Operations Report

INTERNATIONAL EXPLORERS AND PROSPECTORS INC.

Walker-Wilkie Project
Timmins Area, ON

Airborne Horizontal Gradient Magnetic Survey

Timmins Area, ON

April 30, 2014

Report #: B-424

Requested By:
Matthew Johnston
Consulting Geophysicist

Prepared by:
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Terraquest Ltd.

Table of Contents

1. Introduction

1.1. Executive Summary

This report describes the specifications and parameters of an airborne geophysical survey carried out for:

INTERNATIONAL EXPLORERS AND PROSPECTORS INC.
168 Algonquin Blvd. East
Timmins, ON
P4N 1A9

Attention: Matthew Johnston Tel: 705-268-8921 Email: mjohnston@onlink.net
Claude Bonhomme

The survey was performed by:

TERRAQUEST LTD.,
2-2800 John Street, Markham
ON, Canada L3R 0E2

Tel: 905-477-2800 ext. 22 Email: hb@terraquest.ca.

The purpose of the survey of this type is to collect geophysical data for the exploration of mineral resources. Magnetic responses can be used to guide mineral exploration by using the contoured patterns of the geophysical data to make interpretations regarding the surface and subsurface geology and structure. The data are carefully processed and contoured to produce grid files and maps that show distinctive patterns of the geophysical parameters.

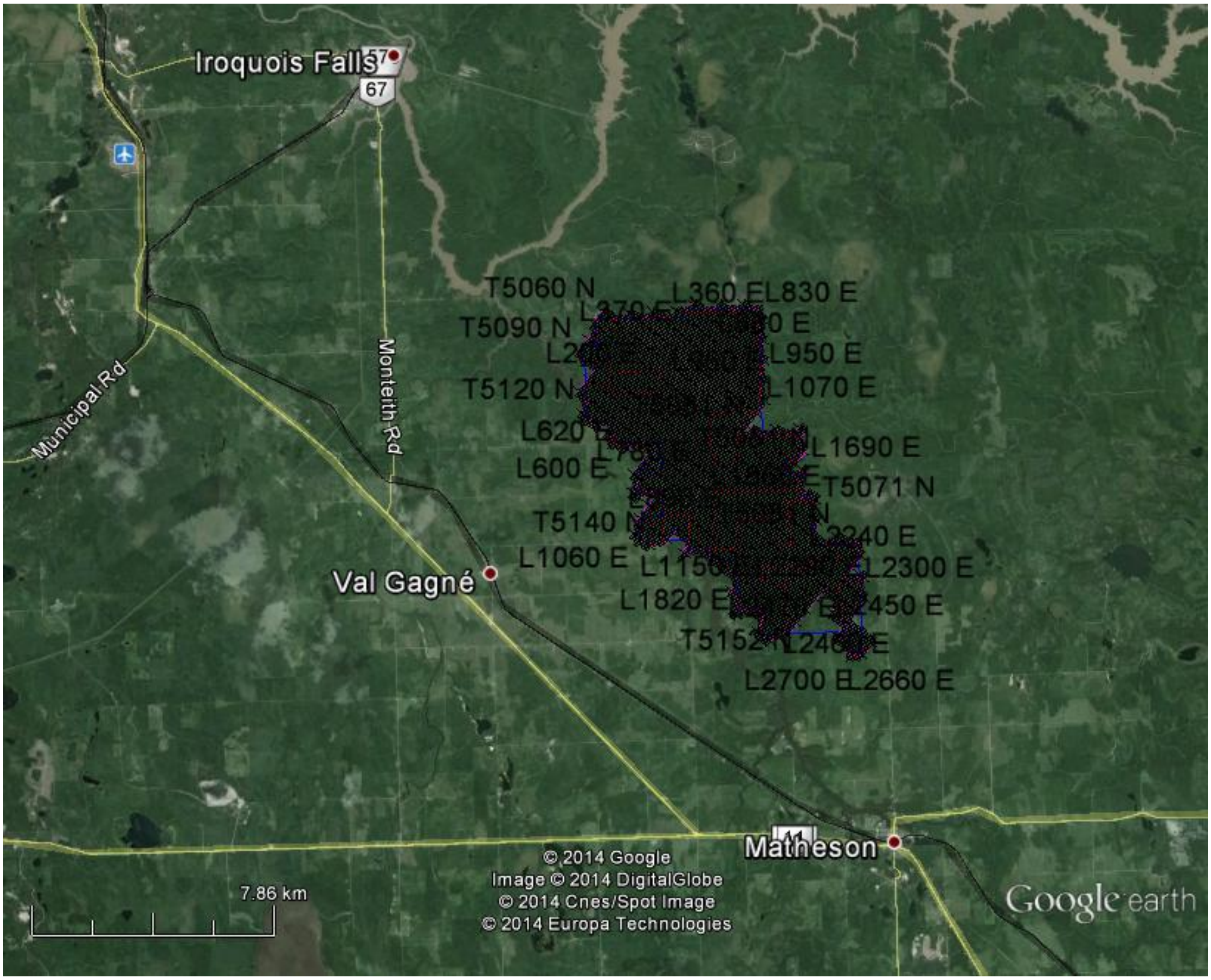
To obtain this data, the area was systematically traversed by a Cessna aircraft (C-GGLS) carrying geophysical equipment along parallel flight lines at a terrain clearance as low as safely possible in order to enhance the geophysical data. The lines are oriented to intersect the geology and structure so as to provide optimum contour patterns of the geophysical data.

1.2. **Location**

The survey is located in northern Ontario in the Cochrane District, in parts of Walker, Wilkie and Carr Townships, approximately 62 kilometres east of Timmins, 21 kilometres southeast of Iroquois Falls, and 13 kilometres north of Matheson. Highway 11 passes 5 kilometres to the west of the survey area.

The survey area lies along the eastern side of the Black River which separates farmland to the west and bush land to the east within the survey area. It is generally low swampy land.

The property outline is irregular in shape with numerous corners but the survey outline has been simplified to 17 corners. The maximum short dimension is 6.2 kilometres and the maximum long dimension is 13.5 kilometres. The centre of the area is approximately 45 degrees 38 minutes north and 80 degrees 31 minutes seconds west.


Iroquois Falls
67
Municipal Rd
Monteith Rd
T5060 N
L360 E
L830 E
T5090 N
L950 E
T5120 N
L1070 E
L620 E
L1690 E
L600 E
T5071 N
T5140 N
L1060 E
L2300 E
L1820 E
L2700 E
L2660 E
Val Gagné
Matheson
7.86 km
© 2014 Google
Image © 2014 DigitalGlobe
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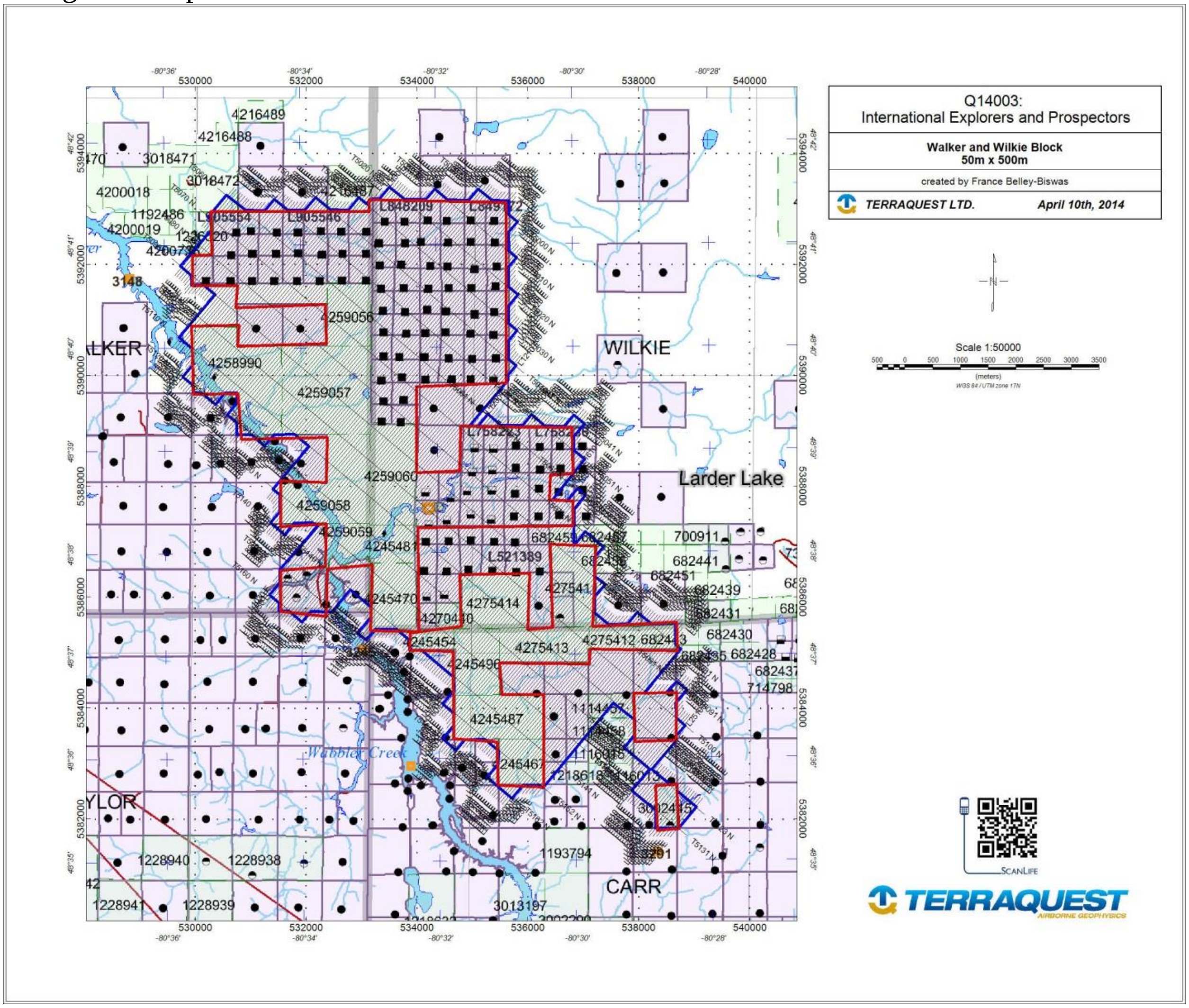
Google earth

Navigation Map



2. SURVEY PARAMETERS

2.1. LINES AND DATA

Parameter	Cessna U206 (GLS)
Aircraft Speed	56 m/s 201.6 km/hr
Magnetic & SP Sampling Interval	5-6 m (10 Hz)
Flight-line Interval	50 m
Flight-line Direction	040/220 degrees
Control-line Interval	500 m
Control-line Direction	130/310 degrees
Aircraft MTC	72 m
Aircraft Minimum/Maximum Clearance	45/80 m

See Appendix 9.5 for statistical analysis of the flight surface, survey elevation and terrain clearance.

