# Report on a Helicopter-Borne AeroTEM II Electromagnetic & Magnetometer Survey

**Aeroquest Job # 05074**

**Anyox Property, Coastal Copper Project**

Stewart area, Northern British Columbia

NTS103O08, 09, 103P05, 12

for

Kenrich-Eskay Mining Corp

KRE - TSX - VENTURE

by

**AEROQUEST LIMITED**

4-845 Main Street East
Milton, Ontario, L9T 3Z3
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June, 2006

# REPORT ON A HELICOPTER-BORNE MAGNETIC AND ELECTROMAGNETIC SURVEY, COASTAL COPPER PROJECT

**Skeena Mining Division**

**Northwestern British Columbia**

**Latitude 55° 27' N**
**Longitude 129° 55' W**

**NTS 103O08, 09, 103P05, 12**

**Tenures worked: 254533, 254595-254598, 364406, 373858-373860, 375266, 415641-415646, 505144, 505253, 505314, 508972, 509492, 509494, 509498, 510041, 510042, 510132, 514927, 516390, 516395, 516397, 516983, 517054, 517106, 517150, 517219, 517254, 517290, 517304, 517318, 517326, 517336, 517339, 517342, 517346, 517349, 517353, 517357, 517361, 518630, 519839, 519840, 519842, 519845, 521215, 521220, 521222, 522432, 522434-522438, 522489, 522491-522495, 522523-522527, 522529, 522537, 522538, 522628-522630, 522737, 522738, 522885, 522886, 522890, 523325, 523326, 523328, 523330, 523332, 523336, 523338, 523342, 523345, 523347, 523349, 523352-523354, 523462, 523463, 528753-528755, 528757, 528826, 529944-529946, 530306, 535616-535620, 535622-535626, 536640**

**For:**

**Kenrich-Eskay Mining Corp.**

**#206-9801 King George Hwy.**
**Surrey, BC V3T 5H5**
**Canada**

**Submitted By:**

**Matt Pozza, M.Sc.**

**Aeroquest Limited**

**4-485 Main St. East**
**Milton, Ontario L9T 3Z3**

**March 29, 2007**

# STATEMENT OF COSTS

**Aeroquest AeroTEM survey**

- airborne magnetics and time-domain EM survey
- 3163 line km
- 12 crew days + mobe/demobe + standby

**Total cost:** **$402,108.68**

# Report on a Helicopter-Borne AeroTEM II Electromagnetic and Magnetic Survey

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### 1.2. Appendices



### 1.3. List of Maps (1:10,000)

Report includes a set of fifteen (15) Maps. Five Map Plates cover the survey area and 3 geophysical products are presented for each plate:

- MAG Coloured Total Magnetic Intensity (TMI) with line contours and EM anomalies
- ZOFF AeroTEM Off-Time Z1 colour grid with line contours and EM anomalies
- AeroTEM Off-Time Profiles (Z2-Z12) and EM anomalies

## 2. INTRODUCTION

This report describes a helicopter-borne geophysical survey carried out on behalf of Kenrich-Eskay Miing Corp. (hereafter Kenrich-Eskay) on the Anyox Property (Properties A & B), Coastal Copper project, near Stewart, Northern BC.

The principal geophysical sensor is Aeroquest's exclusive AeroTEM II time domain helicopter electromagnetic system which is employed in conjunction with a high-sensitivity cesium vapour magnetometer. 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 38,400 samples per second. The streaming data comprise the transmitted waveform, and the X component and Z component of the resultant field at the receivers. A secondary acquisition system (RMS) records the ancillary data.

The total line kms presented in the maps and data totalled 3163, of which 3139.8 km fell within the project area. The survey flying described in this report took place on March 21st and April 1st, 2006.

## 3. SURVEY AREA

The project area is located on 50km south of Stewart, BC and 130kms north of Prince Rupert (NTS103O08, 09, 103P05, 12) (Figure 1. Regional location map of the project area.Figure 1). It is located between two inlets, the Pearse Canal to the west, which separates Canada from the US, and the Portland Inlet to its east. The project area is accessible by boat and by air.

The surveying conducted consisted of one block, the Anyox Block, which is part of the Kenrich-Eskay's Coastal Copper Project (Figure 2). The survey terrain is mountainous with a number of small icefields. The terrain elevation ranges from approx 100-1500m. The historic mining town of Anyox (now largely abandoned), and two historic mines, Hidden Creek mine and Bonanza mine all lie to the south eastern portion of the survey area. The Anyox project area is made up of over 115 current mining claims.

The field crew was based at the Anyox camp in Anyox and and the base magnetometer and fuel caching was located at this site also.


Figure 1. Regional location map of the project area.

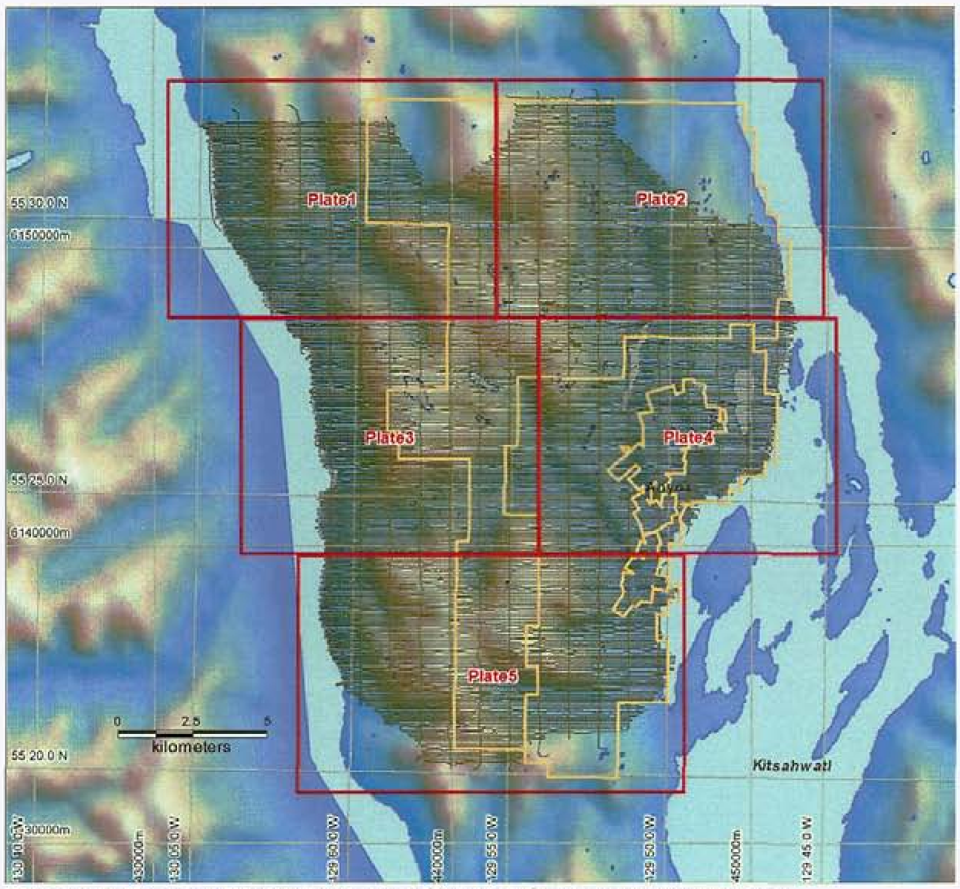



Figure 2. Project Flight Path and Coastal Copper property area.

## 4. LOCAL GEOLOGY & PREVIOUS WORK

(taken from Kenrich-Eskay website www.kenrich-eskay.com, June, 2006)

***Coastal Copper Project – Historic Anyox Mining Camp***

*The Coastal Copper Property is a very promising new mining exploration project in an historically rich region of north coastal British Columbia. The land assembly is optioned 50% by Kenrich-Eskay. The Coastal Copper project is an extensive land package that comprises more than 6250 hectares of mining claims and completely encircles two of the region's former producing copper mines. The former producers are not included in this package, however, the prospective volcanic-sedimentary strata that host the massive sulphide geology are extensively exposed to the Coastal Copper land.*

*The widespread mineral potential of the Anyox region was first recognized in the early 1900s with the discovery of copper-rich massive sulphide deposits. These deposits ultimately lead to the establishment of the mining town of Anyox with a population of 3000, and subsequently the largest copper smelter in the British Commonwealth.*

### *Anyox Mine and Smelter Complex*

*The historic Hidden Creek Mine is not included in the current land assembly but is entirely surrounded by the Coastal Copper Property. This mine was discovered in 1901 and operated from 1914 to 1935. The Hidden Creek deposit was the primary source of copper at Anyox and is reported to have produced 21,781,700 tonnes of ore from eight ore bodies averaging 1.57% copper, 9.26 grams/tonne silver and 0.17 grams/tonne gold. From 1929 to 1935 the Bonanza Mine, again totally surrounded by the Coastal Copper property, produced 647,910 tonnes averaging 2.51% copper.*

*Cominco purchased the mines in 1935 and further exploration lead to the discovery of a number of new massive sulphide bodies, some of which are on the Coastal Copper property. By the late 1990s, government geologists and other scientists had undertaken work in the area.*

### *Regional Geology and Eskay-Rift*

*The Coastal Copper property covers favourable geological host rocks of what is known as the Anyox roof pendant. The roof pendant is essentially an isolated sequence of older volcanic, sedimentary and metamorphic rocks entirely surrounded by younger intrusive granite rocks. Government studies now show that the Anyox pendant is part of the Eskay rift, a 250km belt that hosts over 60 volcanogenic massive sulphide deposits, including the famous Eskay Creek gold-silver mine north of Stewart, BC. The rift is a fault bounded basin hosting thick accumulations of bimodal volcanic rocks, with intercalated sedimentary strata that record the final eruptive events of an island-arc complex of the Early to Middle Jurassic Hazleton Group.*

