HELIBORNE HIGH RESOLUTION AEROMAGNETIC SURVEY

Geoscience BC Report 2013-02

NORTHERN VANCOUVER ISLAND, BC

For:

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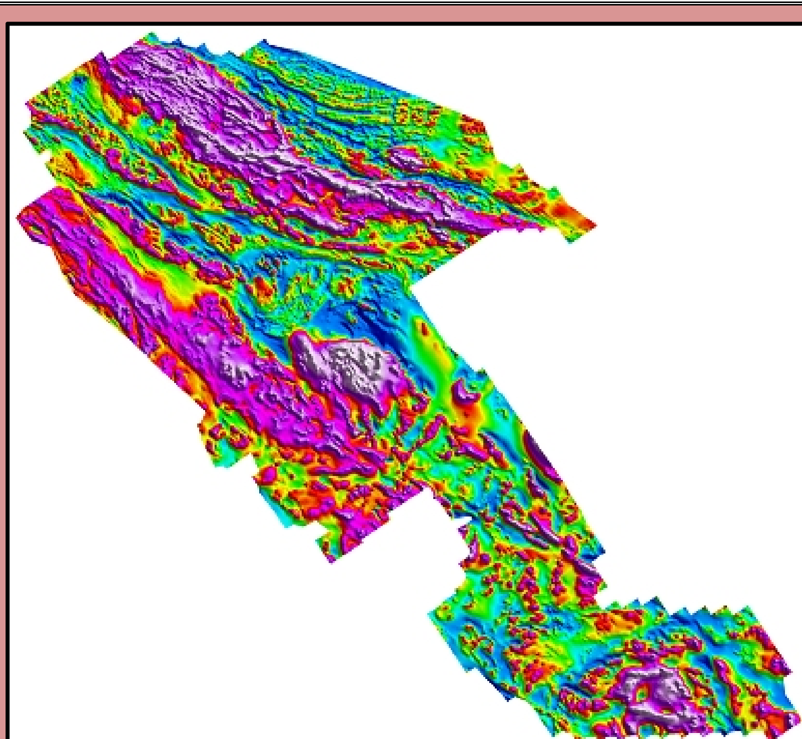
Project Ref.: P12-028 **Final Technical Report**

November 2012



GEOSCIENCE BC

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FINAL TECHNICAL REPORT

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1.0 INTRODUCTION

On August 7th, 2012, **Geo Data Solutions GDS Inc** (GDS) was awarded project P12-028 by **Geoscience BC** (GBC). The project entailed **GDS** to carry out 14 467 line-km of high-resolution helicopter borne magnetic survey on a single block located in the northern part of the Vancouver Island, British Columbia. On September 17th, 4 875 line-km were added to the previous number of line-km, for a total of 19 342 line-km.

From August 15th to September 20th, 2012, the base of operations was set up at **Port Hardy**. Crew and equipment were moved to **Port McNeil** on September 20th, and stay there till the end of the data acquisition period, on September 29th, 2012. **Port Hardy** located inside the block limits while **Port McNeil** is located 50 km northeast of the extension area (see figure 1).

Table 1 presents the flight path specifications, tables 2 and 3 present block co-ordinates and figure 2 shows the topographic relief. Lengths of any traverse or tie-line were adjusted to a minimum of 3 km.

The **GDS**'s survey was executed from August 15th to September 29th, 2012. Excluding calibration and test flights, 65 production flights were needed to cover the requested area.

Stable weather conditions were observed during the data acquisition period.

In terms of altitude, topography in the survey area is classed as rugged (figure 2), ranging from 0 metres to more than 1 100 metres. The survey was flown following a pre-defined flight surface having a rate of climb and descent of 20% and a nominal ground clearance of 80 metres. Altitude was ultimately controlled at the discretion of the helicopter pilot with safety held in priority consideration

The magnetometer sensor was mounted in a stinger fixed to the helicopter (figure 3).

This report (Geoscience BC Report 2013-02) describes survey procedures and data verification, which were carried out in the field, and data processing, which followed at the office.

Table 1: Survey Specifications							
Block	Traverse Line			Tie Lines			Total Line-km
	Azimuth	Line-km	Spacing	Azimuth	Line-km	Spacing	
N.Vanc.Island	N56.5ºE	13 048	250 m	N146.5ºE	1 419	2 500 m	**14 467**
N.Extension	N56.5ºE	530	250 m	N146.5ºE	45	2 500 m	**575**
S.Extension	N56.5ºE	3 861	250 m	N146.5ºE	439	2 500 m	**4 300**
						TOTAL	**19 342**

Table 2: Survey area coordinates (Main Block)					
Vertex	Longitude	Latitude	Vertex	Longitude	Latitude
1	127º 51' 08" W	50º 51' 13" N	**23**	127º 43' 13" W	50º 14' 17" N
2	127º 45' 38" W	50º 50' 19" N	**24**	127º 45' 03" W	50º 15' 11" N
3	127º 39' 57" W	50º 48' 49" N	**25**	127º 46' 44" W	50º 14' 43" N
4	127º 24' 39" W	50º 44' 51" N	**26**	127º 47' 51" W	50º 14' 59" N
5	127º 23' 06" W	50º 41' 58" N	**27**	127º 49' 41" W	50º 15' 40" N
6	127º 16' 38" W	50º 39' 25" N	**28**	127º 51' 43" W	50º 17' 23" N
7	127º 11' 23" W	50º 36' 54" N	**29**	127º 51' 32" W	50º 18' 58" N
8	127º 23' 05" W	50º 36' 57" N	**30**	127º 52' 48" W	50º 20' 46" N
9	127º 34' 00" W	50º 32' 34" N	**31**	127º 54' 54" W	50º 19' 34" N
10	127º 32' 56" W	50º 31' 19" N	**32**	127º 56' 46" W	50º 19' 19" N
11	127º 31' 18" W	50º 29' 06" N	**33**	127º 58' 25" W	50º 21' 29" N
12	127º 27' 43" W	50º 27' 07" N	**34**	127º 57' 49" W	50º 23' 32" N
13	127º 25' 20" W	50º 25' 24" N	**35**	128º 02' 51" W	50º 26' 37" N
14	127º 23' 04" W	50º 24' 19" N	**36**	128º 05' 51" W	50º 28' 32" N
15	127º 16' 27" W	50º 17' 56" N	**37**	128º 09' 24" W	50º 30' 33" N
16	127º 14' 09" W	50º 15' 23" N	**38**	128º 13' 06" W	50º 32' 30" N
17	127º 29' 08" W	50º 15' 19" N	**39**	128º 14' 17" W	50º 33' 51" N
18	127º 29' 20" W	50º 16' 14" N	**40**	128º 15' 52" W	50º 36' 11" N
19	127º 31' 03" W	50º 16' 39" N	**41**	128º 18' 24" W	50º 36' 40" N
20	127º 31' 21" W	50º 20' 23" N	**42**	128º 19' 26" W	50º 38' 08" N
21	127º 41' 59" W	50º 20' 13" N	**43**	128º 19' 03" W	50º 39' 04" N
22	127º 41' 56" W	50º 14' 25" N			
and many points along the south-eastern limit of Cape Scott Provincial Park					