2.2. SURVEY KILOMETRAGE

Number of Lines	Cessna U206 (GLS)
272 Survey Lines	1,149.6 km
33 Control Lines	127.2 km
305 Total Lines	1,276.8 km

2.3. NAVIGATION

The following file is the navigation parameter file (*.nme) for the survey lines, in WGS84 projection zone 17N, line spacing, line direction, master line and other navigational parameters. There are numerous corners in the property outline (see Appendix 9.6) but the survey outline is simplified to 17 corners to facilitate flying and processing. Note that the boundaries are not at 90 degrees to the flight lines and care has been taken to extend the lines to ensure that each traverse line terminates on a control line. The result is a step-like outline with numerous corners.

```
0  B424
1  U 279
2     538890    5381314      AREA CORNER 1
2     535383    5381249      AREA CORNER 2
2     535383    5381249      AREA CORNER 3
2     530112    5385144      AREA CORNER 4
2     530069    5387854      AREA CORNER 5
2     528476    5389188      AREA CORNER 6
2     528498    5392803      AREA CORNER 7
2     530069    5394826      AREA CORNER 8
2     537427    5394804      AREA CORNER 9
2     537427    5394804      AREA CORNER 10
2     537341    5390566      AREA CORNER 11
2     538438    5389920      AREA CORNER 12
2     538632    5387123      AREA CORNER 13
2     539988    5386434      AREA CORNER 14
2     539988    5386434      AREA CORNER 15
2     540052    5382669      AREA CORNER 16
2     538890    5381292      AREA CORNER 17
3     538704    5381841   WP1 WAYPOINT 1
3     538704    5381841  COR1 WAYPOINT 2
4        371                NUMBER OF LINES
5       50.0                SPACING, m
8        75                MAX CROSS TRACK, m
9   0  0  0                 DELTA X/Y/Z
10        1                LOG FPR EVERY 1 SECS
11 0.9996000000      0.0      0.0 K0, X/Y SHIFT
14       200                LINES EXTENDED BEYOND AREA
16        10                FIRST LINE NUMBER
17   538704.0   5381841.0  40.0 MASTER POINT, HEADING
18   538704.0   5381841.0 130.0 TIE LINE MASTER POINT, HEADING
19      500.0      200        TIE LINE SPACING, LINE EXTENSION, m
20 WGS-84     6378137.0   298.257223563 22      ELLIPSOID
21        0                NO EQUATORIAL CROSSING, N HEMISPHERE
30       20    9600  N  1  8  RS-232 PORT 2 INCOMING FORMAT
31       20    9600  N  1  8  RS-232 PORT OUTGOING FORMAT
38        0                METRIC SYSTEM
41      0.00                SYSTEM LAG, Secs.
80       0.00               PLANNED ALTITUDE, m
83        0                GPS ALTITUDE FOR VERTICAL BAR
84      0.00      0.00      ALTITUDE COEFFICIENT, OFFSET
85       100                MAX VERTICAL BAR SCALE
102  UTM                      UTM X/Y SCALE
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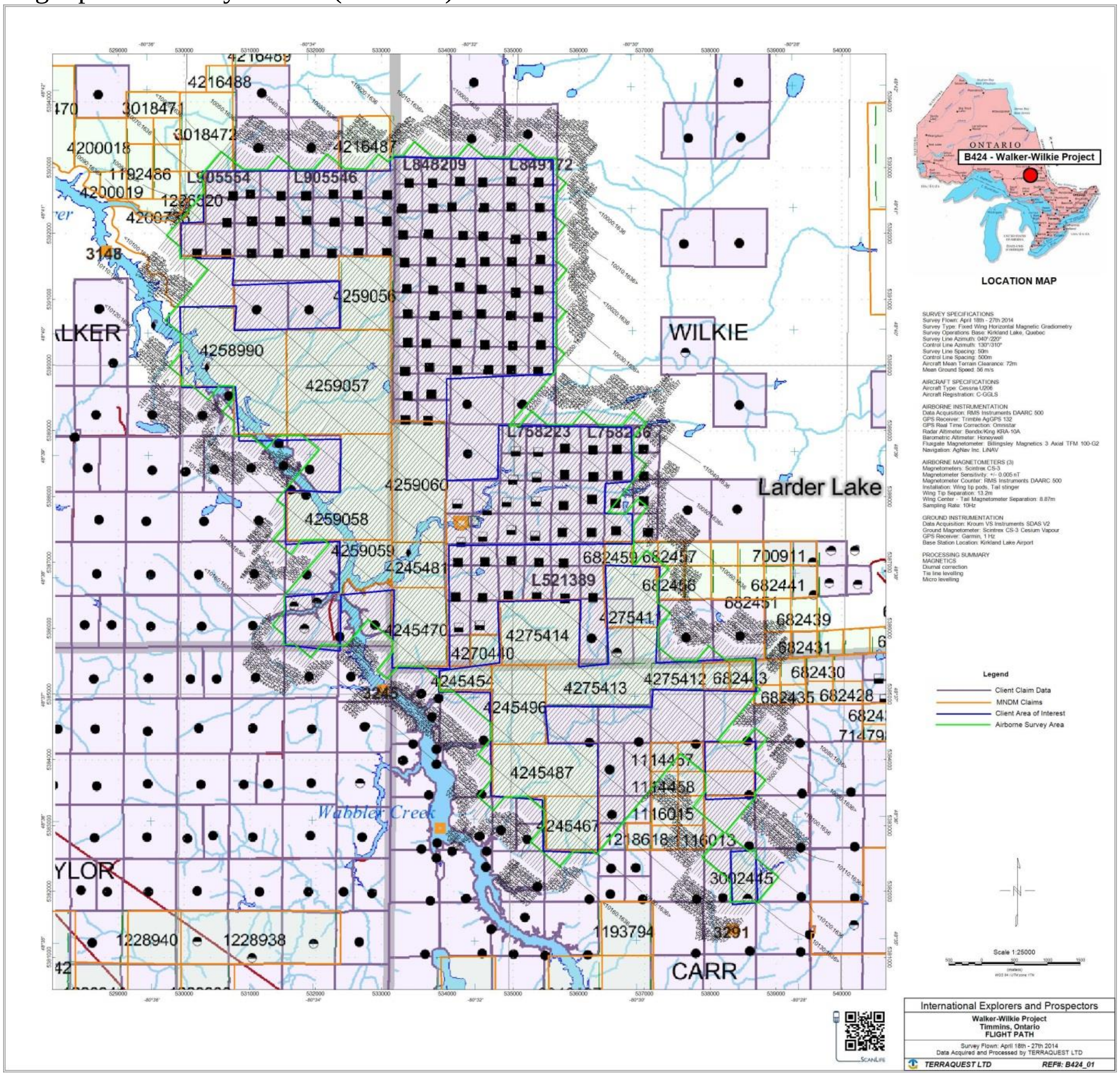
2.4. **FLIGHT PATH**

Flight path flown by Cessna (C-GGLS) .



2.5. **TOLERANCES - REFLIGHT**

1. **Traverse Line Interval**

Contract specifications mandate that re-flights would take place if the flight line separation of the final differentially corrected flight path shall not exceed 1.2 times and not be less than 0.8 times intended line separation over a distance greater than 3 times the traverse line separation.

2. **Terrain Clearance:**

   Contract specifications mandate that the aircraft altitude was to be smoothly maintained as a smooth drape over the topography, as low as a nominal terrain clearance as safety permits and adjusted by the climb and descent characteristics of the aircraft. Re-flights were done if the final differentially corrected altitude deviated from the drape surface altitude by +/-15m over a distance of 5 kilometres, if in the pilot's opinion it was within safety considerations.

3. **Diurnal Variation:**

   Diurnal activity in the survey was limited to 30 nT per hour, 2.5 nT deviations from 3-minute chord and 0.5 nT from a 15 second chord.

4. **GPS Data:**

   GPS data included at least 4 satellites 15 degrees over horizon for navigation and flight path recovery.

5. **Radio Transmission:**

   The aircraft pilot makes no radio transmission that interferes with magnetic response unless mandated by airport and air traffic safety considerations.

6. **Sample Density:**

   A reflight is required if the sample density along one or more of the survey lines exceeds 8 metres over a cumulative total of 1000 metres for the magnetic/SP/electromagnetic survey, and 80 metres over a cumulative total of 1000 metres for the radiometric survey.

7. **Magnetic Noise:**

   The contract mandates that the fourth difference noise envelope for the tail sensor data does not exceed +/- 0.10 nT.

3. AIRBORNE GEOPHYSICAL EQUIPMENT

The primary airborne geophysical equipment is a three-sensor, high sensitivity cesium vapour magnetometer system with real time compensation. Other onboard geophysical equipment beyond the requirement of the contract includes SP/Electric system, low frequency induction coil system, an XDS broadband VLF-EM system and a Matrix VLF-EM system. Ancillary support equipment includes a tri-axial fluxgate magnetometer, recorder, radar altimeter, barometric altimeter, GPS receiver with a real-time correction service, and a navigation system. The navigation system comprises a left/right indicator f
or the pilot and a screen showing the survey area, planned flight lines, and the real time flight path. All data were collected and stored by the data acquisition system. The following provides detailed equipment specifications:

