



# **Ministry of Energy & Mines** Energy & Minerals Division

Geological Survey Branch

# ASSESSMENT REPORT TITLE PAGE AND SUMMARY

TITLE OF REPORT [type of survey(s)] Airborne Electromagnetic and Magnetic Survey of	TOTAL COST the Greater Granduc Mine Area \$194,437.50
AUTHOR(S) Timothy M. Marsh	SIGNATURE(S)(signed electronically)
NOTICE OF WORK PERMIT NUMBER(S)/DATE(S) N/A  STATEMENT OF WORK - CASH PAYMENT EVENT NUMBER(S)/DATE( 4052951/October 28, 2005 (\$40,376.66	
PROPERTY NAMEGranduc Mine	
CLAIM NAME(S) (on which work was done)	, 415488, 415489, 508890, 508892, 508703, 508705,
508775, 508777, 508828, 508887, 508888, 508889,	508891, 508893, 508894, 508895, 508898
COMMODITIES SOUGHT Cu, Ag, Au, Co, Fe	
MINERAL INVENTORY MINFILE NUMBER(S), IF KNOWN 10	4B 021
MINING DIVISION Skeena	NTS104B/01, 08
LATITUDE 56 0 12 , 41 " LONGITUDE	
OWNER(S)  1) 200467 Bell Resources Corporation	2)126630 Teuton Resources Corporation
MAILING ADDRESS	
400-1780 Burrard Street	
Vancouver, B.C. V6C3A6	
OPERATOR(S) [who paid for the work]  1)	2)
MAILING ADDRESS 400-1780 Burrard Street	
Vancouver, B.C. V6C3A6	
PROPERTY GEOLOGY KEYWORDS (lithology, age, stratigraphy, structu Triassic Stikine terrane, Stuhini group, Besshi- South Unuk Shear Zone, Granduc Mine, exhalite	ure, alteration, mineralization, size and attitude): -type, volcanogenic massive sulfide (VMS) deposit
REFERENCES TO PREVIOUS ASSESSMENT WORK AND ASSESSME	NT REPORT NUMBERS ARIS #s 00088, 00089, 00090, 000

TYPE OF WORK IN THIS REPORT Geophysical	EXTENT OF WORK (IN METRIC UNITS) 1206 line-kilometers	ON WHICH CLAIMS (see above list)	PROJECT COSTS APPORTIONED (incl. support)
GEOLOGICAL (scale, area)		(200 02010 1120)	(man sappony
Ground, mapping			
Photo interpretation			
GEOPHYSICAL (line-kilometres)			
Ground			
Magnetic			
Electromagnetic			
Radiometric			
Seismic			
Other			
AirborneElectromagnetic/		(see above list)	\$194,437.50
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	\$194,437.50

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#### Introduction

The technical work described in this report comprises a helicopter-borne electromagnetic/magnetic survey over 11,000 hectares centered on the historically productive Granduc Mine, which is now owned by Bell Resources Corporation. The survey was completed in May 2005 in order to identify new copper-bearing massive sulfide deposits like Granduc on 13 mineral tenures surrounding Bell's crown-granted claims. Aeroquest Limited, of Milton, Ontario, completed the geophysical work under contract to Bell Resources Corporation at a direct survey cost of \$194,437.50. The results of this survey are included as Appendix A of this report.

The 13 mineral tenures for which work credit has been applied are owned either directly by Bell Resources or are held under option to Bell Resources through their current owner, Teuton Resources Corporation. As the area of the aerial geophysical survey extended beyond the bounds of these 13 mineral tenures, the work expenditure has been reduced to \$142,518.14, in proportion to the area of intersection between the survey and the mineral tenures. No expenditure has been claimed for parts of these 13 tenures extending beyond the limits of the survey. Likewise, no expenditure has been claimed for parts of the survey extending beyond the tenures, nor for parts extending over crown claims. No expenditure has been claimed for preparation of this report.

An initial statement of work for this geophysical survey was filed on October 28, 2005 as MT Online Event #4052951 for those mineral tenures owned by Bell Resources, and a second statement of work was filed on February 10, 2006 as MT Online Event #4069251 for those tenures owned by Teuton Resources. The apportionment of the survey cost to the mineral tenures through these two statements of work is summarized in the following table.

