dighem HEM (upper) and AeroTEM (lower) surveys flown in the Raglan area. The AeroTEM responses appear to be more discrete, suggesting that the data is not as heavily filtered as the HEM data. The S/N advantage of AeroTEM over HEM is about 5:1.***

**Aeroquest Limited is grateful to the following companies for permission to publish some of the data from their respective surveys: Wolfden Resources, FNX Mining Company Inc, Canadian Royalties, Nova West Resources, Aurogin Resources, Spectrem Air. Permission does not imply an endorsement of the AeroTEM system by these companies.**

**APPENDIX 5: AEROTEM INSTRUMENTATION SPECIFICATION SHEET**

# AEROTEM Helicopter Electromagnetic System

### System Characteristics

- Transmitter: Triangular Pulse Shape Base Frequency 90 Hz
- Tx On Time – 1,833 (90 Hz) µs
- Tx Off Time – 3,667 (90 Hz) µs
- Loop Diameter - 10 m
- Peak Current - 455 A
- Peak Moment – 183,131 NIA
- Typical Z Axis Noise at Survey Speed = 5 nT/s peak to peak
- Sling Weight: 1000 lb
- Length of Tow Cable: 56 m
- Bird Survey Height: 30 m nominal

### Receiver

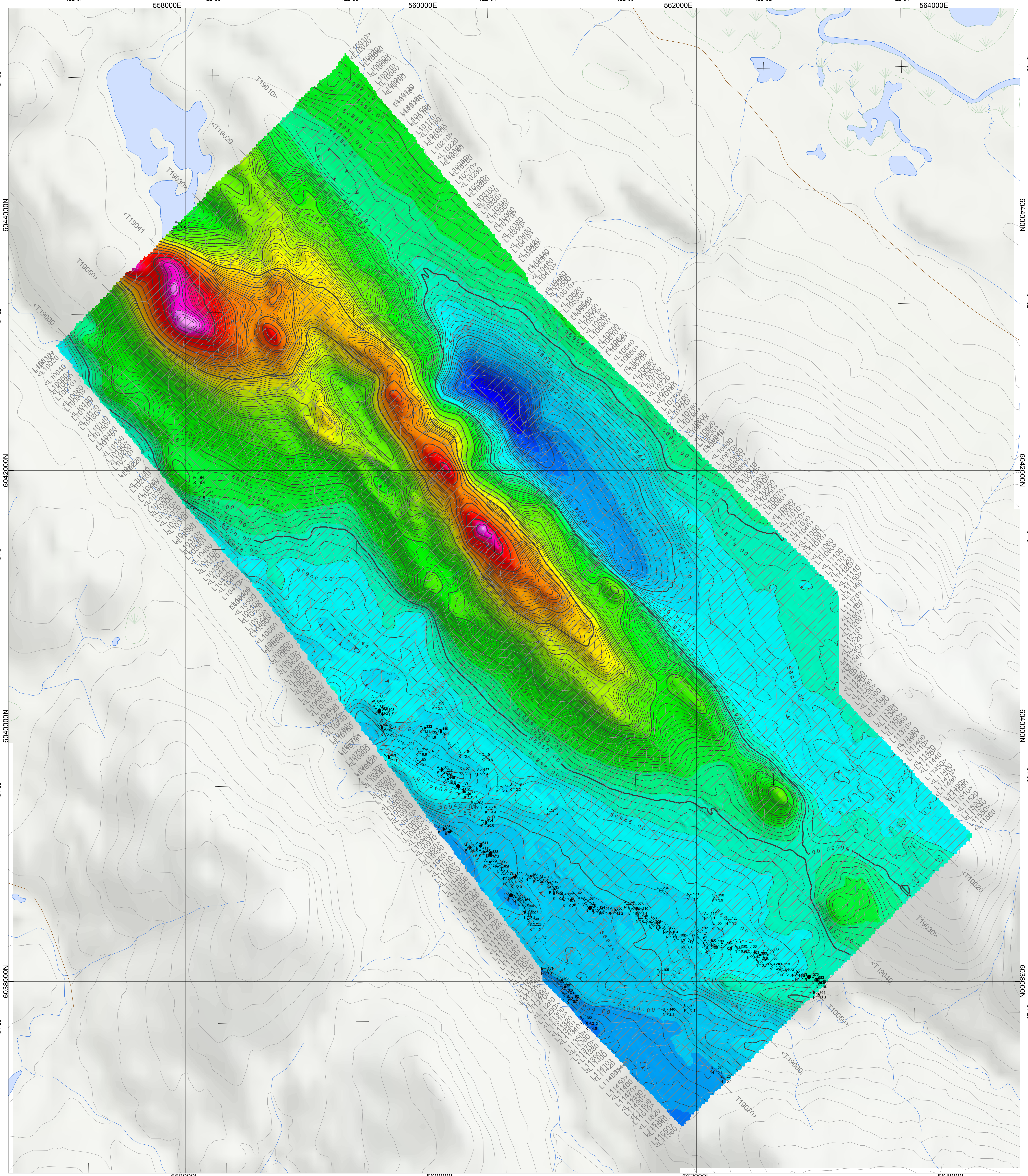
- Two Axis Receiver Coils (x, z) positioned at centre of transmitter loop
- Selectable Time Delay to start of first channel 21.3 , 42.7, or 64.0 ms