3.1. EQUIPMENT SUMMARY

Aircraft	Cessna U206
Equipment:	
Magnetometer	Scintrex CS-3 Cesium Vapour
3-axis Magnetometer	Billingsley TFM100-LN
XDS VLF-EM	Terraquest Ltd., XDS broadband system
Matrix VLF-EM	Matrix VLF-EM system
Static Potential SP/Electric Field	Terraquest Ltd., developmental system
Low Frequency EM Induction Coils	Terraquest Ltd., developmental system
GPS Receiver	Trimble AG 132
Navigation	AgNav Inc. P151 LiNav System
Radar Altimeter	King KRA 10A
Barometric Altimeter	Honeywell
Data Acquisition & Mag Counter	RMS Instruments DAARC 500

3.2. SURVEY AIRCRAFT

The survey aircraft was a Cessna U206, registration C-GGLS, owned and operated by Terraquest Ltd. under full Canadian Ministry of Transport approval and certification for specialty flying including airborne geophysical surveys. The aircraft is maintained at base operations by a regulatory AMO facility, Leggat Aviation Inc.

The aircraft has been specifically modified with long-range fuel cells to provide up to 7 hours of range, outboard tanks, tundra tires, cargo door, and avionics as well as an array of sensors to carry out airborne geophysical surveys.

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3.3. SURVEY EQUIPMENT AND SPECIFICATIONS:

1. High Sensitivity Magnetometer:

Three high-resolution cesium vapour magnetometers are mounted in a tail stinger and wing tip pods. A fluxgate tri-axial magnetometer is mounted in front of the tail stinger to monitor aircraft manoeuvre and magnetic interference; this data is used in real-time to compensate the high sensitivity data for aircraft manoeuvre noise.

Type of Magnetometer Sensor	Cesium Vapour, three sensors
Model	CS-3
Manufacturer	Scintrex Ltd.
Resolution	0.001 nT counting at 0.1 per second
Sensitivity	+/- 0.005 nT
Dynamic Range	15,000 to 100,000 nT
Fourth Difference	0.02 nT
Recorded Sample Rate	0.1 seconds
Noise Envelope	0.10nT (Tail Mag)

2. Tri-Axial Fluxgate Magnetic Sensor

Tri-Axial Fluxgate Magnetic Sensor	(for compensation, mounted in mid-section of tail stinger)
Model	W/FM100G2-1F
Manufacturer	Billingsley Magnetics
Description	Low noise miniature triaxial fluxgate magnetometer
Axial Alignment	> Orthogonality > +/- 1 degree
Accuracy	< +/- 0.75% of full scale (0.5% typical)
Field Measurement	+/- 100,000 nanotesla
Linearity	< +/- 0.015% of full scale
Sensitivity	100 microvolt/nanotesla
Noise	< 12 picotesla RMS/–Hz @ 1 Hz

3. Radar Altimeter

Altimeter	Radar
Model	KRA-10A
Manufacturer	King
Serial Number	071-1114-00
Accuracy	5% up to 2,500 feet
Calibrate Accuracy	1%
Output	Analog for pilot, converted to digital for data acquisition

4. Barometric Sensor

Sensors	Pressure (mB)
Model	PPT0020AWN2VA-C
Manufacturer	Honeywell
Source	coupled to aircraft barometric (pitot static) system
Output	Serial output to DAARC 500 channels 3 & 4 respectively

5. Data Acquisition & Magnetic Compensation System

DAS & Compensation	Combined
Model	DAARC 500
Manufacturer	RMS Instruments
Operating System	QNX 6.3 or greater
Time	104 MHz temperature compensated crystal clock
Front End Magnetic Processing	Resolution 0.32pT; system noise <0.1pT; sample rate 160, 640, 800m or 1280 Hz
Front End - Fluxgate	I/F module; oversampling, self-calibrating 16 bit A/D converter
Compensation	Improvement Ratio (total field) 10-20 typical
Input Serial	8 isolated RS232 channels; ASCII & Binary formats
Input Analog	16 bit, self-calibrating A/D conv.
Input Events	Four latched event inputs
Raw Data Logging	At front end sampling rate, 1 MB buffer

Output/Recording	Rate **10**, 20 or 40 Hz; Serial up to 115.2 kbps; Recording media 1 GB Flash; 80 GB Hard Drive; Flash disk via USB; Display
Front Panel Indicators	8 LEDs for mag input; 2 LEDs for Front End status

6. Navigation System

Navigation & Guidance	Stand-alone module
Model	LiNav P151
Manufacturer	AgNav Inc.
Main Display	LCD Moving map display
Pilot Display	2 line shows left/right, dist. to end of line/survey
Line	Generates and follows survey lines
Input	GPS with corrections; up to 10 Hz
Media	USB memory stick

7. GPS Differential Receiver

GPS Differential Receiver	
Model	AG 132
Manufacturer	Trimble
Antenna	L1/L2
Channels	12
Position Update	0.2 second for navigation
Correction Service	Real time correction service subscription – Omnistar
Sample Rate	1 second
Accuracy	~ 3 meters

8. Optional Terraquest XDS Broadband VLF-EM System

The proprietary XDS broadband VLF-EM System is developed by Terraquest Ltd. It employs 3 orthogonal, air-core coils mounted in the pod of the tail stinger, and coupled with a receiver-console, tuned to receive a range of 22.0 kHz to 26.0 kHz (which includes Cutler Maine NAA frequency 24 kHz, Lamoure North Dakota frequency 25.2 kHz and Seattle WA NLK frequency 24.8 kHz). It measures independently the X, Y and Z directions of the VLF field.

VLF - EM	
Model	XDS
Manufacturer	Terraquest Ltd.
Primary Source	Magnetic field component radiated from government VLF radio transmitters
Parameters Measured	X, Y and Z components, absolute field
Frequency Range	22.0 - 26.0 kHz
Gain	Constant gain setting
Filtering	No filtering

9. Optional Digital Matrix VLF-EM

Type	Digital VLF-EM
Model	Matrix
Manufacturer	Magenta Inc.
Primary Source	Magnetic field component radiated from three government VLF radio transmitters: Cutler, North Dakota and Seattle
Parameters Measured	Separately for each transmitter: Amplitude, Tilt and Quadrature which include the vertical and planar components

10. Developmental Channels

