095294

FINAL REPORT

HELICOPTER-BORNE GEOPHYSICAL SURVEY

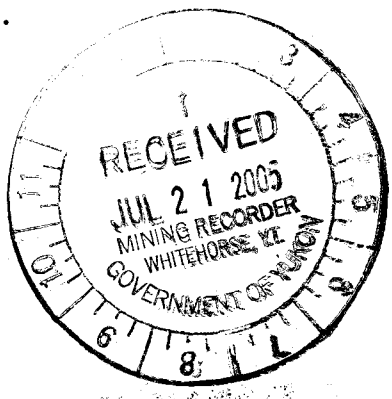
CANOL SURVEY AREA
QUIET LAKE, YUKON TERRITORY
WHITEHORSE MINING DISTRICT

FOR

CORDILLERAN MINERALS LIMITED

BY

MCPHAR GEOSURVEYS LTD.



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MIKLIN CLAIMS 1-248 YC26755-YC39138
NTS MAPS 105C-14/15 - UTM COORDINATE 605400E – 6754750N
WORK COMPLETED AUGUST 1ST – 7TH, 2004

November 19, 2004

Costs associated with this report have been approved in the amount of $74,102.26 for assessment credit under Certificate of Work No. QW27778

Mining Recorder
Whitehorse Mining District

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Final Report on a Helicopter-borne Geophysical Survey Canol Survey Area Yukon Territory

For

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November 19, 2004

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- DGPS Max
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- Robert Hearst
- Henrik T. Anderson
- Barry Levy
- Tonia Bojkova
- Asif Mirza

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SUMMARY

An airborne geophysical survey was completed over an area north of Johnson's Crossing and South of Quiet Lake over the Canol Highway in the Whitehorse Mining District, Yukon Territory, Canada, under contract to Cordilleran Minerals Limited, signed July 2004. The project consisted of a high-resolution helicopter magnetic, electromagnetic (HEM) and radiometric survey.

First tests and calibration flights were completed on August 5, 2004 with data acquisition initiated at the same time. The final survey flight was completed on August 6, 2004. A total of 611 line-kilometres of data was acquired, covering an area of approximately 120 square kilometres.

1. INTRODUCTION

A detailed high-resolution helicopter-borne magnetic, Electromagnetic and radiometric survey was carried out during the period of August 5, 2004 and August 6, 2004 on behalf of Cordilleran Minerals Limited, hereinafter referred to as "CML", by McPhar Geosurveys Ltd, hereinafter referred to as "McPhar", over the survey area approximately 50 kilometres north of Johnson's Crossing in the Yukon Territory, Canada.

The purpose of the survey was to acquire high-resolution geophysical data to map the geophysical characteristics of the geology and structure in an effort to provide an insight into geologic and geophysical settings conducive to economic (Au) mineralisation.

Table 1: Cordilleran Minerals Limited Canol Survey Area Description

AREA NAME	APPROX AREA KM^2	LINE /T.L. SPACING	FLIGHT LINE-KM	TIE-LINE KM	TOTAL LINE-KM	PRIMARY FLIGHT DIRECTION
Canol Area	120	200 m x 2,000 m	611	70	681	N - S
Totals	**120**		**611**	**70**	**681**	

The data acquisition involved the use of precision differential GPS positioning, a high sensitivity magnetometer system incorporated into the *HUMMINGBIRD*™ five (5) frequency helicopter electromagnetic (HEM)system towed beneath a helicopter and a Pico-Envirotec GRS-410 multichannel gamma-ray spectrometer system mounted in the cabin of the aircraft.

Mobilization of the helicopter, equipment and personnel to Johnson's Crossing was completed on August 3, 2004 and the first flight was carried out on August 5, 2004. The final survey flight was completed on August 6, 2004.

2. SURVEY AREA

The survey consisted of one block identified by CML as the Canol Survey Block, located along the Canol Highway in the Yukon Territory. The Canol Survey Block was located to the west of the Canola Highway approximately 50 kilometres north of the Alaska Highway Settlement of Johnson's Crossing. The primary objective of the survey was to acquire geophysical data in support of gold exploration.

The Canol Survey Area is situated in the Big Salmon Range of the Pelly Mountains in the drainage basin of creeks feeding Quiet Lake. CML has interest in a block of 202 claims located in across the valley immediately to the south of Quiet Lake centred on Cottonwood Creek. The topography of the survey area was variable, from flat valley floor flood plain of the Nistulin River to steep mountain slopes and incised creek valleys. The elevation ranged from 800 metres to over 1500 metres above sea level.

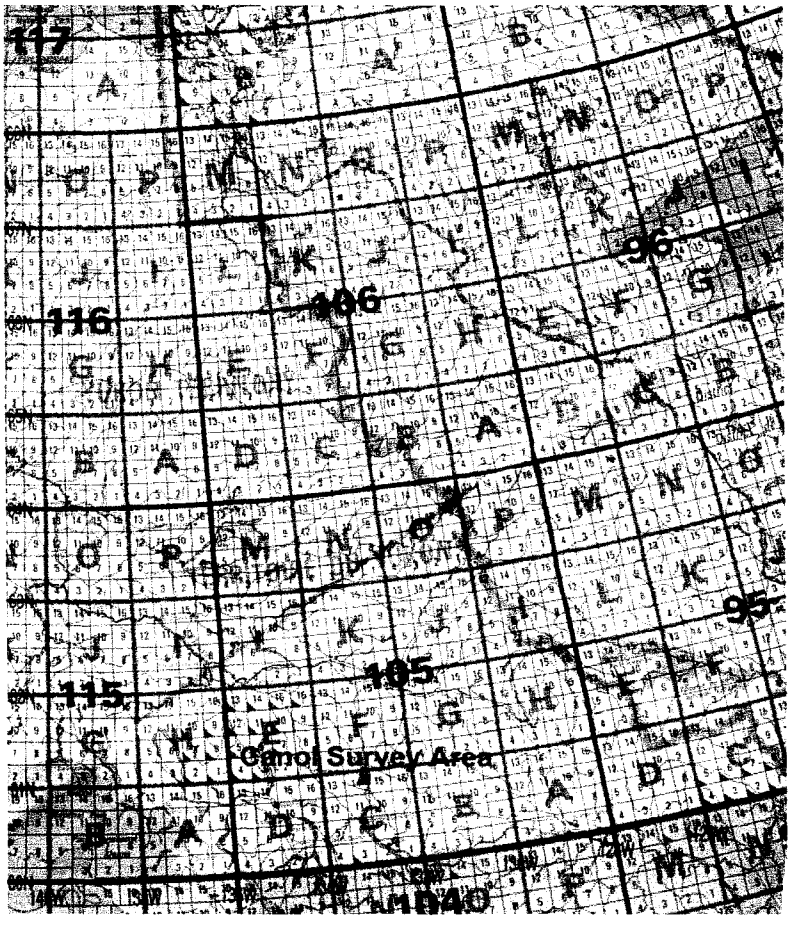


Figure 1: Location of the Canol Survey Area indicating the area flown (red).

The survey block corner coordinates were provided by CML in WGS84/NAD83, Zone 8N UTM easting and northing. Final maps were required in NAD83, Zone 8N UTM easting and northing. The following tables contain the survey block corner coordinates in NAD83.

Table 1: Cordilleran Minerals Limited Canol Survey Area Description

Canol Survey Area		
Corner	**UTM Easting**	**UTM Northing**
1	600000	6748000
2	600000	6760000
3	610000	6760000
4	610000	6748000

The high-resolution magnetic survey lines were flown North – South direction at a flight-line spacing of 200 metres with tie lines flown perpendicular to the main survey lines at line spacing of 2,000 metres.

The Canol Survey Area covered a total of approximately 120 km^2.

The Canol Survey Area was to include all or part of the following 246 claims:

CL1 and CL2 (YA19674 – YA 19675)
ML1 and ML2 (YA19676 – YA19677)
LINDSAY 9 to LINDSAY 24 (YA23779 – YA26087)
MIKLIN 1 to MIKLIN 212 (YC26755 – YC29866)
QUIET 1 to QUIET 14 (YC18184 – YC18197)

Previous geophysical airborne surveying in the area has included magnetic surveys completed by the Geological Survey of Canada.

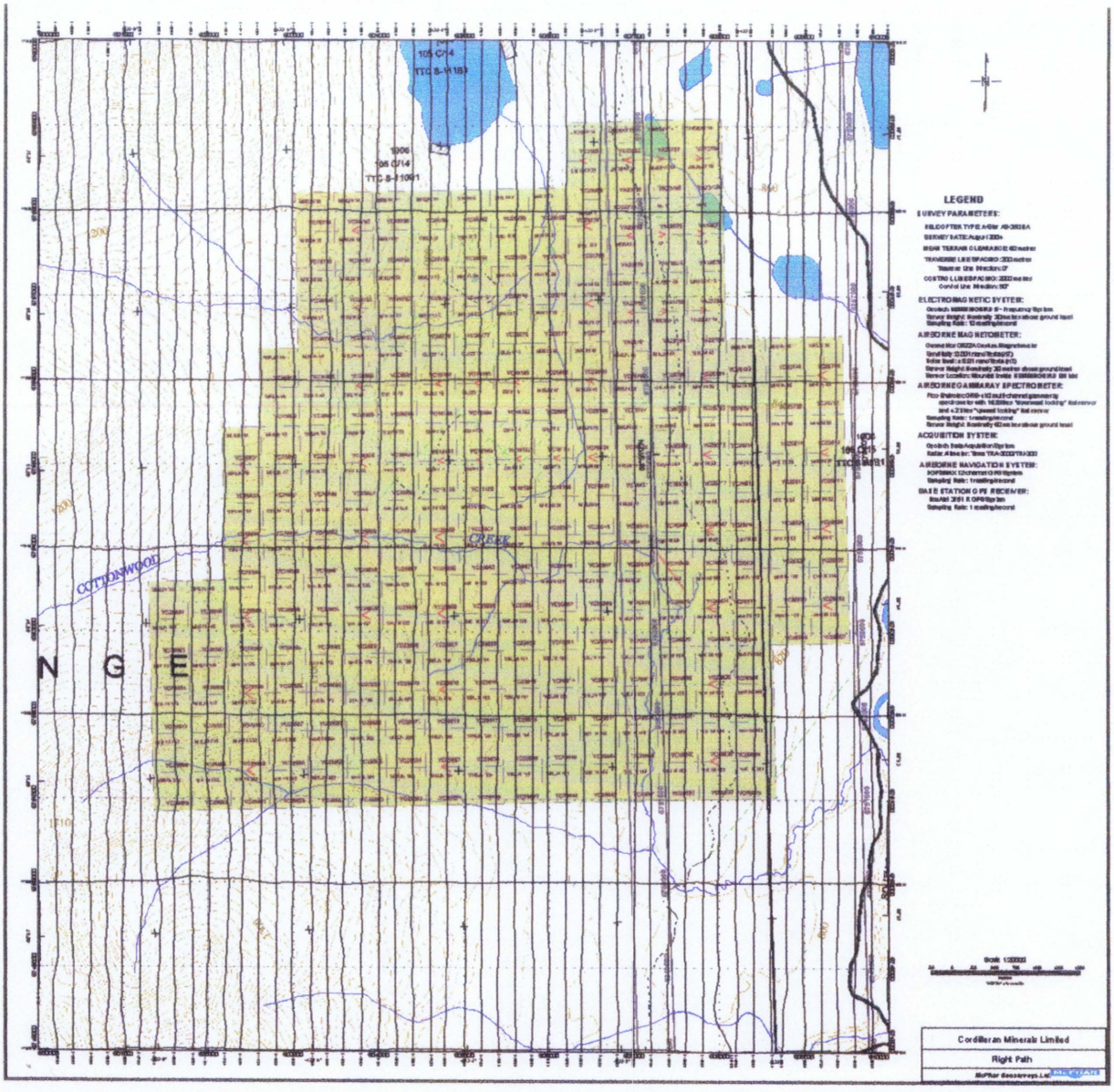
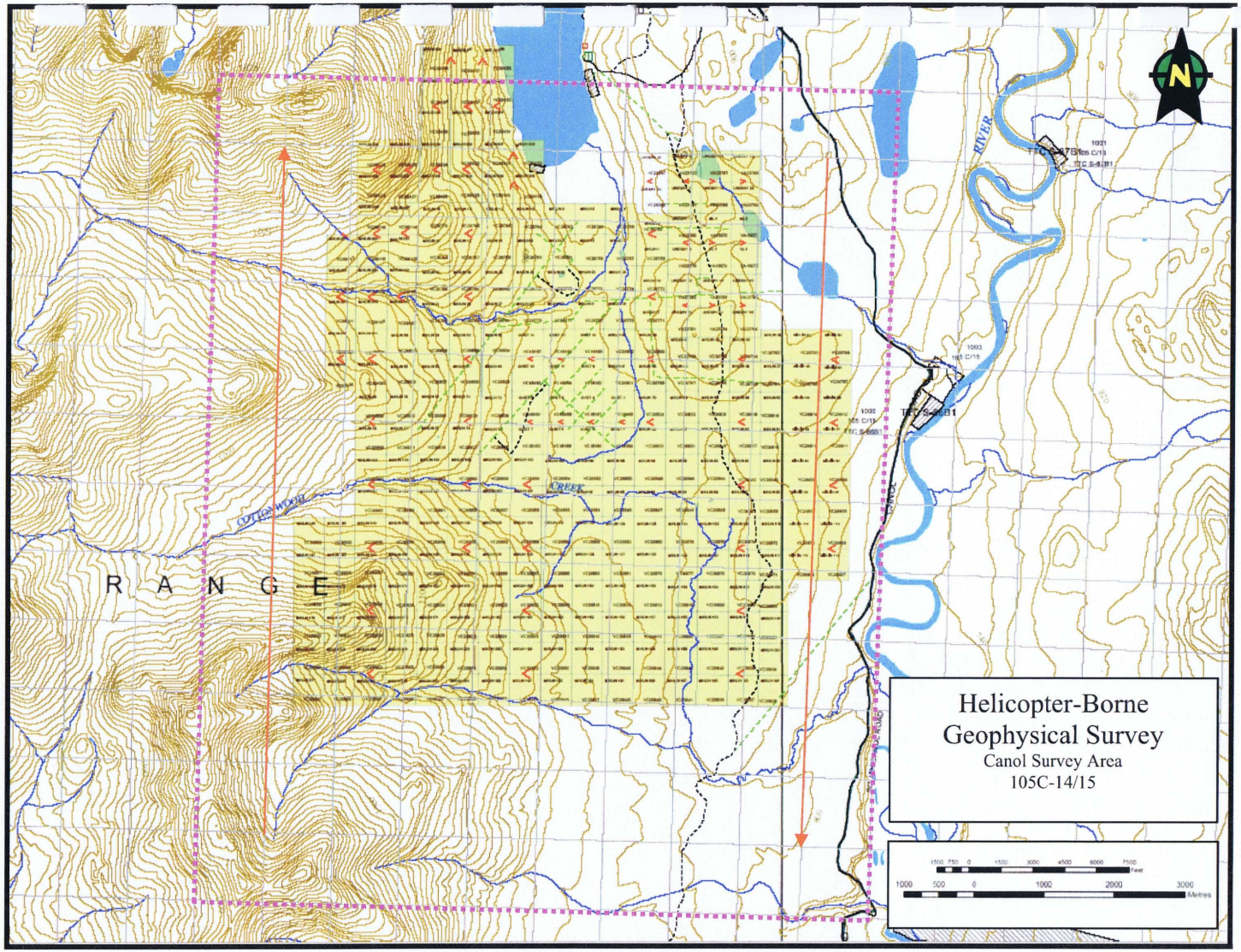