### Display & Acquisition

- AERODAS Digital recording at 120 samples per decay curve at a maximum of 300 curves per second (27.778 µs channel width)
- RMS Channel Widths: 52.9,132.3, 158.7, 158.7, 317.5, 634.9 µs
- Recording & Display Rate = 10 readings per second.
- On-board display - six channels Z-component and 1 X-component

### System Considerations

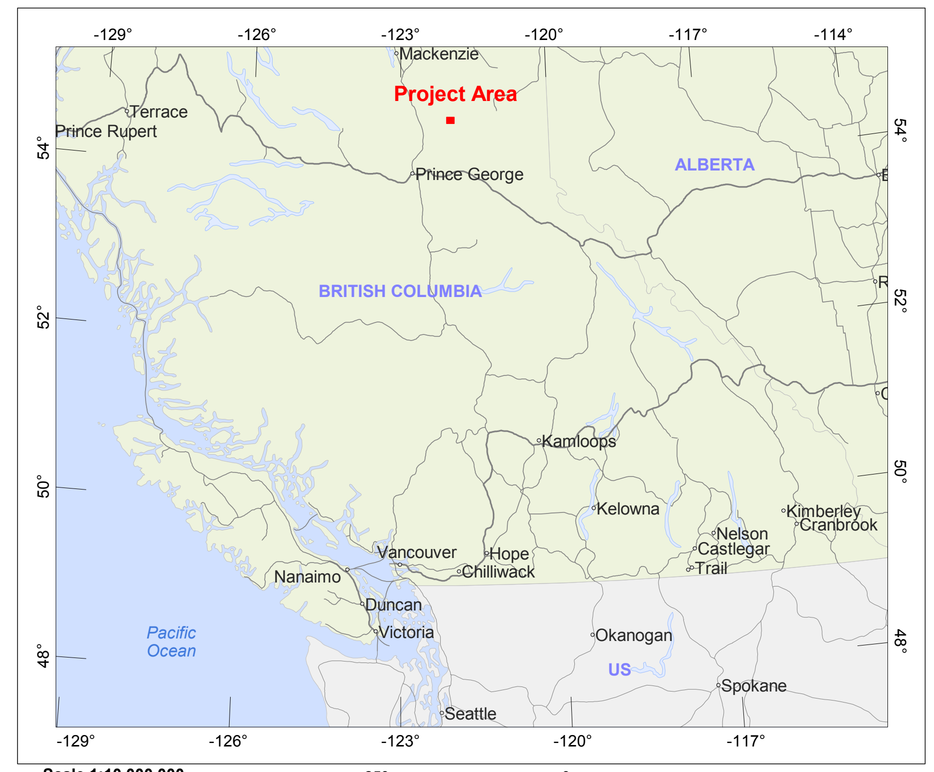
Comparing a fixed-wing time domain transmitter with a typical moment of 500,000 NIA flying at an altitude of 120 m with a Helicopter TDEM at 30 m, notwithstanding the substantial moment loss in the airframe of the fixed wing, the same penetration by the lower flying helicopter system would only require a sixty-fourth of the moment. Clearly the AeroTEM system with nearly 183.131 NIA has more than sufficient moment. The airframe of the fixed wing presents a response to the towed bird, which requires dynamic compensation. This problem is non-existent for AeroTEM since transmitter and receiver positions are fixed. The AeroTEM system is completely portable, and can be assembled at the survey site within half a day.




Grid North
NAD83 - Zone10N

The topographic data base was sourced from 1:50000 NRC (Natural Resources Canada) NTDB data
Background shading derived from NASA SRTM data
Inset data derived from Natural Resources Canada 'Atlas of Canada Base Maps'

This map accompanies the technical report entitled 'Report on a Helicopter-Borne Magnetic, Electromagnetic and Radiometrics Survey, Bear Lake, British Columbia', by Aeroquest Limited, November 2010