Table 3: Survey area coordinates: North & South Extensions					
South Extension					
Vertex	**Longitude**	**Latitude**	**Vertex**	**Longitude**	**Latitude**
1	127º 29' 08" W	50º 15' 19" N	**19**	127º 03' 23" W	49º 58' 30" N
2	127º 14' 09" W	50º 15' 23" N	**20**	127º 13' 33" W	49º 58' 24" N
3	127º 12' 54" W	50º 13' 22" N	**21**	127º 17' 44" W	49º 59' 05" N
4	127º 12' 27" W	50º 12' 17" N	**22**	127º 20' 35" W	50º 01' 13" N
5	127º 13' 32" W	50º 11' 33" N	**23**	127º 23' 51" W	50º 02' 00" N
6	127º 12' 45" W	50º 10' 38" N	**24**	127º 26' 22" W	50º 03' 40" N
7	127º 12' 53" W	50º 09' 06" N	**25**	127º 28' 33" W	50º 05' 14" N
8	127º 13' 48" W	50º 08' 19" N	**26**	127º 29' 37" W	50º 06' 32" N
9	127º 11' 49" W	50º 07' 34" N	**27**	127º 31' 21" W	50º 07' 23" N
10	127º 09' 10" W	50º 07' 46" N	**28**	127º 31' 22" W	50º 08' 02" N
11	127º 06' 21" W	50º 07' 51" N	**29**	127º 28' 20" W	50º 09' 24" N
12	127º 05' 04" W	50º 07' 09" N	**30**	127º 26' 57" W	50º 11' 10" N
13	127º 00' 32" W	50º 07' 11" N	**31**	127º 27' 14" W	50º 11' 59" N
14	126º 56' 27" W	50º 07' 07" N	**32**	127º 26' 39" W	50º 12' 39" N
15	126º 53' 52" W	50º 05' 56" N	**33**	127º 26' 16" W	50º 14' 02" N
16	126º 51' 16" W	50º 04' 08" N	**34**	127º 26' 32" W	50º 14' 31" N
17	126º 50' 53" W	50º 01' 54" N	**35**	127º 28' 51" W	50º 14' 29" N
18	126º 50' 13" W	49º 58' 37" N			
North Extension					
Vertex	**Longitude**	**Latitude**	**Vertex**	**Longitude**	**Latitude**
1	127º 43' 13" W	50º 14' 17" N	**12**	127º 35' 43" W	50º 16' 07" N
2	127º 41' 56" W	50º 14' 25" N	**13**	127º 38' 13" W	50º 14' 56" N
3	127º 41' 59" W	50º 20' 13" N	**14**	127º 38' 22" W	50º 14' 23" N
4	127º 31' 21" W	50º 20' 23" N	**15**	127º 39' 29" W	50º 14' 22" N
5	127º 31' 03" W	50º 16' 39" N	**16**	127º 40' 54" W	50º 12' 58" N
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7	127º 31' 45" W	50º 17' 04" N	**18**	127º 42' 46" W	50º 12' 00" N
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9	127º 33' 35" W	50º 17' 40" N	**20**	127º 44' 01" W	50º 13' 24" N
10	127º 34' 28" W	50º 17' 13" N	**21**	127º 43' 13" W	50º 14' 17" N
11	127º 35' 45" W	50º 16' 57" N			