Figure 2: Flight Plan Map of the Canol Survey Area



Mining
- Staking Direction
- Placer Baselines
- Mining District Boundaries

Claim Status
- Active Quartz Claim
- Active Placer Claim
- Expired Claim

Coal
- Coal Exploration Licence
- Coal Mining Lease
- Expired Licence or Lease

Areas Withdrawn from Staking
- First Nation Interim Protected Lands
- Parks and Special Management Areas

First Nation Settlement Land

Category
- A
- B
- FS

First Nations Surveyed Lands

Category
- A
- B
- FS

NRCan Legal Survey Cadastral
- First Nations Community Lots
- Special Access Rights through FN Lands
- Mineral Claims
- Community Land Transfers (Order in Council)
- Land Dispositions (Lots)
- Easements

EMR Lands
- Land Disposition
- Land Application
- Agricultural Disposition
- Agricultural Application
- Privy Council Orders

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- 1:10000 Mineral Index
- 1:50000 Mineral Index

Base Map Features

Hydrographic
- Watercourse
- Waterbody
- Intermittent waterbody
- Underwater sand
- Dry river bed

Topography
- Contours

Transportation Routes
- Highway
- Main
- Secondary
- Street
- Limited-use road
- Trail
- Cut line
- Railway
- Bridge
- Foot Bridge
- Ferry route

- Air Survey Boundary
- Flight Direction

A list of the claims (with grant numbers) that were surveyed with the 2004 helicopter-borne geophysical survey is below. The claims are owned by Mike Mickey (50%) and Mark Lindsay (50%). The work on the claims was completed for Cordilleran Minerals Limited. The work was completed between August 1st and 7th, 2004.

MIKLIN1 YC26755
MIKLIN2 YC26756
MIKLIN3 YC26757
MIKLIN5 YC26758
MIKLIN6 YC26759
MIKLIN7 YC26760
MIKLIN8 YC26761
MIKLIN9 YC26762
MIKLIN10 YC26763
MIKLIN11 YC26764
MIKLIN12 YC26765
MIKLIN13 YC26766
MIKLIN14 YC26767
MIKLIN15 YC26768
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MIKLIN211 YC26964
MIKLIN212 YC26965

3. SURVEY OPERATIONS

3.1 Operations Base

Survey operations were based out of Johnson's Crossing, Yukon Territory, located on the Alaska Highway, approximately 150 kilometres by road southeast of Whitehorse. Permission was obtained to operate the helicopter and to park it overnight at the accommodation, and to locate and operate the magnetometer base station and the GPS base station at the same location.

Quality Control and preliminary data processing was undertaken by the crew at the Johnson's Crossing Base Camp.

3.2 Survey Conditions

Weather conditions during the survey were good. Generally the temperatures were in the low 10's Celsuis.

Sunspot activity, and hence diurnal geomagnetic activity, was quiet during the entire data acquisition period. No data were lost due to the geomagnetic activity being out of contract specification.

3.3 Navigation

The nominal data acquisition speed was approximately 110 kilometres per hour. Scan rates for magnetic and electromagnetic data acquisition was 0.1 second, 1.0 second for the spectrometer, radar and barometric altimeters, and 1.0 second for the GPS navigation/positioning system. Therefore, a magnetic/electromagnetic value was recorded approximately every 3.0 meters and a position fix each 30 meters along the flight track.

Navigation was assisted by a GPS receiver system that reports GPS co-ordinates as WGS-84 latitude and longitude and directs the pilot over the pre-programmed two-dimensional (2-D) survey grid. The x-y position of the aircraft as reported by the GPS system is recorded together with the terrain clearance as reported by the radar altimeter.

Vertical navigation along flight lines was established using the radar altimeter. The optimum terrain clearance during normal survey flying was 60 m for the helicopter, 30m for the towed-bird magnetometer. However, due to rugged terrain in some areas, and the pilot's judgment of safe flying conditions in these areas, these terrain clearances were not possible 100% of the time.

The final vertical and horizontal survey positions were differentially corrected post flight, computed using the data from the onboard GPS receiver and the GPS base station receiver, to a precision of approximately +/- 1.5m.

3.4 Field Processing & Quality Control

The survey data was transferred to portable magnetic media on a flight-by-flight basis, and then copied to the field data processing workstation. In-field data processing included reduction of the data to GEOSOFT GDB database format and inspection of the magnetometer data for adherence to contract specifications. Survey lines that exhibited excessive deviation after differential correction, or that were considered to be of inferior quality, were marked to be reflown.

3.5 Survey Statistics and Project Diary

The survey entailed a total of 22 flights; all of which were production flights. The first production flight was Flt#01 on August 5, 2004, with the last production flight, Flt#2 on August 6, 2004. These flights also included ferry, test and/or calibration segments.

Table 3: Project Diary

Date	Flt#	Hours Flown	Line-Km Accepted	Comments
05 Aug.	1	5:48	240	Production flight with calibration segments
06 Aug.	2	7:29	361	Production flight with calibration segments
Totals		**11:48**	**611**	

The following personnel were the onsite crew on the project in Johnson's Crossing, Yukon Territory:

Table 4: Field Personnel

Title	Name	Days Onsite
Data Processor/QC Geophysicist	Dr. Andy Anderson	2
Technician/Operator	Barry Levy	2
Helicopter Pilot	Ken Wright	2

McPhar Geosurveys Ltd. of Newmarket, Ontario, Canada, was responsible for the field operations, all geophysical matters and the overall coordination and management of the survey.

4. HELICOPTER AND EQUIPMENT

4.1 The Helicopter

The survey was flown using a Eurocopter AS350BA A-Star helicopter, with Canadian registration C-GPWK provided by Pacific Western Helicopters of Dease Lake, British Columbia. This helicopter featured up to 1.5 hours flight duration with the geophysical system and a crew of 2 persons onboard.

The installation of the geophysical and ancillary equipment was carried out by McPhar personnel at the Johnson's Crossing Base Camp, with final adjustments, calibration and testing completed prior to production survey flights.

Aircraft Registration:	-	Canadian, C-GPWK
Engine:	-	Turbomeca Arriel 1B
Empty weight:	-	2,550 lbs
Gross weight:	-	4,630 lbs
Max cruise:	-	123 knots
HIGE:	-	8,500 ft
HOGE:	-	6,000 ft
Service ceiling:	-	15,000 ft
Standard fuel:	-	143 gal
Survey duration:	-	4.55 hours

4.2 The Survey Instrumentation

4.2.1 Survey System Overview

The instrumentation installed in the helicopter included:

- A Geometrics G822A high-sensitivity Cesium magnetometer mounted in the HUMMINGBIRD™ towed-bird airfoil, 0.001 nT / 20 Hz resolution
- A Geotech HUMMINGBIRD™ five (5) frequency electromagnetic system in a towed-bird airfoil.
- A Pico-Envirotec GRS-410 self-stabilizing multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor.
- A DGPS Navigation System, comprising a CSIRadio DGPSMAX 12-channel GPS system, and a GEONAV GPS computer and pilot steering indicator (PSI)
- A Geotech Data Acquisition System
- A Terra TRA-3000/TRI-300 Radar Altimeter
- A DevTech Geo-iMAGe-Lite Colour Digital Imaging System for capturing images of the flight path during the survey.

The processing and base stations comprised:

- A Field Workstation, comprising a Pentium PC, printer and full data processing software

- A Magnetometer / GPS Base Station, comprising a Gem Systems GSM-19 Overhauser base station magnetometer and NovAtel 3751R GPS system.

A complement of spare parts and test equipment were maintained at the survey site.

4.2.2 The Helicopter-borne *HUMMINGBIRD™* Digital Electromagnetic System

The Geotech *HUMMINGBIRD™* sensor is a multi-frequency, multi-coil electromagnetic system, which measures the in-phase and quadrature responses from a number of coil-pairs installed in a tubular bird, towed beneath a helicopter. The *HUMMINGBIRD™* features horizontal coplanar coil sets operating at frequencies of 880 Hz, 6.6 kHz, and 34 kHz and vertical coaxial coil sets operating at frequencies of 7 kHz and 34 kHz. In-phase and quadrature signals were measured simultaneously for the five (5) frequencies with a time constant of 0.1 seconds. The HEM bird is towed 30 m below the helicopter.

The system noise of the EM sensor is less than 2 ppm of the transmitted field, under ideal conditions. A total of ten (10) EM channels of information are sampled at 0.025-second intervals (40 Hz) or approximately every 0.75 metres along the survey line (at survey airspeed of approximately 110 kph), with a time constant of 0.1 second.

The EM system was calibrated with an external coil at the start and end of each survey and with an internal coil approximately three times per hour during survey flights. The phasing of the EM system was checked with an external ferrite rod before each survey flight.

Sferic activity can be reduced by post-survey processing to less than 2.0 ppm.

The electromagnetic system and ancillary equipment were operated for a sufficient time period prior to survey flying to allow for warm-up and thermal stabilization of the equipment. Nulling, ferrite and external Q-coil calibration for the EM system were performed after the system had stabilized following the-warm-up period. All of these ground calibrations were completed before commencement of each flight. Internal calibrations were performed frequently throughout the survey flight.

The table below lists the arrangement of the coils inside the bird:

Table 4: HUMMINGBIRD™ Coil Configuration

COIL FREQUENCY	COIL ORIENTATION	COIL SEPARATION	CHANNELS (I In-Phase, Q Quadrature)
880 Hz	Coplanar	6.025 meters (20 ft)	I, Q
980 Hz	Coaxial	6.025 meters (20 ft)	I, Q
6630 Hz	Coplanar	6.300 meters (21 ft)	I, Q
7001 Hz	Coaxial	6.300 meters (21 ft)	I, Q
34133 Hz	Coplanar	4.875 meters (16 ft)	I, Q

4.2.3 Airborne Magnetometer

A Geometrics G822A cesium split-beam total-field magnetometer was employed, installed in the *HUMMINGBIRD*™ airfoil. Sampling rate was ten times per second with an in-flight sensitivity of 0.01 nT. Aerodynamic magnetometer noise was 0.25 nT or less. The sensitivity of the magnetometer is documented at 0.001 nT when operated at a sampling rate of 0.1-second.

The Geometrics G822A magnetometer is described in Appendix 3.

4.2.4 Gamma-ray Spectrometer System

A Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor sampling at one sample per second. The thermally isolated NaI crystal sensors were installed in the cabin of the helicopter.

The GRS-410 is a 512 channel, self-stabilizing spectrometer that tracks and corrects for the spectral drift of the system by following a Thorium spectral peak. The standard regions of interest for Total Count (TC), Potassium (K), Uranium (U), Thorium (Th) and cosmic radiation were recorded for post survey processing. The standard regions of interest recorded with window limits in MeV are provided in following table:

Table 5: Standard Gamma-ray Spectrometer Data Acquisition Windows

Standard Gamma-ray Spectrometer Data Acquisition Windows		
Element	Lower Boundary (MeV)	Upper Boundary (MeV)
Total Count	0.41	2.81
Potassium	1.37	1.57
Uranium	1.66	1.86
Thorium	2.41	2.81
Cosmic	3.00	∞
Upward-looking Uranium	1.66	1.86

The spectrometer was calibrated on a daily basis using standard calibration sources for Thorium (Th), Cesium (Cs) and Uranium (U).

The recommendations in the International Atomic Energy Agency – IAEA – TECDOC-1363 – *Guidelines for radioelement mapping using gamma ray spectrometry* were followed throughout the survey.

4.2.5 The Towed-Bird Airfoil and Tow-Cable

The Towed-Bird Airfoil is basically a hollow Kevlar tube, 6.6 meters long, with a bulbous nose into which the electromagnetic system components and electronics are installed along with the magnetometer Cesium sensor mounted in a 3D hand-aligned gimbal. A skirt is used at the tail of the airfoil to stabilize the bird in flight.

The Tow Cable is constructed of coaxial cables complete with a strain member. The length of this tow cable is nominally 30 metres. The tow cable is attached to the helicopter by means of a weak link assembly. The on-board section of the tow cable consists of coaxial cable, the length customized to suit the helicopter.

4.2.6 The Base Station Magnetometer

The magnetometer base station used was comprised of a GEM Systems GSM-19 Overhauser magnetometer to monitor and record diurnal variations of the Earth's magnetic field. The base station magnetometer was set up at Johnson's Crossing in an open field. Every effort was made to ensure that the magnetometer sensor was placed in a location with a low magnetic gradient and sited away from electric transmission lines, and moving ferrous objects, such as motor vehicles and aircraft, without compromising safety and airport operations.

The base-station magnetometer, with digital recording, was operated continuously throughout the airborne data acquisition work with a sensitivity of 0.01 nT. The ground and airborne system clocks were synchronised using GPS time, to an accuracy of 1 second or better. The sample rate was once per second. A continuously updated profile plot of the base station values was presented on the base station screen. At the end of the day, the digital data was transferred from the base station's data-logger to the fieldwork station.

Specifications are included in Appendix 3.

4.2.7 Altimeter

A Terra TRA-3000/TRI-30 radar altimeter was used to record terrain clearance to an accuracy of about 1 ft (30 cm), over a range of 12 metres to 762 metres. The antenna was mounted beneath the bubble of the helicopter cockpit. The recorded value of terrain clearance was adjusted to give bird height above ground. This was possible given the fixed tow cable length of 30 metres.

A Setra Model 276 Barometric Pressure altimeter measured the elevation above sea level, and is calibrated in units of height (metres). This altimeter has a published accuracy of $\pm$ 0.02% and a resolution of 0.5 metres.

The altimeters are interfaced to the data acquisition system with an output repetition rate of 0.1 second, and are digitally recorded.

The altimeters are further described in Appendix 3.

4.2.8 The GPS Satellite Navigation System

A CSIRadio DGPS-Max real-time OmniSTAR GPS navigation system with navigation computer and pilot steering indicator (PSI) provided in-flight navigation control. This navigation system operated on 12-channels. A pilot steering indicator (PSI) installed on top of the cockpit dashboard, in front of the pilot provided steering and cross-track guidance to the pilot. The pilot was therefore provided with GPS, and altimeter data to aid in the flying of the helicopter.

This navigation system yields a real-time positional accuracy of better than ± 2 m.