### *Coastal Copper Property Geology*

*The Coastal Copper property covers the eastern part of the Anyox Pendant and is dominated by a lower sequence of massive and pillowed mafic volcanic flows that transitions upward to submarine flows and flow breccias. The top of the sequence is marked by an increase in volcaniclastics and discontinuous exhalative chert. Conformably above the volcanics are turbiditic sediments of mudstone, siltstone and sandstone. The contact zone between the lower mafic volcanic and overlying clastic sedimentary rocks is the focus of the ore zones of the famous Hidden Creek mine. Similarly, the former Bonanza mine is hosted within the mafic volcanic sequence within 10s of metres of the regional volcanic-sedimentary contact. The Coastal Copper project covers a substantial strike length of this important regional contact zone in addition to the prospective host rocks on either side. Compilation of past exploration work indicates a number of significant mineral prospects exist on the Coastal Copper property as possible extensions to previously mined deposits or as stratiform sulphide accumulations deeper in the stratigraphy.*

*Regional correlation of the volcanic-sedimentary sequence in the Anyox pendant with the geological setting of the Eskay rift, the extensive strike length of the favourable volcanic-sedimentary contact and the number of known massive slphide occurrences combine to make the Coastal Copper property an exciting and potentially very rewarding exploration target.*

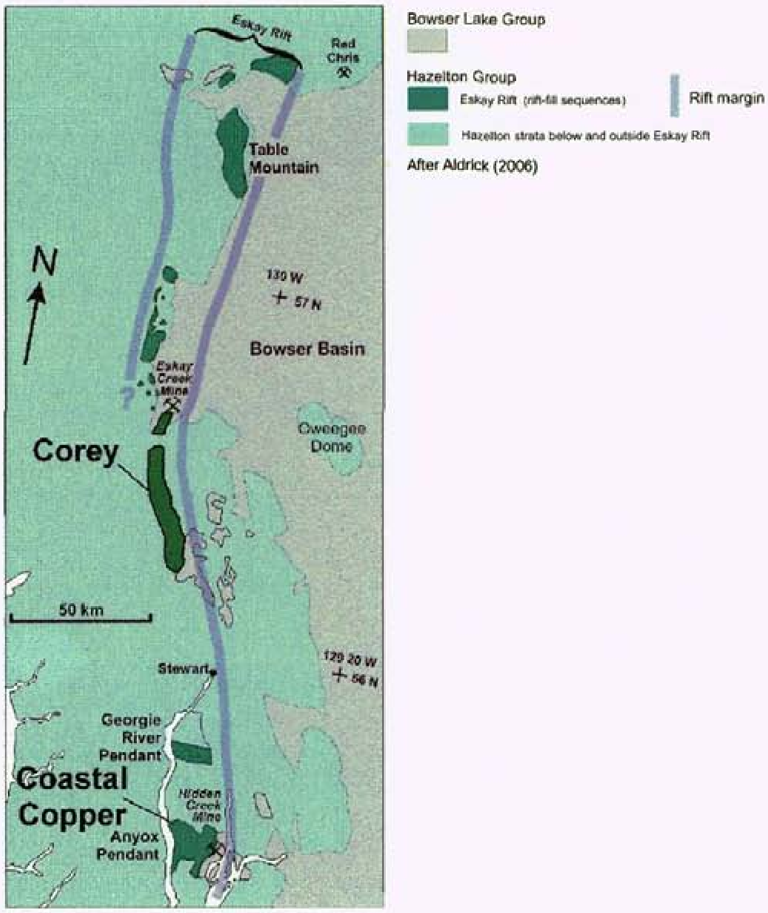



Figure 3. Project area regional geology (from www.kenrich-eskay.com)

# 5. SURVEY SPECIFICATIONS AND PROCEDURES

The survey specifications are summarized in the following table:

| Survey Block | Line Spacing (m) | Line direction | Survey Coverage (line-km) | Dates Flown |
|---|---|---|---|---|
| Anyox | 100 | E-W (90°) | 3139.8 | March 21st - April 1st, 2006 |

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 100 m. The control (tie) lines were flown perpendicular to the survey lines with a spacing of 1 km. The nominal EM bird terrain clearance is 45m, 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 17 metres above the EM bird and 21 metres below the helicopter (Figure 5). 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 38,400 samples per second and is processed to generate final data at 10 samples per second. The 10 samples per second translates to a geophysical reading about every 1.5 to 2.5 metres along the flight path.

## 5.1. Navigation

Navigation is carried out using a GPS receiver, an AGNAV2 system for navigation control, and an RMS DGR-33 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 under 3 metres. A recent static ground test of the Mid-Tech WAAS GPS yielded a standard deviation in x and y of under 0.6 metres and for z under 1.5 metres over a two-hour period.

## 5.2. System Drift

Unlike frequency domain electromagnetic systems, the AeroTEM II 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.

## 5.3. Field QA/QC Procedures

On return of the pilot and operator to the base, usually after each flight, the AeroDAS streaming EM data and the RMS data are carried on removable hard drives and FlashCards, respectively 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 RMS 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 contour, 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.

# 6. AIRCRAFT AND EQUIPMENT

## 6.1. Aircraft

A Eurocopter (Aerospatiale) AS350B2 "A-Star" helicopter - registration C-FPTG was used as survey platform (Figure 4). The helicopter was owned and operated by Hi-Wood Helicopters, Okotose, Alberta.The survey aircraft was flown at a nominal terrain clearance of 220 ft (70 m).

Figure 4. Survey helicopter C-FPTG.

### 6.2. Magnetometer

The Aeroquest airborne survey system employs the Geometrics G-823A cesium vapour magnetometer sensor installed in a two metre towed bird airfoil attached to the main tow line, 17 metres below the helicopter (Figure 5A). 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 51 metres (170 ft.). The magnetic data is recorded at 10Hz by the RMS DGR-33.

### 6.3. Electromagnetic System

The electromagnetic system is an AeroQuest AeroTEM II time domain towed-bird system (Figure 5B). The current AeroTEM transmitter dipole moment is 38.8 kNIA. The AeroTEM bird is towed 38 m (125 ft) below the helicopter. More technical details of the system may be found in Appendix 4.

The wave-form is triangular with a symmetric transmitter on-time pulse of 1.10 ms and a base frequency of 150 Hz (Figure 6). The current alternates polarity every on-time pulse. During every Tx on-off cycle (300 per second), 128 contiguous channels of raw x and z component (and a transmitter current monitor, itx) of the received waveform are measured. Each channel width is 26.04 microseconds starting at the beginning of the transmitter pulse. This 128 channel data is referred to as the raw streaming data. The AeroTEM system has two separate EM data recording streams, the conventional RMS DGR-33 and the AeroDAS system which records the full waveform.

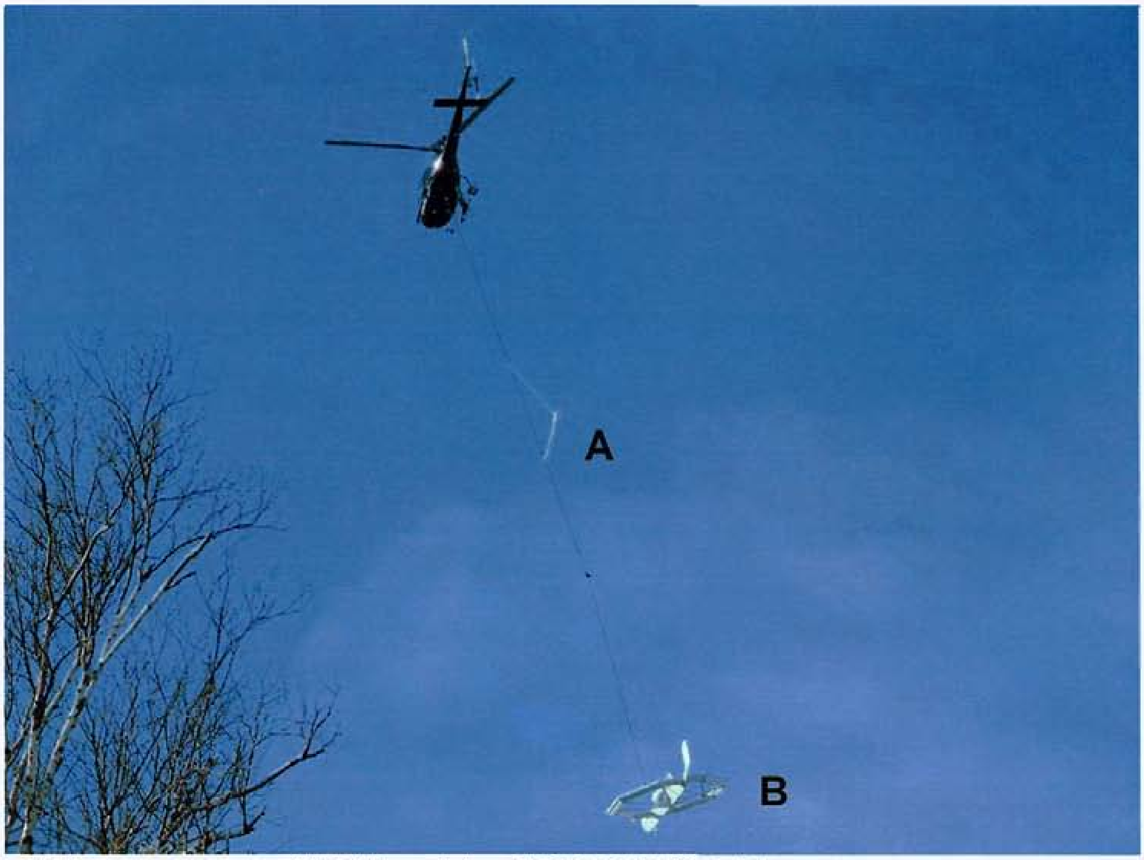



Figure 5. The magnetometer bird (A) and AeroTEM II EM bird (B)