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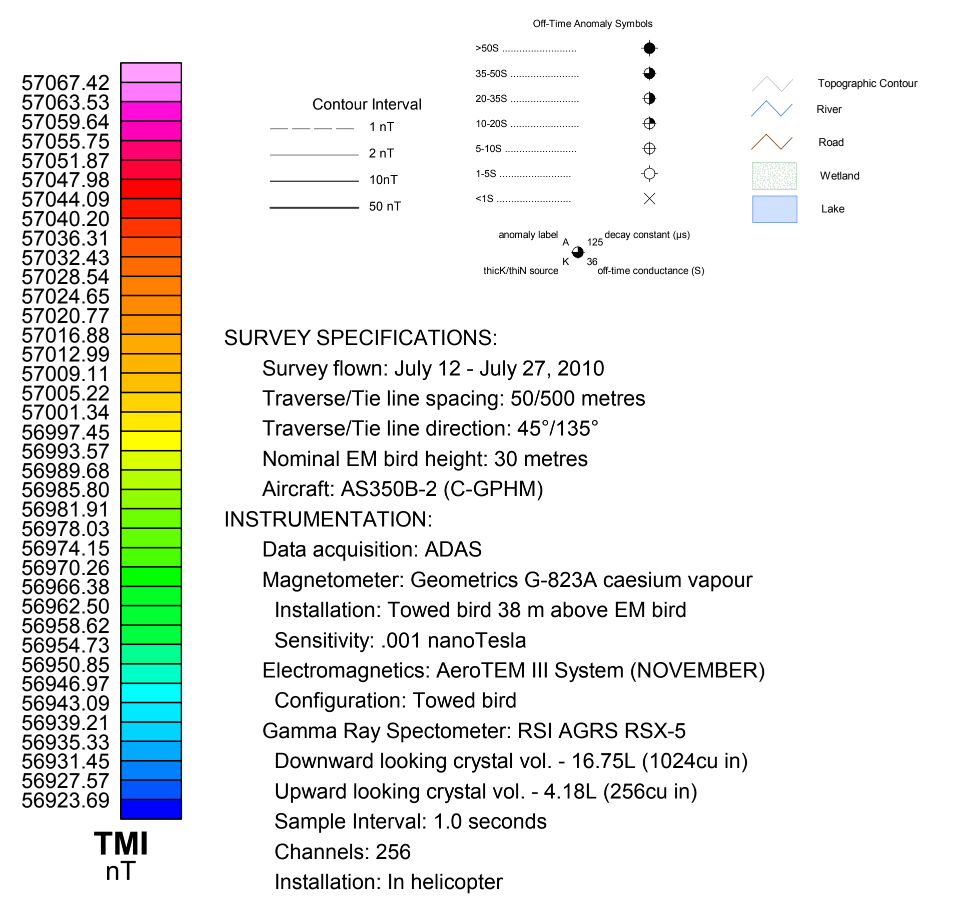
(kilometers)
NAD83 / UTM zone 10N




SURVEY SPECIFICATIONS:
- Survey flown: July 12 - July 27, 2010
- Traverse/Tie line spacing: 50/500 metres
- Traverse/Tie line direction: 45°/135°
- Nominal EM bird height: 30 metres
- Aircraft: AS350B-2 (C-GPHM)

INSTRUMENTATION:
- Data acquisition: ADAS
- Magnetometer: Geometrics G-823A caesium vapour
  - Installation: Towed bird 38 m above EM bird
  - Sensitivity: .001 nanoTesla
- Electromagnetics: AeroTEM III System (NOVEMBER)
  - Configuration: Towed bird
- Gamma Ray Spectometer: RSI AGRS RSX-5
  - Downward looking crystal vol. - 16.75L (1024cu in)
  - Upward looking crystal vol. - 4.18L (256cu in)
  - Sample Interval: 1.0 seconds
  - Channels: 256
  - Installation: In helicopter

NAVIGATION:
- Navigation: Differential Global Positioning System (DGPS)
- Navigation equipment: AGNAV with MID-TECH RX400p receiver
- Radar Altimeter: Terra TRA3000/TRI-30

POSITIONING
- Datum: NAD 83
  - Major Axis: 6378137.000
  - Eccentricity: 0.081819191

MAP PROJECTION
- Projection: Universal Transverse Mercator
- Central Meridian: 123°W (Zone 10N)
- Central Scale Factor: 0.9996
- False Easting/Northing: 500,000m/0m

scale 1:20,000
250 0 250 500 750 1000 1250 1500
(meters)
NAD83 / UTM zone 10N

Canadian International Minerals Inc.
Bear Lake, British Columbia

# TOTAL MAGNETIC INTENSITY

# Carbo Block

NTS 093J08, 09


AEROQUEST
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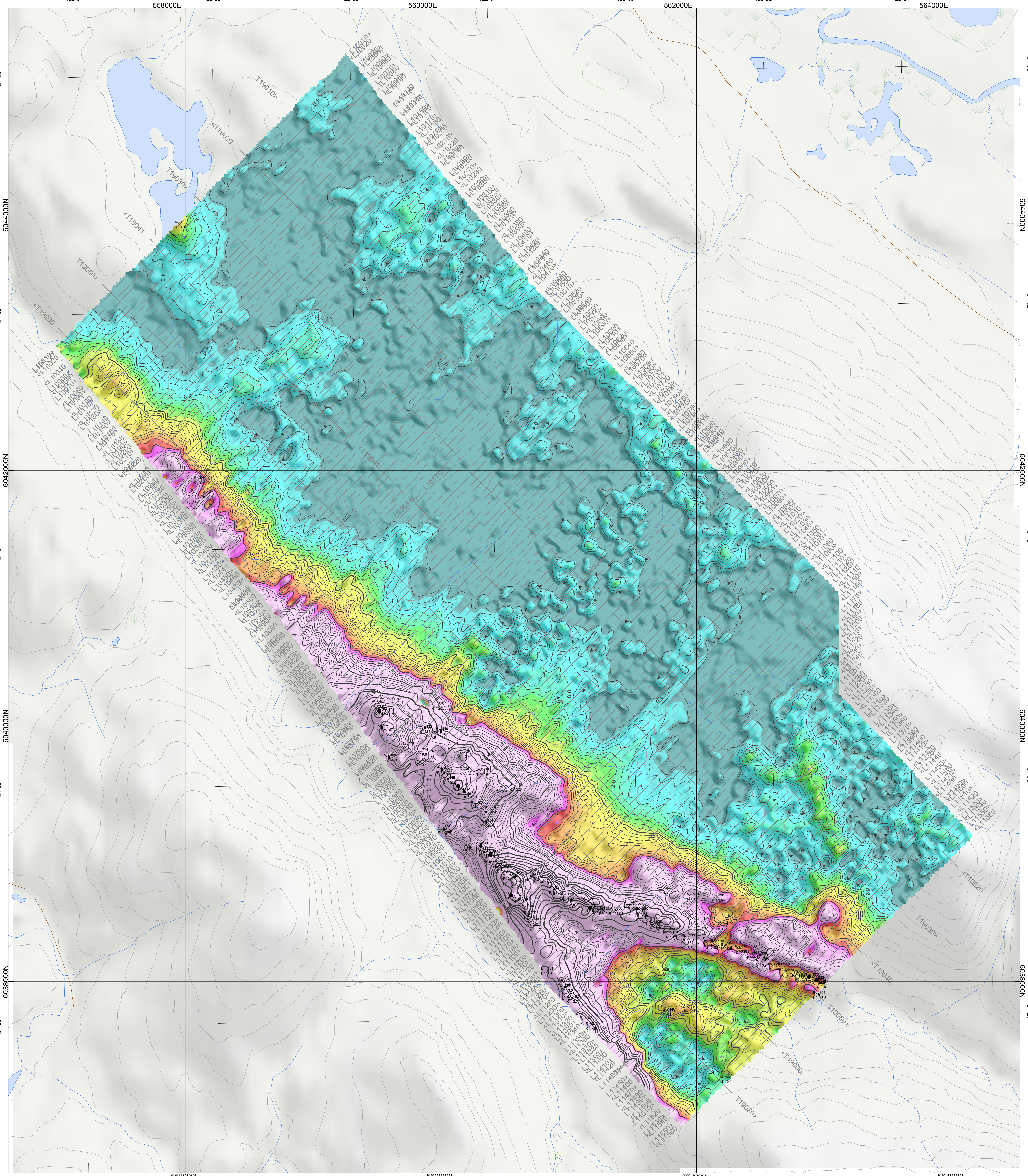
www.aeroquest.ca