Survey co-ordinates are set-up prior to survey and the information is fed into the airborne navigation system. The co-ordinate system employed in the survey design and digital recording is WGS-84 latitude and longitude. The GPS positional data is recorded at one-second intervals and used with the base station data to calculate differentially corrected locations.

The GPS receiver is fully described in Appendix 3.

4.2.9 Data Acquisition/Recording System

A Geotech *HUMMINGBIRD™* data acquisition system recorded the digital survey data on an internal hard disk drive. Data is displayed on an LCD screen as traces to allow the operator to monitor the integrity of the system. Sampling rates are as indicated in Table 3.

Table 6: Sampling Rates of Digital data

SYSTEM and No. of CHANNELS	SAMPLING RATE (second)
Total Field Magnetometer (1 channel)	0.1
E.M. - 880 Hz (2 channels) Coplanar	0.1
E.M. – 980 Hz (2 channels) Coaxial	0.1
E.M. – 6.6 kHz (2 channels) Coplanar	0.1
E.M. – 7 kHz (2 channels) Coaxial	0.1
E.M. – 34 kHz (2 channels) Coplanar	0.1
Gamma-ray Spectrometer (512 channels plus U, Th, K, TC and cosmic)	1.0
Radar Altimeter (1 channel)	1.0
DGPS Navigation	1.0

All data collection routines, checking, buffering, recording and verification are software controlled for maximum flexibility. The recorded data is monitored on a colour LCD display as pseudo-analog traces to verify quality and functionality of the system.

4.2.10 Colour Digital Video Imaging System

A record of the flight path was acquired using a DevTech Geo-iMAGe-Lite Colour Digital Imaging System, comprised of the following:

- Stand alone rack mountable mini-computer system, Pentium III 1.0 GHz clock speed c/w 256 MB RAM memory, 20 GB HDD, LCD TFT screen, keyboard and mouse.
- Windows 2000 Professional Operating System software.
- Custom software to enable acquisition of .JPG video frames at a resolution of up to 800 x 600 pixel x 256 colours.
- Frame acquisition rate controlled by 1 PPS signal from GPS receiver - 1 frame per second.
- User-selectable video formats including NTSC.

- Sony digital colour video camera with 1/3 inch CCD video element.
- 2.8- to 4-mm focal length auto-iris lens for low-level video acquisition (47° to 96° viewing angle).

A set of digital images of the ground was taken. The video frames are stored on a large capacity hard disk. A naming convention for each frame has been developed utilizing GPS time as the reference. The frames are numbered in the format SSSSSSS.DDD where SSSSSSS represents the GPS seconds of the day past midnight and DDD represents the Julian day of the year. In the interests of maximum compatibility with other computer processing systems the frame naming system has been kept within the "DOS" naming convention. The system includes a CD-RW writer and appropriate software to allow storage of the imagery on CD-ROM media for long-term archival purposes.

4.2.11 Field Computer Workstations

A Data Processing Field Workstation (FWS) comprised of a dedicated PC- based notebook computer for use at the technical base in the field, was used on this project. The FWS is designed for use with Geosoft OASIS/Montaj Data Processing Software. The FWS has a data replot capability, and may be used to produce pseudo-analogue charts from the recorded digital data within less than 12 hours after the completion of a survey flight, if this is necessary. It is also capable of processing and imaging all the geophysical and navigation data acquired during the survey, producing semi-final, preliminary-levelled maps.

The FWS was used to accomplish the following:

- **Quality Control/Digital Data Verification** - flight data quality and completeness were assured by both statistical and graphical means on a daily basis
- **Flight Path Plots** - flight path plots were generated from the GPS satellite data to verify the completeness and accuracy of each day's flying
- **Preliminary Maps** - the Geosoft software system permitted preliminary maps to be quickly and efficiently created for noise and coherency checks.

The FWS is fully described in Appendix 3.

The Montaj software is designed for airborne data editing, compilation, processing and plotting. The software reads the portable data media from the airborne system, checks them for gaps, spikes or other defects and permits the data to be edited where necessary. The base station GPS/magnetometer data is checked, edited, processed and then merged with the airborne data. GPS flight path plots are created and plotted for both flight planning and flight path verification.

4.2.12 Spares

A normal compliment of spare parts, tools, back-up software, and necessary test instrumentation was available in the office at the airport.

5. INSTRUMENT CHECKS AND CALIBRATIONS

5.1 Airborne Magnetic System Tests and Calibrations

5.1.1 Magnetic Heading Effect

The magnetic heading effect was determined by flying a cloverleaf pattern oriented in the same direction as the survey lines and tie lines. Two passes in each direction were flown over a recognizable feature on the ground in order to obtain sufficient statistical information to estimate the heading error. The heading error was determined from a test completed on a subsequent survey completed in September in the same area of the Yukon Territory.

5.1.2 Lag Tests

A Lag Test was performed on a subsequent survey in September to ascertain the time difference between the magnetometer readings and the operation of the GPS System. The lag test is included in Appendix 2.

5.2 Airborne Electromagnetic System Tests and Calibrations

The *HUMMINGBIRD*^{TM} EM system was:

- calibrated at the start of the survey day, on the ground, using a ferrite rod and calibration coil;
- at the beginning of each flight internal Q-coil calibrations were performed by the onboard technician;
- at the beginning of each flight, the helicopter climbed to 500 m (1500 ft) AGL to allow the onboard technician to perform background and drift checks.

5.3 Airborne Gamma-ray Spectrometer System Tests and Calibrations

5.3.1 Test Line

A test line was flown and recorded at the start and end of each survey flight to test the repeatability of the gamma-ray spectrometer system. The minimum, maximum and average deviation for each of the four windows (TC, U, Th and K) shall be calculated and stored in a database for future reference and use.

5.3.2 Altitude Attenuation Coefficient

The altitude attenuation coefficient were derived prior to the survey. This was be done by flying a test line at various altitudes from 100' (30 m) up to 1,000' (305 m) above the test line. The coefficients used are included in Appendix 2.

5.3.3 Cosmic Window Calibrations

Cosmic window calibrations or Background Attenuation Coefficients were measured and calculated for the detector crystal packs prior to the survey. The coefficients were calculated from a sequence of passes flown at various altitudes over a large body of water (from 250 ft up to 5,000 ft at intervals of 1,000 ft), with each altitude flown for a minimum of 2 minutes.

The average values of the counts measured in each of the 4 windows (TC, U, Th and K) are compared against the average counts for the cosmic window at each of the altitudes flown. The results of this calibration are presented in Appendix 2.

5.3.4 Spectral Resolution Test

The resolution of the spectrometer was determined before and after each survey flight, using the 662 keV gamma rays from a Cs^{137} source. The pre flight measurements were to be completed after any detector gain adjustments had been applied. The post flight measurement was to be completed without any gain adjustment being made. Unfortunately the field crew did not record these tests digitally and the results can not be reported.

5.3.5 Daily Source Checks

The spectrometer was calibrated before the first survey flight of the day and after the last survey flight of the day using standard calibration sources, comprised of Cesium (Cs137), Uranium (Bi214) and Thorium (Th208). A background measurement was to be recorded, then each of the sources recorded, followed by a background measurement. Each measurement was to have a duration of 60 seconds. The sources were placed in exactly the same position relative to the gamma-ray sensors each time the source check were completed. Unfortunately the field crew did not complete the final background measurement and the results of this test could not be tabulated and presented.

5.4 Altimeter Calibration Checks

Checks of the radar altimeter calibration were undertaken during a subsequent survey in September. Calibrations were determined by comparing the radar altitude with a suitable reading from the GPS system during a radar "stack" over a suitable feature.

5.5 GPS Static Test

In addition to carefully selecting a magnetically suitable area for the positioning of the magnetometer base station, care was taken to ensure that the exact position of the base station is known. The GPS system itself was used, over a period of time, to calculate the coordinates of the base station. Care was taken to ensure that the base station GPS had a maximum field-of-view to the NAVSTAR satellites.

6. QC AND DATA PROCESSING

Daily quality control, initial processing and archiving of the data were completed on-site at the base of operations at the Johnson's Crossing Base Camp using Geosoft MONTAJ software and a notebook PC computer. All data were verified upon receipt, and checked against the operator's flight logs.

The pre-processing or infield processing sequence included the following quality control measures:

a) Examination and checking of all incoming data to ensure completeness of data sets.
b) The production of preliminary flight path maps, speed checks, terrain clearance checks.
c) Full profile quality control of all acquired traces for noise levels, data completeness, spike editing, and adherence to contract specifications.

The final data processing, map generation and report was completed by McPhar at the Newmarket, Ontario office.

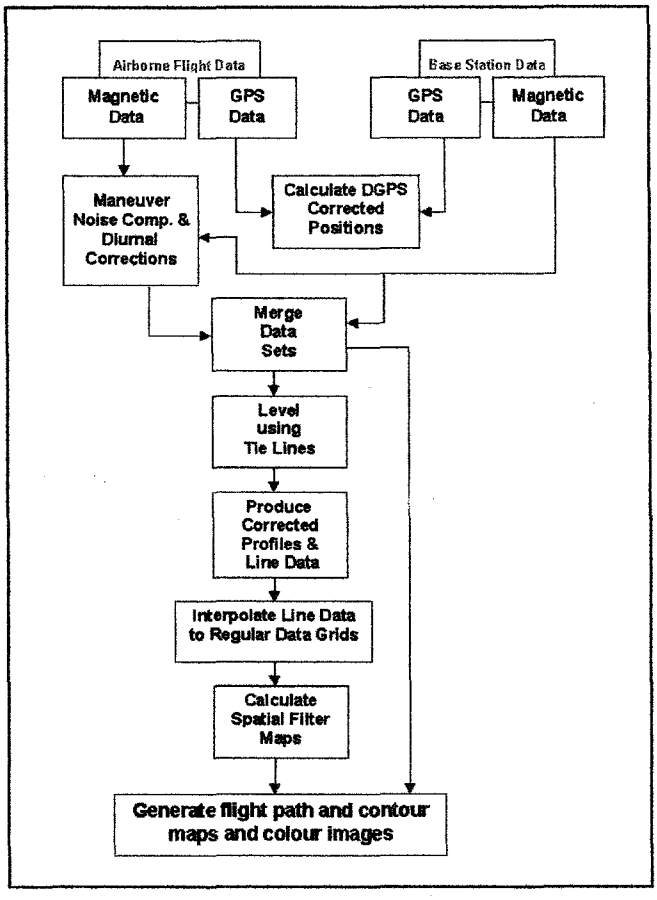


Figure 3: Data Processing Flow Chart

6.1 Flight Path Compilation

The flight path was derived from differentially corrected GPS positions using the real-time airborne GPS data. A position was calculated each 1.0 second (approx. each 30 meters along the flight path) to an accuracy of better than +/- 1.5 meter. These position data were merged into magnetic and ancillary data in the Geosoft GDB database.

6.2 Base Station Magnetic Data

The base station magnetometer data was edited, plotted and merged into the GDB database on a daily basis.

6.3 Corrections to the Magnetic Data

The processing of the data involved the application of the following corrections:

- Correction for diurnal variation using the digitally recorded ground base station magnetic values

- Adjustment of the data for the time lag between the GPS position and the position of the magnetic sensor
- Correction for the heading effect and
- Network adjustment using the flight line and tie line information to level the survey data set.

The corrected data was then used to generate the Total Magnetic Intensity grid.

6.3.1 Additional Corrections Applied to Profile Data

After applying the above corrections to the profile data residual line-direction-related noise was removed through application of microlevelling. The microlevelling technique consists of applying directional and high pass filters to produce a grid containing noise-only in the line direction. In order to differentiate between the two of them, the grid is extracted to the profile database, and an amplitude limit and a filter length are determined, so that the final error channel reflects only noise present on the grid without removing or changing geological signal. This error channel is then subtracted from the initial data channel in order to obtain the final microlevelled channel. The resulting grid is free of line direction noise.

6.3.2 Gridding

The corrected magnetic line data was interpolated between survey lines using a random point minimum curvature gridding algorithm to yield x-y grid values for a standard grid cell size of $1/5^{th}$ of the line spacing.

6.3.3 Filter Derivatives

The Total Magnetic Intensity (TMI) data were subjected to:

- IGRF removal
- Reduction-to-the-pole
- Calculation of the First Vertical Derivative (1VD)
- Calculation of the Second Vertical Derivative (2VD)
- Calculation of the Analytic Signal

Colour/contour images were produced for all the above listed magnetic products.

All of these spatial filtering techniques were completed using the Oasis Montaj Magmap and IGRF modules for filtering in the 2D FFT domain.

6.3.3.1 IGRF Removal

The International Geomagnetic Reference Field (IGRF) is a long-wavelength regional magnetic field calculated from permanent magnetic observatory data collected around the world. The IGRF is updated and determined by an international committee of geophysicists every 5 years. Secular variations in the Earth's magnetic field are incorporated into the determination of the IGRF.

Through the removal of the IGRF from the observed Total Magnetic Intensity (TMI), the resulting residual magnetic intensity allows for more valid modelling of individual near surface anomalies. Additionally, the data can be more easily incorporated into databases of magnetic data acquired in the past or to be acquired in the future.

6.3.3.2 Reduction-to-the-Pole

To compensate for the shift of the true anomaly position over the causative source, due to the magnetic inclination and declination, the magnetic data was recomputed so that magnetic anomalies will appear as they would if located at the north magnetic pole. The result of this operation is that in theory, the magnetic anomaly is located directly overtop of the causative source. The computation is referred to as "reduction-to-the-pole" (RTP). The reduction-to-the-pole is computed using a FFT (Fast Fourier Transform) operator.

The RTP not only shifts the anomalies to their correct position with respect to the causative magnetic bodies, but assists in the direct correlation and comparison of magnetic anomalies, trends, structural axis, and discontinuities with mapped geologic surface expression.

The RTP was calculated using the following parameters for the survey area:

Geomagnetic Inclination:	79.94° N
Geomagnetic Declination:	25.44° E

6.3.3.3 Calculation of the First Vertical Derivative (1VD)

Vertical derivatives compute the rate of change of the field as it drops off when measured vertically over the same point (upward continuation). Potential field data obeys Laplace's equation, which allows for the computation, through the FFT package, to take advantage of this symmetry and solve for the vertical or "z" component of the field. The First Vertical Derivative (1VD) has the effect of sharpening anomalies, which allows for better spatial location of source axes and boundaries

6.3.3.4 Calculation of the Second Vertical Derivative (2VD)

To enhance local anomalies and to outline the edges of anomalous bodies within the data, a Second Vertical Derivative (2VD) is computed. The 2VD is a powerful interpretive tool and that is used to assist in the delineation of causative bodies and to accurately locate changes in the magnetic field gradients. Better definition of discontinuities and their relationship to geology can be gained from the use of this tool. A 2VD will show steep gradients over faults and positive closures over the "up thrown" blocks.