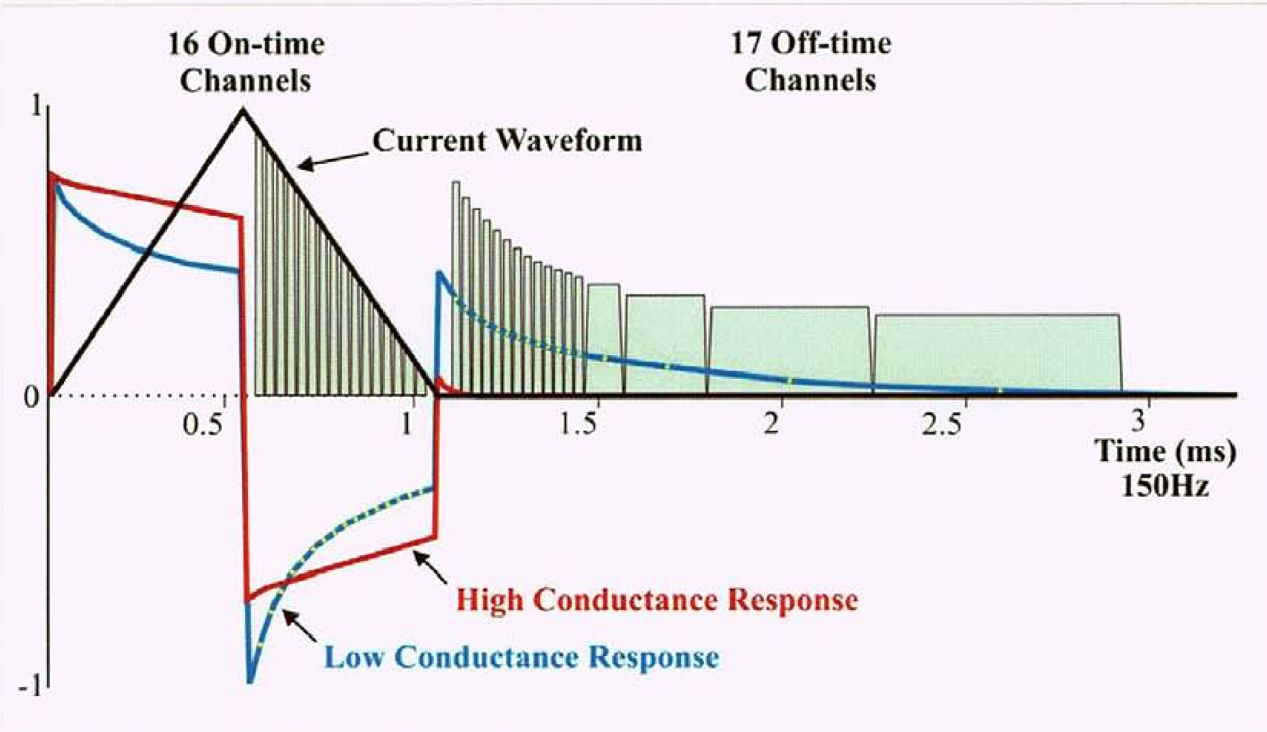



Figure 6. Schematic of Transmitter and Receiver waveforms

### 6.4. AERODAS Acquisition System

The 128 channels of raw streaming data are recorded by the AeroDAS acquisition system (Figure 7) onto a removable hard drive. 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: | Start Gate | End Gate | Start (us) | Stop (us) | Mid (us) | Width (us) |
|---|---|---|---|---|---|---|
| 1 ON | 25 | 25 | 651.0 | 677.0 | 664.0 | 26.0 |
| 2 ON | 26 | 26 | 677.0 | 703.1 | 690.1 | 26.0 |
| 3 ON | 27 | 27 | 703.1 | 729.1 | 716.1 | 26.0 |
| 4 ON | 28 | 28 | 729.1 | 755.2 | 742.1 | 26.0 |
| 5 ON | 29 | 29 | 755.2 | 781.2 | 768.2 | 26.0 |
| 6 ON | 30 | 30 | 781.2 | 807.2 | 794.2 | 26.0 |
| 7 ON | 31 | 31 | 807.2 | 833.3 | 820.3 | 26.0 |
| 8 ON | 32 | 32 | 833.3 | 859.3 | 846.3 | 26.0 |
| 9 ON | 33 | 33 | 859.3 | 885.4 | 872.3 | 26.0 |
| 10 ON | 34 | 34 | 885.4 | 911.4 | 898.4 | 26.0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 ON | 35 | 35 | 911.4 | 937.4 | 924.4 | 26.0 |
| 12 ON | 36 | 36 | 937.4 | 963.5 | 950.5 | 26.0 |
| 13 ON | 37 | 37 | 963.5 | 989.5 | 976.5 | 26.0 |
| 14 ON | 38 | 38 | 989.5 | 1015.6 | 1002.5 | 26.0 |
| 15 ON | 39 | 39 | 1015.6 | 1041.6 | 1028.6 | 26.0 |
| 16 ON | 40 | 40 | 1041.6 | 1067.6 | 1054.6 | 26.0 |
| 0 OFF | 44 | 44 | 1145.8 | 1171.8 | 1158.8 | 26.0 |
| 1 OFF | 45 | 45 | 1171.8 | 1197.8 | 1184.8 | 26.0 |
| 2 OFF | 46 | 46 | 1197.8 | 1223.9 | 1210.9 | 26.0 |
| 3 OFF | 47 | 47 | 1223.9 | 1249.9 | 1236.9 | 26.0 |
| 4 OFF | 48 | 48 | 1249.9 | 1276.0 | 1262.9 | 26.0 |
| 5 OFF | 49 | 49 | 1276.0 | 1302.0 | 1289.0 | 26.0 |
| 6 OFF | 50 | 50 | 1302.0 | 1328.0 | 1315.0 | 26.0 |
| 7 OFF | 51 | 51 | 1328.0 | 1354.1 | 1341.1 | 26.0 |
| 8 OFF | 52 | 52 | 1354.1 | 1380.1 | 1367.1 | 26.0 |
| 9 OFF | 53 | 53 | 1380.1 | 1406.2 | 1393.1 | 26.0 |
| 10 OFF | 54 | 54 | 1406.2 | 1432.2 | 1419.2 | 26.0 |
| 11 OFF | 55 | 55 | 1432.2 | 1458.2 | 1445.2 | 26.0 |
| 12 OFF | 56 | 56 | 1458.2 | 1484.3 | 1471.3 | 26.0 |
| 13 OFF | 57 | 60 | 1484.3 | 1588.4 | 1536.4 | 104.2 |
| 14 OFF | 61 | 68 | 1588.4 | 1796.8 | 1692.6 | 208.3 |
| 15 OFF | 69 | 84 | 1796.8 | 2213.4 | 2005.1 | 416.6 |
| 16 OFF | 85 | 110 | 2213.4 | 2890.4 | 2551.9 | 677.0 |

### 6.5. RMS DGR-33 Acquisition System

In addition to the magnetics, altimeter and position data, six channels of real time processed off-time EM decay in the Z direction and one in the X direction are recorded by the RMS DGR-33 acquisition system at 10 samples per second and plotted real-time on the analogue chart recorder. These channels are derived by a binning, stacking and filtering procedure on the raw streaming data. The primary use of the RMS EM data (Z1 to Z6, X1) is to provide for real-time QA/QC on board the aircraft.

The channel window timing of the RMS DGR-33 6 channel system is described in the table below.

| RMS Channel | Start time (microsec) | End time (microsec) | Width (microsec) | Streaming Channels |
|---|---|---|---|---|
| Z1, X1 | 1269.8 | 1322.8 | 52.9 | 48-50 |
| Z2 | 1322.8 | 1455.0 | 132.2 | 50-54 |
| Z3 | 1428.6 | 1587.3 | 158.7 | 54-59 |
| Z4 | 1587.3 | 1746.0 | 158.7 | 60-65 |
| Z5 | 1746.0 | 2063.5 | 317.5 | 66-77 |
| Z6 | 2063.5 | 2698.4 | 634.9 | 78-101 |

Figure 7. AeroTEM II Instrument Rack. Includes (AeroDAS system and RMS DGR-33 and AeroTEM power supply, data acquisition computer and AG-NAV2 navigation)

### 6.6. Magnetometer Base Station

The base magnetometer was a Geometerics G-858 cesium vapour magnetometer. Data logging and UTC time syncronisation was carried out within an external data logging computer, with an external GPS providing the timing signal. That data logging was configured to measure at 0.1 second intervals (10Hz). Digital recording resolution was 0.001 nT. The sensor was placed on a tripod in an area 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 levels.

### 6.7. 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. The recorded data represents the height of the antenna, i.e. helicopter, above the ground. The Terra altimeter has an altitude accuracy of +/- 1.5 metres.

### 6.8. Video Tracking and Recording System

A high resolution colour digital video camera (**Error! Reference source not found.**) 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 8. Digital video camera typical mounting location.

### 6.9. 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 under 3 metres. A recent static ground test of the Mid-Tech WAAS GPS yielded a standard deviation in x and y of under 0.6 metres and for z under 1.5 metres over a two-hour period.