November 2010




Grid North
NAD83 - Zone10N

The topographic data base was sourced from 1:50000 NRC (Natural Resources Canada) NTDB data
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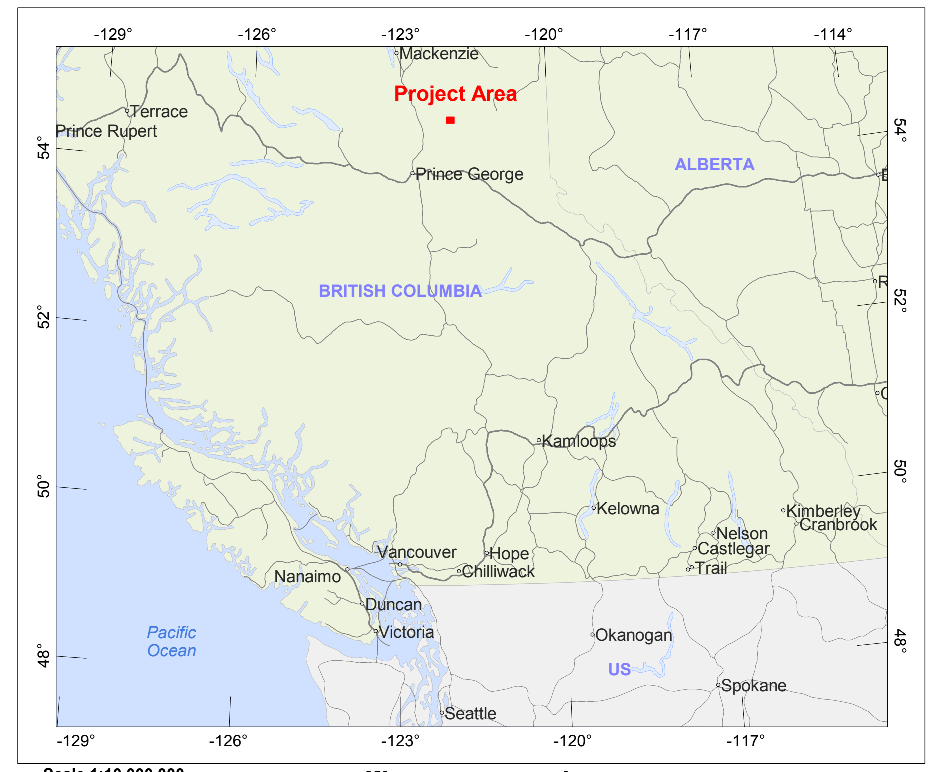


Scale 1:10,000,000

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NAD83 / UTM zone 10N

Contour Interval
- 20 nT/s
- 40 nT/s
- 200 nT/s
- 1000 nT/s

Off-Time Anomaly Symbols
- >50S
- 35-50S
- 20-35S
- 10-20S
- 5-10S
- 1-5S
- <1S

anomaly label A, decay constant (μs) 125, thicK/thiN source K, off-time conductance (S) 36

- Topographic Contour
- River
- Road
- Wetland
- Lake

ZOFF1
nT/s

475.00
450.00
425.00
400.00
375.00
350.00
325.00
300.00
275.00
250.00
225.00
200.00
175.00
150.00
125.00
100.00
75.00
50.00
25.00

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scale 1:20,000

250 0 250 500 750 1000 1250 1500
(meters)
NAD83 / UTM zone 10N

Canadian International Minerals Inc.