6.3.3.5 Calculation of the Analytic Signal

The analytic signal is the square root of the sum of the squares of the derivatives in the x, y, and z directions:

$$asig = sqrt\ (\ dx*dx + dy*dy + dz*dz\ )$$

where: asig is the Analytic Signal
sqrt is the square root of
dx is the horizontal gradient in the x direction
dy is the horizontal gradient in the y direction
dz is the vertical gradient in the z direction

The analytic signal is useful in locating the edges of magnetic source bodies, particularly where remanence and/or low magnetic latitude complicates interpretation.

6.4 Corrections to Electromagnetic Data

A two stage digital filtering process was used to reject major sferic events and to reduce system noise.

Local sferic activity can produce sharp, large amplitude events that cannot be removed by conventional filtering procedures. Smoothing or stacking will reduce their amplitude but leave a broader residual response that can be confused with geological phenomena. To avoid this possibility, a computer algorithm searches out and rejects the major sferic events. The filter used was a non-linear filter. The signal-to-noise ratio was further improved by the application of a low-pass linear digital filter. This filter has zero phase shift that prevents any lag or peak displacement from occurring, and it suppresses only variations with a wavelength less than about 0.3 seconds or approximately 30 metres.

EM channels were filtered with the following specification:

Table 8: EM Filtering Specifications

EM CHANNEL	APPLIED FILTERS
Ip1, Q1 (7 kHz coaxial)	Non-linear 0.3 s Low-pass 4.0 s
Ip2, Q2 (6 kHz coplanar)	Non-linear 0.3 s Low-pass 4.0 s
Ip3, Q3 (980 Hz coaxial)	Non-Linear 0.3 s Low-pass 4.0 s
Ip4, Q4 (880 Hz coplanar)	Non-Linear 0.3 s Low-pass 4.0 s
Ip5, Q5 (34 kHz coaxial)	Non-Linear 0.3 s Low-pass 4.0 s

Following the filtering process, a base level correction was made using EM zero levels determined during the high altitude calibration sequences. The correction applied is a linear function of time that ensures the corrected amplitude of the various in-phase and quadrature components is zero when no conductive or permeable source is present. The filtered and leveled data were used in the determination of apparent resistivity and anomaly picking. Manually picked zero-levels were used during the intervening period between high-level calibrations.

6.4.1 Apparent Conductivity

The apparent conductivity is calculated by assuming a uniform resistive half-space model. The computer program determines the conductivity that would be consistent with the recorded in-phase and quadrature response amplitudes at the selected frequency. The conductivity channel values were

calculated in Log (base10).

6.4.2 EM Anomaly Selection and Analysis

The main purpose of EM anomaly selection is to identify possible near-vertical or dipping thin sheet bedrock conductors. If the source conductance is not large, such anomalies may not register on the apparent resistivity maps as a distinctive resistivity low.

The response type expected from a vertical thin sheet conductor is a positive anomaly in the coaxial EM channels with a coincident low in the coplanar channels.

In some cases a negative in-phase anomaly will be accompanied by a positive quadrature response that suggests a source that is both conductive and magnetic (or conductors and magnetic sources which are in close proximity to each other). In rare instances, the coaxial in-phase trace will exhibit a small positive peak superimposed on a larger negative response in both coaxial and coplanar channels. Such anomalies are often of special exploration interest.

EM anomalies were automatically picked from the offset profiles using Geosoft HEM software. Most anomalies have a response in the 980 Hz coaxial channel. The coaxial channels are more sensitive to vertical thin conductors typified by sulphide mineralisation.

6.4.3 Line Profiles

After leveling the EM channels, they were profiled with the following specifications:

- For 880 Hz coplanar and 980 Hz coaxial frequencies the in-phase and quadrature profiles utilized a vertical scale of 2.5 ppm/mm;
- For 6600 Hz frequency the in-phase and quadrature profiles utilized a vertical scale of 15 ppm/mm;
- Stacked profiles were produced for the 980 Hz coaxial, 880 Hz Coplanar and 6600 Hz coplanar coils only.

6.4.4 Gridding

The corrected conductivity line data was interpolated between survey lines using a random point minimum curvature gridding algorithm to yield x-y grid values for a standard grid cell size of $1/5^{th}$ of the line spacing.

6.5 *Corrections to Radiometric Data*

6.5.1 Background to Corrections and Processing

Gamma-ray spectrometer surveys are utilized for mapping the concentration and distribution of naturally occurring radioelements. The use of an airborne gamma-ray spectrometer allows for the in-situ analysis of radioelement concentrations of naturally occurring Potassium (K), Uranium (U) and Thorium (Th) in the field.

To the geologist, maps of the concentrations of K, U, and Th can prove diagnostic in the mapping of rocks and soils as an aid in geologic mapping and in the exploration for uranium, gold, tin and tungsten deposits where the primary mineralisation process is often related to K metasomatism.

Radioactivity measurements from an airborne platform are dependent upon the detection of gamma rays produced through radioactive decay of the nuclide to be detected. Only three radioactive elements emit sufficient gamma radiation to be measured by airborne methods. The three major sources are:

- Potassium-40 (^{40}K) which comprises 0.011% of all potassium
- Daughter products from the ^{238}U decay series,
- Daughter products from the ^{232}Th decay series.

High energy cosmic rays of non-terrestrial origin can be detected by airborne gamma-ray spectrometer surveys. This cosmic radiation interacts with molecules in the atmosphere, the aircraft, and the NaI detectors resulting in the production of high energy radiation. This radiation is detectable and increases exponentially with height above sea level and must be compensated for to obtain reliable and repeatable measurements and detection of terrestrial radiation sources.

The traditional energy windows used to detect gamma ray radiation from K, Th, and U sources have overlapping areas where the energy recorded for a given element contains some contribution from all three radioelements. A correction procedure, known as stripping, is applied to the data to compensate for this spectral overlapping.

The natural gamma ray spectrum over the range of 0 to approximately 3000 keV is resolved by the spectrometer used into 511 channels, each channel ranging from 5 to 6.5 KeV in width. A separate channel records all high energy radiation above 3000 KeV, the cosmic radiation contribution. Within the defined radioelement windows, the counts recorded are summed over a given time period.

Care must be taken during the acquisition of gamma-ray spectrometer data as the contribution from radon gas and it's related decay products in the atmosphere can result in misleading count rates. Radon gas can also diffuse from the ground, but only one radon nuclide is the directly related to the Uranium decay series. In order to minimise the impact of radon "contamination", radiometric surveys are not completed during rain ("washes" radon from the air and increases ground concentrations) or fog conditions and for a period of not less than 2 hours after precipitation has finished in order to allow for dispersion of radon gas to normal background levels.

Radiometric surveys have limited depth penetration; most radioactive sources being within the upper 1.5 metres of the ground. Radiometric surveys are therefore not effective over water bodies or snow covered areas, the presence of water (in either liquid or solid state) effectively masking radiometric sources.

Spectrometer data are typically acquired in units measured in counts per second. The instrumentation used requires some time each second to process the incoming data – during this time period no counts are recorded. This time period is referred to as "*equipment down time or system dead-time*". A correction is applied to compensate for this time period.

6.5.2 Processing Applied Using Geosoft Radiometric Processing System

The reduction of radiometric data followed standard processing steps as outlined in the recommendations of IAEA-TECDOC-1363 - Guidelines for radioelement mapping using gamma ray spectrometry data.

The processing of radiometrics data involved:

1. correction for system dead-time,
2. background removal,
3. Cosmic correction (Compton scattering correction)
4. Stripping ratios
5. effective height calculation (correct for pressure/temperature change),
6. conversion of count rates to ppm values

Note that the terrain clearance correction is limited to 250 metres to prevent unstable amplification of low counts.

As part of the processing step the digital elevation model (DEM) is calculated via the subtraction of the radar altimeter from the barometric altimeter. The barometric altimeter is leveled using the GPS altimeter. The DEM is calculated as a check on the barometers and to provide information on the topography for interpretation of the radiometric data.

Micro-leveling of the radiometric data was completed to eliminate and/or reduce streaking on final gridded images of the individual channels.

7. DELIVERABLE PRODUCTS

The survey data are presented as colour/contour maps on paper, produced at a scale of 1:20,000. A set of report-sized colour/contour images, on paper, is included as Appendix 5. The basic co-ordinate system used is Universal Transverse Mercator, referenced to the longitude & latitude (NAD83). All digital data are also presented on CD-ROM in ASCII format.

The deliverable items of this survey are:

7.1 Maps

The following maps, at a scale of 1:20,000, are delivered in two (2) paper copies.

- Flight Path (on a topographic and claim base)
- Digital Terrain Model (DTM) Calculated from Altimeter Data
- Total Magnetic Intensity (IGRF removed)
- Reduction to the Magnetic Pole (RTP) of the Total Magnetic Intensity
- Calculated First Vertical Derivative (1VD) of the Total Magnetic Intensity
- Calculated Second Vertical Derivative (2VD) of the Total Magnetic Intensity
- Analytic Signal of the Total Magnetic Intensity
- Total Count
- Thorium
- Potassium
- Uranium
- Thorium/Potassium (Th/K) Ratio
- Offset Profiles of Horizontal Coplanar 6600 Hz Coil
- Offset Profiles of Horizontal Coplanar 800 Hz Coil and Vertical Coaxial 980 Hz Coil
- Conductivity of Horizontal Coplanar 6600 Hz Coil with Vertical Coaxial 980 Hz Coil Conductance Anomalies

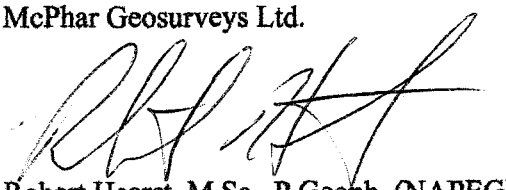
7.2 Digital Data

The edited field and processed digital data are delivered in three (3) copies, in ASCII code, on CD-ROM. The final processed line and grid data, in GEOSOFT format, are also delivered in three (3) copies on CD-ROM. Full descriptions of the digital data formats are included in this final report (see below) and as text files on each CD-ROM. Each CD-ROM has a README.TXT file describing the contents and the file formats.

7.3 Report

Two (2) copies of a survey report was delivered, complete with final prints of report size maps. This report provides information about the acquisition, processing and presentation of the survey data.

Respectfully submitted,
McPhar Geosurveys Ltd.



Robert Hearst, M.Sc., P.Geoph. (NAPEG)
Consulting Geophysicist

APPENDICES

APPENDIX 1 **Statement of Qualifications**

APPENDIX 2 **Lag Test, Heading Table, Flight Logs, Daily Reports**

APPENDIX 3 **Equipment Documentation**

- Hummingbird HEM System Specifications
- Geometrics G-822A Cesium Magnetometer
- Pico-Envirotec GRS 410 Gamma Spectrometer
- DGPS Max
- Terra TRA-3000 / TRI-30 Radar Altimeter
- Tetra Model 276 Pressure Transducer
- Geo-iMAGe Lite CDIS
- GSM-19 Overhauser Magnetometer
- NovAtel GPSCards
- Field Data Processing Workstations

APPENDIX 4 **Personnel Resumes**

- Tim Bodger
- Robert Hearst
- Henrik T. Anderson
- Barry Levy
- Tonia Bojkova
- Asif Mirza

APPENDIX 5 **Digital Data Specifications**

APPENDIX 6 **Page Size Maps**

- Flight Path (on a topographic and claim base)
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APPENDIX 1

Statement of Qualifications

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Statement of Qualifications

I, Robert Bruce Hearst, P.Geoph. do hereby certify that:

1. I am currently employed as a Consulting Geophysicist by:

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   Newmarket, Ontario
   Canada, L3Y 8Z9

2. I graduated with a degree in H.BSc. Geophysics, Geology and Geophysics option from the University of Western Ontario in 1983. In addition, I have obtained a M.Sc. Geology and Geophysics from McMaster University in 1996.

3. I am a member of the CIM (National and Toronto Branches), KEGS (Canadian Exploration Geophysical Society, Past President), SEG (Society of Exploration Geophysicists), EEGS (Environmental and Engineering Geophysicists Society), PDAC (Prospectors and Developers Association of Canada) and a Licensee of NAPEGG (Association of Professional Engineers, Geologists and Geophysicists of the Northwest Territories).

4. I have worked as a geophysicist for a total of 21 years since my graduation from the University of Western Ontario.

5. I have read the definition of "qualified person" set out in National Instrument 43-101 ("NI 43-101") and certify that by reason of my education, affiliation with a professional association (as defined by NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

6. I am responsible for the preparation of the *Final Report on an Helicopter-borne Geophysical Survey, Canol Survey Area, Yukon Territory.* Dated November 19, 2004 (the "Technical Report") relating to the Rutherford Claims of TTM Resources Inc. I have not visited the property.

7. I am not aware of any material fact or material change with respect to the subject matter of the Technical Report that is not reflected in the Technical Report, the omission to disclose which makes the Technical Report misleading.