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 18N projection. The real-time differentially corrected GPS positional data was recorded by the RMS DGR-33 in geodetic coordinates (latitude and longitude using WGS84) at 0.2 second intervals.

### 6.10. Digital Acquisition System

The AeroTEM received waveform sampled during on and off-time at 128 channels per decay, 300 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 26.04 microseconds. The streaming data was recorded on a removable hard-drive and was later backed-up onto DVD-ROM from the field-processing computer.

The RMS Instruments DGR33A data acquisition system was used to collect and record the analogue data stream, i.e. the positional and secondary geophysical data, including processed 6 channel EM, magnetics, radar altimeter, GPS position, and time. The data was recorded on 128Mb capacity FlashCard. The RMS output was also directed to a thermal chart recorder.

## 7. PERSONNEL

The following AeroQuest personnel were involved in the project:

- Manager of Operations: Bert Simon
- Field Data Processors: Chris Kahue
- Field Operator: Tom Szumigaj
- Data Interpretation and Reporting: Matt Pozza, Marion Bishop

The survey pilot Paul Kendall was employed directly by the helicopter operator – Hi-Wood Helicopters, Okotose, Alberta.

## 8. DELIVERABLES

The report includes a set of fifteen (15) geophysical maps plotted at a scale of 1:10,000. Three data products are presented for each of the five map plates that cover the survey area (Figure 2).

- MAG Coloured Total Magnetic Intensity (TMI) with line contours and EM anomalies
- ZOFF AeroTEM Off-Time Z1 colour grid with line contours and EM anomalies
- EM AeroTEM Off-Time Profiles (Z2-Z12) and EM anomalies

The coordinate/projection system for the maps is NAD83 Universal Transverse Mercator Zone 9 (for Canada; Central America; Mexico; USA (ex Hawaii Aleutian Islands)). For reference, the latitude and longitude in NAD83 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 on-time conductance. The anomaly symbol is accompanied by postings denoting the calculated on-time conductance, a thick or thin classification and an anomaly identifier label. The anomaly symbol legend is given in the margin of the maps. The magnetic field data is presented as superimposed line contours with a minimum contour interval of 10 nT. Bold contour lines are separated by 5000 nT.

The geophysical profile data is archived digitally in a Geosoft GDB binary format database. The database contains the processed streaming data, the RMS data, the base station data, and all processed channels. A description of the contents of the individual channels in the database can be found in Appendix 3. This digital data is archived at the Aeroquest head office in Milton.

# 9. 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 wide Hewlett Packard ink-jet plotters.

## 9.1. Base Map

The geophysical maps accompanying this report are based on positioning in the datum of NAD83. The survey geodetic GPS positions have been projected using the Universal Transverse Mercator projection in Zone 9N. A summary of the map datum and projection specifications are as follows:

- 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 9 (Central Meridian 129°W)
- Central Scale Factor: 0.9996
- False Easting, Northing: 500,000m, 0m

## 9.2. 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 (5Hz) 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 to WGS84 (GPS) altitude and are not tied in to surveyed geodetic heights.

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.

## 9.3. Electromagnetic Data

The raw streaming data, sampled at a rate of 38,400 Hz (128 channels, 300 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, leveled and split up into the individual line segments. Further base level adjustments may be carried out at this stage.

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 mergered into 'array format; channels in the final Geosoft database as Zon, Zoff, Xon, and Xoff

The filtering of the stacked data is designed to remove or minimize high frequency noise that can not be sourced from the geology. Apparent bedrock EM anomalies were interpreted with the aid of an auto-pick from positive peaks and troughs in the on-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.

### 9.4. Magnetic Data

Prior to any leveling 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 random grid technique with a grid cell size of 25 metres. The final leveled grid provided the basis for threading the presented contours which have a minimum contour interval of 10 nT.

In order to enhance subtle magnetic trends a 'tilt' derivative grid was calculated from the total magnetic intensity (TMI) grid. **This product is included in the final digital archive.** The Tilt Derivative (TDR) of the TMI enhances low amplitude and small wavelength magnetic features which define shallow basement structures as well as potential mineral exploration targets. The TILT derivative can be though of as a combination of the first vertical derivative and the total horizontal derivative of the total magnetic intensity.

Mathematically, the TDR is defined as:

TDR = arctan (VDR/THDR), where VDR and THDR are first vertical and total horizontal derivatives, respectively, of the total magnetic intensity T.

$$VDR = dT/dz$$
$$THDR = sqrt\left( (dT/dx)^2 + (dT/dy)^2 \right)$$

Due to the nature of the arctan trigonometric function in the filter, all amplitudes are restricted to $+\pi/2$ and $-\pi/2$ radians. This gives the Tilt derivative the added advantage of acting like an automatic gain control (AGC) filter. The calculated TDR grid is presented a colour sun-shaded image (illumination from the north-northeast). Line contours are also overlain which have a minimum contour interval of 0.05 radians.

# 10. RESULTS AND INTERPRETATION

The survey was successful in mapping the magnetic and conductive properties of the geology throughout the survey area. Below is an interpretation of the results starting with a general overview of the geophysical response of the area followed by a more detailed interpretation of the Priority areas defined by the client.

## 10.1. 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.

The magnetic data is very complex, but appears to be primarily responding to broad volcanic intrusions, smaller cross-cutting dyke structures, and older basement rocks with a complex metamorphic and intrusive history. The strike direction of the overlying sediments is not well represented in the magnetic data. The dominant magnetic trends are NW-SE and N-S, however subtle linear magnetic lows (many trending N-S) likely define the most recent faulting direction of the area.

The magnetic data ranges from lows of approximately 56,070 nT to highs of approximately 57,700 nT with an average background of 56,500 nT (Figure 9A). The highest magnetic response occurs in the south-central portion of the block and likely defines a zone of either volcanic or intrusive rocks. Higher frequency magnetic anomalies within this zone reveal several structures including a north-south trending fault (that appears to cut and displace the zone of elevated response) and a sub-circular anomaly in the south east portion of the survey block (Figure 9). North of this zone (in the central portion of the survey block), subtle linear magnetic lows in the data provide additional evidence of north-south trending faulting. Several smaller curvilinear magnetic highs (<1km across strike) also generally run North-South across the central portion of the survey block. These likely represent a structural zone of increased metamorphism and intrusion.

Higher frequency magnetic signal is revealed in the TDR and vertical derivative (1VD) grids. Several magnetic lineaments (possibly dyke structures) of varying strike are clearly imaged. Some of these lineaments show extensive strike length, and may add to the structural understanding of the area. In addition, a subtle and likely older SW-NE magnetic fabric direction is evident (Figure 9). The South Western portion of the survey block (i.e. Priority areas 1 and 2 discussed later) shows subtle magnetic lows trending NW-SE which may indicate recent faulting.

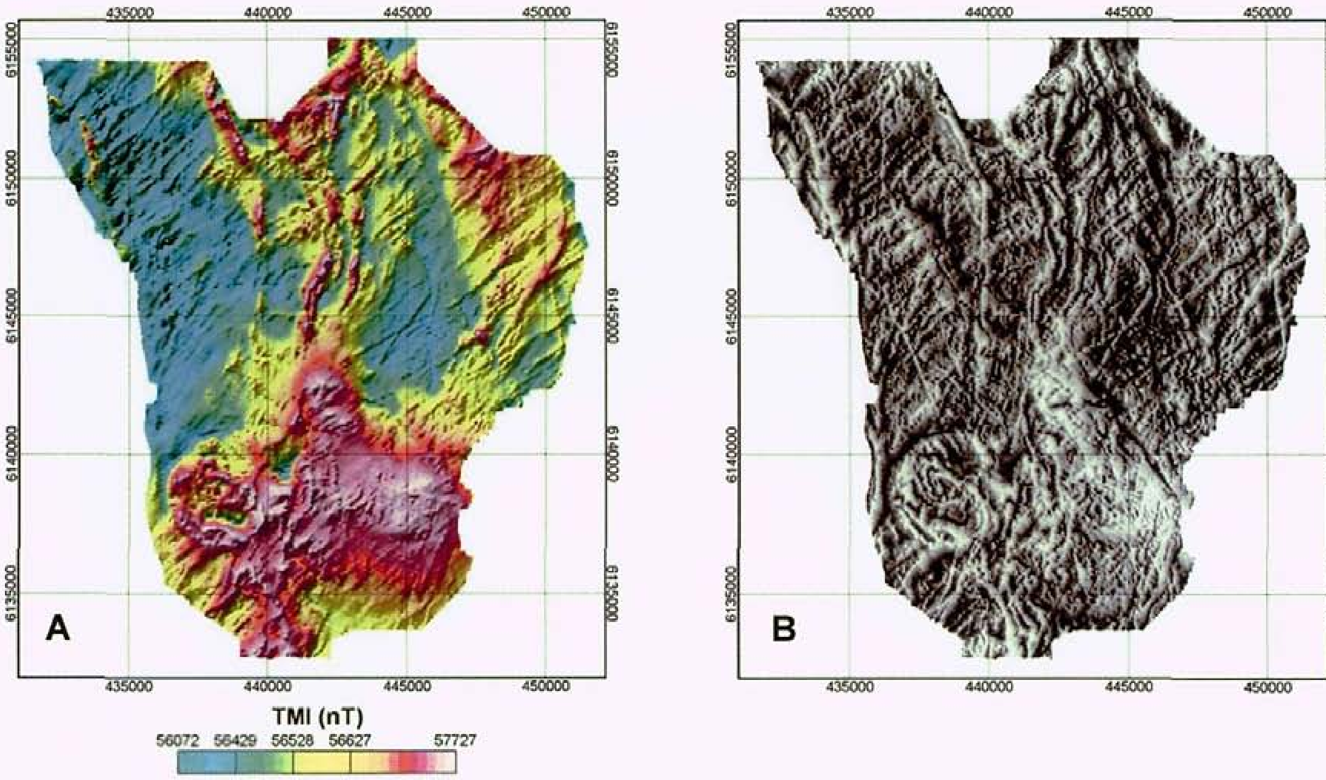



Figure 9. A) Total magnetic intensity map (illumination from the NW). B) TDR Map presented with a grey colour-scale to highlight subtle magnetic lineaments.