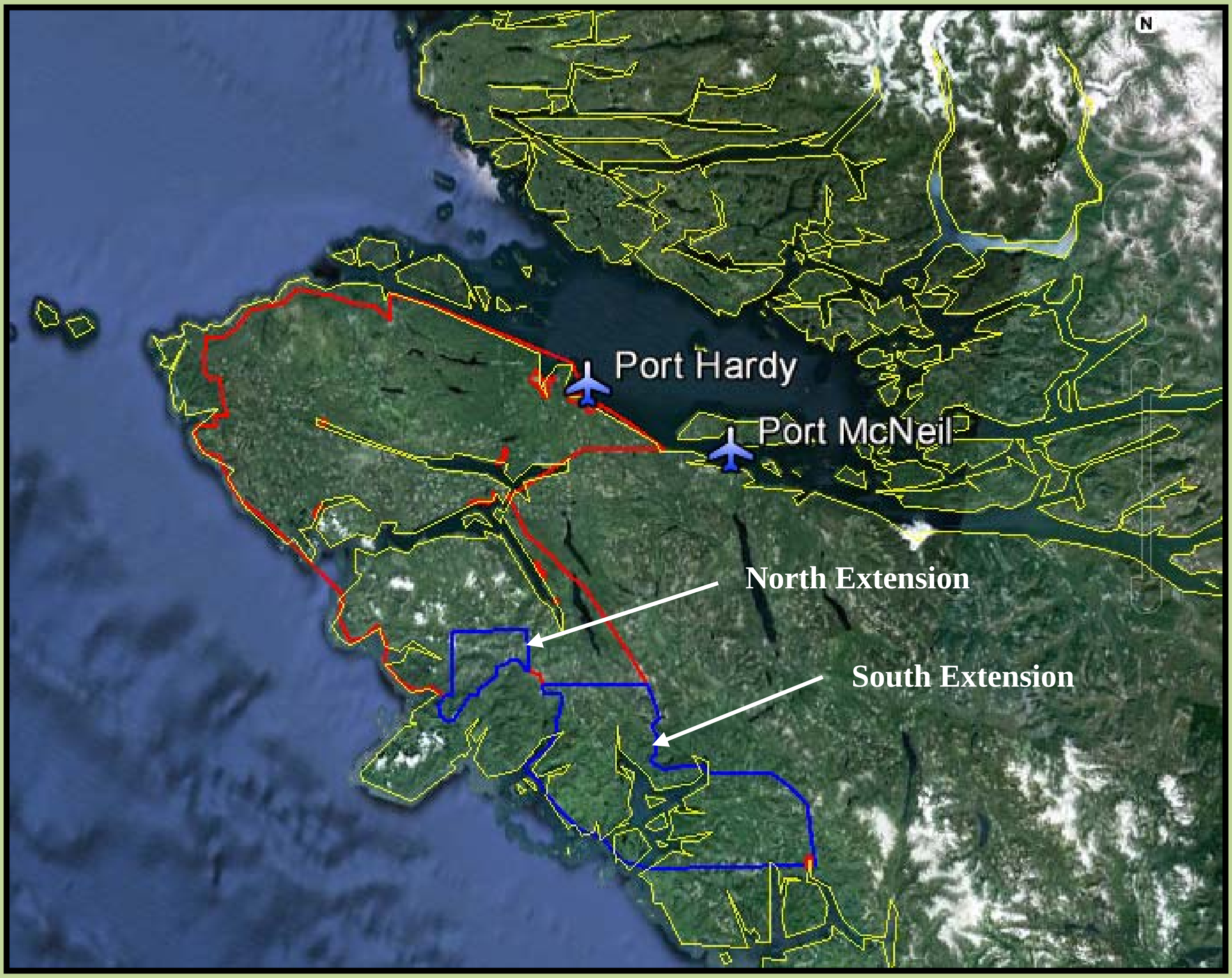

Figure 1: Block Location Including North and South Extensions

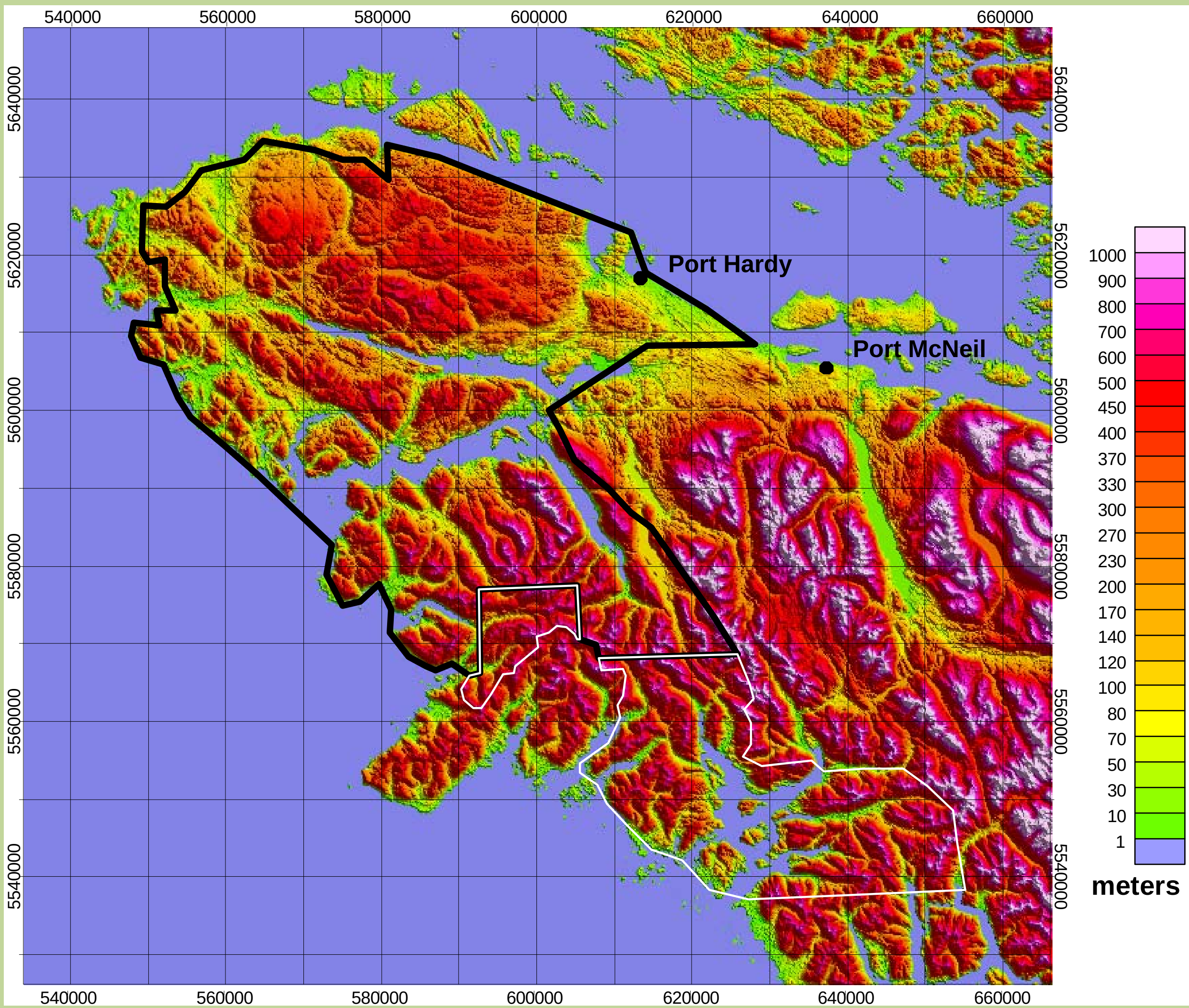

Figure 2: Block 3 Topographic Relief

2.0 SURVEY SPECIFICATIONS

Airborne survey and noise specifications were as follows:

a) Number of line-km flown, traverse spacing and direction
- Table 1 presents the number of line-km flown and traverse/tie-line spacing and directions.