8. I am independent of the issuer applying all of the tests in section 1.5 of National Instrument 43-101.

9. I have read National Instrument 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

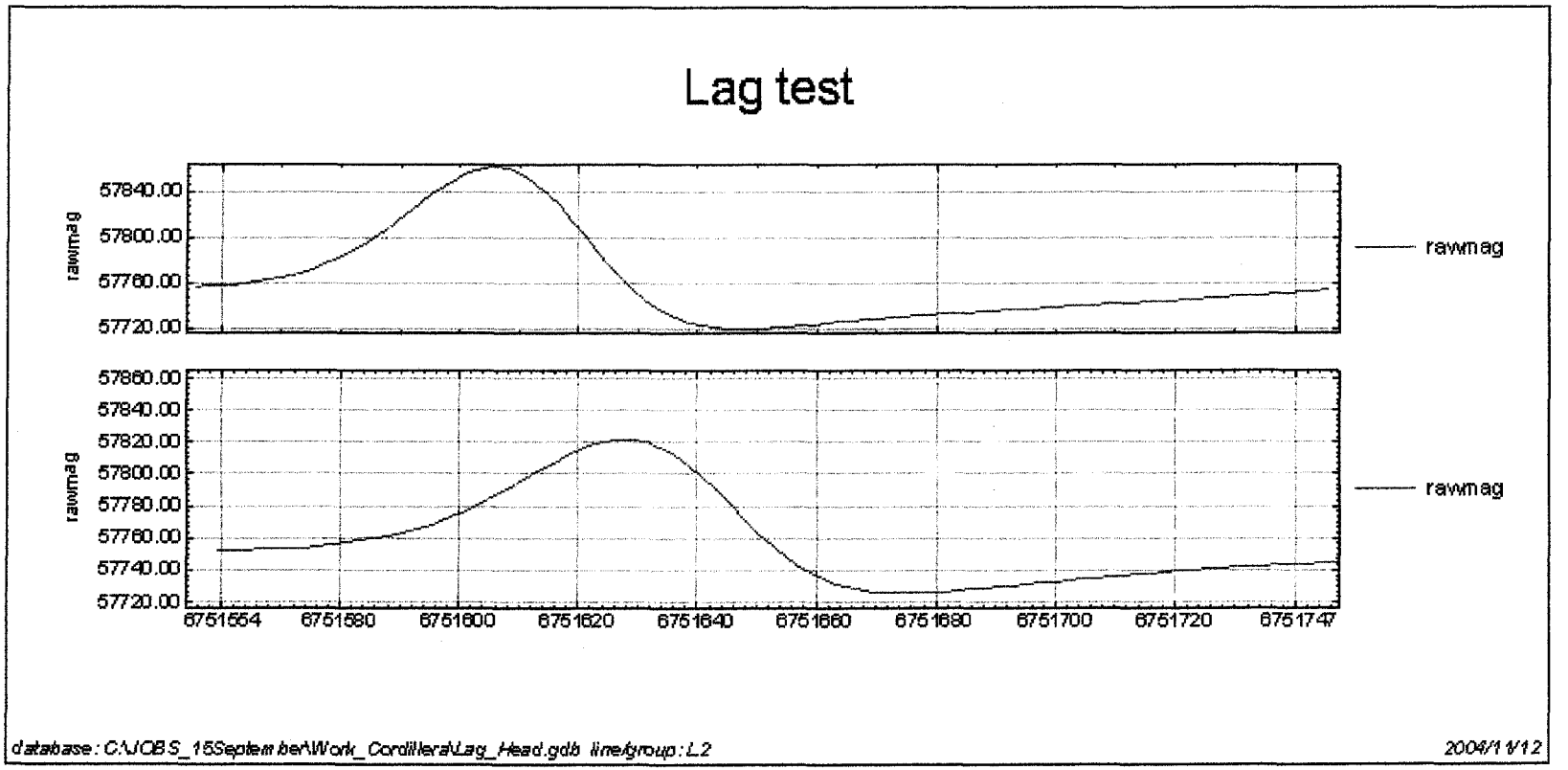
10. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 19th Day of November, 2004

Signature of Qualified Person

APPENDIX 2

Lag Test
Heading Table
Flight Logs
Daily Reports


Lag test
rawmag
57840.00
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57760.00
57720.00
rawmag
rawmag
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57840.00
57820.00
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57780.00
57760.00
57740.00
57720.00
6751554
6751580
6751600
6751620
6751640
6751660
6751680
6751700
6751720
6751747
rawmag
database: C:\JOBS_15September\Work_Cordillera\Lag_Head.gdb lineAgroup: L2
2004/11/12

Geosoft Magnetic Heading Correction Table

Direction (real, °)	Correction (real, nT)
0°	-3.47
90°	-0.78
180°	+4.11
270°	+0.58
0°	-3.45

AIRBORNE GEOPHYSICAL FLIGHT LOG

CLIENT: Cordilleran	BLOCK # : Canol	JOB: 414	PAGE 1 OF 4

FLT #: 1 DATE: 05/08/04 OPERATOR: Barry Levy

PILOT: Ken Knight O.A.T.: 13 / A/C REG: C-GPWK

DEPART TIME: 22:07 RETURN TIME: 3:36 TOTAL FLT TIME: 5:29

SURVEY HEIGHT: 200 ft

LINE #	FIDUCAL START	FIDUCAL END	BINARY FILE NAME	COMMENTS
BKD	96	500		
Th	580	1000		
U	1094	1500		1500-1900
Cs	1995	2400		
BKD	2430			
CAL	670	706		I CAL
NULL	710	745		NULL
CAL	750	795		I CAL
1010	1514	1890		Turbulence LN ST. 2225
1030	2045	2510		
CAL	2543	2580		I CAL
NULL	2505	2630		NULL
CAL	2640	2671		I CALL
1050	2790	3250		
CAL	5096	5127		I CAL
NULL	5130	5165		NULL
CAL	6170	5210		I CAL
1070	5320	5709		

ANY LINE REFLOWN SHOULD HAVE THE LINE NUMBER INCREMENTED BY 1 EACH TIME

AIRBORNE GEOPHYSICAL FLIGHT LOG

CLIENT: Cordilleran	BLOCK # : Canol	JOB: 414	PAGE 2 OF 4

FLT #: 1 DATE: 05/08/04 OPERATOR: Barry Levy

PILOT: Ken Knight O.A.T.: 13 / A/C REG: C-GPWK

DEPART TIME: 22:07 RETURN TIME: 3:36 TOTAL FLT TIME: 5:29

SURVEY HEIGHT: 200 ft

LINE #	FIDUCAL		BINARY FILE NAME	COMMENTS
	START	END		
1090	5870	5709		
1110	6464	6380		
CAL	6890	6922		I CAL
NULL	6929	6969		NULL
CAL	6981	7015		I CAL
1130	7082	7482		
1150	7567	7960		
1170	8055	8440		
1190	8507	8920		
CAL	8960	9000		I CAL
NULL	9008	9043		NULL
CAL	9045	9080		I CAL
1210	9430	9800		
1230	9880	10268		
1250	10350	10700		
1270	10766	11156		
1290	11180	11570		
1310	11643	12032		
1330	12092	12420		
1350	12481	12877		

ANY LINE REFLOWN SHOULD HAVE THE LINE NUMBER INCREMENTED BY 1 EACH TIME

AIRBORNE GEOPHYSICAL FLIGHT LOG

CLIENT: Cordilleran	BLOCK # : Canol	JOB: 414	PAGE 3 OF 4

FLT #: 1 DATE: 05/08/04 OPERATOR: Barry Levy

PILOT: Ken Knight O.A.T.: 13 / A/C REG: C-GPWK

DEPART TIME: 22:07 RETURN TIME: 3:36 TOTAL FLT TIME: 5:29

SURVEY HEIGHT: 200 ft

LINE #	FIDUCAL		BINARY FILE NAME	COMMENTS
	START	END		
1370	12940	13310		
1390	13380	13740		
1410	13790	14172		
1430	14250	14636		
CAL	14700	14735		I CAL
NULL	14741	14786		NULL
CAL	14788	14832		I CAL
CAL	758	800		I CAL
NULL	802	840		NULL
CAL	845	900		I CAL
1450	1000	1400		WIND ST LN 0229
1470	1460	1874		
1490	1930	2275		
1510	2335	2430		
7060	2850			CUT LINE
CAL	3152	3200		I CAL
NULL	3206	3230		NULL
CAL	3235	3271		I CAL

ANY LINE REFLOWN SHOULD HAVE THE LINE NUMBER INCREMENTED BY 1 EACH TIME

AIRBORNE GEOPHYSICAL FLIGHT LOG

CLIENT: Cordilleran	BLOCK # : Canol	JOB: 414	PAGE 4 OF 4

FLT #: 1 DATE: 05/08/04 OPERATOR: Barry Levy

PILOT: Ken Knight O.A.T.: 13 / A/C REG: C-GPWK

DEPART TIME: 22:07 RETURN TIME: 3:36 TOTAL FLT TIME: 5:29

SURVEY HEIGHT: 200 ft

LINE #	FIDUCAL		BINARY FILE NAME	COMMENTS
	START	END		
7040	3310	3660		
CAL	3800	3845		I CAL
NULL	3847	3925		NULL
CAL	3926	3964		I CAL
PHASING	5700	5760		CHK PHASING
980	5860	5877		CHK CAL
880	5905	5920		
6 K	5936	5955		
BKD	11200	11600		
Th	11660	12060		
U	12070	12470		
Cs	12480	12880		
BKD	12890	13290		

ANY LINE REFLOWN SHOULD HAVE THE LINE NUMBER INCREMENTED BY 1 EACH TIME

AIRBORNE GEOPHYSICAL FLIGHT LOG

CLIENT: Cordilleran	BLOCK # : Canol	JOB: 414	PAGE 1 OF 4

FLT #: 2 DATE: 06/08/04 OPERATOR: Barry Levy

PILOT: Ken Knight O.A.T.: 10 / A/C REG: C-GWPK

DEPART TIME: 18:10 RETURN TIME: 0:41 TOTAL FLT TIME: 6:31

SURVEY HEIGHT: 200 ft

LINE #	FIDUCAL		BINARY FILE NAME	COMMENTS
	START	END		
BKD	0	400		
Th	960	1360		
U	1380	1780		
Cs	1820	2220		
BKD	2220	2620		
PHASING	170	671		
CAL	675	995		
CAL	2717	2751		I CAL
NULL	2755	2790		NULL
CAL	2800	2835		I CAL
7070	3822	4217		I CAL
				NULL
CAL	4279	4317		I CALL
NULL	4320	4358		
CAL	4360	4400		
CAL	5854	5890		I CAL
NULL	5891	5925		NULL
CAL	5927	5975		I CAL
7030	6110	6537		Spec restart on lone 1910

ANY LINE REFLOWN SHOULD HAVE THE LINE NUMBER INCREMENTED BY 1 EACH TIME

AIRBORNE GEOPHYSICAL FLIGHT LOG

CLIENT: Cordilleran	BLOCK # : Canol	JOB: 414	PAGE 2 OF 4

FLT #: 2 DATE: 06/08/04 OPERATOR: Barry Levy

PILOT: Ken Knight O.A.T.: 10 / A/C REG: C-GPWK

DEPART TIME: 18:10 RETURN TIME: 0:41 TOTAL FLT TIME: 6:31

SURVEY HEIGHT: 200 ft

LINE #	FIDUCAL		BINARY FILE NAME	COMMENTS
	START	END		
7020	6723	7115	4080619.POO	SPEC
7010	7270	7658		
7050	7900	8300		
7060	8392	8888		
1500	9113	9547		
1480	9656	10042		
1460	10130	10545		
1440	10580	10980		
1420	11050	11417		
1400	11515	11878		
CAL	11940	11975		I CAL
NULL	11977	12015		NULL
CAL	12017	12060		I CAL
1380	12115	12530		
1360	12570	12905		
1340	13045	13400		
1320	13466	13842		
1300	13880	14250		
1280	14300	14672		
1260	14720	15110		
1240	15150	15550		

ANY LINE REFLOWN SHOULD HAVE THE LINE NUMBER INCREMENTED BY 1 EACH TIME

AIRBORNE GEOPHYSICAL FLIGHT LOG

CLIENT: Cordilleran	BLOCK # : Canol	JOB: 414	PAGE 3 OF 4

FLT #: 2 DATE: 06/08/04 OPERATOR: Barry Levy

PILOT: Ken Knight O.A.T.: 10 / A/C REG: C-GPWK

DEPART TIME: 18:10 RETURN TIME: 0:41 TOTAL FLT TIME: 6:31

SURVEY HEIGHT: 200 ft

LINE #	FIDUCAL		BINARY FILE NAME	COMMENTS
	START	END		
CAL	15630	15670		I CAL
NULL	15671	15710		NULL
CAL	15715	15754		I CAL
CAL	472	507		I CAL
NULL	510	580		NULL
CAL	581	621		I CAL
1220	742	1155		ON LINE 2246/08062234.HUM,, NEW FILE
1200	1196	1635		
1180	1722	2126		
1160	2212	2570		
1140	2730	3135		
1120	3204	3645		
1100	3710	4135		
1080	4190	4666		
1060	4730	5175		
1040	5232	5700		
1020	5740	6175		
CAL	6242	6280		I CAL
NULL	6300	6342		NULL
CAL	6344	6406		I CAL

ANY LINE REFLOWN SHOULD HAVE THE LINE NUMBER INCREMENTED BY 1 EACH TIME

AIRBORNE GEOPHYSICAL FLIGHT LOG

CLIENT: Cordilleran	BLOCK # :	JOB: 414	PAGE 4 OF 4

FLT #: 2 DATE: 06/08/04 OPERATOR: Barry Levy

PILOT: Ken Knight O.A.T.: 10 / A/C REG: C-GPWK

DEPART TIME: 18:10 RETURN TIME: 0:41 TOTAL FLT TIME: 6:31

SURVEY HEIGHT: 200 ft

LINE #	FIDUCAL		BINARY FILE NAME	COMMENTS
	START	END		
270	6530	6576		
90	6644	6717		
0	6844	6920		
180	7050	7162		
NW	9160	9176		
0	9277	9291		
180	9333	9360		
500	10511	10521		
400	10592	10605		
300	10644	10658		
200	10685	10700		
PHASE	11509	11509		
CAL 980	11665	11685		
880	11715	11735		
6??	11747	11767		
BKD	23000	23400		
Th	23430	23830		
U	23880			

ANY LINE REFLOWN SHOULD HAVE THE LINE NUMBER INCREMENTED BY 1 EACH TIME

Project #:	414	Daily Field Report Helicopter-Borne Geophysical Survey						
Report Date:	05-Aug-04	Aircraft:	C-GPWK	AS 350 BA	SURVEY PERSONNEL		
Report Number:	1	Ops Base:		Johnson's Crossing	Pilot		Ken Knight
Client:	Cordilleran	Country:		Canada	Operator		Barry Levy
Survey Type:	Magnetic, HEM and spectrometry Survey				Field Data QC:		Andy Anderson
Survey Area:	Canol Survey Area						
Project Km:			Total Flown	Total Accepted			
Km flown today:			240.00	240.00			
Accumulated km:							
Percent Completed:			39.0%	39.0%			
Lines flown:							

Flight #	Tach start	Tach Stop	Flight Total	Tach Accumulated	Take off (GPS time)	Land (GPS time)	Hours Flown
1					22:07	3:36	5:29

Weather:		Hours Flown Today:	5:29
Accum. Standby:	Accumulated Survey Days:	Accumulated Project Hours:	5.48

COMMENTS

CONTROL	Flight # :		Flight date:	
POST FLIGHT	Accepted km	Rejected km	Reasons for Rejection	

REFLIGHTS		OBSERVATIONS.	LINES REFLOWN
Rejected km			
Kms today			
Accumulated km			
Percent Completed			

Operations Base: Johnson's Crossing, Yukon Territory, Canada

Geophy Co-ordinator:	Dr. H.T. Andersen			
Project Manager:	Tim Bodger		1-905-649-0043	tbodger@mgssurveys.com
Systems Engineer	Keith W. Hall		1-905-954-5212	khall@mgssurveys.com
HSE Manager:	Victor Oetke		1-905-830-6880	vho@mgssurveys.com

McPhar Geosurveys Ltd.
12565 Kerrisdale Boulevard, Newmarket, Ontario, Canada L3Y 7V1
Tel: (905) 830-6880, Fax: (905) 895-0335, E-mail: info@mgesurveys.com

*Please note that kilometres flown are estimates.