### 10.2. EM Anomalies – General Comments

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 10). For a vertically orientated thick source (say, greater than 10m), the response is a single peak in the z-component response and a negative to positive crossover in the x-component response (Figure 11). 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 12). 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.

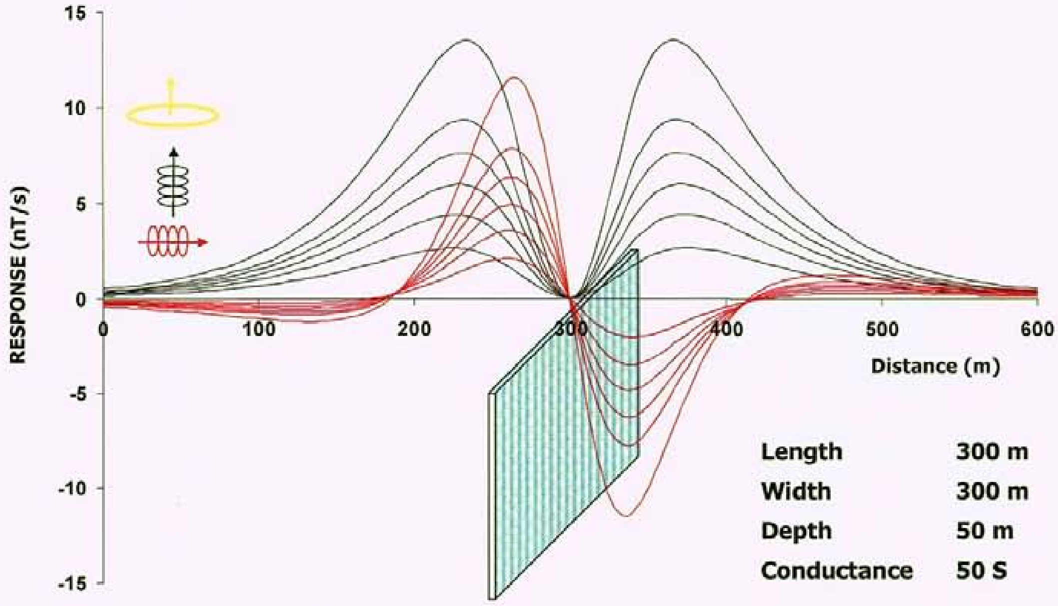



Figure 10. AeroTEM response to a 'thin' vertical conductor.

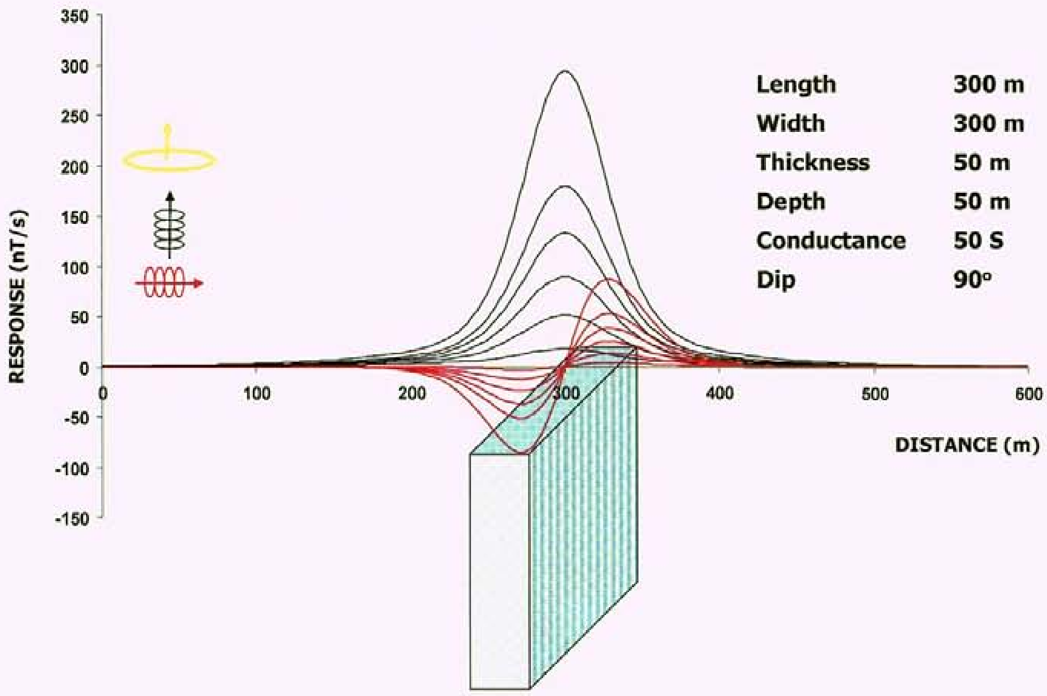



Figure 11. AeroTEM response for a 'thick' vertical conductor.

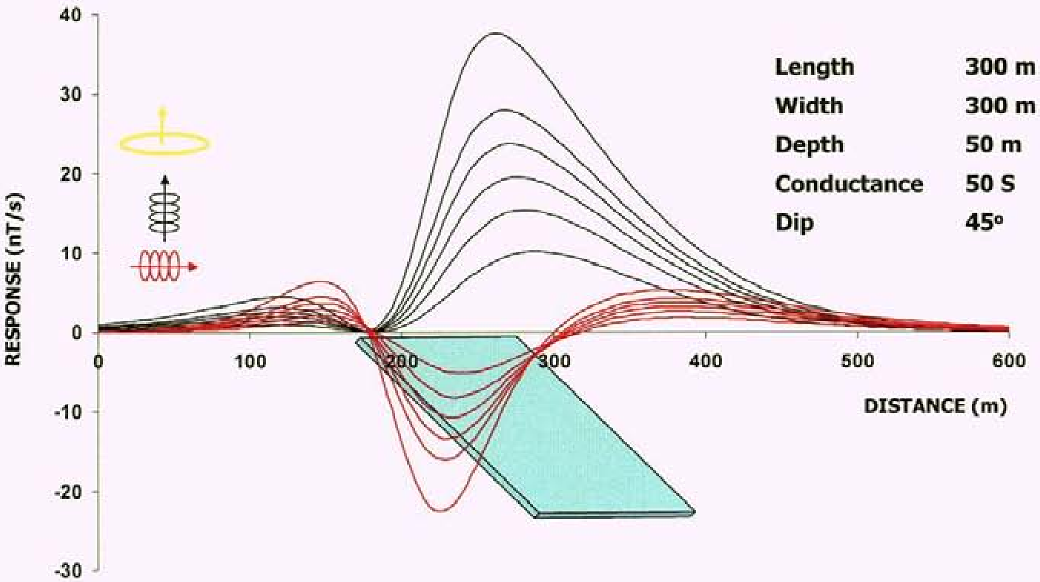



Figure 12. AeroTEM response over a 'thick' dipping conductor.

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.

### 10.3. EM Anomalies – Overview

The EM response of the area is summarised in Figure 13 . Priority zones identified by the client are indicated on Figure 13B. In general the survey area is resistive, with the exception of a conductive sedimentary package in the east-central portion of the block. This area of active response dominates the amplitude range of the gridded Z component data and indicates that the sediments here are likely at or near to surface. The x-component data shows that many of the responses in the area have a shallow dip towards the east. The calculated conductances of the EM responses in this area generally ranges from about 5- 30 S with a few responses showing higher calculated conductances. However, the complexity of the area makes it is difficult to discriminate possible anomalous VMS exploration targets from the responses originating from thicker sequences of sedimentary units. In this area, priority should be given to anomaly picks which have a correlating magnetic response and occur within a favourable geological environment. Extremely high amplitude EM responses near the margin of the survey block is sourced by salt water. EM data collected near the shorelines of the survey block and over areas with cultural activity should be interpreted with caution.