Bear Lake, British Columbia

# AeroTEM Z1-Offtime Time after Tx Off

# Carbo Block

NTS 093J08, 09


AEROQUEST

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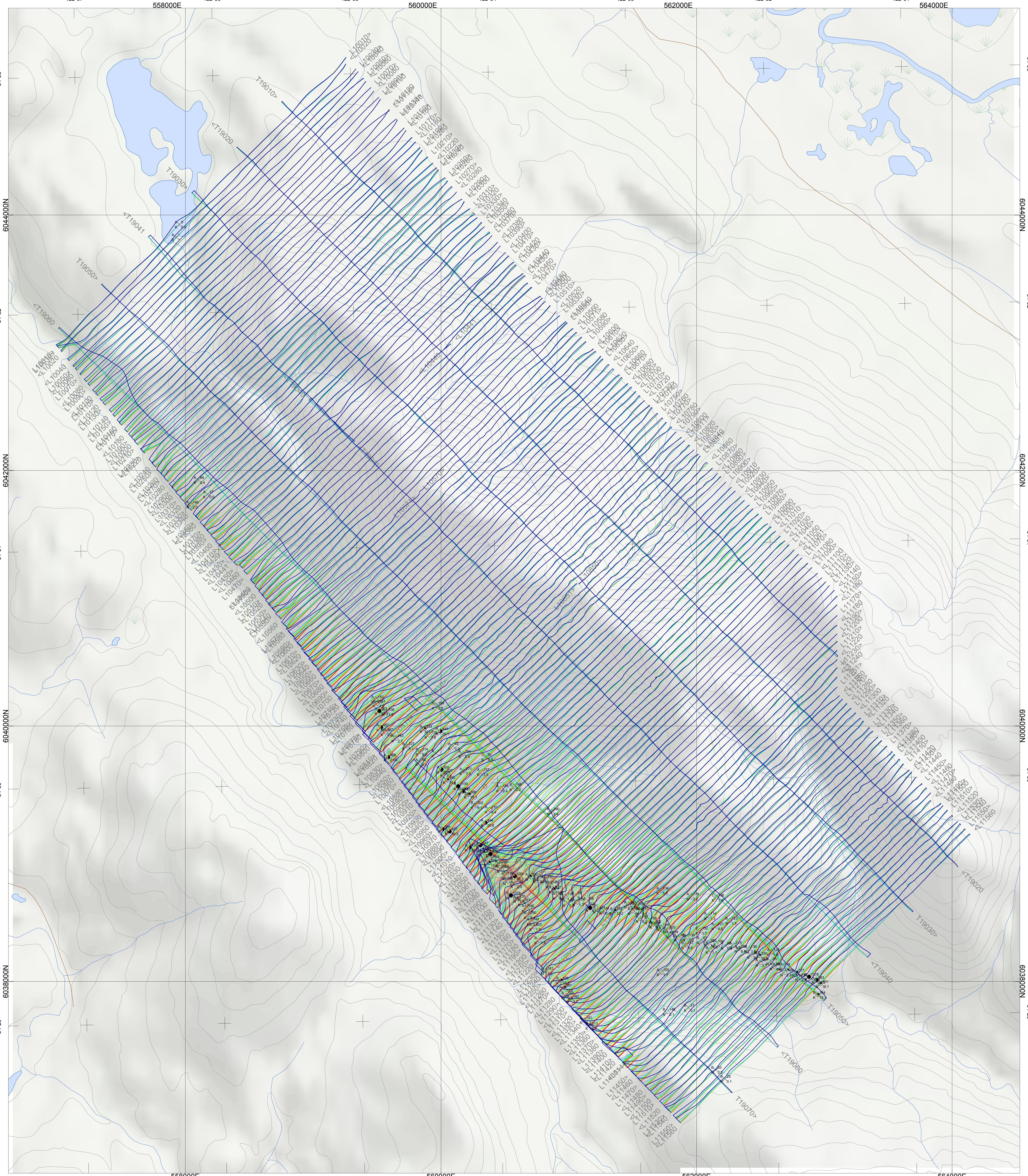
www.aeroquest.ca


November 2010

ZOFF1

ZOFF1_20k_Carbo Block.map, AQL Job no. 10-043



Grid North
NAD83 - Zone10N

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Scale 1:10,000,000

250 0
(kilometers)
*NAD83 / UTM zone 10N*

AeroTEM Z Off-Time Profiles
positive excursion to top and right, 1mm=200nT/s

- Z1 Time Gate 84.1 μs
- Z2 Time Gate 111.9 μs
- Z3 Time Gate 139.7 μs
- Z4 Time Gate 167.5 μs
- Z5 Time Gate 195.3 μs
- Z6 Time Gate 250.8 μs
- Z7 Time Gate 334.1 μs
- Z8 Time Gate 417.5 μs
- Z9 Time Gate 500.8 μs
- Z10 Time Gate 611.9 μs
- Z11 Time Gate 750.8 μs

Off-Time Anomaly Symbols

- >50S
- 35-50S
- 20-35S
- 10-20S
- 5-10S
- 1-5S
- <1S

anomaly label A 125 decay constant (μs)
thicK/thiN source K 36 off-time conductance (S)