# Statement of Work (Technical) - Bell Resources Corporation/Teuton Resources Granduc Project

Aeroquest Survey Total Cost
Line Kilometers Surveyed
Total Survey Area
Prorating Ratio

\$194,437.50
1206 km
11032 ha
11032 ha

Tenure	Claim Name	Owner	SOW Event	Claim Area (ha)	Surveyed Area (ha)	Expenditure
415482	TON-1	200467 (100%)	4052951	500.0	241.1	\$4,250.32
415483	TON-2	200467 (100%)	4052951	500.0	0.0	\$0.00
415484	TON-3	200467 (100%)	4052951	500.0	384.2	\$6,772.29
415485	TON-4	200467 (100%)	4052951	500.0	0.0	\$0.00
415486	PEARSON 1	200467 (100%)	4052951	500.0	500.0	\$8,812.66
415487	PEARSON 2	200467 (100%)	4052951	500.0	218.3	\$3,847.02
415488	PEARSON 3	200467 (100%)	4052951	500.0	500.0	\$8,812.66
415489	PEARSON 4	200467 (100%)	4052951	500.0	447.2	\$7,881.72
508890	Tunnel 1	200467 (100%)	4052951	449.722	0.0	\$0.00
508892	Tunnel 2	200467 (100%)	4052951	449.724	0.0	\$0.00
					•	\$40,376.66
500700		100000 (1000()	4000054	4000.070	40.47.0	<b>#</b> 40.450.00
508703		126630 (100%)	4069251	1062.373	1047.3	\$18,458.80
508705		126630 (100%)	4069251	953.487	938.6	\$16,542.28
508775		126630 (100%)	4069251	143.976	144.0	\$2,537.62
508777		126630 (100%)	4069251	360.098	335.6	\$5,915.75
508828		126630 (100%)	4069251	899.306	894.2	\$15,760.06
508887 Le	educ Silver NW	126630 (100%)	4069251	431.614	425.6	\$7,500.58
508888 Le	educ Silver W1	126630 (100%)	4069251	431.797	427.6	\$7,535.92
508889 Le	educ Silver W2	126630 (100%)	4069251	431.981	335.6	\$7,613.80
508891 Le	educ Silver SW1	126630 (100%)	4069251	432.165	426.4	\$7,515.88
508893 Le	educ Silver SW2	126630 (100%)	4069251	450.369	116.1	\$2,046.35
508894 Le	educ Silver S	126630 (100%)	4069251	450.362	194.5	\$3,427.41
508895 Le	educ Silver SE	126630 (100%)	4069251	360.239	50.3	\$886.28
508898		126630 (100%)	4069251	377.926	363.2	\$6,400.76
					•	\$102,141.48

# Summary - Exploration and Development Work (Technical)

Event Number	Owner	Work Amount
4052951	200467 (100%)	\$40,376.66
4069251	126630 (100%)	\$102,141.48
		\$142,518.14

## **APPENDIX A**

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



# Aeroquest Job # 05010 Granduc Project

Stewart Area, British Columbia NTS 104B/01,08

for

# **Bell Resources Corporation**

#1780-400 Burrard Street, Vancouver, BC V6C 3A6

by

# =AEROQUEST LIMITED

4-845 Main Street East Milton, Ontario, L9T 3Z3 Tel: (905) 693-9129 Fax: (905) 693-9128 www.aeroquestsurveys.com June, 2005

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#### 2. INTRODUCTION

This report describes a helicopter-borne geophysical survey carried out on behalf of Bell Resources Corporation on the Granduc Project, in the Stewart area, British Columbia.

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 kilometers flown totaled 1206 km. The survey flying described in this report took place between April 22nd and May 4th, 2005.

#### 3. SURVEY AREA

The Granduc Property is located approximately 40 km NW of Stewart, BC. The field crew were based the King Edward Hotel, Stewart. The helicopter was provided by HiWood helicopters, Calgary, Alberta and it was stationed at VHS Heli-pad in Stewart for the duration of the survey.



Figure 1. Regional location map of the project area.

#### 4. SURVEY SPECIFICATIONS AND PROCEDURES

The survey specifications are summarized in the following table:

Project Name	Line Spacing (m)	Tie-Line Spacing (m)	Line Direction	Tie-Line Direction	Survey Coverage (line-km)	Dates Flown
Granduc	100	1000	67°	159°	1206	April 22 <sup>nd</sup> to May 4th, 2005.

The survey coverage was calculated by adding up the along-line distance of the survey lines and control (tie) lines in the final Geosoft database. The database was windowed to the survey block outline prior to this calculation. The survey was flown with a spacing of 100 m. The control (tie) lines were flown perpendicular to the survey lines with a spacing of 1000 m.

The nominal EM bird terrain clearance is 30m (98 ft). The magnetometer sensor is mounted in a smaller bird connected to the tow rope 21 metres above the EM bird and 17 metres below the helicopter (Figure 4). Nominal survey speed is 75 km/hr. 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 2-3 metres along the flight path.

Navigation is carried out using a GPS receiver, an AGNAV2 system for navigation control, and an RMS 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.

Unlike frequency domain electromagnetic systems, the AeroTEM© II system has negligible drift due to thermal expansion. The system static offset is removed by high altitude zero calibration lines and employing local leveling corrections where necessary.