Numerous other anomalous EM responses occur throughout Western, Northern and South-Eastern portion of the survey block. survey block (Figure 13) and are indicated on the maps. The anomalies have been carefully reviewed to indicate only bedrock sources. In the priority areas (Figure 13B, P1, P2, P3), anomalies have been aggressively picked to include even weak bedrock sources where possible. Several of the indicated EM responses also show also North striking /East dipping trends,

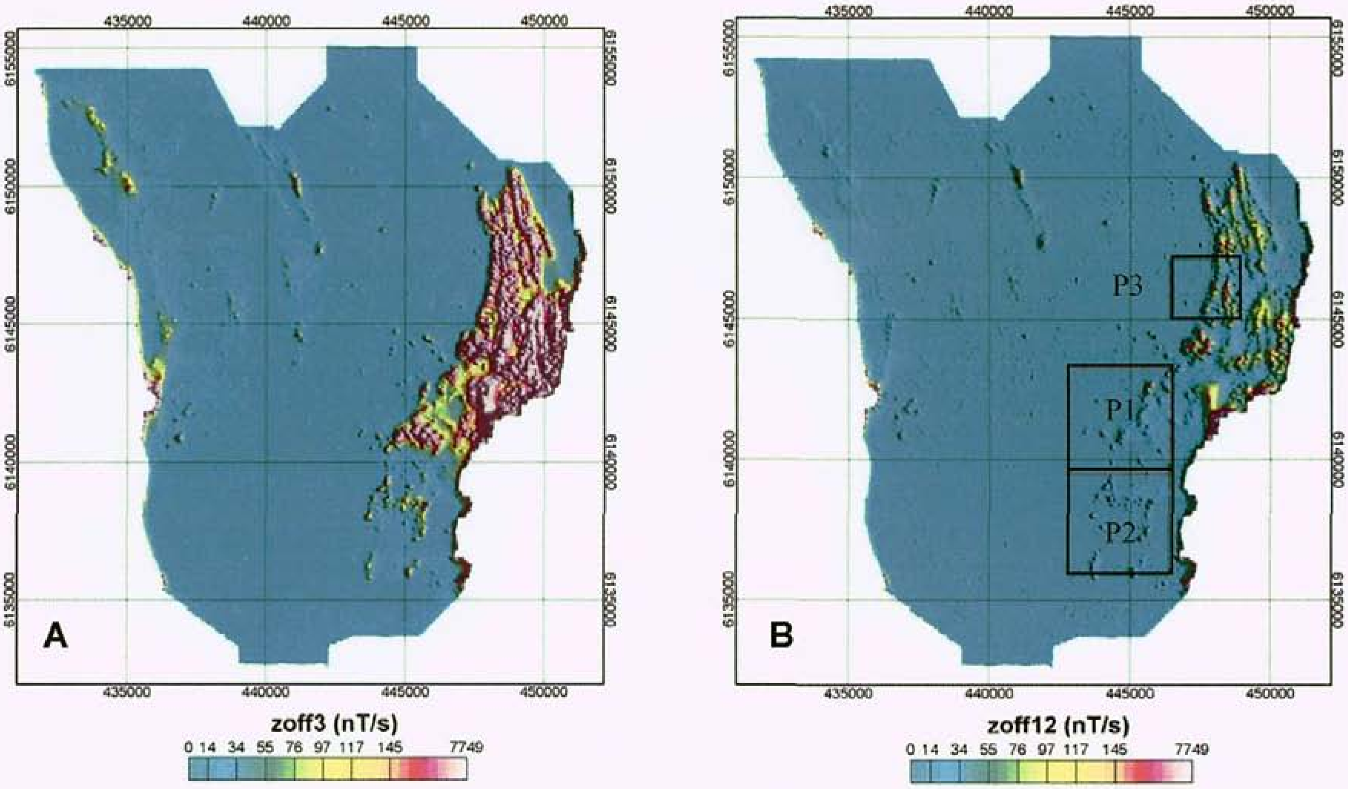



Figure 13. A) Z3 Off-time colour grid B) Z12 Off-time colour grid, highlighting higher conductance sources.

and are likely related to conductive sedimentary horizons. Again, EM Anomalies that directly correlate with magnetic responses are more likely to be sourced by VMS mineralization in this area. Anomalies that do not form linear trends and/or anomalies have a an anomalous interpreted dip direction are also more likely to be of exploration interest. The tables and text in the following sections highlight the most prominent EM targets for the priority areas as well as a few responses of interest outside of these zones.

### 10.4. Priority Area 1 Targets

| Anomaly | Comments | Easting | Northing |
|---|---|---|---|
| L112259C | Strong EM response with correlating discrete mag response. Appears to be dipping east. Should be ground checked at L112259B (444917E/ 6142918N). Follow up recommended. | 445015 | 6142917 |
| L11230G | Similar discrete EM/mag response as L112259C, but conductor is "thick-style" and near vertical. Follow up recommended. | 444793 | 6142818 |
| L11240E | Low conductance, but discrete EM source with discrete magnetic response. Ground truthing recommended as conductor appears to be at surface. Conductor likely dips S to L11250K. | 444206 | 6142708 |
| L11240F,G | Weak magnetic response occurring in a series of East dipping and N-S striking EM responses likely related to conductive sediments. May indicate a localised intrusion. Not a particularly good target but may be ground truthed at 445634E/ 6142710N. | 445718 | 6142715 |
| L11250G | Low conductance EM response on peak of a N-S striking magnetic high. Follow up recommended if geology is favourable. | 446235 | 6142619 |
| L11260D | Lower conductance EM source (2S), but is discrete and is located on the western margin of a small magnetic source. May be dipping east. Follow-up is recommended only if geology is favourable. | 444927 | 6142507 |
| L11280B | Weak conductor on margin of magnetic high. No response to North. Weaker positive magnetic trend continues SSE with associated EM response (see L11290G and L11300E). EM trends continue S within magnetic low. | 445340 | 6142307 |
| L11290E | Possible high conductance source (65S) dipping West within conductive background. No direct magnetic association but occurs in an area of magnetic complexity. X-component data not well defined due to EM complexity of the area. Review of the geology in the vicinity of the response is recommended. L11290F indicates down-dip heart of response. L11300F may indicate where the conductor is coming to surface. Follow-up is recommended. | 446133 | 6142210 |
| L11410F,G<br>L11420G | Two line EM response showing high calculated conductances 33-46S. On Eastern margin of some weak magnetic response. Possibly dipping steeply to the SW. Follow up recommended. | 444053 | 6140921 |
| L11480B | 3S response in area of EM complexity. Mag low trending NNE. | 446051 | 6140316 |
| L11650C,D | 38S response, dipping E. Line to south does not show response along strike. Subtle Mag high visible in 1VD grid. | 444446 | 6138613 |

Table 1. Priority Area 1 targets. All other anomalies in the area should be reviewed with available geological and geochemical information before follow-up. The Anomalies listed here can be found on the south-western portion of Map Plate 4.

### 10.5. Priority Area 2 Targets

| Anomaly | Comments | Easting | Northing |
|---|---|---|---|
| L11531B | Weak East-dipping conductor with subtle magnetic response. | 445458 | 6139811 |
| L11650B | Moderate conductance EM source on magnetic high. Likely sediment sourced. | 444942 | 6138617 |
| L11660A | Strong conductor, near to surface and striking NE. Response is centred over a high frequency magnetic low and surrounded by a magnetic high. May be conductive sediments but noted due to interesting magnetic setting. Dip near vertical. L11650F indicates similar along strike response. | 443733 | 6138515 |
| L11710D | Near surface EM response on high frequency magnetic high. 11S, dipping East. Weaker EM response to north for 3 lines and to the south for 1. – may be a localised intrusion/alteration along a sedimentary horizon. Follow up is recommended if the geology is favourable. | 443645 | 6138006 |
| L11750C | Discrete EM response (10S) on southern edge of subtle N-S trending magnetic lineament. Conductor appears to be dipping East. | 444024 | 6137609 |
| L11760A | Low amplitude, low conductance "thin" source on subtle magnetic high. Dipping East. | 443718 | 6137503 |
| L11790A | 8S, high amplitude EM response on subtle magnetic high. – may be sediment sourced as EM activity continues to the NE. | 445405 | 6137209 |
| L11840 A,B<br>L11850D,C | N-S striking thin conductor dipping East with subtle Mag association. Low conductance. | 443724 | 6136611 |
| L11903C,B<br>L11010C,D | N-S striking thin conductor clearly dipping WEST. Subtle Mag association. Moderate to high conductance (8-31S). and amplitude suggests that source is at or near to surface. Follow-up recommended. Co-ordinates indicate interpreted top edge of the response. | 445232<br>445209 | 6136111<br>6136011 |
| L11930A,B | Conductance on maps likely overestimated due to low amplitude response in the late time. Conductor at depth and also dipping west. | 445197 | 6135817 |

Table 2. Priority Area 2 Targets. All other anomalies in the area should be reviewed with available geological and geochemical information before follow-up. The Anomalies listed here can be found on on Map Plate 5.

### 10.6. Priority Area 3 Targets

The only target for Priory Area 3 is L10950M. It is a weak EM source with a N-S trend visible on adjacent lines but westerly dip. The anomaly occurs on a weak magnetic low visible in the 1VD and TILT grids. The EM response of the Eastern portion of the area is dominated by conductive sediments.

### 10.7. Other Anomalies of Note

| Anomaly | Comments |
|---|---|
| L10210B,C | Discrete EM response with Moderate conductance (12S) and correlating magnetic response. Dipping East. |
| L10291B L10302A | Corresponding magnetic response. Source likely between lines. Possible NE strike. 1- 3S conductance. |
| L10522A | Discrete EM response with correlating magnetic response. |
| | |
| L10592A,B | Moderate conductance response (13S) with correlating magnetic response. Dipping East. |
| L10640B,C | Linear EM response striking N-S. Conductor appears to have West dip at this point along strike as well as a correlating magnetic high. ~2S. |
| L10670L,M | Discrete EM response with moderate-high conductanve (19S) and correlating magnetic response |
| L10831C,D | |
| L10901C | High conductance response (71S) |
| L11001H,G L11011D | |
| L11090L (and surrounding anoms) | Oblate magnetic high (~ 900 nT), with correlating high conductance EM response on margin. |
| L11225B,C L11230 G | |

Table 3. Other anomalies of note outside of the priority zones .

Respectfully submitted,

Matthew Pozza MSc.