b) Nominal terrain clearances
- A smooth drape surface was followed with a nominal ground clearance of 80 metres and a rate of climb of 20%. Figure 7 presents a histogram of the helicopter ground clearance.

c) Nominal Speed
   - The helicopter nominal speed was 125 km/hr. Under these conditions, the distance between samples along survey lines is typically 3.4 m. Figure 8 presents a histogram of the helicopter speed.

d) magnetic diurnal variation
   - A maximum tolerance of 10 nT (peak to peak) deviation from a long chord equivalent to a period of 5 minutes at the magnetometer base station was respected during all the survey period.

e) magnetometer noise envelope
   - in-flight noise envelope did not exceed 0.5 nT, for straight and level flight.
   - base station noise envelope did not exceed 0.2 nT.

f) Re-flights and turns
   - line-spacing did not vary by more than 50 % from the nominal spacing over a distance of more than 1.5 km. The minimum length of any survey line was 3 km.
   - all reflights of line segments intersected at least two control lines.

3.0 HELICOPTER, EQUIPMENT AND PERSONNEL

3.1 Helicopter

Figure 3 presents the Astar 350 B2 helicopter technical specifications and capacity.

3.2 Equipment

Magnetometer:

A Geometrics Cesium split-beam total field magnetic sensor was installed at the end of a stinger fixed to the helicopter (figure 3). Its characteristics are: Sensitivity of 0.01 nT, Sampling rate of 10 Hz, Resolution better than 0.025 nT per measurement. The sensor tolerates gradients up to 10 000 nT/m, and operates in a range from 20 000 nT to 100 000 nT. The noise envelope did not exceed 0.5 nT over 500 metres line-length without a reflight.

Magnetometer Base Station:

A GEM GSM-19 Overhauser magnetometer base station (figure 4) was mounted in a magnetically quiet area at the base of operation. The base station measured the total intensity of the earth's magnetic field in units of 0.01 nT at intervals of 1 second, within a noise envelope of 0.10 nT.

Co-ordinates of the base station and mean magnetic field values obtained were:

Port Hardy:	Latitude: 50.6858402°N	Longitude: 127.3757706°W
	Mean magnetic field value:	54 501 nT (flights 2 to 51)
Port McNeil:	Latitude: 50.5711878°N	Longitude: 127.0295271°W
	Mean magnetic field value:	54 593 nT (flights 52 to 66)

Type	Astar 350 B2
Power	732 shp
Powerplant	Turbomeca Arriel 1 B series turbine
Number of main rotor blades	3
Average survey speed	125 km/hr
Average cruising speed	226 km/hr
Maximum gross weight	Internal: 4960 lbs
	External: 5512 lbs
Aircraft empty eight	2690 lbs
Maximum range	410 miles
Fuel consumption	170 l/hr
External sling load	1650 lbs

Figure 3: The Astar 350 B2 helicopter

Magnetic Compensator and Data Acquisition System (figure 5):

The magnetic field generated by the aircraft was compensated using a RMS DAARC500 Automatic Aeromagnetic Digital Compensator system. The DAARC500 is an instrument used to compensate or correct in real time for the magnetic interference caused by the aircraft itself and aircraft manoeuvring in the Earth's magnetic field, when using inboard-mounted high sensitivity magnetometers. The compensation accounts for the effects of permanent magnetism, induced magnetism, Eddy currents and also heading errors caused by the sensor themselves. It provides a frequency bandwidth of DC to 0.9 Hz, frequencies of most interest to the geophysicist. Other bandwidths are optionally available. Signals from magnetometers are digitized faithfully without aliasing or phase distortion.

The DAARC500 is based on many years of research and development on automatic aeromagnetic compensation by the National Aeronautical Establishment (NAE), a division of the National Research Council of Canada. Following the transfer of technology, RMS Instruments continued with the development resulting in an instrument which is extremely reliable, capable of accepting the Larmor frequencies of up to four high sensitivity magnetometers, and is based on a sophisticated compensation algorithm which is extremely robust.

The DAARC500 incorporate a sophisticated and flexible data acquisition system. Geophysical instruments and sensors may be directly connected to the DAARC500, via 8 Outputs and Inputs high speed RS232 digital ports, 16 analogic Inputs ports and an Ethernet port. Incoming data are real time processed. All acquired data are synchronized through a GPS receiver pulse-per-second (PPS).

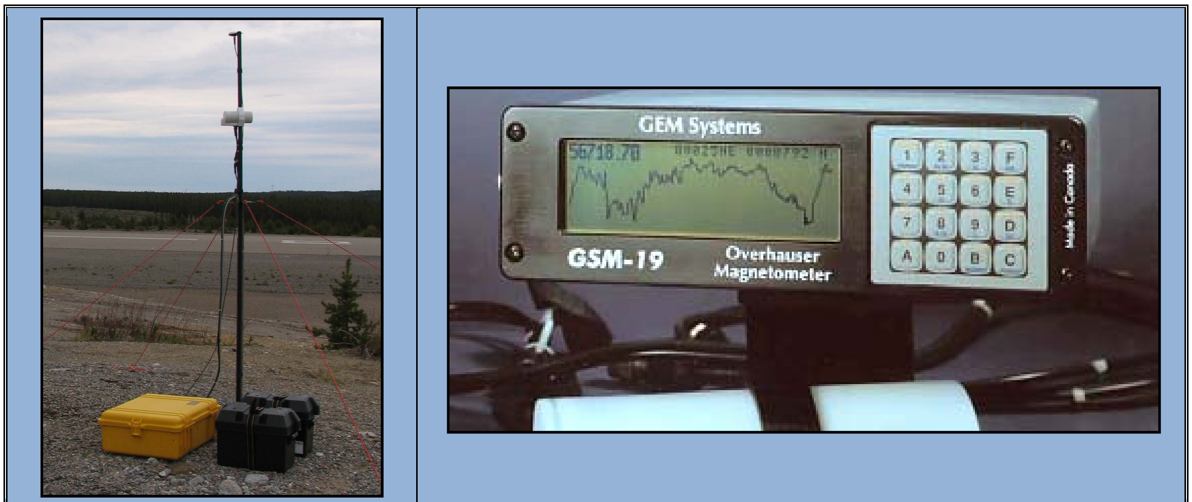

Figure 4: Base station magnetometer and console

Figure 5: Magnetic compensator and Data Acquisition System

GPS and Navigation System:

Table 4 describes the airborne GPS system, which provided both real-time navigation and flight-path recovery (figure 6).