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. He also maintains a detailed flight log during the survey noting the times of the flight and any unusual geophysical or topographic features.

On return of the pilot and operator to the base usually after each flight, the ProtoDAS 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.

### 5. AIRCRAFT AND EQUIPMENT

#### 5.1. Aircraft

A Eurocopter (Aerospatiale) AS350B2 "A-Star" helicopter - registration C-GPTG used as survey platform. The helicopter was owned and operated by HiWood Helicopters, Calgary, Alberta. Installation of the geophysical and ancillary equipment was carried out by AeroQuest Corp at VHS Helicopters in Stewart, BC and the helicopter was based here for the duration of the survey. The survey aircraft was flown at a nominal terrain clearance of 220 ft (70 m).



Figure 2. Survey helicopter C-GPTG

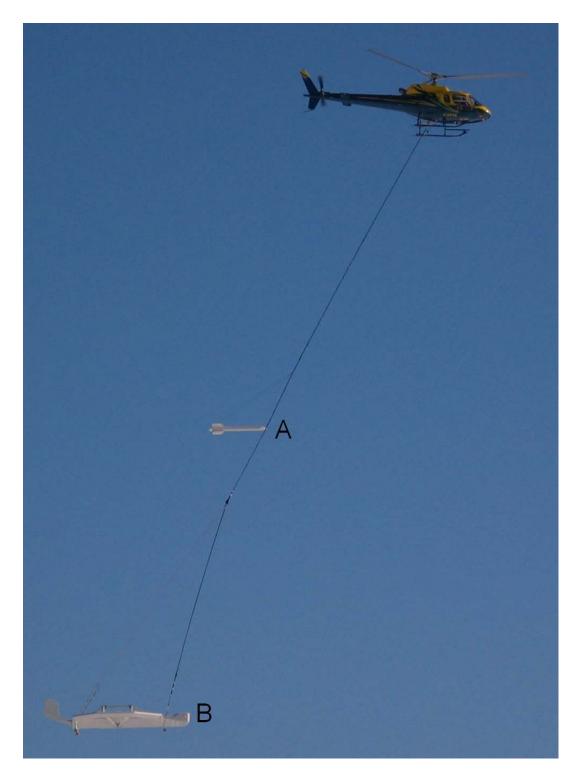


Figure 4. The magnetometer bird (A) and AeroTEM II EM bird (B)

#### **5.2.** 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. 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.

#### **5.3.** Electromagnetic System

The electromagnetic system is an AeroQuest AeroTEM© II time domain towed-bird system. 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 1.150 ms and a base frequency of 150 Hz. 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 26.0 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 PROTODAS system which records the full waveform.



Figure 3. AeroTEM II Instrument Rack

## **5.4. PROTODAS Acquisition System**

The 128 channels of raw streaming data are recorded by the PROTODAS acquisition system 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	Stop	Mid	Width
			(us)	(us)	(us)	(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

#### 5.5. 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	Noise tolerance
Z1, X1	1269.8	1322.8	52.9	48-50	20 ppb
Z2	1322.8	1455.0	132.2	50-54	20 ppb
Z3	1428.6	1587.3	158.7	54-59	15 ppb
Z4	1587.3	1746.0	158.7	60-65	15 ppb
Z5	1746.0	2063.5	317.5	66-77	10 ppb
Z6	2063.5	2698.4	634.9	78-101	10 ppb

#### 5.6. Magnetometer Base Station

The base magnetometer was a Geometrics 858 with a built in GPS receiver and external GPS antenna. Data logging and UTC time synchronisation was carried out within the magnetometer, with the GPS providing the timing signal. That 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 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.

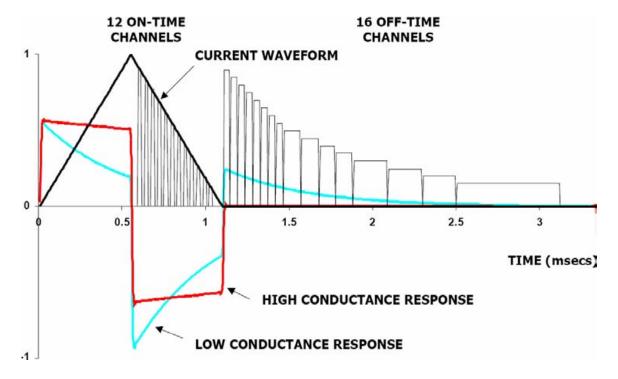


Figure 4. Schematic of Transmitter and Receiver waveforms

#### 5.7. 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.

#### 5.8. Video Tracking and Recording System

A high resolution colour digital video camera is used to record the helicopter ground flight path along the survey lines. The video is digitally annotated with GPS position, time and fiducial number, which can be used to verify ground positioning information and cultural causes of anomalous geophysical responses. The data is achieved digitally at the Aeroquest head office.