As part of an ongoing research program at Terraquest Ltd., several developmental channels were included in the data acquisition sampled at 10 Hz. The hardware and software are both still under development.

Static Potential (SP)/Electric Field channels:
Sensors are small whip antennae located near the rear portion of the tail stinger
SP/Electric field, +/- 3.0 volts DC; x, y, z components
SP/Electric field, RMS amplitude, 0 – 3.0 volts: xyz components (intended for operator)

Low Frequency EM Induction Coils:
Sensors are high permeability, permalloy core coils located in the forward section of the tail stinger. They primarily respond to the AC field in the approximate range of 5 to 300 Hz; the signal is amplified and rectified to DC values in the range of 0-3 volts.
X and Y components, RMS values 0 – 3.0 volts DC

4. Base Station Equipment

4.1. BASE STATION MAGNETOMETER

High sensitivity magnetic base station data was provided by a split beam cesium vapour magnetometer logging onto a computer and with time synchronization from a GPS base station receiver.

The magnetometer was similar to the type used in the aircraft, a cesium magnetometer manufactured by Scintrex. The magnetometer processor was a KMAG manufactured by Kroum VS Instruments and the data logger was a PDA by Archer. The counter was powered by a 10VAC 50/60hz to 30VDC 3.0 amp power supply with an internal 12VDC fan. The logging software SDAS-1 was written by Kroum VS Instrument Ltd. specifically for handheld pc hardware. It supports real time graphics with selectable windows (uses two user selectable scales, coarse and fine). Time recorded was taken from the base GPS receiver. Magnetic data was logged at 1Hz. Data collection was by RS232 recording ASCII string and stored on flash card.

Ground Magnetometer	Cesium Vapour
Model	CS – L
Manufacturer	Scintrex
Sensitivity	0.005 nT
Noise Envelope	0.05 nT
Sampling Interval	1 second

During the survey period the geophysicist also monitored the Regional Geomagnetic Forecasts for North America provided by both Spaceweather.com and Spaceweather.ca.

4.2. BASE STATION GPS RECEIVER

A Garmin base GPS receiver was used to provide the GPS time stamp to the base station magnetic data.

5. TESTS AND CALIBRATIONS

5.1. MAGNETIC FIGURE OF MERIT

Compensation calibration tests were performed to determine the magnetic influence of aircraft maneuvers and the effectiveness of the aircraft compensation method. The aircraft flew a square pattern in the four survey directions at a high altitude over a magnetically quiet area and perform pitches (± 5°), rolls (± 10°) and yaws (± 5°). The sum of the maximum peak-to-peak residual noise amplitudes in the total compensated signal resulting from the twelve maneuvers is referred to as the FOM. The FOM was done on April 16, 2014 flight 1635 with a results of 1.42 nT, 1.49 nT and 0.96 nT for respectively the left, right and tail sensors. Refer to ***9.3 Appendix III – Figure of Merit*** for details.

5.2. MAGNETIC LAG

Evaluation of the magnetic lag factor was accomplished by survey flying over a clearly identifiable discrete anomaly flown in opposing directions. The measured lag was 0.6 seconds for the tail sensor and 0.5 for the wing tip sensors.

B424: LAG TEST and EVALUATION

LINE	DIR		A	B	C		
RIGHT WING SENSOR (TF2)							
1640	SW	X	531288.9	533127.4	534488.9		
		Y	5389108.2	5391295.4	5392911.7		
		SPEED (S_1)	59.0	57.3	55.1		
1641	NE	X	531332.3	533148.0	534513.3		
		Y	5389157.9	5391325.0	5392956.9		
		SPEED (S_2)	54.8	55.0	56.1		
		DELTA	**66.0**	**36.1**	**51.4**		
		LAG*	**0.6**	**0.3**	**0.5**	**AVG LAG**	**0.5**
TAIL SENSOR (TF3)							
1640	SW	X	531292.4	533120.4	534488.9		
		Y	5389112.4	5391286.6	5392911.7		
		SPEED (S_1)	59.0	57.3	55.1		
1641	NE	X	531332.3	533159.3	534520.7		
		Y	5389157.9	5391338.6	5392965.6		
		SPEED (S_2)	54.8	54.9	56.1		
		DELTA	**60.5**	**64.9**	**62.6**		
		LAG*	**0.5**	**0.6**	**0.6**	**AVG LAG**	**0.6**

**** Lag factor calculated as LAG = DELTA/(S_1+S_2)***

6. LOGISTICS

6.1. PERSONNEL

The contractor supplied the following properly qualified and experienced personnel to carry out the survey and to reduce, compile and report on the data:

Field:	Survey Pilot	Chad Tiffin
	Operator	Nick Bain
	Office Geophysicist	Carolyn Boone
Office:	Geophysicist	Carolyn Boone
	Project Manager	Charles Barrie

6.2. LOGISTICS AND FLIGHT REPORTING

The contract was given a verbal go-ahead on April 11, 2014. The aircraft and crew arrived in Kirkland Lake on April 16, 2014, and flew the Figure of Merit and radar calibration flight. The following day they set up the ground logistics and base station, but it was too windy to fly.

The survey was flown successfully in a total of 5.5 flights (one flight was split with another contract for the same client), GLS1635-1642 over 9 days from April 16th to 24th, 2014 including calibrations. A reflight was flown on April 27th, flight GLS1645. There were a total of 4.5 survey production days, 3 weather days, 1 scheduled aircraft maintenance day and 0 geophysical equipment days.

The pilot maintained personal and aircraft log books plus an Operational Flight Plan for each flight. The operator recorded all calibration and flight activity on a flight log which was given to the field geophysicist along with airborne and base station data. The survey geophysicist performed quality control on the raw survey data site after each flight.