Post-flight differential correction of the raw GPS data was done using the Natural Resources Canada online GPS processing service CRSR-PPP (Canadian Spatial Reference System - Precise Point Positioning).

Table 4: The GPS Navigation System	
Item	**Specifications**
GPS Manufacturer	Novatel
Model	DL-V3 Dual-freq L1/L2
Serial Number	NBV07400024
Frequency	1 hertz
Number of Channels	12
Sampling Interval	2 Hz
Navigation System	AGNAV (LiNAV)

Figure 6: Novatel GPS receiver and AGNAV Linav navigation system

Radar Altimeter

A frequency-modulated radio altimeter was used for measuring accurately distances between helicopter and ground. Table 5 presents its technical characteristics.

Table 5: The Radio Altimeter Specifications	
Item	**Specifications**
Manufacturer	Free Flight
Model	TRA 3000
Minimum range	0 to 800 metres
Accuracy:	5 %
Sensitivity:	10 mV/m
Digital resolution:	0.1 metre

Ancillary Equipment

Ancillary equipment included Computer workstation, complement of spare parts and test instruments.

3.3 Personnel

The general management of the project was monitored offsite by Mr. Mouhamed Moussaoui, **GDS**'s President. Mr. Saleh Elmoussaoui and Ms My Phuong Vo were responsible for the field data quality control to ensure that the work was carried out according to contractual specifications. Final data evaluation and processing were performed at the Laval **GDS**'s office by Ms My Phuong Vo. Survey crew and office personnel are listed in table 6.

Table 6: Field and Office Crew	
Position	**Name**
Project Manager	Mr Mouhamed Moussaoui, Ing.
Data quality control	Mr Saleh Elmoussaoui Ms My Phuong Vo
Field Operator	Mr Jamal Ez-Ziani
Pilot	Mr Ralph Greenaway
Final Processing	Ms My Phuong Vo
Survey Report	Mr Camille St-Hilaire, P.Geo

4.0 SURVEY SCHEDULE

The survey was flown over a single block with flight line bearing selected to run perpendicular to the average trend of the local geological structures.

Survey steps were:

Mobilization:	August 12th, 2012
Survey:	August 15th to September 29th, 2012
Demobilization:	October 1st, 2012
Number of Flights:	65

Preliminary results were delivered to **GBC** on September 30th, 2012 while final maps and data were sent in mid-November 2012.

5.0 DATA ACQUISITION

The following tests were performed before the survey production.

FOM Magnetometer Test:

Effects of helicopter manoeuvres (roll, pitch and yaw) are determined by a FOM test (Figure of Merit). The test is performed over a magnetically quiet zone, at high altitude. It consists of flying $\pm 10^o$ rolls, $\pm 5^o$ pitches and $\pm 5^o$ yaws peak to peak along North, South, East and West headings over periods of 4-5 seconds. The compensation Figure of Merit (FOM) for the helicopter is calculated by summing up the peak-to-peak amplitudes of these 12 magnetic signatures. FOM test results are presented in appendix A.

Quality Control

After data acquisition, profiles were examined as a preliminary assessment of the noise level on the recorded data. Altimeter deviations from the prescribed flying altitudes were also closely examined as well as the magnetic diurnal activity, as recorded on the base station.

All digital data were verified for validity and continuity. Data from helicopter and base station were transferred to a PC's hard disk. Basic statistics were generated for each parameter recorded. These included minimum, maximum, mean values, standard deviation, and any null values were located. Editing of all recorded parameters for spikes or datum shifts was done, followed by final data verification via an interactive graphic screen with on-screen editing and interpolation routines.

Quality of GPS navigation was controlled by recovering the helicopter flight path.

Checking all data for adherence to specifications was carried out before crew and aircraft demobilization.

6.0 DATA COMPILATION AND PROCESSING

6.1 Base maps

The base map of the survey area was plotted from topographic maps of the Department of Natural Resources Canada at a scale of 1:50 000.

Projection description

Datum:	NAD83
Projection:	UTM Zone 9N
False Easting:	500 000
False Northing:	0
Scale Factor:	0.9996

6.2 Processing of Base Station data

Recorded magnetic diurnal data from the magnetometer base station were reformatted and loaded into the OASIS database. After initial verification of the integrity of the data from statistical analysis, the appropriate portion of the data was selected to correspond to the exact start and end time of the flight. Data were then checked and corrected for spikes using a fourth difference editing routine. Following this, interactive editing of the data was done, via a graphic editing tool, to remove events caused by man-made disturbances. A non-linear filter of 20 second with tolerance of 0.001followed by a low-pass filter of 5 seconds were then applied. The averages of the Total Field Magnetic Intensities measured at the Base Station were 54 501 nT during the **Port Hardy** operations, and 54 593 nT during the **Port McNeil** operations.

6.3 Processing of the Positioning Data (GPS)

The raw GPS data were recovered and corrected for spikes. The resulting corrected latitudes and longitudes were then converted to the local map projection and datum (Nad83). A point-to-point speed calculation was then done from the final X, Y coordinates and reviewed as part of the quality control. The flight data were then cut back to the proper survey line limits and a preliminary plot of the flight path was done and compared to the planned flight path to verify the navigation. The positioning data were then exported to the other processing files.