#### 5.9. 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 9N 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.

#### 5.10. 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 PROTODAS data acquisition system. The channel sampling commences at the start of the Tx cycle and the width of each channel is 26.445 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.

#### 6. PERSONNEL

The following AeroQuest personnel were involved in the project:

- Manager of Operations: Bert Simon
- Field Data Processors: Nick Venter
- Field Operators: Mark Fortier
- Data Interpretation and Reporting: Jonathan Rudd, Nick Venter, Gordon Smith, Marion Bishop

The survey pilot Paul Kendell was employed directly by the helicopter operator – HiWood Helicopters Ltd.

#### 7. DELIVERABLES

The report includes a set of three geophysical maps plotted at a scale of 1:20,000.

- Map 1: Total Magnetic Intensity contour grid with line contours and EM anomalies
- Map 2: Tilt Derivative of Total Magnetic Field shaded grid with EM anomalies
- Map 3: Z11, Z13, Z15 Off-Time EM offset profiles and EM anomalies
- Map 4: Z11, Z13, Z15 On-Time EM offset profiles 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 100 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.

#### 8. 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.

#### 8.1. 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 9. 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

The skeletal topography was derived from the Federal Government's 1: 250,000 NTS map series.

#### 8.2. 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 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.

#### 8.3. 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 Corp. 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 filtering of the stacked data is designed to remove or minimize high frequency noise that can not be sourced from the geology. An overburden stripped response was generated by subtracting the off-time response from the on-time response for the X1 to X16 and Z1 to Z16 channels. New RMS emulation channel windows, Z1New to Z6New and X1New, were calculated based on the original 6 z-component and 1 x-component channels that the AeroTEM I system recorded in order to provide for compatibility and comparisons with earlier AeroTEM surveys.

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 imported into an array format and are labeled in the database as 'Zon' (Z on-time channels 1-16), 'Zoff' (Z off-time channels 0-16), 'Xon' (X on-time channels 1-16), and 'Xoff' (X off-time channels 0-16).

Apparent bedrock EM anomalies were interpreted with the aid of an auto-pick from positive peak excursions in the on-time Z channel responses. The auto-pick algorithm was based on two criteria, 1) a minimum threshold of 30 nT/s in the 4<sup>th</sup> Zon channel (Zon4) and 2) a peak in Zon4 channel as defined by two leading values that are increasing, and two trailing values that are decreasing with a minimum amplitude of 8 nT/s. 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, and to identify cultural EM anomalies. 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 on-time and 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. Each conductor pick was then classified according to a set of seven ranges of calculated on-time conductance values, since the on-time data provide a more accurate measure of the conductance 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 on-time conductance were classified as a low conductance source. EM response interpreted as originating from power lines or other cultural sources are identified on the maps as unique symbols.

#### 8.4. 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 total magnetic intensity (TMI) grid provided the basis for threading the presented contours which have a minimum contour interval of 5 nT.

In order to map shallow basement response a 'tilt' derivative product was calculated from the TMI grid. The Tilt Derivative (TDR) of the TMI tends to enhance smaller wavelength magnetic features which define shallow basement structures as well as potential mineral exploration targets.

The TDR is defined as:

where VDR and THDR are first vertical and total horizontal derivatives, respectively, of the total magnetic intensity T.

$$VDR = dT/dz$$

$$THDR = sqrt ( (dT/dx)^{2} + (dT/dy)^{2} )$$

Respectfully submitted,

Nick Venter, M.Sc. Aeroquest Corp. June, 2005

# **APPENDIX 1 – PROJECT CORNER COORDINATES**

The Granduc Project has a boundary which is defined in the following table. All geophysical data presented in this report have been windowed to this outline. Positions are in UTM Zone 9 - NAD83.

Corner	Easting (m)	Northing (m)	
1	408815.0	6243775.0	
2	415237.0	6246513.0	
3	418451.0	6239250.0	
4	420563.0	6233726.0	
5	421587.0	6228947.0	
6	418438.8	6226691.5	
7	418575.0	6226387.1	
8	415815.3	6225210.5	
9	415490.5	6225938.4	
10	411133.0	6226304.0	
11	411601.0	6236441.0	
12	410792.0	6239481.0	
13	408752.0	6241322.0	