All survey personnel crew adopted and worked under the Terraquest Ltd. Health, Safety and Environmental Protection Manual (which include Site Specific Safety Plan and Emergency Response Plan), aviation Safety Management System (SMS), and guidelines from the IAGSA safety and security standards. All aircraft maintenance items were supervised by and signed out by an Approved Mechanical Engineer (AME) under Canadian Aviation Regulations (CARs) with signing authority through Sky Wrench Inc.

6.3. BASE OF OPERATIONS

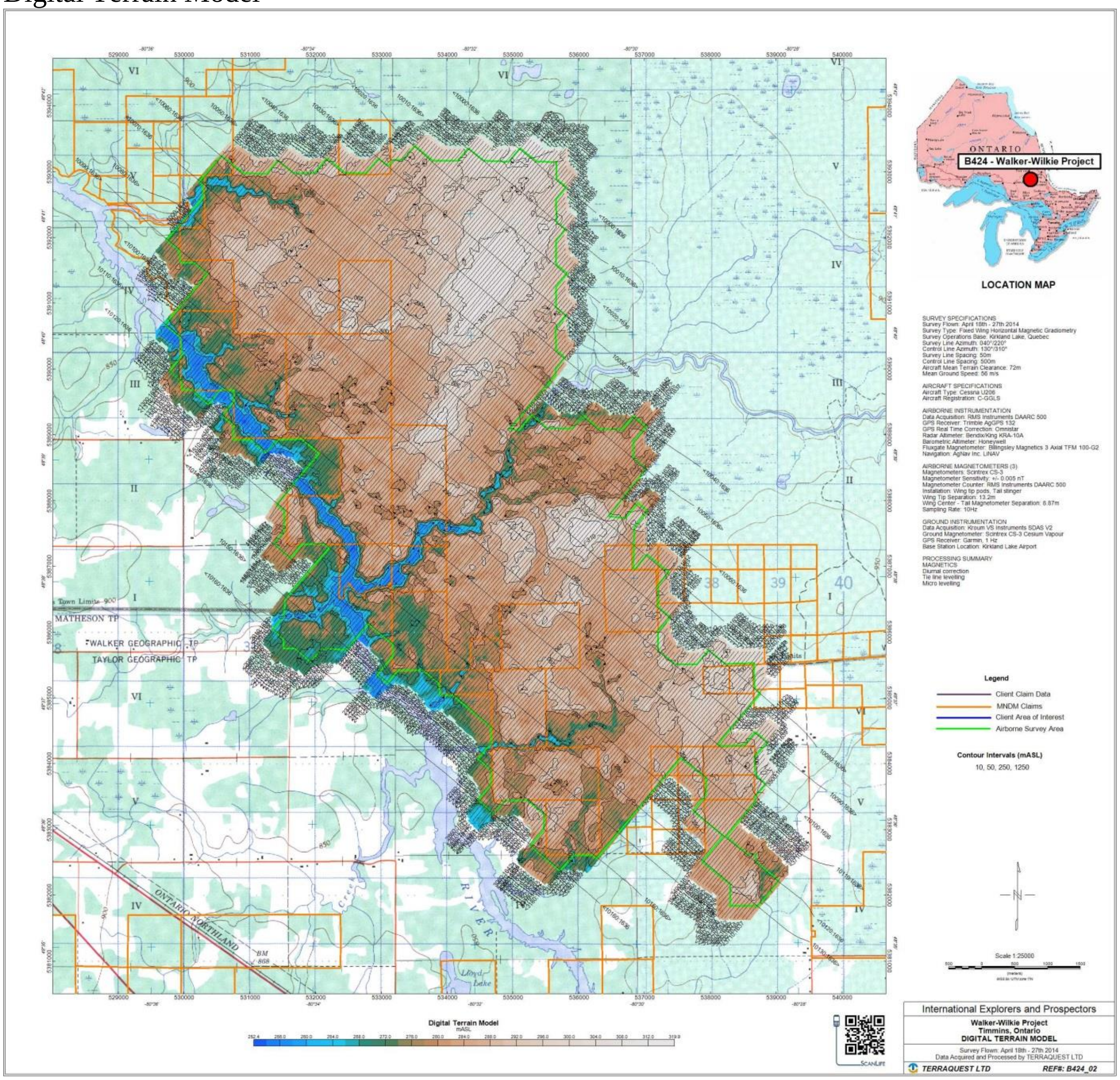
The base of operations including the diurnal base station was at Kirkland Lake, Ontario.

7. Data Processing

7.1. DATA QUALITY CONTROL

The field data were examined during the survey to inspect for quality control and tolerances on all channels. All data were checked for continuity and integrity. Note that GPS correction was done in real-time during the survey using Omnistar subscription services. The magnetic data were real-time compensated using the DAARC 500. The Digital Terrain Model was calculated using data from both aircraft from the GPS z component and the radar altimeter values.

Digital Terrain Model



7.2. FINAL MAGNETIC DATA PROCESSING

1. Lag Correction of Total Magnetic Field

The Evaluation of the magnetic lag factor was accomplished by acquiring survey data flown in opposite directions over a cultural anomaly. The measured factor was 0.6 fiducials for the tail Mag and 0.5 for the wing tips.

2. Diurnal Data and Diurnal Corrections of the Total Magnetic Field

Magnetic data from the diurnal base station were scrutinized for spurious readings (data spikes) and any obvious cultural interference. Any such features were manually removed and the data re-interpolated (akima spline) to maintain a continuous record. The data were then subsequently used to correct measured airborne magnetic readings.

3. Magnetic Field Tie- Line levelling

The diurnal and lag corrected data were further refined using tie- line levelling. Using the Geosoft Oasis implementation of this procedure, an initial table of tie-traverse line intersection differences is compiled (together with supporting ancillary parameters such as local gradient, etc.) and intersection data is loaded into the processing databases. In a series of iterative levelling passes, outlier intersection values are either disabled or modified to refine and finalize the overall result.

4. Magnetic Field Micro-Levelling

Minor levelling imperfections may still exist in the intersection levelled data, most likely due to incomplete removal of diurnal influences in sections of lines between intersection points. These errors are removed by application of mild micro-levelling procedure whereby highly directional filtering identifies and removes residual noise correlated with the traverse direction. The resulting corrections are limited to the maximum amplitude of 3 nT to avoid “damaging” valid, geologic responses.

5. Calculated Vertical Derivative

The first Vertical Derivative was calculated using a 2D FFT operator on the Total Magnetic Intensity and Reduction to the Pole Magnetic Intensity grid. Unwanted, high frequency “ ringing” in the resulting 1VD grid was minimized by concurrent application of an 8^{th} order Butterworth low pass filter keyed to slight larger than the line spacing (60m).

6. Horizontal Gradients

The longitudinal, or along-line, magnetic gradient (HY) was calculated by subtracting the successive readings from the tail sensor. The calculated gradients were converted from aircraft centric to survey grid orientation by selectively inverting (i.e. multiplying by -1) the calculated values in the South West direction.

The transverse or lateral magnetic gradient (HX) was calculated by subtracting the left wing sensor reading from the right wing sensor reading and dividing the resulting value by the tip-to-tip separation (13.5 metres), yielding the measurement expressed as nT/m.

Finally, the calculated lateral gradient was adjusted for directional bias by subtracting the median value on a line-by-line basis and then lagging the resulting values by the wing sensor lag factor (0.5 sec).

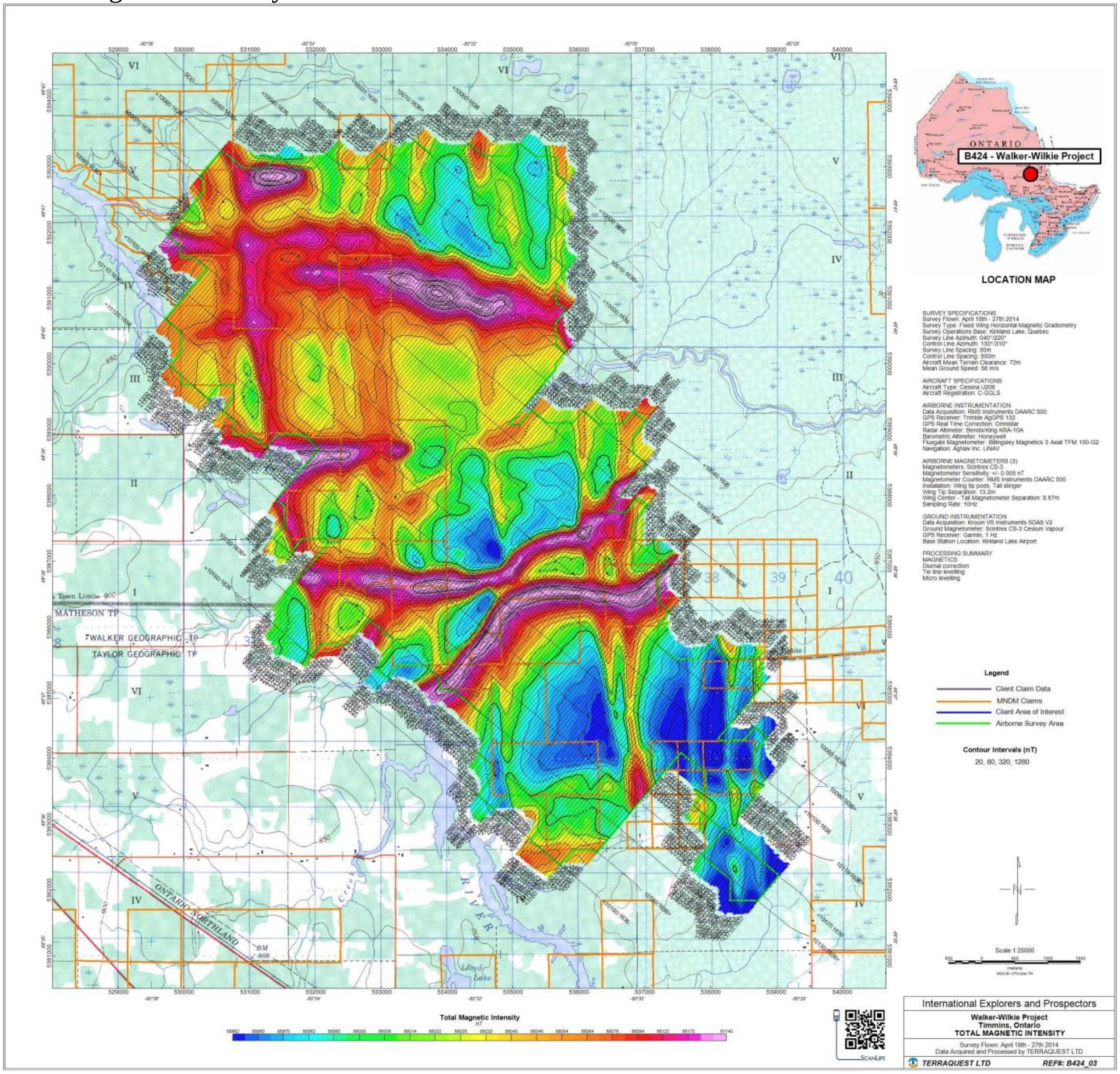
7. Reconstructed Total Magnetic Field (RTF)

Data grids of the measured horizontal gradients (HX, HY) were used to generate the Reconstructed Total Magnetic Field using the 2D FFT process described by J. B. Nelson *(reference: Nelson, J.B., 1994, Leveling total-field aeromagnetic data with measured horizontal gradients: Geophysics, 59, 1166-1170)*. This product (RTF) has the advantage of being un-affected by magnetic diurnal activity, though longer magnetic spatial wavelengths are not represented due to measurement resolution limitations in the magnetometers. The resulting data units (expressed as pseudo nano-Tesla) are not true nT: approximate conversion to true nT may be accomplished by application of scaling factor if required. Using the calculated Reconstructed Total Field data grid, a "RTF" Geosoft database channel is created by performing a grid look-up ("grid sample") for each data point in the production database. Only grids were produced for the Total Reconstructed Field.

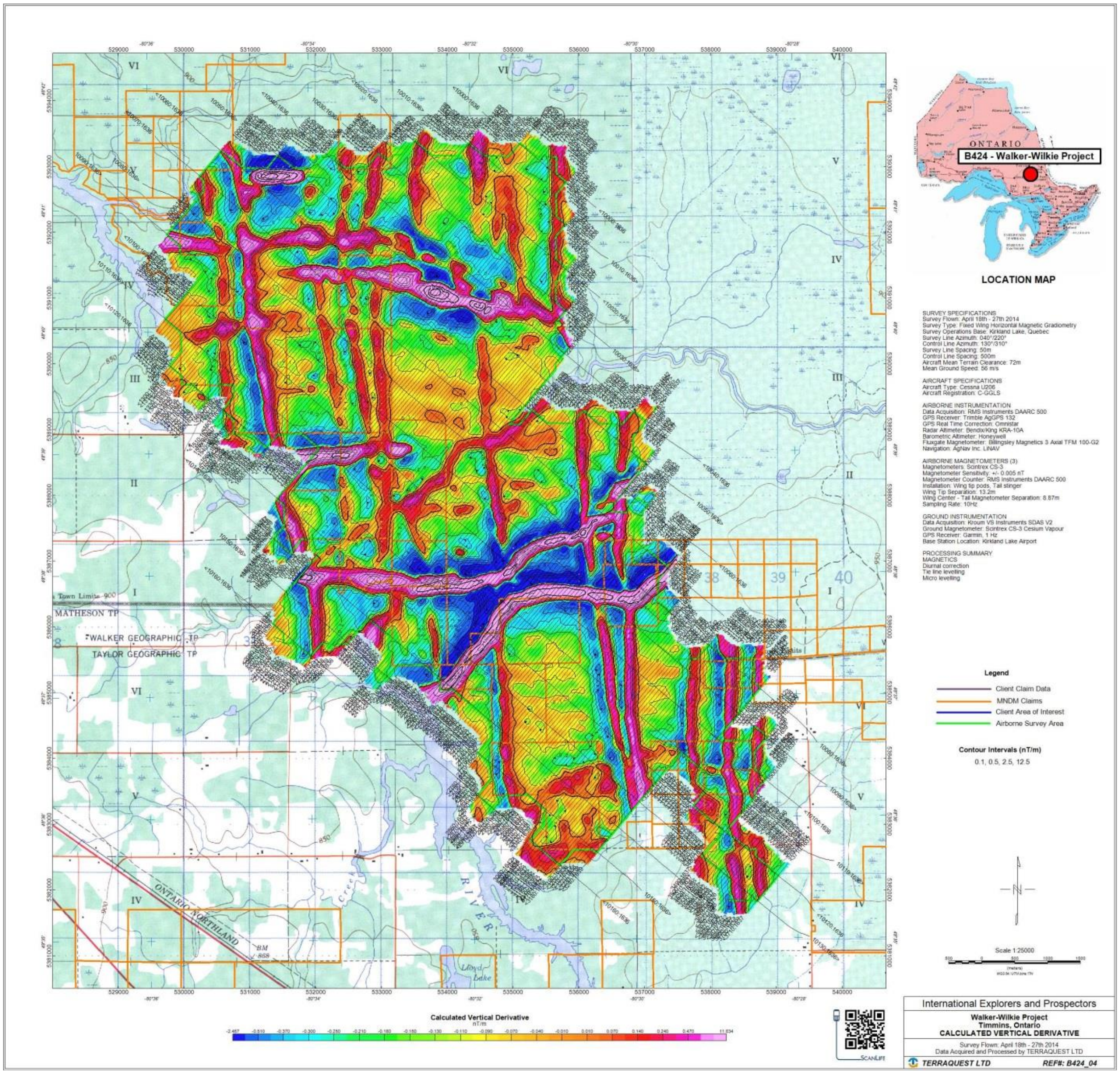
8. Data Grids

Magnetic data grids were created using Bidirectional data interpolations at a cell size of 12.5m.

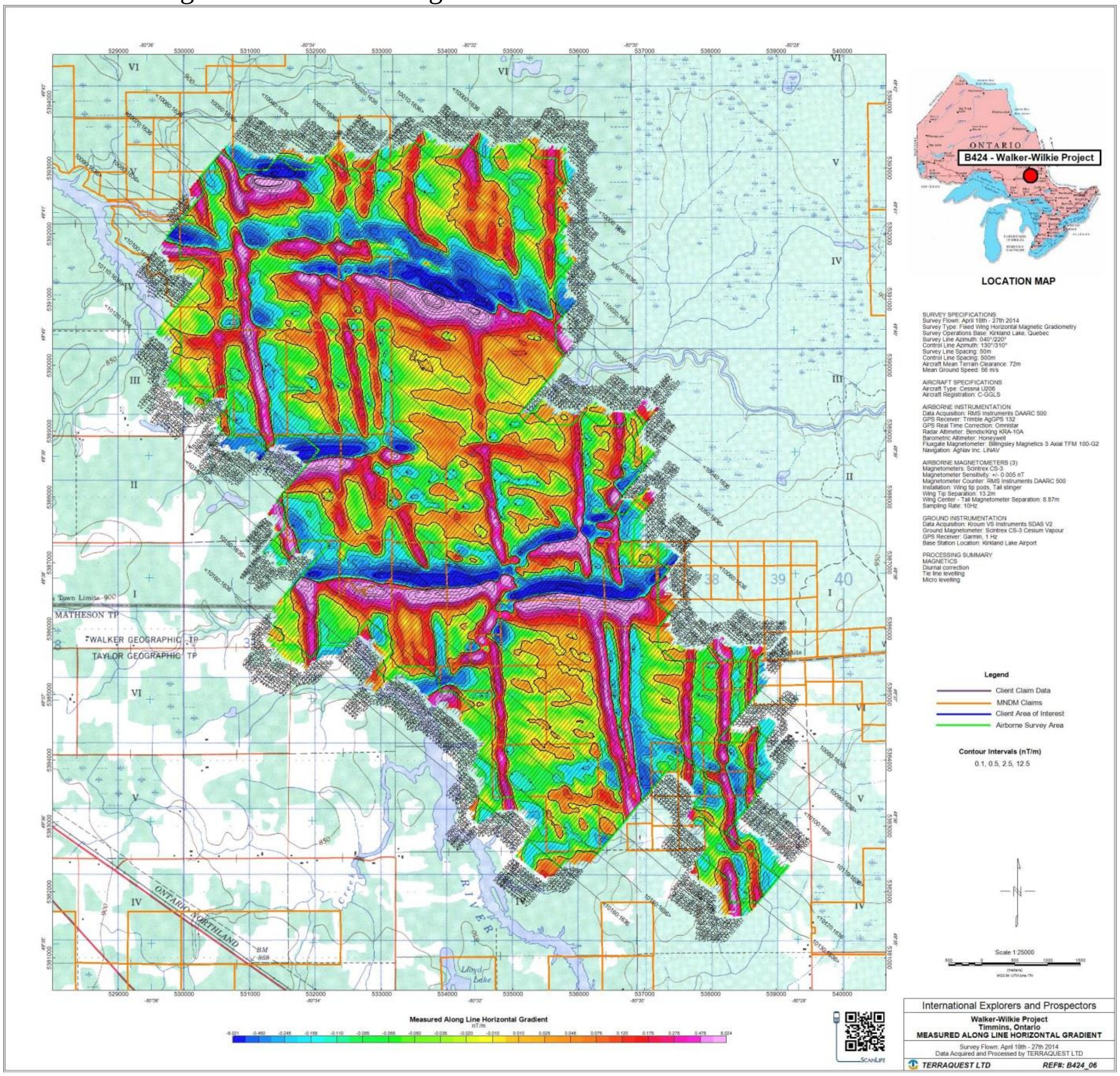
Total Magnetic Intensity



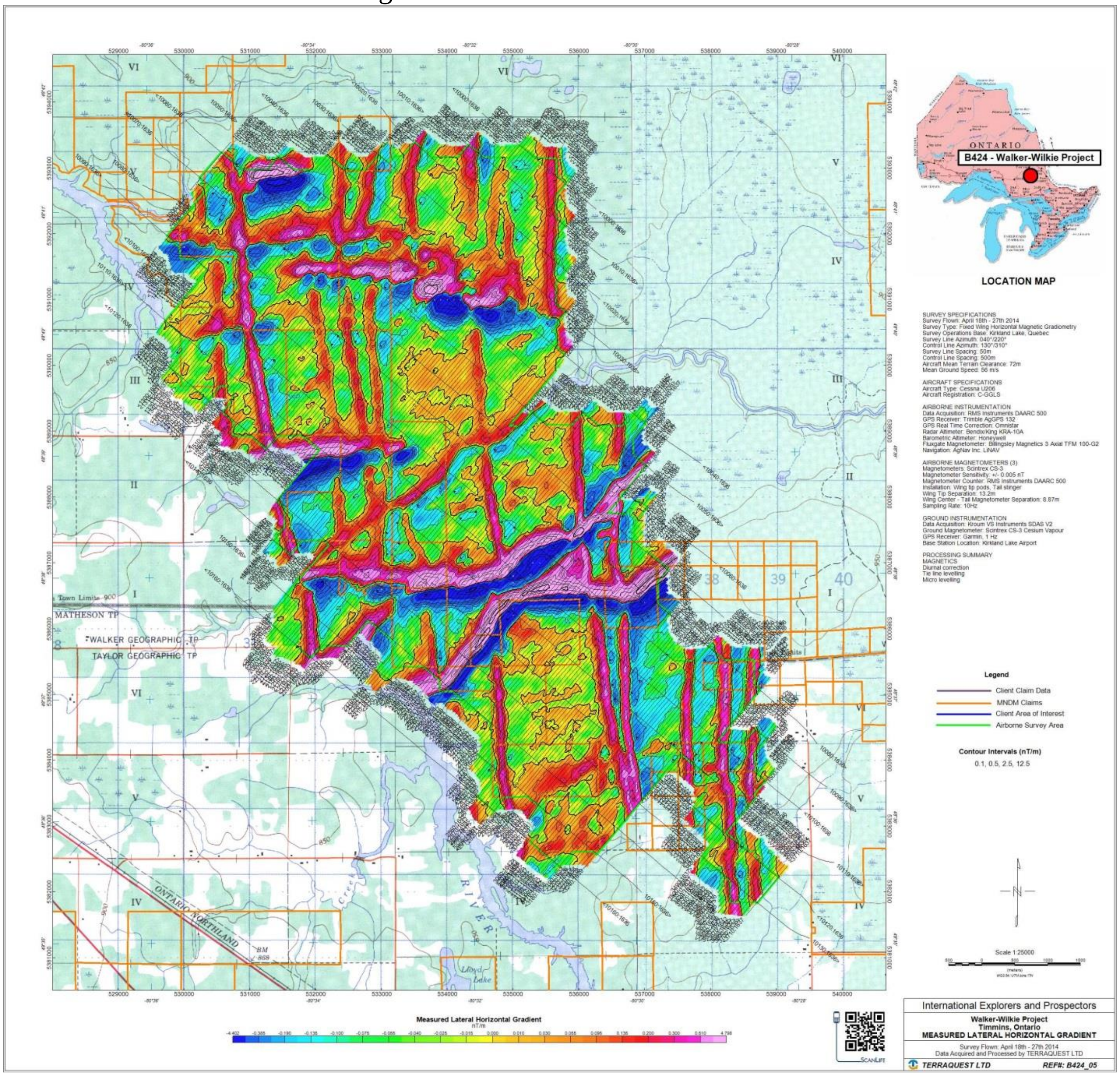
Calculated Vertical Derivative



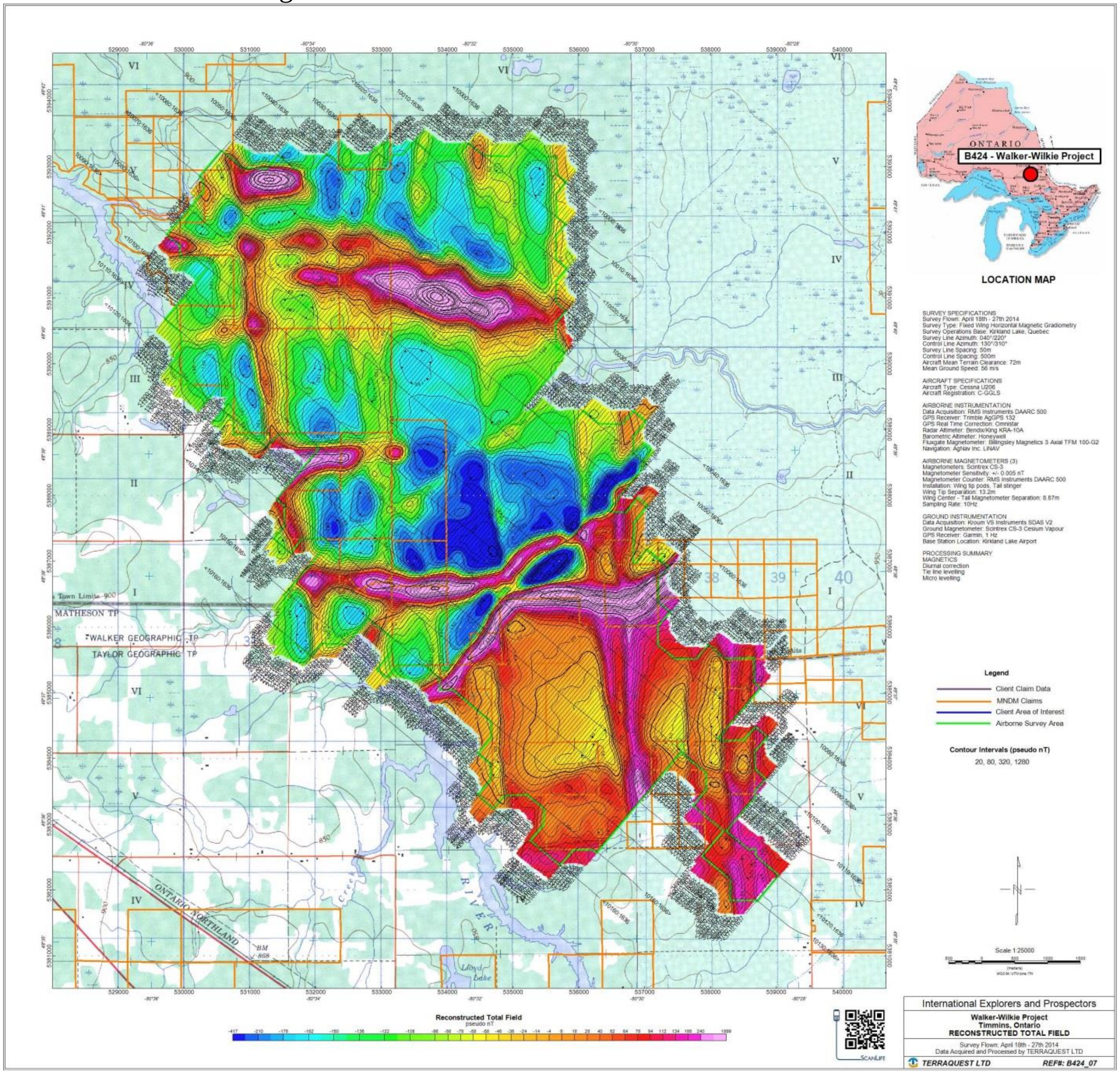
Measured Along Line Horizontal Magnetic Gradient



Measured Lateral Horizontal Magnetic Gradient



Reconstructed Total Magnetic Field from Horizontal Gradient Data