*Exact kilometres will be calculated upon completion of survey, and will be based on GPS observations & contractual boundaries

Project #:	414	Daily Field Report Helicopter-Borne Geophysical Survey						
Report Date:	06-Aug-04	Aircraft:	C-GPWK	AS 350 BA	SURVEY PERSONNEL			
Report Number:	2	Ops Base:		Johnson's Crossing	Pilot		Ken Knight	
Client:	Cordilleran	Country:		Canada	Operator		Barry Levy	
Survey Type:	Magnetic, HEM and spectrometry Survey				Field Data QC:		Andy Anderson	
Survey Area:	Carlot Survey Area							
Project Km:			Total Flown	Total Accepted				
Km flown today:			361.00	361.00				
Accumulated km:			611.00	611.00				
Percent Completed:			100.0%	100.0%				
Lines flown:								

Flight #	Tech start	Tech Stop	Flight Total	Tech Accumulated	Take off (GPS time)	Land (GPS time)	Hours Flown
2					18:06:00 PM	1:35	7:29

Weather:		Hours Flown Today:	7:29
Accum. Standby:	Accumulated Survey Days:	Accumulated Project Hours:	11:48

COMMENTS

CONTROL	Flight # :		Flight date:	
POST FLIGHT	Accepted km	Rejected km	Reasons for Rejection	

REFLIGHTS		OBSERVATIONS.	LINES REFLOWN
Rejected km			
Kms today			
Accumulated km			
Percent Completed			

Operations Base: Johnson's Crossing, Yukon Territory, Canada

Geophy Co-ordinator:	Dr. H.T. Andersen			
Project Manager:	Tim Bodger		1-905-649-0043	tbodger@mgssurveys.com
Systems Engineer	Keith W. Hall		1-905-954-5212	khall@mgssurveys.com
HSE Manager:	Victor Oetke		1-905-830-6880	vho@mgssurveys.com

McPhar Geosurveys Ltd.
1256B Kerrisdale Boulevard, Newmarket, Ontario, Canada L3Y 7V1
Tel: (905) 830-6880, Fax: (905) 898-9338, E-mail: info@mgssurveys.com

*Please note that kilometres flown are estimates.

*Exact kilometres will be calculated upon completion of survey, and will be based on GPS observations & contractual boundaries

APPENDIX 3

Equipment Documentation

- Hummingbird HEM System Specifications
- Geometrics G-822A Cesium Magnetometer
- Pico-Envirotec GRS 410 Gamma Spectrometer
- DGPS Max
- Terra TRA-3000 / TRI-30 Radar Altimeter
- Tetra Model 276 Pressure Transducer
- Geo-iMAGe Lite CDIS
- GSM-19 Overhauser Magnetometer
- NovAtel GPSCards
- Field Data Processing Workstations

DATA PROCESSING

McPhar is dedicated to processing geophysical data in the field.

For this purpose all our airborne systems are sent to the field with a geophysicist and a PC-based data processing system to support them. The Field Data Verification Workstation (FWS), as this system is known, can process airborne magnetic, radiometric and EM data, and produce plots and maps in full-color of the survey data, often within hours of the survey flight ending.

The FWS software, which is the core of this system, permits our field geophysicists to differentially correct the GPS navigation data; carry out flight path recovery; perform magnetic compensation and leveling; undertake radiometric corrections and preliminary processing; electromagnetic processing; and generally to perform filtering, gridding and contouring of data, imaging of selected data and plotting to any map scale and layout.

INTERPRETATION

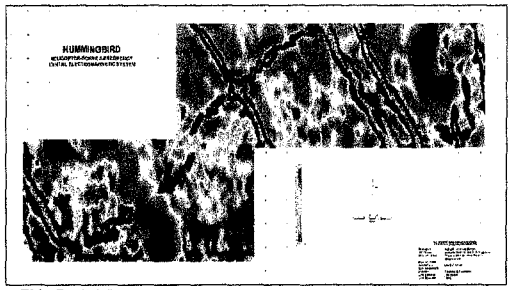
The interpretation of geophysical results into meaningful geological parameters is the prime function of any of our interpreters.

The many highly qualified geophysicists and technicians on our staff share a strong geological back-ground. The manipulation of geophysical data is only a means to an end, and the final product of the interpretation is the compilation of a series of maps showing interpreted geological parameters. The data processing routines and mathematical operators applied to the data are not the end product of the interpretation; they help delineate geologic and economic targets to be discussed in the final report.

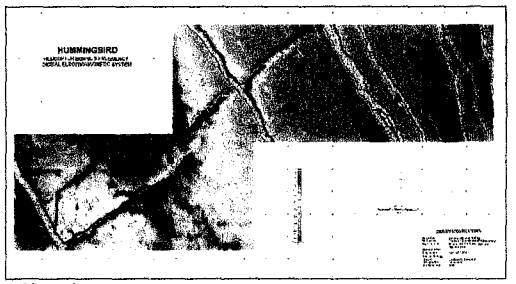
We bring many techniques to bear on an interpretation project in order to determine depths to causative sources, to delineate discontinuities and boundaries, and to draw conclusions regarding geological structure beneath the survey.

A wide variety of contour and interpretation maps, profiles, cross-sections and models, and a written report are the result of the interpretation.

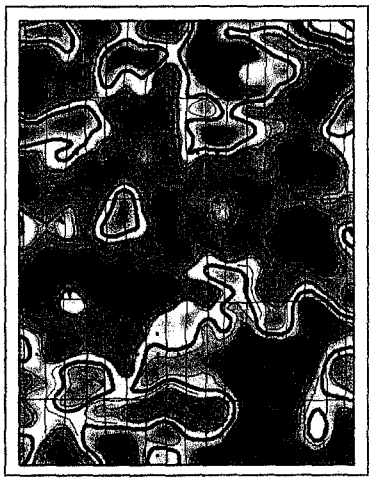
Magnetics



EM - Resistivity



Magnetics



EM – Resistivity3

HUMMINGBIRD

Helicopter-borne Digital Electromagnetic System

Undoubtedly, helicopter-borne electromagnetics (EM), combined with total field magnetics and often gamma-ray spectrometry, have been one of the most productive and useful of airborne system developments to date, and have accounted for the discovery of billions of dollars worth of mineral resources, tapped into numerous ground water reservoirs and provided immense volumes of data for environmental site evaluations. These systems are ideally suited for working in rugged, mountainous terrain, or over small claim block-sized properties.

Currently, electromagnetics (EM) combined with a high-sensitivity magnetometer are the techniques of choice for most mining companies worldwide, to locate and define diamondiferous kimberlite pipes and base and precious metal deposits.

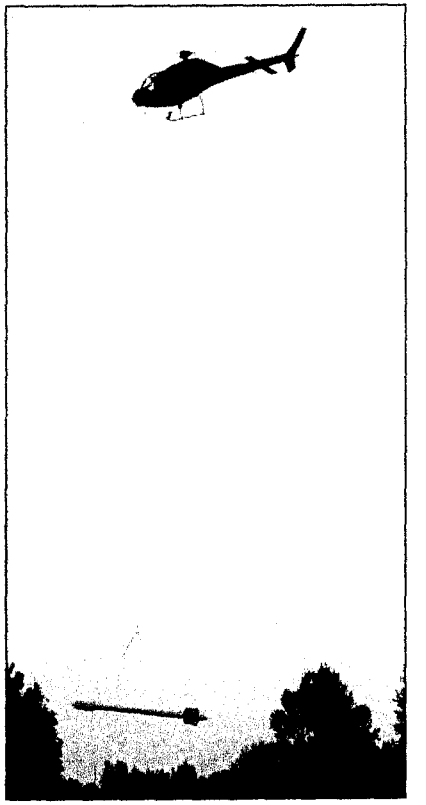
McPhar's electromagnetic survey systems are integrated around the HUMMINGBIRD EM sensor, which are available in either 4- or 5-frequency configurations.

The HUMMINGBIRD EM sensor, which is the heart of this system, can be simply described as a multi-frequency, multi-coil electromagnetic system, which measures the inphase and quadrature responses from a number of coil-pairs installed in a tubular bird, towed beneath a helicopter.

All components of the HEM instrumentation are digitally controlled. The HUMMINGBIRD is currently the only operating HEM system that is 100% digital from front to back. All digital samples generated by the instrumentation are supplied as inphase and quadrature measurements.

Data is telemetered on a lightweight serial cable to the data acquisition console onboard the helicopter, where it is displayed on a LCD colour screen and recorded on a removable PCMCIA hard disk.

Pilot guidance and DGPS navigation systems are integrated into the package together with a gammaray spectrometer (optional). Other flight control instruments include radar or laser altimeters and a barometric altimeter and a digital colour video imaging system.



McPHAR

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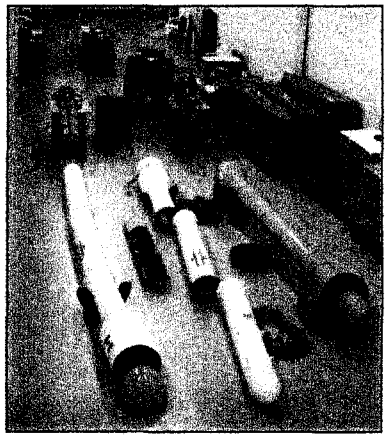
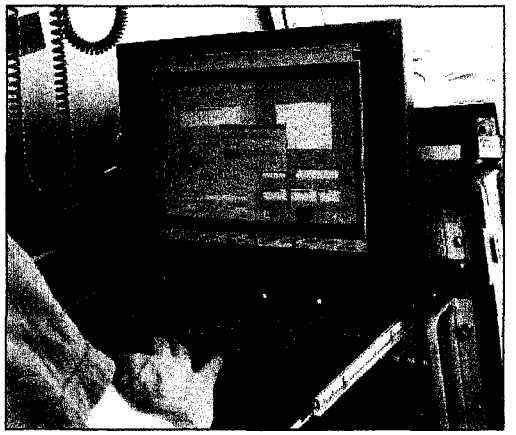
1256B Kerrisdale Blvd., Newmarket, Ontario, Canada L3Y 7V1
Tel: (905) 830-6880, Fax: (905) 898-0336
E-Mail: info@mgssurveys.com
WebSite: www.mgssurveys.com

The depth in the earth to which a single frequency can penetrate is a function of the frequency and the conductivity of the earth. [Skin Depth = 503 / (frequency x conductivity)^1/2] Lower frequencies penetrate deeper into the earth than higher frequencies. The higher frequencies are more sensitive to weakly conductive geology, and to subtle changes in the conductivity of the ground.

A HUMMINGBIRD system measures the in-phase "I" and quadrature "Q" (sometimes called out-of-phase) components of the total EM field. The amplitude of these components are always given as a value that is relative to the transmitted primary. The ratio of in-phase to quadrature (I/Q) depends mostly on the conductivity of the geology and the operating frequency; the amplitude depends mostly on the depth of the conductor below the sensor. (While this description of the relationship is only an approximation, it is a good start from which to understand changes in I and Q measurements.)



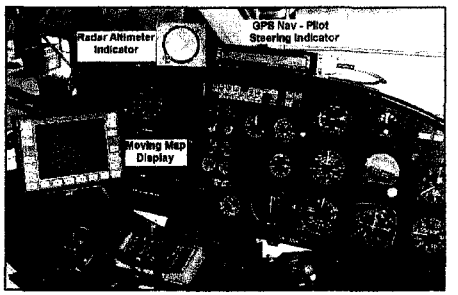
Two 5-frequency and a 4-frequency (in yellow) HUMMINGBIRD sensors undergoing preparations for the field at McPhar's offices in Newmarket, Ontario



Operator's screen/keyboard assembly – HUMMINGBIRD system

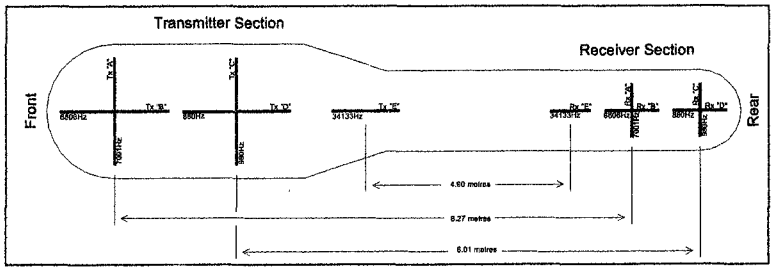
Typical system configuration is:

- 5-frequency HUMMINGBIRD EM sensor, 880 Hz, 980 Hz, 6.6 kHz, 7 kHz and 34 kHz frequencies
- high-sensitivity cesium magnetometer, 0.001 nT/10 Hz resolution
- 12-channel real-time differential GPS navigation system
- PC-based data acquisition system
- radar (*optional* laser) & barometric altimeters
- colour digital video imaging system
- *optional* gammaray spectrometer and 16.8/4.2 litres sensor

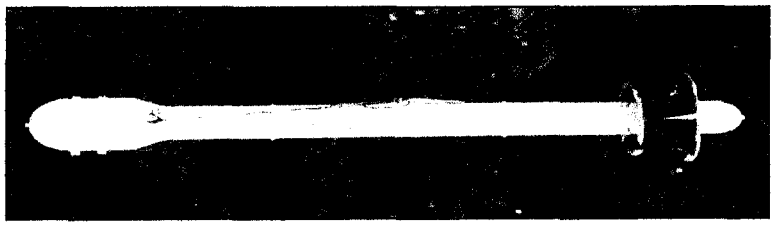


Cockpit displays for the pilot – HUMMINGBIRD system

COIL FREQUENCY	COIL ORIENTATION	COIL SEPARATION	CHANNELS
880 Hz	Coplanar	6.0 meters (19.5ft)	I, Q
980 Hz	Coaxial	6.0 meters (19.5ft)	I, Q
6.6 kHz	Coplanar	6.3 meters (20.5ft)	I, Q
7 kHz	Coaxial	6.3 meters (20.5ft)	I, Q
34 kHz	Coplanar	4.9 meters (16ft)	I, Q



Layout and dimensions of the transmitter and receiver coils in the HUMMINGBIRD



Vertical view of the 5-frequency HUMMINGBIRD sensor

SPECIFICATIONS

Frequency Range:	5 frequencies, 880 Hz, 980 Hz, 6.6 kHz, 7 kHz, 35 kHz
Coil Orientations:	Horizontal coplanar and vertical coaxial coil-sets
Output:	Inphase and Quadrature samples (ppm)
Sampling Rate:	10 Hz
Noise Levels:	2 –4 ppm under ideal conditions
Time Constant:	0.1 second
Filters:	50/60 Hz power line, spheric rejection, 4th order digital, 15Hz 2nd order analog and 5Hz Low Pass 6th order digital
Data Recording:	On removable PCMCIA hard disk or flash card
Data Acquisition:	Pentium-PC based
Display:	Sunlight visible colour TFT back-lit LCD
Power Requirements:	12-36 VDC, maximum 30 Amps
Temperature Range:	-40°C to +40°C
Bird/Cable Weight:	Approx. 180 kg (400 lb) including tow-cable
Bird Length:	7.5 meters (3 joined sections each of approx. 2.5 m)