# **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".

# **Geosoft Database Channel Description:**

Column	Description
Χ	Zone 9 UTM Easting in metres (NAD83)
Υ	Zone 9 UTM Northing in metres(NAD83)
emfid	DAS Fiducial counter
pwrline	Culture/powerline monitor
bheight	Terrain clearance of EM bird in feet
Dtm	Digital Terrain Model in metres
Mag	Diurnally corrected total magnetic intensity in nT
basemagf	Mag basestation (diurnal)
galtf	GPS altitude WGS84
Lat_wgs84	GPS Latitude WGS84
Long_wgs84	GPS Longitude WGS84
ZON	Processed Streaming On-Time Z component Array 1-16 in nT/s
ZOFF	Processed Streaming Off-Time Z component Array 0-16 in nT/s
XON	Processed Streaming On-Time X component Array 1-16 in nT/s
XOFF	Processed Streaming Off-Time X component Array 0-16 in nT/s
Grade	Classification from 1-7 based on conductance of conductor pick
Thick-Thin	Type of conductor response (either K or N)
Anom_labels	Letter label of conductor pick
off_con2	Off-time conductance in siemens
on_con2	On-time conductance in siemens
utctime	GPS time

## **APPENDIX 3: AeroTEM Instrumentation Specification Sheet**

# =AEROQUEST LIMITED

Tel: +1 905 878-5616. Fax: +1 905 876-0193. Email: sales@aeroquestsurveys.com

# **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 128 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**

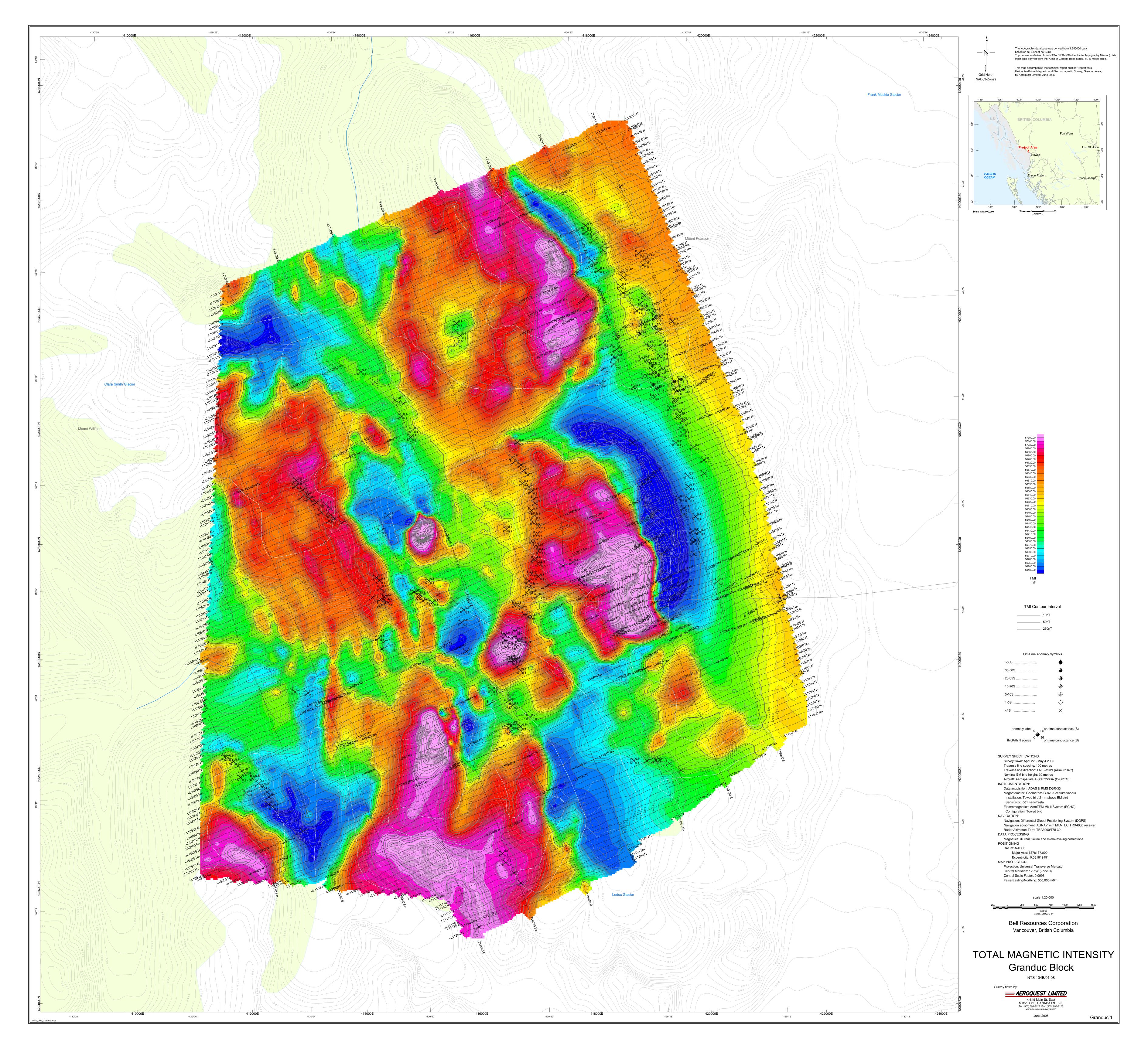
Comparing a fixed-wing time domain transmitter with a typical moment of 500,000 NIA flying at an altitude of 120 m with a Helicopter TDEM at 30 m, notwithstanding the substantial moment loss in the airframe of the fixed wing, the same penetration by the lower flying helicopter system would only require 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.