Geophysicist
Aeroquest Limited
June, 2006

# APPENDIX 1 – PROJECT CORNER COORDINATES

The Project consists of an irregular shaped block with boundaries as defined in the following table. Positions are in UTM Zone 9 – NAD83.

| X | Y |
|---|---|
| 431680.5 | 6154220.0 |
| 437764.6 | 6154153.1 |
| 438882.5 | 6152042.5 |
| 440580.0 | 6152083.8 |
| 442285.8 | 6153841.0 |
| 442285.2 | 6155043.5 |
| 445287.7 | 6155029.3 |
| 445286.8 | 6153814.6 |
| 448252.1 | 6150895.2 |
| 450035.8 | 6150831.5 |
| 451628.7 | 6148804.3 |
| 450610.1 | 6142538.1 |
| 448259.3 | 6141010.8 |
| 447434.1 | 6139210.2 |
| 447352.6 | 6135745.5 |
| 445384.6 | 6133688.1 |
| 443199.8 | 6133688.1 |
| 442137.7 | 6133350.2 |
| 442136.9 | 6132684.3 |
| 439137.1 | 6132684.9 |
| 439138.4 | 6133350.8 |
| 435881.9 | 6135691.1 |
| 435180.9 | 6139750.1 |
| 434943.6 | 6146036.4 |
| 432926.4 | 6148290.0 |
| 431858.4 | 6150662.2 |

## 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".

Database (05074_ anyox_final.gdb):

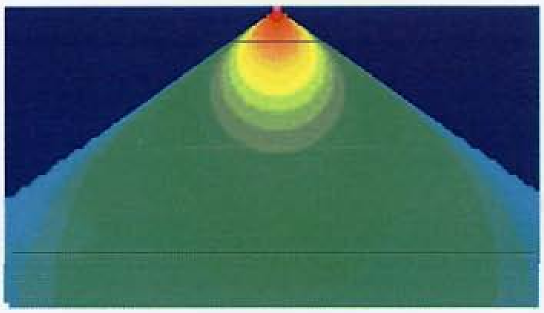
| Column | Units | Description |
|---|---|---|
| emfid | | AERODAS Fiducial |
| utctime | hh:mm:ss.ss | UTC time |
| x | m | UTM Easting (NAD83, zone 9N) |
| y | m | UTM Northing (NAD83, zone 9N) |
| galtf | m | GPS altitude (WGS84) |
| bheight | m | Terrain clearance of EM bird |
| dtm | m | Digital Terrain Model |
| magf | nT | Final leveled total magnetic intensity |
| basemagf | nT | Base station total magnetic intensity |
| zon | nT/s | Processed Streaming On-Time Z component Channels 1-16 |
| zoff | nT/s | Processed Streaming Off-Time Z component Channels 0-16 |
| xon | nT/s | Processed Streaming On-Time X component Channels 1-16 |
| xoff | nT/s | Processed Streaming Off-Time X component Channels 0-16 |
| pwrline | | Power line monitor channel |
| Anom_labels | | Letter label of conductor pick |
| Anom_ID | | Letter label of conductor thickness (N or K) |
| off_tau | µs | Off-time decay constant of conductor pick |
| on_con | S | On-time conductance |
| grade | | Classification from 1-7 based on conductance of conductor pick |
| off_allTau | µs | calculated off-time decay constant |

# APPENDIX 3: AEROTEM DESIGN CONSIDERATIONS

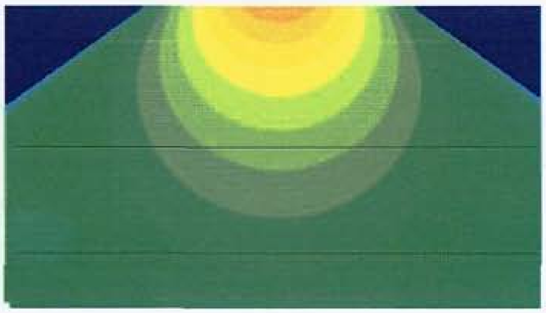
Helicopter-borne EM systems offer an advantage that cannot be matched from a fixed-wing platform. The ability to fly at slower speed and collect data with high spatial resolution, and with great accuracy, means the helicopter EM systems provide more detail than any other EM configuration, airborne or 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 favor 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.

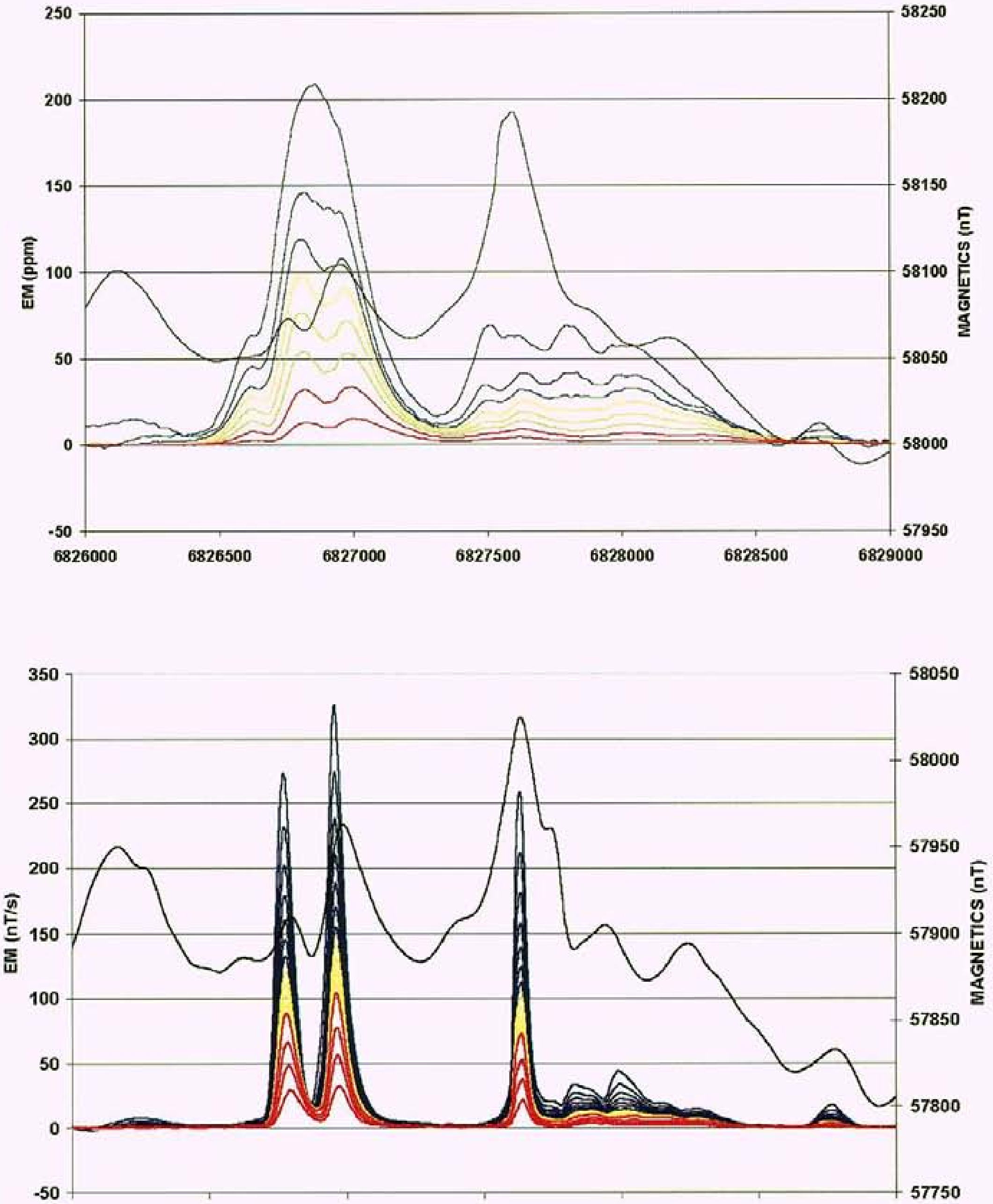



***Figure 2. Fixed-wing (upper) and AeroTEM (lower) comparison over the eastern limit of the Mesamax Deposit, a Ni-Cu-PGE zone located in the Raglan nickel belt and owned by Canadian Royalties. Both systems detected the Deposit further to the west where it is closer to surface.***

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 favorable 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.

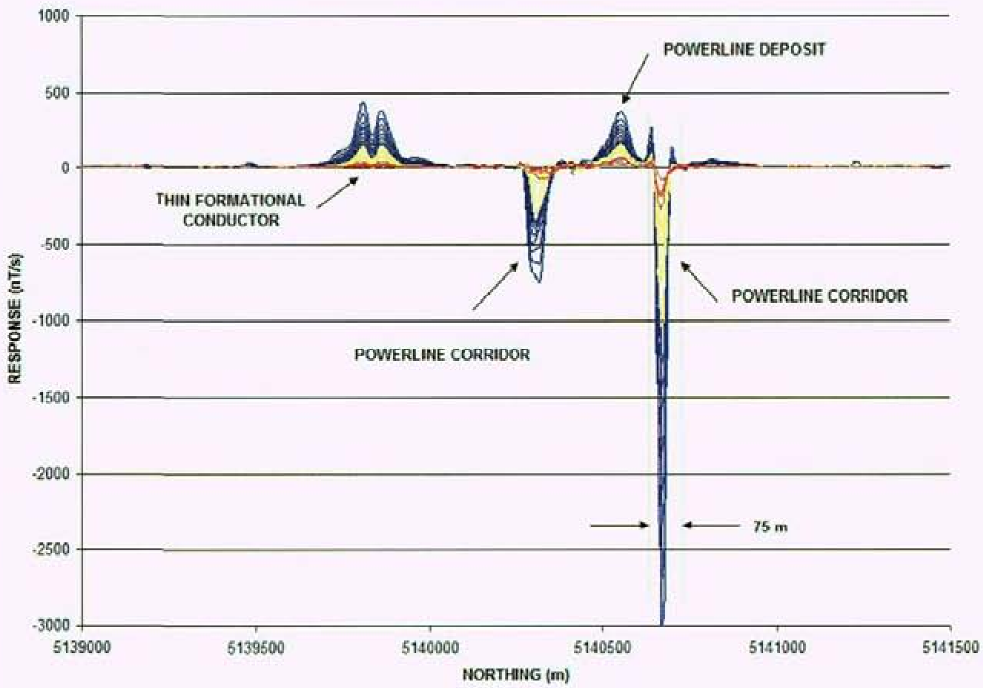



***Figure 3. The Powerline Deposit is located between two major power line corridors, which make EM surveying problematic. Despite the strong response from the power line, the anomaly from the Deposit is clearly detected. Note the thin formational conductor located to the south. The only way to distinguish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