7.3. **XDS VLF-EM DATA PROCESSING**

The optional XDS VLF-EM system was operational and recorded during this survey and is available to the client upon request.

7.4. **PROCESSING DEVELOPMENTAL CHANNELS**

The developmental SP and Induction Coil data were collected on this survey and will be processed for equipment developmental purposes and may be available as an option to the client.

7.5. LIST OF FINAL PRODUCTS

The following final grids were produced using projection WGS84, UTM zone 17N:

B424_FP_1.map	Flight Path
B424_DTM_2.map	Digital Terrain Model (m Above Sea Level)
B424_TMI_3.map	Total Magnetic Intensity (nT)
B424_VD_4.map	Calculated 1st vertical derivative of the TMI (nT/m)
B424_HY_6.map	Measured Along Line Horizontal Gradient (nT/m)
B424_HX_5.map	Measured Lateral Horizontal Gradient (nT/m)
B424_RTF_7.map	Reconstructed Total Field (created from gradients using Nelson method) (pseudo nT)

ARCHIVES (on DVD in back pocket of Report):

- Digital database (GDB)
- Grid and Map files in GEOSOFT format (compatible with 4.1 or higher)
- JPEG and PDF Images of Map files
- Readme File (Word doc and txt formats)
- Copy of this report

8. SUMMARY

An airborne high sensitivity, horizontal gradient magnetic survey was performed over the Walker-Wilkie Project in northern Ontario. The resulting survey flight surface has a smooth drape profile with a mean terrain clearance of approximately 72 metres, 50 metre line intervals, 500 metre control line intervals and with data sample points at approximately 50 to 60 metres along the flight lines. The base of operations including magnetic base station was at Kirkland Lake airport.

The data were subjected to final processing to produce the following grids and maps:

a) **Magnetics**: total magnetic intensity (TMI) of tail sensor
b) **Calculated Gradient Magnetics**: calculated first vertical derivative of the TMI
c) **Measured Gradient Magnetics:** Along-Line and Lateral Gradients, Reconstructed Total Field

All above data have been archived as Geosoft database (GDB) and GRID files.

In addition, two types of VLF-EM data plus five developmental channels (3 Static Potential and 2 Induction Coils) were recorded beyond the request of the contract and may be purchased by the client.

Respectfully Submitted,

Charles Barrie, M.Sc., P.Geo.
Vice President
Terraquest Ltd.

9. APPENDICES

9.1. APPENDIX I - CERTIFICATE OF QUALIFICATION

I, Charles Barrie, certify that I:

1) am registered as a Fellow with the Geological Association of Canada, as a P.Geo. with the Association of Professional Geoscientists of Ontario (APGO) and work professionally as a geologist,
2) hold an Honours degree in Geology from McMaster University, Canada, obtained in 1977,
3) hold an M.Sc. in Geology from Dalhousie University, Canada, obtained in 1980,
4) am a member of the Prospectors and Developers Association of Canada,
5) am a member of the Canadian Institute of Mining, Metallurgy and Petroleum,
6) have worked as a geologist for over thirty years,
7) am employed by and am an owner of Terraquest Ltd., specializing in high sensitivity airborne geophysical surveys, and
8) have prepared this operations and specifications report pertaining to airborne data collected by Terraquest Ltd.

Markham, Ontario, Canada

Signed

Charles Barrie, M.Sc., P.Geo.
Vice President
Terraquest Ltd.

PROFESSIONAL GEOSCIENTIST
CHARLES Q. BARRIE
PRACTISING MEMBER
1874
ONTARIO

9.2. APPENDIX II – FIELD LOG

Pilot: Chad Tiffin
Operator: Nick Bain
Aircraft: Cessna U206, registration C-GGLS
Survey Base: Kirkland Lake

April 16, 2014
Aircraft and crew arrive in Kirkland Lake;
Flight **1635**, 1.8 hours, perform airborne calibrations (FOM and Radar altitude)

April 17, 2014
Weather; too windy to fly; set up base station (and recorded base station sample data for Geophysicist to QC), loaded navigation files and participated in a safety meeting.

April 18, 2014
Flight **1636**, 4.2 hours, flew ties and a few lines; abort flight too windy

10000	10110	1000	3300
10010	10120	1100	3400
10020	10121	1200	3500
10030	10122	1300	3600
10040	10123	1400	3700
10041	10130	1500	3650
10050	10131	1600	3550
10051	10140	1700	3450
10060	10141	1800	3350
10061	10150	1900	3250
10062	10151	2000	3150
10070	10152	2100	3050
10071	10160	2200	2950
10080	10161	2300	2850
10081	10162	2400	3300
10090	2750	2500	3400
10091	2650	3100	3500
10100	2550	3200	3600
2450	2150	1850	
2350	2050	1750	
2250	1950	1650	

April 19, 2014

Flight **1637**, 4.2 hours – survey lines

1550	2310	3490	1590
1450	2410	3390	1490
1350	2510	3290	1390
1250	2610	3190	1290
1150	2710	3090	1190
1050	2810	2990	1090
1010	2910	2890	1020
1110	3010	2790	1120
1210	3110	2690	1220
1310	3210	2590	1320
1410	3310	2490	1420
1510	3410	2390	1520
1610	3510	2290	1620
1710	3610	2190	1720
1810	3710	2090	1820
1910	3690	1990	1920
2010	3590	1890	2020
2110	2520	1790	2120
2210	2620	1690	2220
2820	2720		2320
2920			2420

Flight **1638**, 3.3 hours – survey lines

3020	2580	1280	2330
3120	2480	1180	2430
3220	2380	1080	2530
3320	2280	1030	2630
3420	2180	1130	2730
3520	2080	1330	2830
3620	1980	1430	2930
3680	1880	1530	3030
3580		1630	3130
3480	1680	1730	3230
3380	1580	1830	3330
3280	1480	1930	3430
3180	1380	2030	3530
3080	1230	2130	3630
2980	2880	2230	3330
2680	2780	1330	1430

April 20, 2014

Weather, as well as a class G1 magnetic storm.

NOAA Scales Activity

Range 1 (minor) to 5 (extreme)

NOAA Scale	Past 24 hours	Current
Geomagnetic Storms *	G1	G1
Solar Radiation Storms	S1	none
Radio Blackouts	none	none