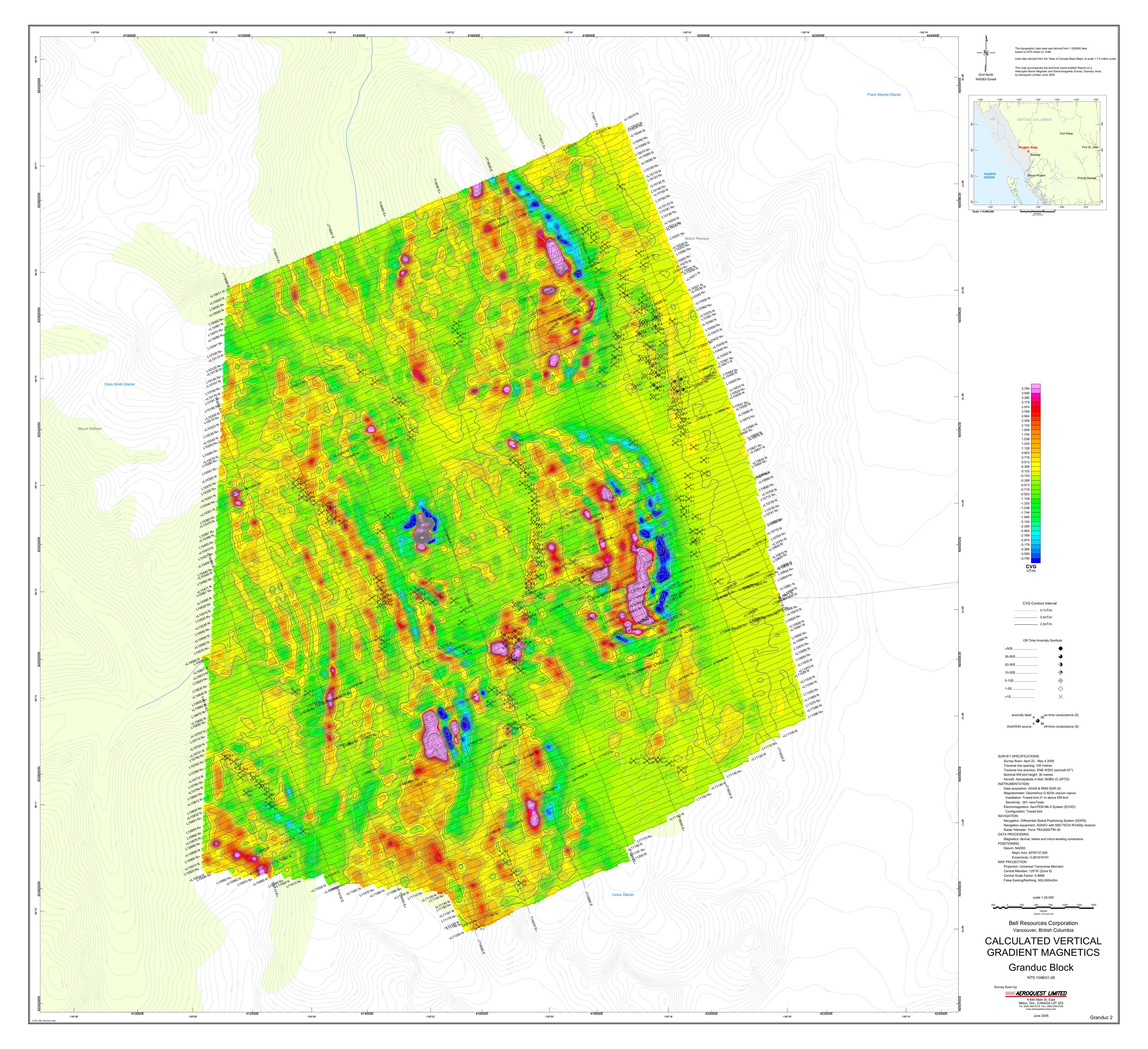
## **APPENDIX 4: Statement of Qualifications**