- Topographic Contour
- River
- Road
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- Lake

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scale 1:20,000

250 0 250 500 750 1000 1250 1500
(meters)
*NAD83 / UTM zone 10N*

Canadian International Minerals Inc.
Bear Lake, British Columbia

# AEROTEM EM PROFILES
# Z1-Z11
# Carbo Block

NTS 093J08, 09

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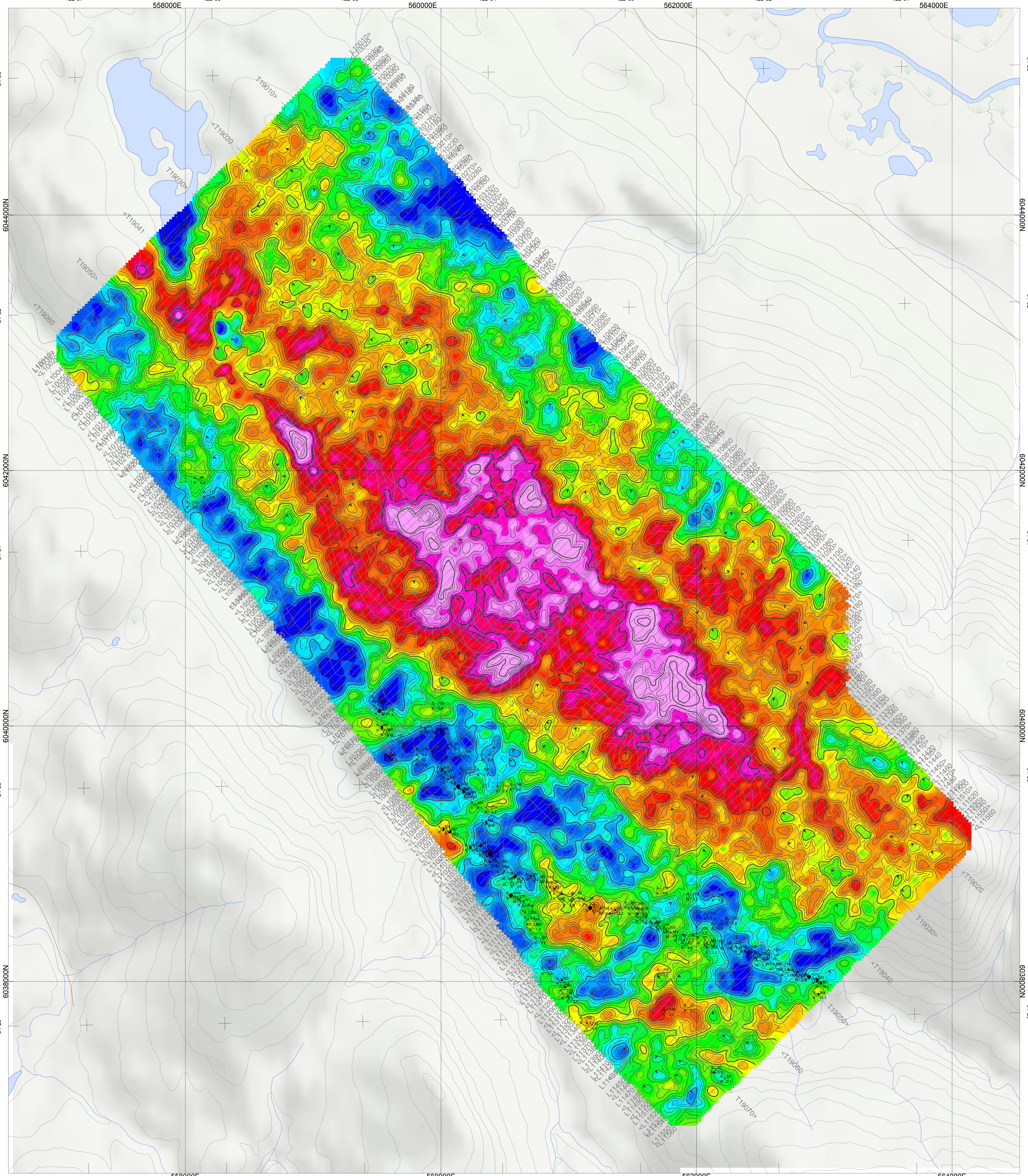
November 2010

EM PROFILES

EM PROFILES_20k_Carbo Block map, AQL Job no. 10-043




Grid North
NAD83 - Zone10N

The topographic data base was sourced from 1:50000 NRC (Natural Resources Canada) NTDB data
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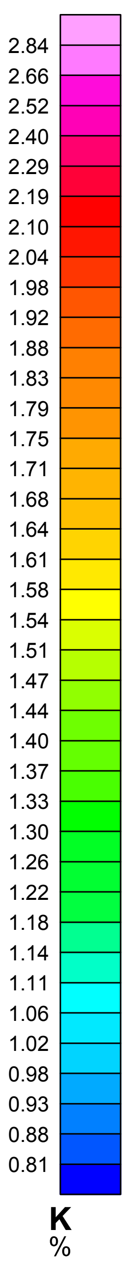
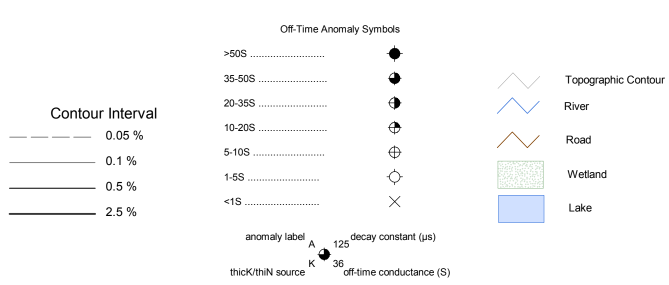
Scale 1:10,000,000