```
Product: Geophysical Alert Message wwv.txt
:Issued: 2014 Apr 20 1505 UTC
# Prepared by the US Dept. of Commerce, NOAA, Space Weather Prediction Center
#
#          Geophysical Alert Message
#
Solar-terrestrial indices for 19 April follow.
Solar flux 169 and estimated planetary A-index 15.
The estimated planetary K-index at 1500 UTC on 20 April was 5.

Space weather for the past 24 hours has been minor.
Geomagnetic storms reaching the G1 level occurred.
Solar radiation storms reaching the S1 level occurred.

Space weather for the next 24 hours is predicted to be moderate.
Geomagnetic storms reaching the G2 level are likely.
Solar radiation storms reaching the S1 level are expected.
Radio blackouts reaching the R1 level are likely.
```

April 21, 2014
Flight **1639**, 2.7 hours – survey lines
Flight **1640**, 0.7 hours; ferry to Cochrane for maintenance

3640	2440	1240	2060
3540	2340	1140	2160
3440	2240	1040	2260
3340	2140	1060	2360
3240	2040	1160	2460
3140	1940	1260	2560
3040	1840	1360	2660
2940	1740	1460	2760
2840	1640	1560	2060
2740	1540		2160
2640	1440	1760	2260
2540	1340	1860	2360
		1960	2460

April 22, 2014
Maintenance at Cochrane, scheduled 100 hour inspection

April 23, 2014
Flight **1641**, 0.9 hours, ferry return from Cochrane
Weather too windy to fly survey

April 24, 2014
Flight **1642**, 4.1 hours – 50% B424 Survey and 50% B425 Survey
Lines from B424 are as follows:

2760	3370	2570	1670
2860	3270	2470	1570
2960	3170	2370	1470
3060	3070	2270	1370
3160	2970	2170	1270
3260	2870	2070	1170
3360	2770	1970	1070
3460	2670	1870	3570
3560	3660	1770	3470
	3670		

April 27, 2014
Flight **1645**, 4 hours – B424 Missed Lines 1660 and 1780
(also flew part of next survey B425)

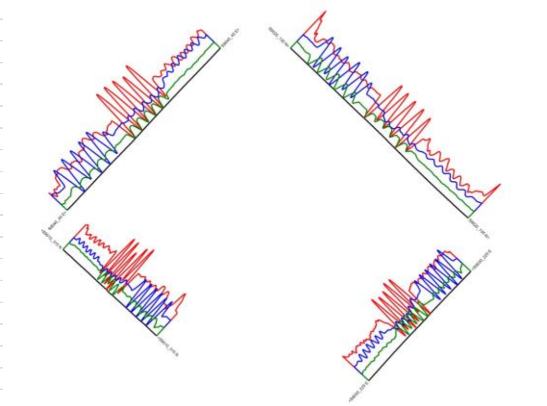
9.3. APPENDIX III – FIGURE OF MERIT

TERRAQUEST LTD.

Magnetic Figure of Merit Analysis

Job Ref:	B424_B425	Date:	16-Apr-14	Aircraft:	C-GGLS
Location :	Kirkland Lake, ON				

Flight Path + Manoevers



FOM Index : Tail Magnetometer

LINE	DIR	TRAV FLG	PITCH		ROLL		YAW			P	R	Y	Σ
			MAX	MIN	MAX	MIN	MAX	MIN					
9010	NW		0.0290	-0.0310	0.0270	-0.0210	0.0110	-0.0150		0.0600	0.0480	0.0260	0.1340
9020	SE		0.0870	-0.1500	0.0320	-0.0720	0.0270	-0.0400		0.2370	0.1040	0.0670	0.4080
9030	SW	⚐	0.0440	-0.0510	0.0380	-0.0300	0.0300	-0.0470		0.0950	0.0680	0.0770	0.2400
9040	NE	⚐	0.0560	-0.0290	0.0730	-0.0410	0.0150	-0.0260		0.0850	0.1140	0.0410	0.2400
									Σ	0.4770	0.3340	0.2110	1.0220

Full FOM Index :	1.0220
Eq. Traverse FOM Index (Σ Trav x 2) :	0.9600

FOM Index : Right Magnetometer

LINE	DIR	TRAV FLG	PITCH		ROLL		YAW			P	R	Y	Σ
			MAX	MIN	MAX	MIN	MAX	MIN					
9010	NW		0.0840	-0.0870	0.0380	-0.0380	0.0240	-0.0410		0.1710	0.0760	0.0650	0.3120
9020	SE		0.1070	-0.1440	0.0580	-0.0790	0.0470	-0.0550		0.2510	0.1370	0.1020	0.4900
9030	SW	⚐	0.0870	-0.0590	0.0420	-0.0620	0.0600	0.0780		0.1460	0.1040	-0.0180	0.2320
9040	NE	⚐	0.0880	-0.1170	0.0700	-0.0960	0.0320	-0.0590		0.2050	0.1660	0.0910	0.4620
									Σ	0.7730	0.4830	0.2400	1.4960

Full FOM Index :	1.4960
Eq. Traverse FOM Index (Σ Trav x 2) :	1.3880

FOM Index : Left Magnetometer

LINE	DIR	TRAV FLG	PITCH		ROLL		YAW			P	R	Y	Σ
			MAX	MIN	MAX	MIN	MAX	MIN					
9010	NW		0.0580	-0.0610	0.0400	-0.0300	0.0290	-0.0400		0.1190	0.0700	0.0690	0.2580
9020	SE		0.0820	-0.1350	0.0590	-0.0790	0.0340	-0.0530		0.2170	0.1380	0.0870	0.4420
9030	SW	⚐	0.0700	-0.0480	0.0520	-0.0520	0.0460	-0.0550		0.1180	0.1040	0.1010	0.3230
9040	NE	⚐	0.0740	-0.0430	0.0780	-0.0890	0.0470	-0.0570		0.1170	0.1670	0.1040	0.3880
									Σ	0.5710	0.4790	0.3610	1.4110

Full FOM Index :	1.4110
Eq. Traverse FOM Index (Σ Trav x 2) :	1.4220

9.4. APPENDIX IV – RADAR ALTIMETER CALIBRATION

B424: RADAR CALIBRATION DATA SUMMARY
Calibration performed 16 APR 2014, Flight GLS1635(Kirkland lake, ON)

INTERCEPT: 5.8817
SLOPE: 83.568525

LINE	RAW RADAR	GPS ALT	CORRECTED GPS ALT	RAW RADAR	CALIBRATED RADAR	ERROR *
Ground Ref	0	357.7	0.0			
S100:1635	0.2484	384.9	27.2	0.2	26.6	
S200:1635	0.6497	420	62.3	0.6	60.2	-2.1
S300:1635	1.0539	450.3	92.6	1.1	94.0	1.4
S400:1635	1.5292	489.9	132.2	1.5	133.7	1.5
S500:1635	2.1479	543.1	185.4	2.1	185.4	0.0
S800:1635	3.2995	640	282.3	3.3	281.6	-0.7

** Error estimated as (Calibrated Radar) - (Corrected GPS Alt)*

Cal Comparison with Previous Factors"

PREV INT	2.3344
PREV SLP	88.7899
	DIFF
60.02	-0.2
95.91	2.0
138.11	4.4
193.05	7.7
295.30	13.7

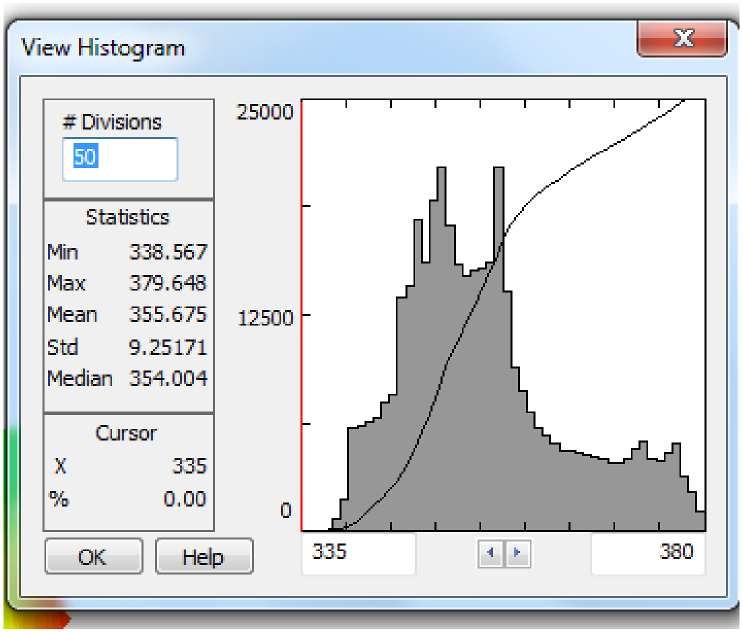
(DuBois, PA 2013)

Imperial Units

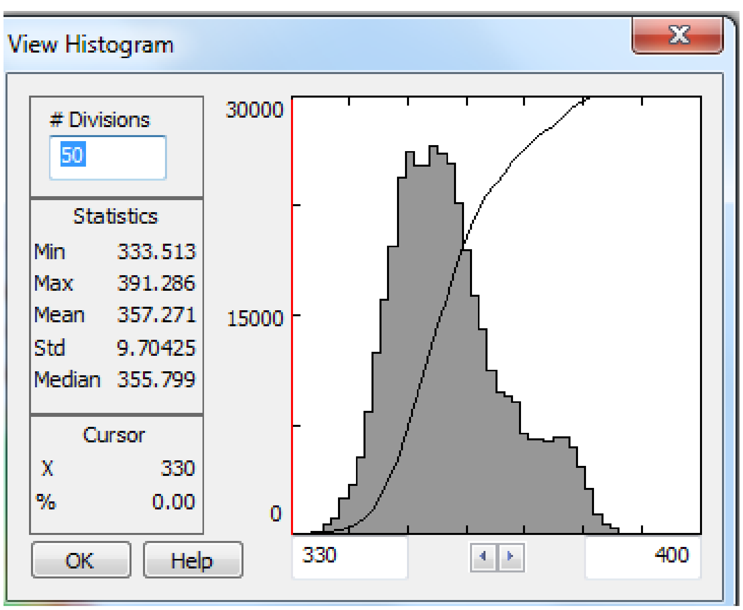
LINE	GPS_ALT	CAL_RAD
S100:1635	89.2	87.40197
S200:1635	204.4	197.4284
S300:1635	303.8	308.2499
S400:1635	433.7	438.5653
S500:1635	608.3	608.1973
S800:1635	926.2	923.9372

9.5. APPENDIX V – ALTITUDE & TERRAIN CLEARANCE STATS

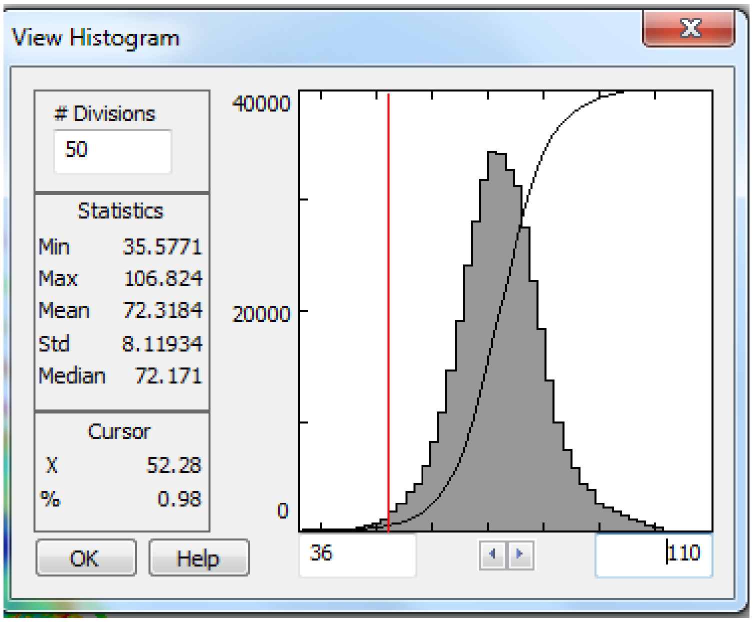
Computer Generated Flight Drape Surface (metres above sea level)



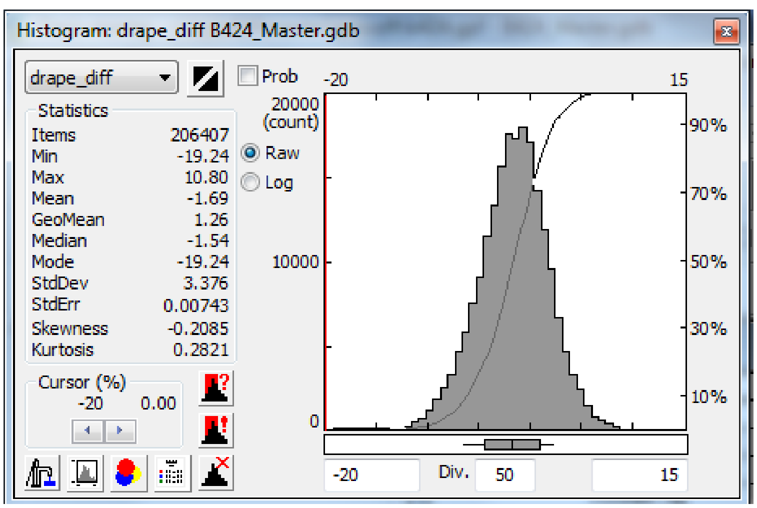
Statistics for drape surface flown (GPS metres above sea level)



Terrain Clearance flown statistics (Radar metres above ground)



Flight Deviation from Drape



9.6. APPENDIX VI – CORNER COORDINATES

The following is a list of coordinates for the outline of the property.

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/#Projection="Transverse Mercator",0,-81,0.9996,500000,0
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9.7. APPENDIX VII – README FILE