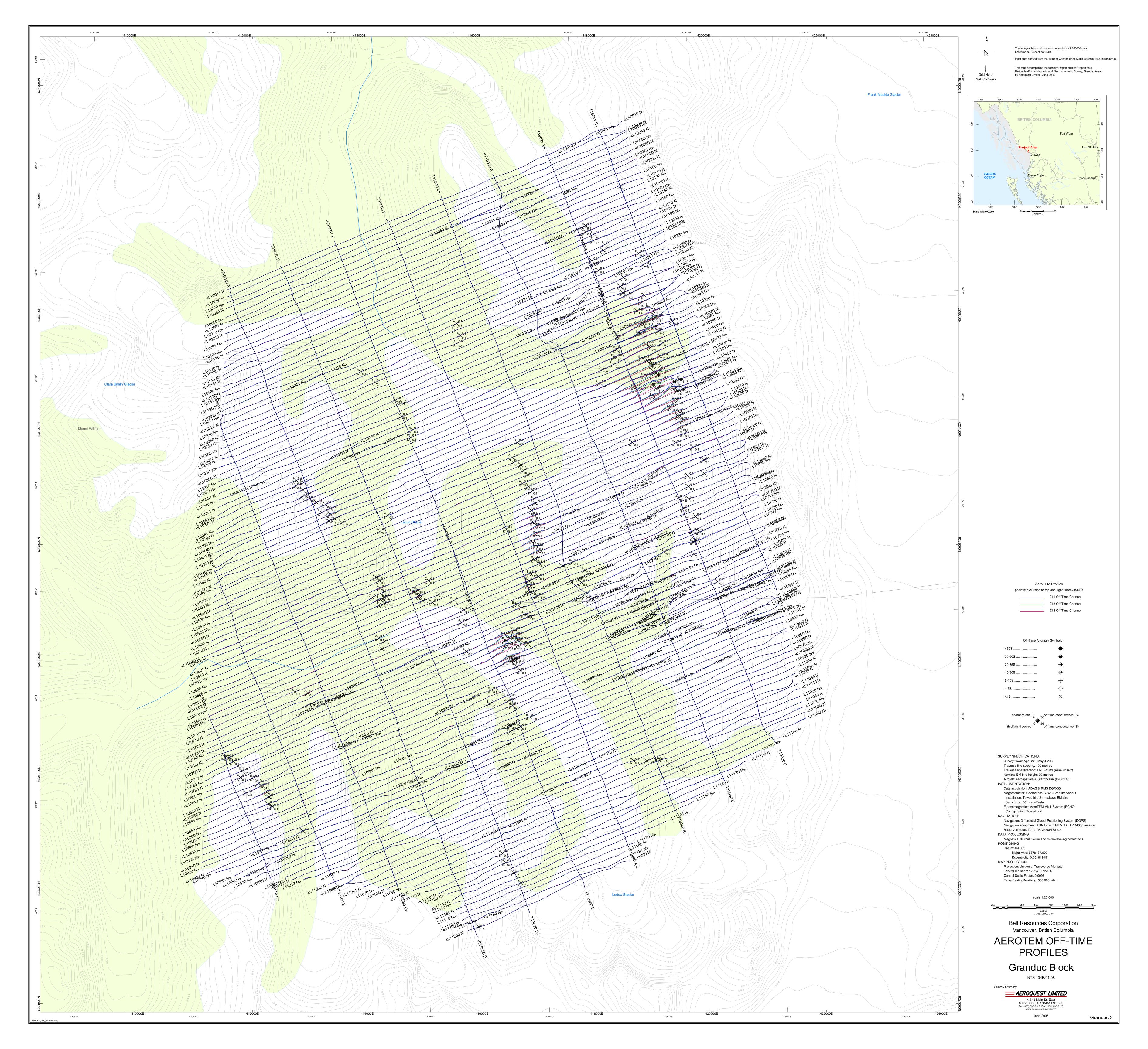
# Jonathan Rudd, P.Eng.