6.4 Processing of the Altimeter data

The altimeter data, which includes radar altimeter and the GPS elevation values were checked and corrected for spikes using a fourth difference editing routine. A small low pass filter of 2.8 seconds was then applied to the data. Following this, a digital terrain trace was computed by subtracting the radar altimeter values from the corrected GPS elevation values. All resulting parameters were then checked, in profile form, for integrity and consistency, using a graphic viewing editor.

6.5 Processing of Magnetic data

The airborne magnetic data were reformatted and loaded into the OASIS database. After initial data verification by statistical analysis, positions were adjusted for system lag. Data were then checked and corrected for any spikes using a fourth difference editing routine and inspected on the screen using a graphic profile display. Interactive editing was done at this stage.

An altitude correction was applied to the total field magnetic intensity by using the vertical gradient. This correction was done by downward or upward continuation of the field around the drape surface. Histogram of the ground clearance is shown on figure 7.

The long wavelength component of the diurnal (section 6.2) was subtracted from the data as a pre-levelling step. Preliminary grids of the total field and first vertical derivative were created and verified for obvious problems, such as errors in positioning or bad diurnal. Appropriate corrections were then applied to data, as required.

Then, the levelling consisted of calculating positions of the control points (intersections of traverses and tie lines), calculating elevation and magnetic differences at the control points and applying a series of levelling corrections to reduce misclosures to zero. New grids of the values were then created and checked for residual errors. Any gross errors detected were corrected in the profile database and the levelling process repeated (table 7). Manual intersection levelling were required due to rugged terrain in some parts of the survey area.

A micro-levelling was finally applied in order to removes minor imperfections visible on shadow images (clipping ±5 nT, Low pass filter of 2.8 seconds). This produced grids of exceptional aesthetic quality with no degradation of the high frequency content of the data.

The International Geo-Reference Field (IGRF) was removed from the Total Magnetic Field Intensity. Model used was 2010, survey date September 6th, 2012, elevation 267 metres.

A Geosoft database was created with channels described in appendix B (Standard Processing Database).

Table 7: Magnetic Levelling Steps

Pass	Filter	Control	Traverse
1	Butterworth(25000,6)	x	
2	Butterworth(5000,8)		x
3	Butterworth(10000,6)	x	
4	Butterworth(2500,8)		x
5	Butterworth(1000,6)	x	
6	Butterworth(500,8)		x
7	Butterworth(300,8)	x	

6.6 Residual Total Magnetic field and First Vertical Derivative Grids

The residual total magnetic field grids were calculated from the final reprocessed profiles by a minimum curvature algorithm. The accuracy standard for gridding was that the grid values fit the profile data to within 0.0001 nT for 99.99999% of the profile data points. Grids have a grid cell size of 62.5 metres.

Minimum curvature gridding provides the smoothest possible grid surface that also honours the profile line data. However, sometimes this can cause narrow linear anomalies cutting across flight lines to appear as a series of isolated spots.

The first vertical derivative of the total magnetic field was computed to enhance small and weak near-surface anomalies and as an aid to delineate geologic contacts having contrasting susceptibilities. The calculation was done in the frequency domain, using Win-Trans and Geosoft FFT algorithms.

7.0 FINAL PRODUCTS

The following parameters were processed:

- Residual Total Magnetic Field data
- Calculated First Vertical Derivative of the Residual Total Magnetic Field data
- Digital Elevation Model data

7.1 Maps:

GDS made the base map from information present on published topographic maps. Each map was produced at scales of 1:50 000 (6 maps) and 1: 125 000 (1 map) displaying base-map features, flight path and UTM co-ordinates. Three paper copies of the following final maps were delivered to **GBC**:

- Shaded Residual Total Magnetic Field (contour and colour interval)
- Shaded Magnetic First Vertical Derivative (colour interval)

All final map products were also delivered in PDF and Geotiff formats at resolution suitable to accurately reproduce plotted products.

7.2 Final digital archive of line data:

GDS produced three copies of a CD-ROM containing digital archives and maps (PDF and Geotiff formats). Digital archives, described in Appendix B, contain the Geosoft database of all survey data. The database is referenced to the standard UTM co-ordinates for the area.

GDS stores a copy of the digital archive for one year after production of final products. On request by **GBC**, **GDS** will supply raw data from the survey with survey products. Otherwise, **GDS** will store raw data with copy of the digital archive.

7.3 Miscellaneous

Three paper copies of this technical report, with the corresponding digital PDF file, have been produced and delivered to **GBC**.