```
Terraquest Ltd.
B424 Walker-Wilkie Project International Explorers and Prospectors
Fixed Wing Horizontal Magnetic Gradiometry

DATA ARCHIVE FOR B424 Walker-Wilkie Project
CONTENTS------------------------

       1.1 /DATABASE
       1.2 /GRIDS
       1.3 /MAPS
       1.4 /JPEGs
       1.5 /PDFs
       1.6 /B424_ReadMe.docx

1.1 /DATABASE
    B424_ARC.gdb

1.2 /GRIDS
    B424_DTM_2.grd            Digital Terrain Model (m Above Sea Level)
    B424_TMI_3.grd            Total Magnetic Intensity (nT)
    B424_VD_4.grd             Calculated 1st vertical derivative of the TMI (nT/m)
    B424_HY_6.grd             Measured Along Line Horizontal Gradient (nT/m)
    B424_HX_5.grd             Measured Lateral Horizontal Gradient (nT/m)
    B424_RTF_7.grd            Reconstructed Total Field ( created from gradients using Nelson
                              method) (pseudonT)

1.3 /MAPs
    B424_FP_1.map             Flight Path
    B424_DTM_2.map            Digital Terrain Model (m Above Sea Level)
    B424_TMI_3.map            Total Magnetic Intensity (nT)
    B424_VD_4.map             Calculated 1st vertical derivative of the TMI (nT/m)
    B424_HY_6.map             Measured Along Line Horizontal Gradient (nT/m)
    B424_HX_5.map             Measured Lateral Horizontal Gradient (nT/m)
    B424_RTF_7.map            Reconstructed Total Field ( created from gradients using Nelson
                              method) (pseudonT)

1.4 /JPGs
    B424_FP_1.jpg             Flight Path
    B424_DTM_2.jpg            Digital Terrain Model (m Above Sea Level)
    B424_TMI_3.jpg            Total Magnetic Intensity (nT)
    B424_VD_4.jpg             Calculated 1st vertical derivative of the TMI (nT/m)
    B424_HY_6.jpg             Measured Along Line Horizontal Gradient (nT/m)
    B424_HX_5.jpg             Measured Lateral Horizontal Gradient (nT/m)
    B424_RTF_7.jpg            Reconstructed Total Field ( created from gradients using Nelson
                              method) (pseudonT)

1.5 /PDFs
    B424_FP_1.pdf             Flight Path
    B424_DTM_2.pdf            Digital Terrain Model (m Above Sea Level)
    B424_TMI_3.pdf            Total Magnetic Intensity (nT)
    B424_VD_4.pdf             Calculated 1st vertical derivative of the TMI (nT/m)
    B424_HY_6.pdf             Measured Along Line Horizontal Gradient (nT/m)
    B424_HX_5.pdf             Measured Lateral Horizontal Gradient (nT/m)
    B424_RTF_7.pdf            Reconstructed Total Field ( created from gradients using Nelson
                              method) (pseudonT)

1.6 /B424_ReadMe.docx
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B424 **ARC** channel list

****Note- Traverse lines in the databases are denoted with an L, Tie lines with a T****
The Magnetics data files for B424 **Walker-Wilkie Project contain the following channels:**

PARAMETER	**UNIT**	**DESCRIPTION**
LINE	number	Line number
FLIGHT	number	Flight number
DATE	date	Date in YYYY/MM/DD format
X	Metres	Easting (WGS84, UTM Zone 17 N)
Y	Metres	Northing (WGS84, UTM Zone 17 N)
LON	degrees	Longitude WGS84 (decimal degrees)
LAT	degrees	Latitude WGS84 (decimal degrees)
TIME	seconds	UTC Time (seconds after midnight)
ALT	metres	GPS Altitude (metres Above Sea Level)
Radar_m	metres	Radar Altitude (metres Above Ground Level)
DTM_FINAL	metres	Digital Terrain Model (metres Above Sea Level)
VMX	nT	Fluxgate X component
VMY	nT	Fluxgate Y component
VMZ	nT	Fluxgate Z component
TF1UNC	nT	Raw Magnetic Intensity (left sensor)
TF2UNC	nT	Raw Magnetic Intensity (right sensor)
TF3UNC	nT	Raw Magnetic Intensity (tail sensor)
TF1CMP	nT	Compensated Magnetic Intensity (left sensor)
TF2CMP	nT	Compensated Magnetic Intensity (right sensor)
TF3CMP		Compensated Magnetic Intensity (tail sensor)
Diurnal	nT	Diurnal Magnetic Intensity (raw)
TMI	nT	Total Magnetic Intensity (diurnal corrected, tie- line leveled)
TMI_ML	nT	Total Magnetic Intensity (diurnal corrected, tie- line leveled, micro-levelled, final processed TMI)
HX_FINAL	nT/m	Measured lateral horizontal gradient
HY_FINAL	nT/m	Measured Along line horizontal gradient