250 0
(kilometers)
*NAD83 / UTM zone 10N*

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scale 1:20,000

250 0 250 500 750 1000 1250 1500
(meters)
*NAD83 / UTM zone 10N*

Canadian International Minerals Inc.
Bear Lake, British Columbia

# RADIOMETRICS POTASSIUM PERCENTAGE

## Carbo Block

NTS 093J08, 09

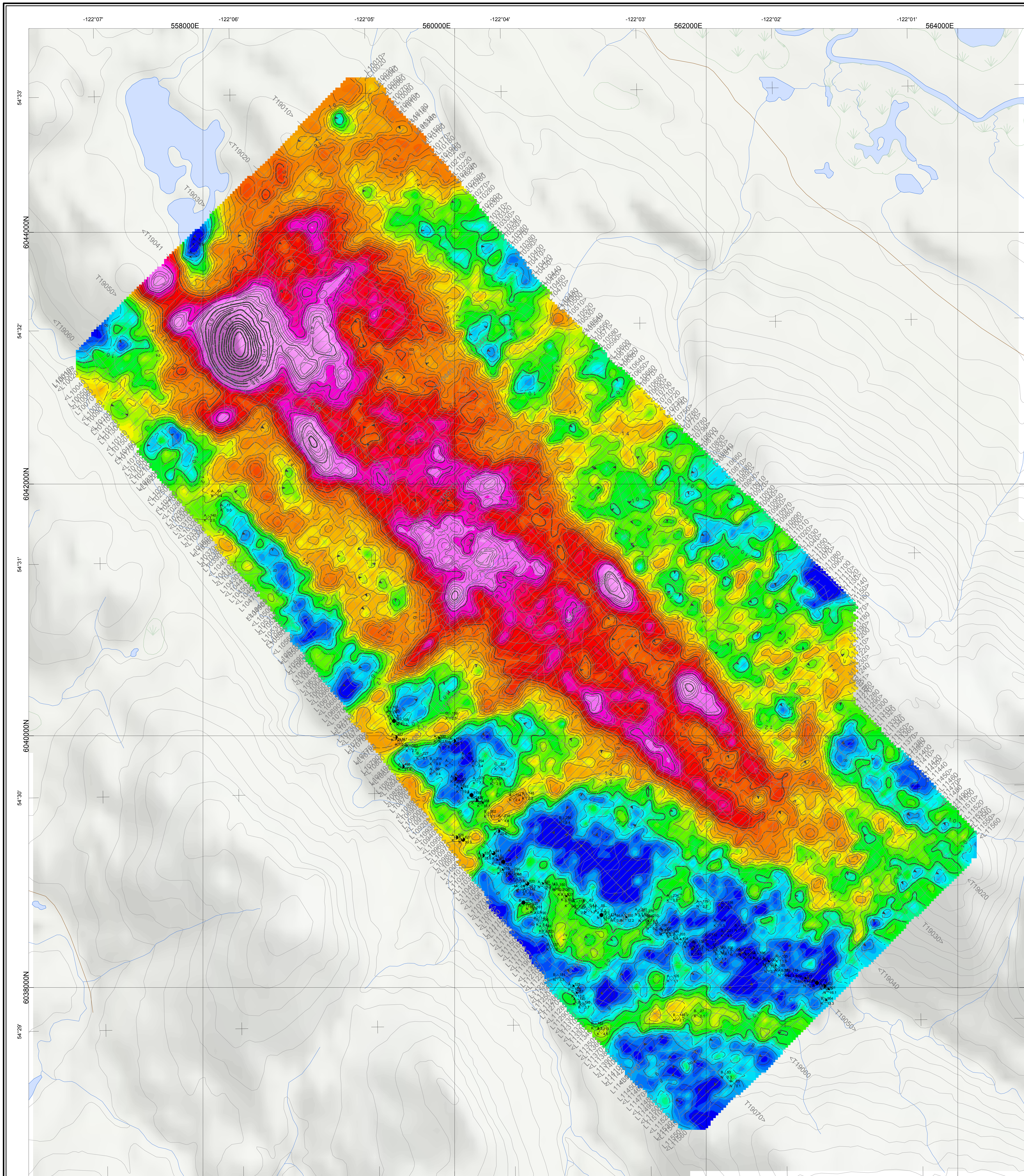
AEROQUEST


7687 Bath Road, Mississauga, ON, L4T 3T1, Canada
Tel: (905) 672-9129 Fax: (905) 672-7083
www.aeroquest.ca


November 2010

K%

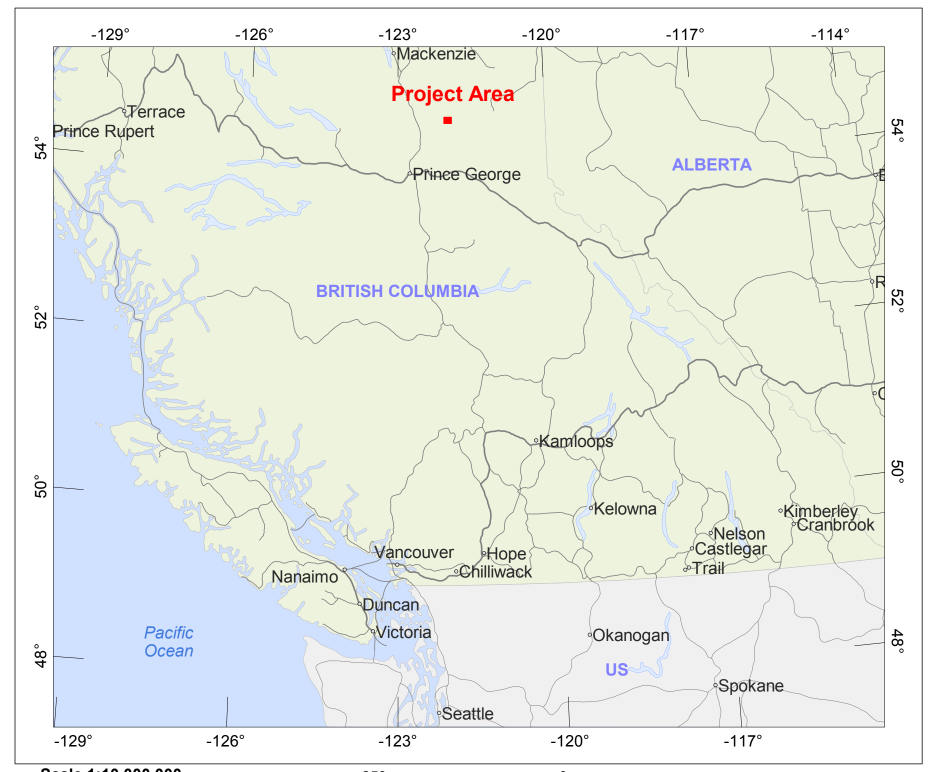
K%_20k_Carbo Block.map, AQL Job no. 10-043



Grid North
NAD83 - Zone10N

The topographic data base was sourced from 1:50000 NRC (Natural Resources Canada) NTDB data
Background shading derived from NASA SRTM data
Inset data derived from Natural Resources Canada 'Atlas of Canada Base Maps'

This map accompanies the technical report entitled 'Report on a Helicopter-Borne Magnetic, Electromagnetic and Radiometrics Survey, Bear Lake, British Columbia', by Aeroquest Limited, November 2010




Scale 1:10,000,000

250 0 (kilometers)
NAD83 / UTM zone 10N

Th ppm: 35.86, 31.02, 28.48, 26.75, 25.42, 24.22, 23.09, 21.82, 20.61, 19.56, 18.53, 17.62, 16.79, 16.04, 15.33, 14.71, 14.16, 13.70, 13.28, 12.87, 12.51, 12.17, 11.87, 11.57, 11.28, 10.98, 10.70, 10.43, 10.15, 9.85, 9.57, 9.24, 8.88, 8.51, 8.11, 7.68, 7.20, 6.58

Contour Interval
- 1 ppm
- 2 ppm
- 10 ppm
- 50 ppm

Off-Time Anomaly Symbols
- >50S
- 35-50S
- 20-35S
- 10-20S
- 5-10S
- 1-5S
- <1S