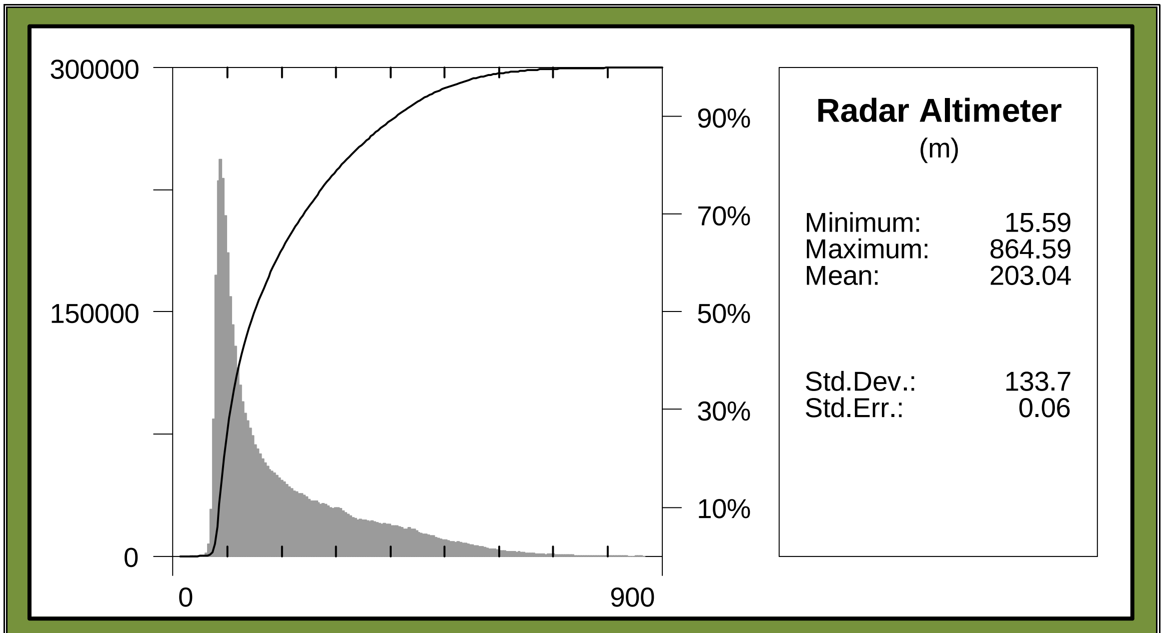

Figure 7: Histogram of the Helicopter Ground Clearance

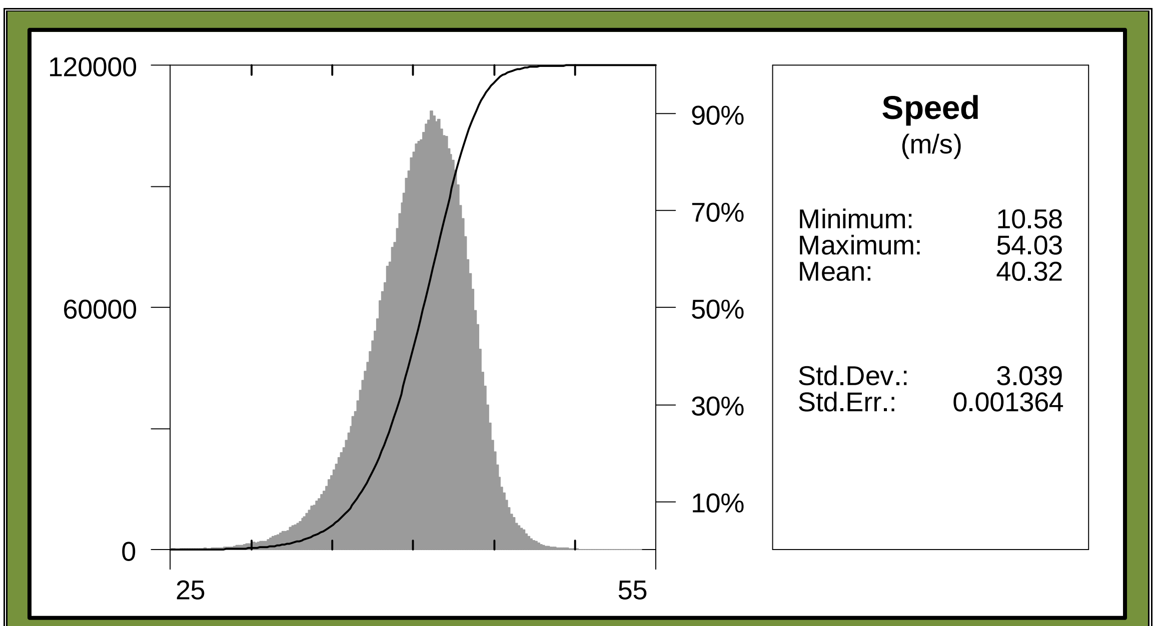

Figure 8: Histogram of the Helicopter Speed

8.0 CONCLUSIONS

Flown from August 15th to September 29th, 2012, the helicopter borne aeromagnetic survey was completed inside the estimated time frame.

All airborne and ground-based records were of excellent quality. Magnetic data acquisition was done in good diurnal conditions.

Noise levels observed on the Total Magnetic Field were well within accepted limits, determined from the fourth difference of the lagged, edited airborne magnetic data.

GPS results proved to be of high quality. The flight path was surveyed accurately and speed checks showed no abnormal jumps in data.

It is hoped that information presented in this report, and on the accompanying products, will be useful both in planning subsequent exploration efforts and in the interpretation of related exploration data.

Respectfully Submitted,

Camille St-Hilaire, M.Sc.A.
P.Geo. 339

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APPENDIX A

TESTING AND CALIBRATION

GEODATA SOLUTIONS GDS INC.
FOM TEST

Configuration:	Front Stinger	Date:	August 15th, 2012
Altitude:	3 000 m	Helicopter:	Astar B2
Pilot :	Ralph Greenaway	Location :	Port Hardy, BC

North (360º)	Uncompensated mag (nT)	Compensated mag (nT)	Improv. Ratio
PITCH	3,098	0,218	14,211
ROLL	25,656	0,182	140,967
YAW	7,090	0,148	47,905
TOTAL	**35,844**	**0,548**	**65,409**
East (90º)	**Uncompensated mag (nT)**	**Compensated mag (nT)**	**Improv. Ratio**
PITCH	3,161	0,253	12,494
ROLL	18,721	0,196	95,515
YAW	6,632	0,266	24,932
TOTAL	**28,514**	**0,715**	**39,880**
South (180º)	**Uncompensated mag (nT)**	**Compensated mag (nT)**	**Improv. Ratio**
PITCH	4,988	0,175	28,503
ROLL	27,689	0,211	131,227
YAW	10,430	0,367	28,420
TOTAL	**43,107**	**0,753**	**57,247**
West (270º)	**Uncompensated mag (nT)**	**Compensated mag (nT)**	**Improv. Ratio**
PITCH	5,365	0,218	24,610
ROLL	30,749	0,211	145,730
YAW	8,570	0,193	44,404
TOTAL	**44,684**	**0,622**	**71,839**
RESULTS	**Uncomp. mag (nT)**	**Comp. Mag (nT)**	**Improv. Ratio**
	152,149	**2,638**	**57,676**