***Advantage 2 – Conductance Discrimination***

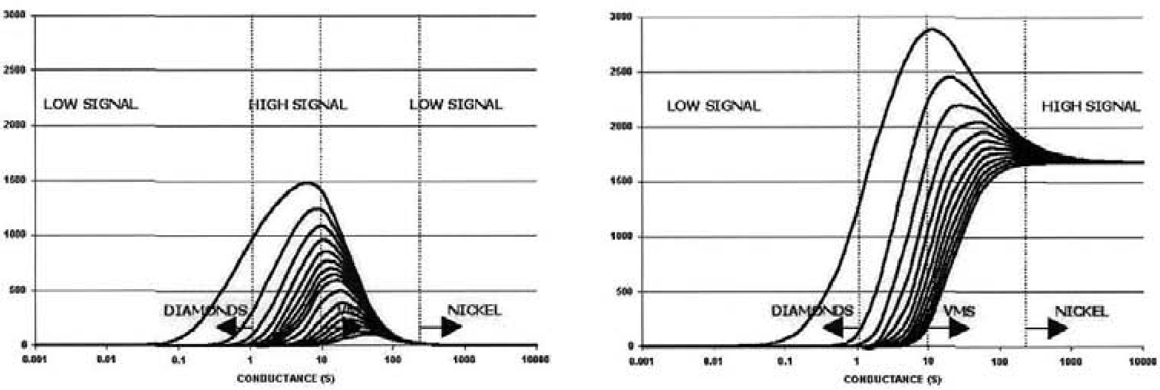
The AeroTEM system features full waveform recording and as such is able to measure the on-time response due to high conductance targets. Due to the processing method (primary field removal), there is attenuation of the response with increasing conductance, but the AeroTEM on-time measurement is still 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 inphase 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:

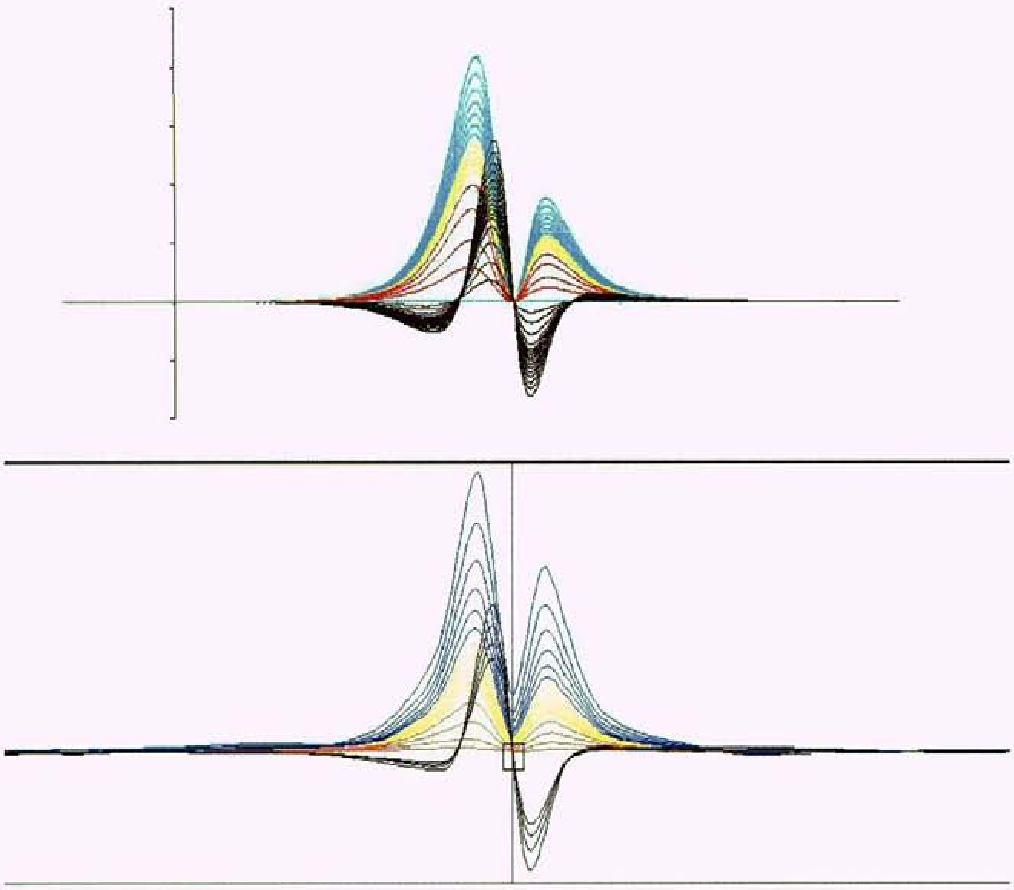


***Figure 5. Measured (lower) and modeled (upper) AeroTEM responses are compared for a thin steeply dipping conductor. The response is characterized by two peaks in the Z-axis coil, and a cross-over in the X-axis coil that is centered between the two Z-axis peaks. The conductor dips toward the higher 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 (Zaxis) 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.

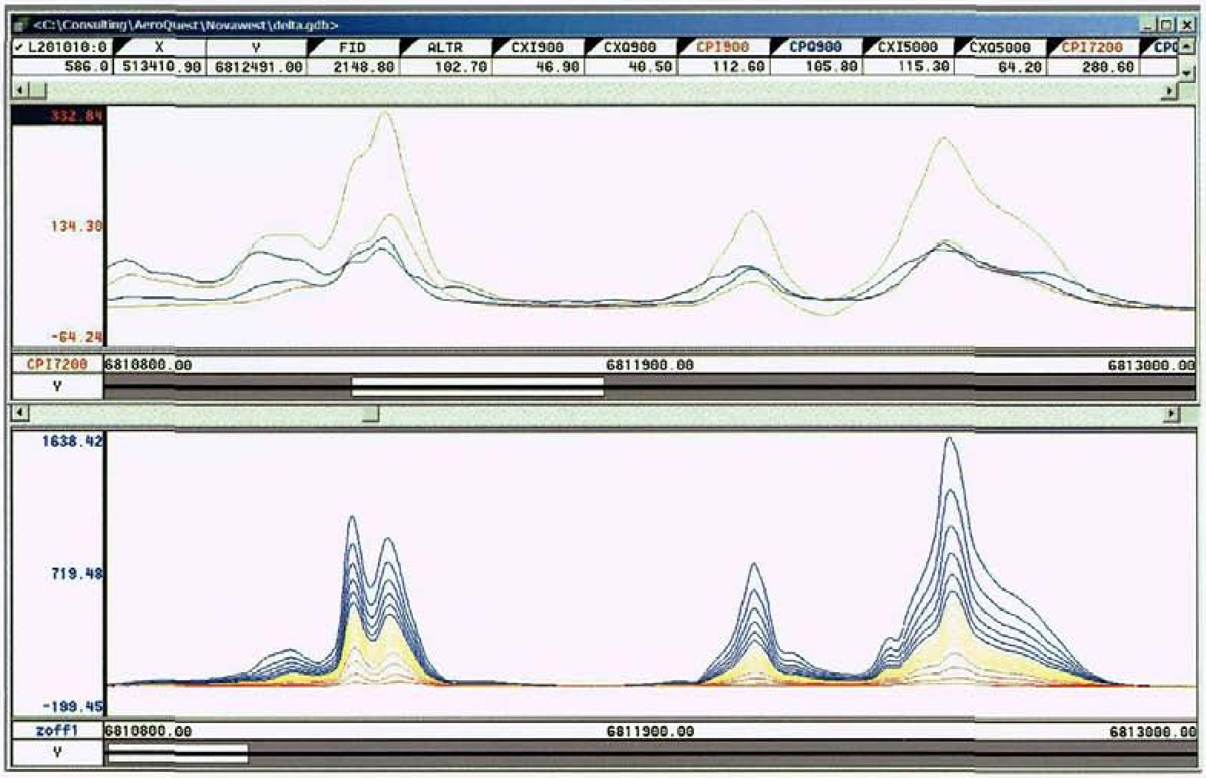



***Figure 6. Comparison between Dighem HEM (upper) and AeroTEM (lower) surveys flown in the Raglan area. The AeroTEM responses appear to be more discrete, suggesting that the data is not as heavily filtered as the HEM data. The S/N advantage of AeroTEM over HEM is about 5:1.***

**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 4: AeroTEM Instrumentation Specification Sheet

# AEROTEM Helicopter Electromagnetic System

### System Characteristics

- Transmitter: Triangular Pulse Shape Base Frequency 30 or 150 Hz
- Tx On Time - 5,750 (30Hz) or 1,150 (150Hz) μs
- Tx Off Time - 10,915 (30Hz) or 2,183 (150Hz) μs
- Loop Diameter - 5 m
- Peak Current - 250 A
- Peak Moment - 38,800 NIA
- Typical Z Axis Noise at Survey Speed = 8 ppb peak
- Sling Weight: 270 Kg
- Length of Tow Cable: 40 m
- Bird Survey Height: 30 m or less nominal

### Receiver

- Three Axis Receiver Coils (x, y, 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

- PROTODAS Digital recording at 126 samples per decay curve at a maximum of 300 curves per second (26.455 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 40,000 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.

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