Specifications may be subject to change without notice

GEOMETRICS

G-822A CESIUM MAGNETOMETER

Airborne and Vehicle Applications with Multi-Sensor Array Capability

Automatic Hemisphere Switching

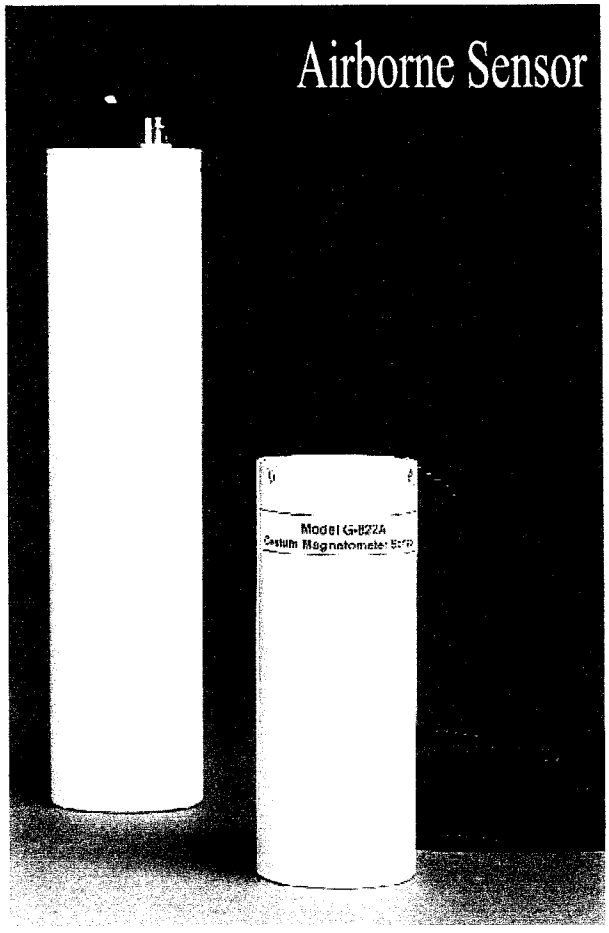
Highest Sensitivity – 0.0005 nT/√Hz RMS with the G-822A Super-Counter

Highest Versatility – Full Aircraft Compensation with RMS AADCII or Button-on Towed Bird system with CM-201 Internal Mini-Counter, with 6 Channel 12 bit A to D converters

Very low heading error – ±0.15nT over entire 360° Equatorial and Polar spins

Gradiometer arrays offering simultaneous operation of up to four separate sensors with the RMS Instruments AADCII , Geometrics' G-822A Super-Counter or CM-201 Internal Mini-counter (See 823A Data Sheet)

Geometrics offers complete turnkey systems including Birds, Stingers, Wingtip installation accessories as well as Digital Data Acquisition Systems, Flight Path Recovery, GPS Navigation, Gamma Ray Spectrometers, VLF EM , Post Acquisition Data Processing Software and Training



The G-822A is designed for all airborne or mobile applications where the unique combination of high sensitivity and very rapid sampling of the earth's magnetic field are required. Applications include mapping geologic structure for mining, oil and gas exploration, and the detection and delineation of target bodies in environmental or military type surveys. The unit consists of a high performance low heading error cesium vapor sensor with its associated cables and driver electronics package.

The G-822A sensor uses a precise well-proven design, carefully selected and tested components to insure the very best specifications in sensitivity, noise, heading error and absolute accuracy. A proven record of stable and reliable operation over long periods is the hallmark of the industry standard G-822A. A single coaxial cable of up to 50 meters length supplies both 28 VDC power and Larmor signal transmission from the sensor driver electronics to the 822A Super-Counter or the RMS Instruments' AADCII Automatic Aeromagnetic Digital Compensator. Internal or external signal/power filter-decoupler assemblies are available to provide extremely low noise operation.

The interconnect cable from the driver/electronics to the sensor may be supplied in lengths of 82 and 136 inches. Tuning throughout the earth's field range is fully automatic, and includes automatic hemisphere switching for equatorial surveys.

The sensor/electronics package is watertight, temperature controlled, and delivers full performance under extreme operating conditions. Accessories include special mounting clamps and orientation platforms for installation into a variety of vehicle or aircraft mounting configurations, as well as Birds, Stingers and Wing Tip fairings.

MODEL G-822A AIRBORNE CESIUM MAGNETOMETER SENSOR SPECIFICATIONS

OPERATING PRINCIPLE:	Self-oscillating split-beam Cesium Vapor (non-radioactive)
OPERATING RANGE: **OPERATING ZONES:**	20,000 to 100,000 nT The earth's field vector should be at an angle greater than 6 from the sensor's equator and greater than 6° away from the sensor's long axis. Automatic hemisphere switching.
SENSITIVITY:	<0.0005 nT/√Hz rms. Typically 0.003 nT P-P at a 0.1 second sample rate using 822A Supercounter, 0.02nT P-P for CM-201
HEADING ERROR:	±0.15 nT (over entire 360° polar and equatorial spin)
ABSOLUTE ACCURACY:	<3 nT throughout range
OUTPUT:	Cycle of Larmor frequency = 3.498572 Hz/nT, 2V P-P coupled through the sensor power input
MECHANICAL:	
Sensor:	2.375" (60.32 mm) dia., 6.25" (158.75 mm) long, 12 oz (339 g) - any orientation in 7" dia. stinger
Sensor Electronics:	2.5" (63.5 mm) dia., 11" (279.4 mm) long, 22 oz (623 g)
Cables:	
Sensor to electronics:	70" (1.78 m) or additional 40" (1.1 m) increments with quick disconnect on electronic end. Longer lengths available - Up to 19.5 ft (6.1m)
Sensor Electronics to Counter:	Up to 220 ft (70 m)
OPERATING TEMPERATURE:	-30°F to +122°F (-35°C to +50°C)
STORAGE TEMPERATURE:	-48°F to +158°F (-45°C to +70°C)
ALTITUDE:	Up to 30,000 ft (9,000 m)
WATER TIGHT:	Sealed for up to 2 ft (0.9 m) depth
POWER:	24 to 32 VDC, 0.75 amp at turn-on and 0.5 amp thereafter
ACCESSORIES:	
Standard:	Power/Larmor coaxial cable (electronics to counter), lengths to be specified, spare O rings, operation manual and carrying case
Optional:	
Signal/Power Decoupler:	Separates the Larmor signal from the power (28 V) to enable connection to RMS Instruments' AADCII Automatic Aeromagnetic Compensator or Customer supplied counter
Internal Decoupler:	P/N 27504 - up to two sensor installation
External Decoupler:	P/N 27560 - three and four sensor installation
Internal CM-201 Counter	See G-823 A Data Sheet
Stinger, Wingtip, Bird	Contact Factory for complete system integration information
Base Station Accessories	Non-magnetic Tripod, clamps cables

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE **2/04**

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GEOMETRICS

GRS410 Intelligent Gamma Spectrometer

The GRS410 Gamma spectrometer is an advanced Spectrometer utilizing the NaI(Tl) detectors with the newest technology. It is hardware-software designed system, exhibiting simplicity, easy interfacing and substantial versatility. It is based on the experience with the individual detector signal processing reducing potential hazards (or complex circuitry) of "zero base shift" and practically eliminating the "dead time". It is achieved through a special design feature almost completely eliminating the decaying part of each detected and eliminating any internal DC coupling and completely digital peak detector unit.
New - natural peak detection algorithm provides safe and fast system stabilization without temperature stabilization of the detector housing and without implanted radioactive sources in the detector housing. No implanted sources (usually Cs137) for stabilization means no spectra pollution on low energies and therefore better sensitivity of the system for low energies - mostly for man-made sources.
When calibrated (with Th source about once a year) linearity of the each detector is measured and linearity correction coefficients are calculated. When operating in real time, collecting data, the linearity of each detector is mathematically corrected for each measurement.
Individual detector tracking (tuning) and linearity correction provides better fit of the individual spectra that are being summed and therefore sharper (better resolution) spectrum is obtained.
Optionally the GRS410 system can be controlled by the altitude of the aircraft and calculate absolute values of contamination by individual radionuclei related to the ground and provide the dose rate related to 1meter above the ground.
Interfacing via single RS232 communication channel makes the system very flexible.

Technical parameters:

Spectra resolution:	256/512 channels Individual spectra recording in 256 or 512 channels
Data sampling:	1sec and longer, 0.5sec optional
Energy spectra:	50keV to 3MeV with threshold adjustable from 50keV 300keV. All energies above 3MeV are detected as Cosmic Rays.
Anticoincidence:	For improvement peak-valley ratio on lower energies, Coincidental pulses detected among neighboring

© Pico Envirotec Inc.

	detectors are removed and placed in a special channel.
Spectra tracking:	Individual detectors. with recorded status of tuning
Time to stabilization:	Automatic on natural radionuclei. Usually less than 30 sec on the ground and less than 2minutes in the air at 100 m altitude. In case of a system failure old tracking because of low counts, parameters (not more than 15 minutes) are used till new tracking is re-established.
Spectra linearization:	Automatic after system calibration. Calibration is required once a year or when a detector or electronics are replaced.
Windows (ROIs):	Additionally to the full spectra up to 22 special windows can be collected (4 are IAEA standard windows, 8 are optional activities altitude related).
Detector Box:	For logical distribution of detectors one detector box may contain up to six individual detectors served by one concentrator. Physically the detectors may be packaged differently.
Recommended Detectors:	4x4x16inch NaI(Tl);
Max. number of detectors	
With one Concentrator:	Ten (10)
With a Superconcentrator:	Four (4) Concentrators or Forty(40) detectors. Any of the detectors may used as down or up looking.
Signal sampling:	20 MHz by an internal 12bit A to D for each detector.
Peak detector:	Digital - time resolution 50nsec.
Dead time:	Negligible for up to 60000 pulses/sec/detector
Pulse rate per detector:	> 60000 pulses per second with negligible dead time.
Channel capacity:	65500 counts/sampling period.
Communication:	Serial among all units (Detector,Concentrator, Superconcentrator and Host).
Test programs:	Supplied with hardware
Interfacing:	Supplied with the hardware
Operating temperature:	-10 to 55 deg. C.

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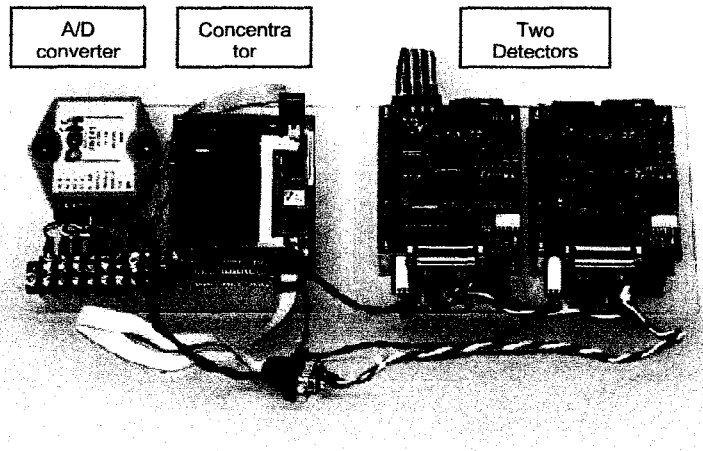
Two-detector GRS4 Gamma Spectrometer with IRIS (Integrated Radiation Information System).



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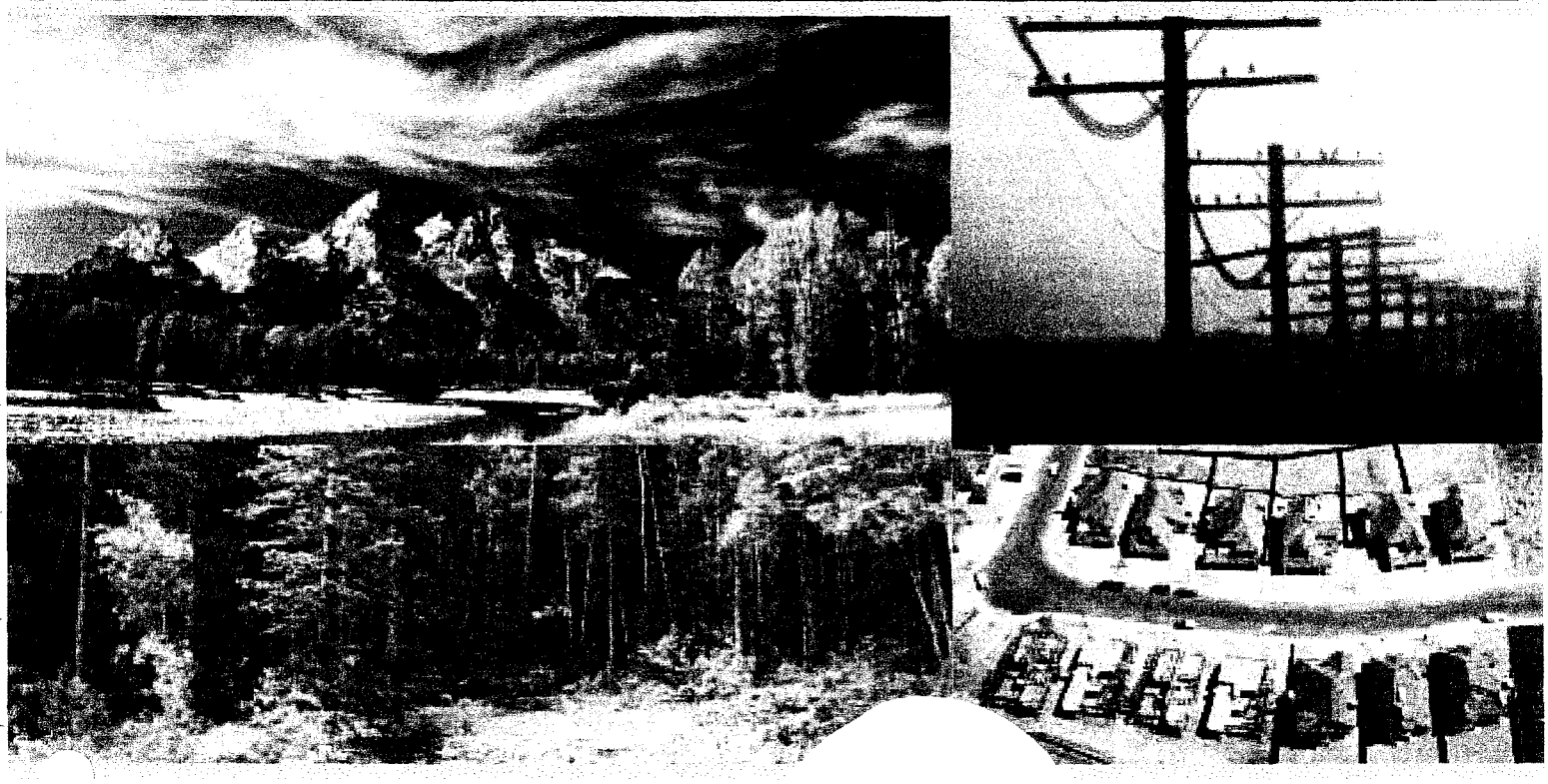
DGPS MAX