APPENDIX B

PROFILE DATABASE ARCHIVE
AND CHANNEL/FILE DESCRIPTION

MAGNETIC LINE ARCHIVE CHANNEL DESCRIPTION

Channel	Description	Sampling	Unit	Format
date	Flight date	10Hz	yyyy/mm/dd	d11.0
flt	Flight number	10Hz		s5.0
line	Line number	10Hz		d6.0
UTC	UTC time in second after midnight	10Hz	second	d8.1
xrt	Raw real time easting UTM, NAD83, Zone 9N	10Hz	meters	d9.2
yrt	Raw real time northing UTM, NAD83, Zone 9N	10Hz	meters	d10.2
zrt	Raw real time GPS elevation (MSL)	10Hz	meters	d7.2
lon	Post-processed longitude, NAD83	10Hz	dd.mm.ss.s	d14.2
lat	Post-processed latitude, NAD83	10Hz	dd.mm.ss.s	d13.2
x	Post-processed easting UTM, NAD83, Zone 9N	10Hz	meters	d9.2
y	Post-processed northing UTM, NAD83, Zone 9N	10Hz	meters	d10.2
z	Post-processed GPS elevation – orthometric MSL	10Hz	meters	d7.2
raltlc	Corrected radar altimeter	10Hz	meters	d8.2
drape	Drape surface used for height navigation	10Hz	meters	d7.2
DTMc	Digital Terrain Model (levelled)	10Hz	meters	d7.2
baseao	Base A diurnal data original (main base mag)	10Hz	nanoteslas	d10.3
basea	Filtered main base mag	10Hz	nanoteslas	d10.3
mfluxX	Fluxgate X component	10Hz	nanoteslas	d13.3
mfluxY	Fluxgate Y component	10Hz	nanoteslas	d13.3
mfluxZ	Fluxgate Z component	10Hz	nanoteslas	d13.3
MBu	Raw uncompensated mag	10Hz	nanoteslas	d10.3
MBul	Lagged uncompensated mag	10Hz	nanoteslas	d10.3
MBc	Raw compensated mag	10Hz	nanoteslas	d10.3
MBclc	Compensated mag (lagged and de-spiked)	10Hz	nanoteslas	d10.3
drift_LF	Low-frequency diurnal correction	10Hz	nanoteslas	d10.3
magbc	Magnetic field, diurnally corrected	10Hz	nanoteslas	d10.3
coralt	Altitude correction	10Hz	nanoteslas	d10.3
magalt	Magnetic field, corrected by altitude	10Hz	nanoteslas	d10.3
corlvl	Cumulative tie line mag levelling adjustment	10Hz	nanoteslas	d10.3
maglvl	Levelled mag	10Hz	nanoteslas	d10.3
cormicro	Microleveling correction	10Hz	nanoteslas	d10.3
magmicro	Microleveled mag (TMI)	10Hz	nanoteslas	d10.3
igrf	International geo-referenced field (model 2010; 2012/09/06)	10Hz	nanoteslas	d10.3
magres	Mag IGRF removed (residual)	10Hz	nanoteslas	d10.3

File list and descriptions

(Database and grids are in Geosoft format and in NAD83 UTM zone 9)

GDS_GeoscienceBC_NVI.pdf	Technical report
Files list description.pdf	This file

\Database

NVI_GBC.gdb	Magnetic database
Channels list description.pdf	Database field description

\Grids

Magres_NVI.grd	Residual Total Magnetic Field grid
FVDmagres_NVI.grd	First vertical derivative of the magnetic field grid
DTMc_NVI.grd	Digital Terrain Model grid

\Maps\125k (1:125000 scale maps in Adobe PDF and GeoTiff 300dpi format)

GBC-2013-02-01 MAG.pdf	Residual Total Magnetic Field map
GBC-2013-02-01 MAG.tif	Residual Total magnetic Field map
GBC-2013-02-02 1VD.pdf	First Vertical Derivative of the Magnetic Field map
GBC-2013-02-02 1VD.tif	First Vertical Derivative of the Magnetic Field map

\Maps\50k (1:50000 scale maps in Adobe PDF and GeoTiff 300dpi format)

GBC-2013-02-03 MAG.pdf	Residual Total Magnetic Field map – South-E area
GBC-2013-02-03 MAG.tif	Residual Total magnetic Field map – South-E area
GBC-2013-02-05 MAG.pdf	Residual Total Magnetic Field map – South-W area
GBC-2013-02-05 MAG.tif	Residual Total magnetic Field map – South-W area
GBC-2013-02-07 MAG.pdf	Residual Total Magnetic Field map – Central-W area
GBC-2013-02-07 MAG.tif	Residual Total magnetic Field map – Central-W area
GBC-2013-02-09 MAG.pdf	Residual Total Magnetic Field map – Central-E area
GBC-2013-02-09 MAG.tif	Residual Total magnetic Field map – Central-E area
GBC-2013-02-11 MAG.pdf	Residual Total Magnetic Field map – North-E area
GBC-2013-02-11 MAG.tif	Residual Total magnetic Field map – North-E area
GBC-2013-02-13 MAG.pdf	Residual Total Magnetic Field map – North-W area
GBC-2013-02-13 MAG.tif	Residual Total magnetic Field map – North-W area

GBC-2013-02-04 1VD.pdf	First Vertical Derivative of the Magnetic Field map – South-E area
GBC-2013-02-04 1VD.tif	First Vertical Derivative of the Magnetic Field map – South-E area
GBC-2013-02-06 1VD.pdf	First Vertical Derivative of the Magnetic Field map – South-W area
GBC-2013-02-06 1VD.tif	First Vertical Derivative of the Magnetic Field map – South-W area
GBC-2013-02-08 1VD.pdf	First Vertical Derivative of the Magnetic Field map – Central-W area
GBC-2013-02-08 1VD.tif	First Vertical Derivative of the Magnetic Field map – Central-W area
GBC-2013-02-10 1VD.pdf	First Vertical Derivative of the Magnetic Field map – Central-E area
GBC-2013-02-10 1VD.tif	First Vertical Derivative of the Magnetic Field map – Central-E area
GBC-2013-02-12 1VD.pdf	First Vertical Derivative of the Magnetic Field map – North-E area
GBC-2013-02-12 1VD.tif	First Vertical Derivative of the Magnetic Field map – North-E area
GBC-2013-02-14 1VD.pdf	First Vertical Derivative of the Magnetic Field map – North-W area
GBC-2013-02-14 1VD.tif	First Vertical Derivative of the Magnetic Field map – North-W area