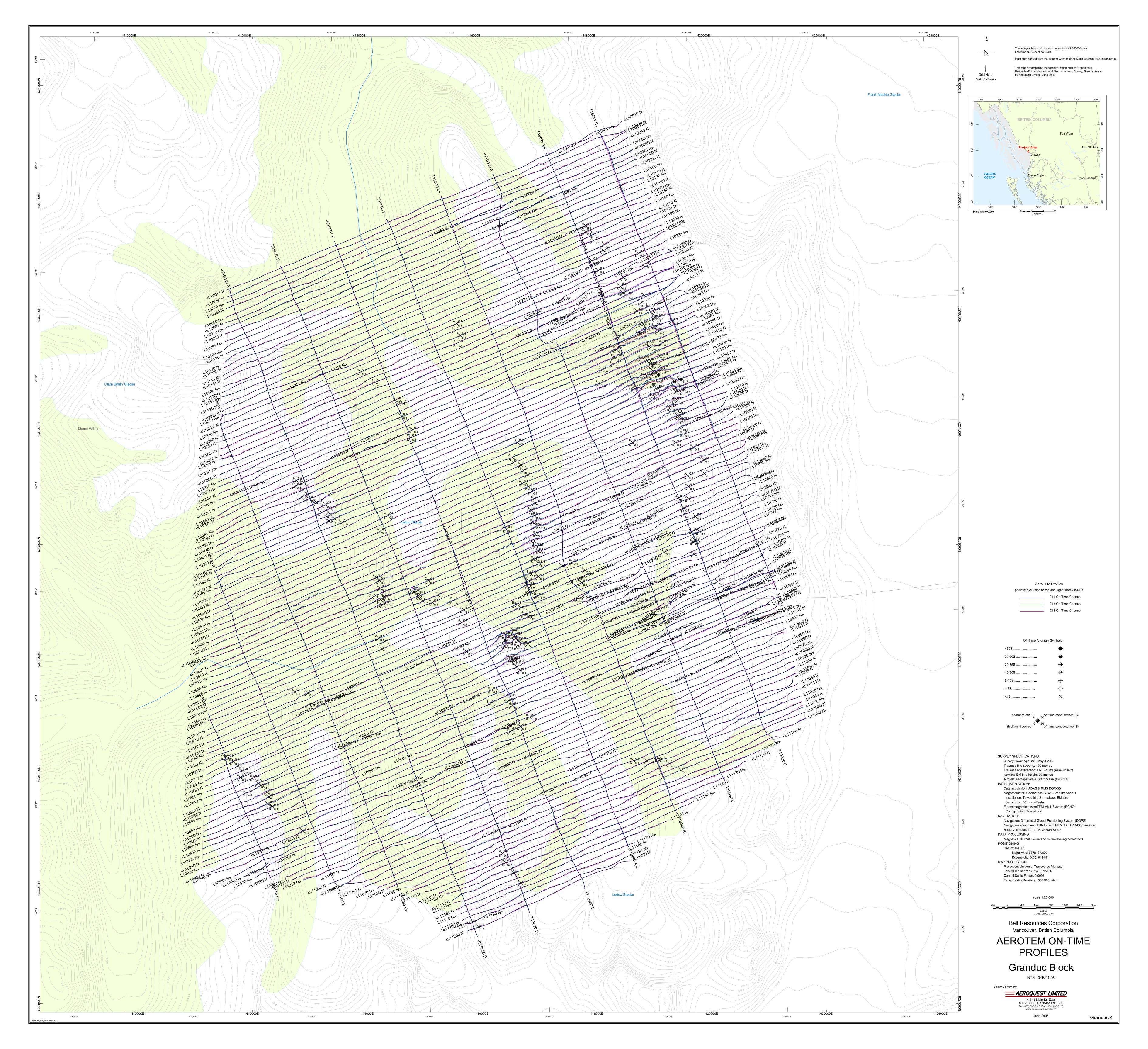
- 1. I am a full-time employee of Aeroquest Corp., based in Milton, Ontario, Canada.
- 2. My residence is at 54 Alona Avenue, Cambridge, Ontario, N3C 3Y4.
- 3. I graduated with an honours B.Sc.E. in Geological Engineering in Geophysics, 1988, from Queen's University, Kingston, ON.
- 4. I have been practicing continuously as an exploration geophysicist for 16 years.
- 5. I am a registered as a Professional Engineer and am entitled to engage in the practice of professional engineering in the province of Ontario under the terms of the Professional Engineers Act, Revised Statutes of Ontario, 1990, Chapter p 28.
- 6. Non-professional affiliations: Society of Exploration Geophysicists, Prospectors and Developers Association of Canada, Sudbury Prospectors and Developers Association, Sudbury Geological Discussion Group, Ontario Prospectors Association
- 7. I directly supervised the airborne geophysical work as described in this report.

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### **Statement of Qualifications**

# Timothy M. Marsh, PhD, P. E.

- 1. I am an officer of Bell Resources Corporation, based in Vancouver, British Columbia, Canada.
- 2. My residence is at 10354 East Jan Avenue, Mesa, Arizona, 85209, United States of America.
- 3. I graduated in 1986 with a B.S. in Geological Engineering as Outstanding Senior, Kappa Mu Epsilon (math), Tau Beta Pi (engineering), Colorado School of Mines, Golden, Colorado.
- 4. I graduated in 1997 with a PhD in Applied Earth Sciences, Ore Deposits and Exploration, from Stanford University, Stanford, California.
- 5. I have been practicing as a geological engineer and geologist for 15 years.
- 6. I am registered as a Professional Engineer and am entitled to engage in the practice of professional engineering in the state of Arizona under the terms of the Board of Technical Registration, Title 32, Arizona Revised Statutes.
- 7. I am affiliated with the following organizations: Society of Economic Geologists, Society for Mining, Metallurgy, and Exploration, and Arizona Geological Society.
- 8. I assembled and reviewed all of the components of this report.