anomaly label A, decay constant (μs) 125, thicK/thiN source K, off-time conductance (S) 36

- Topographic Contour
- River
- Road
- Wetland
- Lake

SURVEY SPECIFICATIONS:
Survey flown: July 12 - July 27, 2010
Traverse/Tie line spacing: 50/500 metres
Traverse/Tie line direction: 45°/135°
Nominal EM bird height: 30 metres
Aircraft: AS350B-2 (C-GPHM)

INSTRUMENTATION:
Data acquisition: ADAS
Magnetometer: Geometrics G-823A caesium vapour
Installation: Towed bird 38 m above EM bird
Sensitivity: .001 nanoTesla
Electromagnetics: AeroTEM III System (NOVEMBER)
Configuration: Towed bird
Gamma Ray Spectrometer: RSI AGRS RSX-5
Downward looking crystal vol. - 16.75L (1024cu in)
Upward looking crystal vol. - 4.18L (256cu in)
Sample Interval: 1.0 seconds
Channels: 256
Installation: In helicopter

NAVIGATION:
Navigation: Differential Global Positioning System (DGPS)
Navigation equipment: AGNAV with MID-TECH RX400p receiver
Radar Altimeter: Terra TRA3000/TRI-30

POSITIONING
Datum: NAD 83
Major Axis: 6378137.000
Eccentricity: 0.081819191

MAP PROJECTION
Projection: Universal Transverse Mercator
Central Meridian: 123°W (Zone 10N)
Central Scale Factor: 0.9996
False Easting/Northing: 500,000m/0m

scale 1:20,000
250 0 250 500 750 1000 1250 1500
(meters)
NAD83 / UTM zone 10N

Canadian International Minerals Inc.
Bear Lake, British Columbia

# RADIOMETRICS EQUIVALENT THORIUM

## Carbo Block

NTS 093J08, 09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November 2010

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