Feature-packed sub-meter GPS positioning



DGPS MAX

- Receives GPS, SBAS, OmniSTAR, and beacon signals
- Automatic dual channel SBAS tracking for more reliable reception
- Sub-meter positioning at rates of up to 5 Hz
- Raw measurement data for post-processing applications
- COAST™ technology allows use of corrections for up to 40 minutes without significant performance loss
- Easy configuration using the Setup Wizard
- User-defined profiles save receiver configurations for later use

ESRI Technology
AUTHORIZED BUSINESS PARTNER

csi wireless™
www.csi-wireless.com

DGPS MAX

Feature-packed sub-meter GPS positioning

GPS Sensor Specifications

Receiver Type:	L1, C/A code, with carrier phase smoothing
Channels:	12-channel, parallel tracking (10-channel when tracking WAAS)
WAAS Tracking:	2-channel, parallel tracking
Update Rate:	1 Hz default, 5 Hz max
Horizontal Accuracy:	<1 m 95% confidence (DGPS*) <5 m 95% confidence** (autonomous, no SA)
Cold Start:	1 min typical
Antenna Input Impedance:	50 Ω

L-band Sensor Specifications

Frequency Range:	1525 to 1559 MHz
Sensitivity:	-120 dBm for $<10^{-3}$ BER
Tuning Mode:	Manual or automatic
Adjacent Channel Rejection:	50 kHz spacing >25 dB, 1 MHz spacing >60 dB

Beacon Sensor Specifications

Channels:	2-channel, parallel tracking
Frequency Range:	283.5 to 325 kHz
Channel Spacing:	500 Hz
MSK Bit Rates:	50, 100, and 200 bps
Operating Modes:	Manual, automatic, semi-automatic
Cold Start Time:	< 1 minute typical
Reacquisition Time:	< 2 seconds typical
Demodulation:	Minimum shift keying (MSK)
Sensitivity:	2.5 µV/m for 6 dB SNR @ 200 bps
Dynamic Range:	100 dB
Frequency Offset:	± 8 Hz (~ 27 ppm)
Adjacent Channel Rejection:	61 dB ± 1 dB @ f_o ± 400 Hz

Communications

Serial ports:	1 full duplex, 1 RTCM input
Interface Level:	RS-232C
Baud Rates:	4800, 9600, 19200
CAN Bus:	CAN 2.0B
Correction Input / Output Protocol:	RTCM SC-104
Data Input / Output Protocol:	NMEA 0183
Raw Measurement Data:	Proprietary binary (RINEX utility available)
Timing Output:	1 PPS (HCMOS, active high, rising edge sync, 10 kΩ, 10 pF load)
Event Marker Input:	HCMOS, active low, falling edge sync, 10 kΩ, 10 pF load

Environmental

Operating Temperature:	-32°C to +74°C
Storage Temperature:	-40°C to +85°C
Humidity:	95% non-condensing
EMC:	FCC Part 15, Subpart B, Class B CISPR 22

Power

Input Voltage Range:	9.2 to 48 VDC
Reverse Polarity Protection:	Yes
Power Consumption:	< 4.8 W
Current Consumption:	< 400 mA @ 12 VDC
Load Dump Protection:	Up to 86 VDC
Antenna Voltage Output:	5 VDC
Antenna Short Circuit Protection:	Yes

Mechanical

Enclosure:	Powder-coated aluminum
Dimensions:	203 mm L x 125 mm W x 51 mm H (8.0" L x 4.9" W x 2.0" H)
Weight:	0.80 kg (1.76 lb)
Display:	2-line x 16-character LCD
Keypad:	3-button
Power Switch:	Push-button
Power Connector:	2-pin miniature
Data Connector:	DB9-socket
Antenna Connector:	TNC-socket

Pin-out

Main Port

Pin 2	Transmit data (TXD)
Pin 3	Receive data (RXD)
Pin 5	Signal ground

RTCM Input Port

Pin 2	Transmit data (TXD)
Pin 3	Receive data (RXD)
Pin 5	Signal ground
Pin 6	Event marker input
Pin 9	1 PPS

CDA-3 Antenna

GPS Freq. Range:	L1 (1575 MHz ± 20 MHz)
GPS LNA Gain:	27 dB
L-band Freq. Range:	1525 to 1585 MHz
L-band LNA Gain:	28 dB
Beacon Freq. Range:	283.5 to 325 kHz
Beacon LNA Gain:	34 dB
Dimensions:	141 mm dia x 127 mm H (5.57" dia 5.00" H)
Weight:	0.478 kg (1.1 lb)
Antenna Connector:	TNC-socket
Enclosure:	polycarbonate
Mounting Thread:	1-14-UNS-2B
Input Voltage:	5.0 to 15.0 VDC
Input Current:	50 to 60 mA
Operating Temp.:	-40°C to +85°C
Storage Temp.:	-40°C to +85°C
Relative Humidity:	100% condensing

* SVs > 5, HDOP < 2, RTCM SC-104 correction data from a dual frequency reference station, short baseline, and low multipath environment.

** Dependent upon ionospheric activity and multipath

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Warranty: Each CSI Wireless product is covered by a limited one-year warranty on parts and labor.

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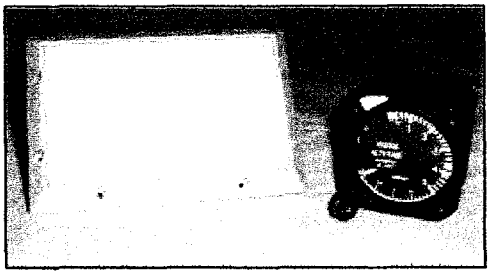
TERRA TRA-3000 / TRI-30 Radar Altimeter

The Terra TRA-3000 Radar Altimeter unit provides AGL (Above Ground Level) altitude information from 40 feet (12.3 m) up to 2,500 feet (769 m). The system consists of a single TRA-3000 receiver/transmitter/antenna unit and a TRI-30 indicator.



SPECIFICATIONS

TRA-3000 Unit

Type:	Single antenna, FMCW
Altitude Range:	40 to 2,500 ft
System Accuracy:	
• **40 to 100 ft**	+/- 5 ft
• **100 to 500 ft**	+/- 5%
• **500 to 2,500 ft**	+/- 7%
Frequency Range:	100 MHz sweep within 4,200 to 4,400 GHz range
Input Voltage:	Approx. 20 VDC from indicator
Input Current:	600 ma
Altitude Output:	Digital
Self-Test:	Ground or flight, initiated at indicator
Transmitter/Receiver/Antenna:	All solid-state, microstrip antenna,
Physical:	Size - 1" H x 5" W x 7.625" L, Weight - 1.5 lb.
Environment:	-40° C to + 70° C
Unlock display:	Altitude – 45,000 ft

TRI-30 Indicator

Power Supply:	Input voltage – 27.5 VDC +/- 20%
Environment:	Power – 16 watts nominal (includes power to T/R/A unit
Physical:	Size – 3.25" H x 3.25" W x 4" L, Weight – 1 lb.
Mounting:	Front panel mounting; requires a 3" ATI mounting space
Altitude range:	40 ft. to 2,500 ft (linear); 40 – 500 ft (enlarged linear)
Analog display:	Servo; pointer and dial type Needle will go off scale on the high-end
Decision height:	Bug, continuous setting from 40 to 2,500 ft.
Display update rate:	continuous
Analog output:	2.5 mv/ft., 100 mv = 40 ft.
Display disable:	One strut switch input, ground to enable
Altitude accuracy:	
• **40 to 100 ft**	+/- 5 ft
• **100 to 500 ft**	+/- 5%
• **500 to 2,500 ft**	+/- 7%
Aural Decision Height alert:	1 KHz tone for 2 sec. (500 ohms) adjustable audio level
Self-test:	Indicates 40 ft., DH operates normally
Visual alert:	Amber lamp with automatic adjustable intensity; internal LED standard; external lamp operation available.

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Setra Model 276
Pressure Transducer

Specifications:

Pressure Media: Clean dry non-conductive, non-corrosive gas

Accuracy:

accuracy[1]	+/- 0.02% full scale at 70°F (21°C)
nonlinearity	+/- 0.012% full scale (end point)
hysteresis	0.010% full scale
non-repeatability	+/- 0.010% full scale
thermal zero shift[2]	+/- 0.002% FS/ °F (+/- 0.004% FS/ °C)
thermal span shift[2]	+/- 0.001% FS/ °F (+/- 0.002% FS/ °C)
altitude resolution	1 ft (30.5cm) - 4 ft (1.23 m) for 100 psi range
stability, 24 hours	+/- 0.005% full scale
stability, 30 days	+/- 0.02% full scale
stability, 1 year	+/- 0.05% full scale

Output: Bidirectional RS-232 interface

Physical:

pressure fitting	1/8th barbed male fitting
pressure port	10-32 internal thread
height	4 in (10 cm)
width	3.5 in (8.9 cm)
depth	5.25 in (13.3 cm)
weight	2.4 lb (1.09 kg)

Power: 5 VDC +/1%, 70 mA; 17 mA w/200 Microampere sleep mode option

Notes:

1. Accuracy as RSS of non-Linearity, hysteresis and non-repeatability.
2. Unit calibrated at 70 °F. Maximum thermal error is computed from this datum.
3. Specifications are subject to change without notice.

DEV-TECH

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Geo-iMAGe Lite Colour Digital Imaging System

The airborne geophysical survey industry has traditionally acquired flight path imagery to document the position of the aircraft and sensor array with respect to the ground. The technology has progressed from 35 mm continuous-strip or frame film camera to videotape and VCR's, usually in the VHS - NTSC format. Current technology overlays the acquired video imagery with GPS position data as well as information from the geophysical data acquisition system, permitting correlation of the video imagery to the ground surface.

This technology has not progressed much since the early 1970's, and although digital camera systems have been available for some time, the industry has not utilized them for many reasons, mainly the inability to store the large volumes of video data in real time. Due to advances in the computer technology industry, this limitation has been overcome. Now that more versatile computer systems are available for use in the aircraft and the capacity to store large volumes of data quickly has become readily and affordably available, digital video has taken on a far more attractive role in airborne geophysics.

The older videotape systems generated imagery that was usually of poor quality, and there was no way to quickly find any given ground location on the tape without playing the entire tape. The video data was good for little more than proving that the aircraft had passed over a given point on a flight line. Certainly it was not of any use in creating any kind of map or photo-mosaic.

Today, however, we can acquire and record high-resolution video images in a format that can be read on any standard PC type computer. These images, combined with suitable information (GPS position, time, height above ground, height above sea level, pitch and roll axis tilt) will now permit the generation of digital 3D terrain models that can be integrated into the geophysical data set.

Most of the areas currently being explored for minerals or hydrocarbons have, at best, very poor topographical information. In many areas no useable information is available at all. Satellite imagery while available, is very costly and usually takes many months to acquire and process, and yields imagery with typically ten meters (or worse) pixel resolution.

Our goal is to provide simultaneously, with the acquisition of the geophysical data, medium to high resolution digital video frames (sub 3-meter pixels) with sufficient horizontal and vertical overlap to allow generation of video stereo pairs, and with the addition of the GPS and altimeter information to create a 3D terrain model.

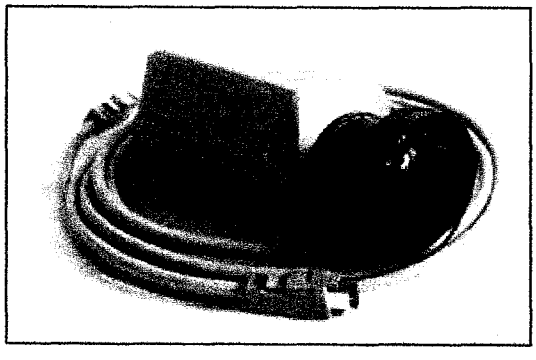


Figure 1: Sony Digital Colour Camera

The basic Geo-iMAGe Lite module comprises a stand-alone rack-mountable console that contains a powerful micro-computer, hard disk drive

comprises the following:

- Stand alone, 1 "U" high, rack mountable computer system, c/w Pentium III 1.0 GHz clock speed (or faster) processor,256 MB RAM memory, 20 GB HDD, 2 RS-232 serial ports, 2 IEEE 1394 firewire ports, 2 LAN ports, and CD-RW drive
- Windows 2000 Professional Operating System software
- Proprietary video image and GPS data acquisition software to enable acquisition of JPEG, TIF, BMP or PNG format video frames with a resolutionof 640 x 480, 320 x 240 or 160 x 120 pixel resolutions, user selectable.
- User selectable video frame and GPS data acquisition rate - from 1 frame per second to 1 frame every 10 seconds – synchronized with GPS time
- Sony digital video camera with 1/3 inch CCD video element
- 5.64 to 64.8 mm focal length lens with wide angle adapter (0.6 X increase in view angle)

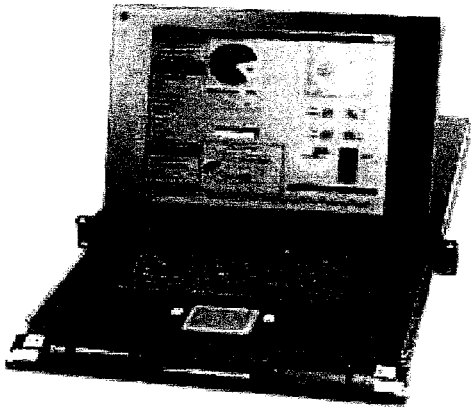
Optional modules for use with Geo-iMAGe Lite include:

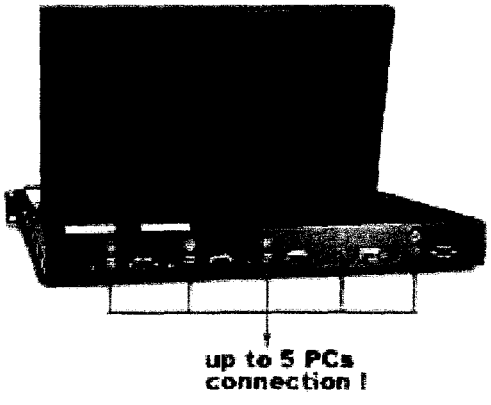
Geo-iMAGe GPS module

- Comprises a NovAtel OEM-4 GPSCard receiver, 12-channel, L1 code, imbedded in the Geo-iMAGe console.
- Novatel 511 aircraft certified active GPS antenna or Novatel 521 land vehicle active antenna, and cabling

Geo-iMAGe Screen/Keyboard module

Comprises a 19", 1 "U" high, rack-mount drawer containing a folding 15" LCD TFT (1024 x 768 pixel resolution) screen, keyboard and touchpad "mouse" p ointing device. Permits as up to 5 different PC devices to be attached to the screen and keyboard, eliminating the need for multiple screens and keyboards in the system.





Figures 2 & 3: Geo-iMAGe Screen/Keyboard module comprising a 19", 1 "U" high, rack-mount drawer containing a folding 15" LCD TFT (1024 x 768 pixel resolution) screen, keyboard and touchpad "mouse" pointing device.

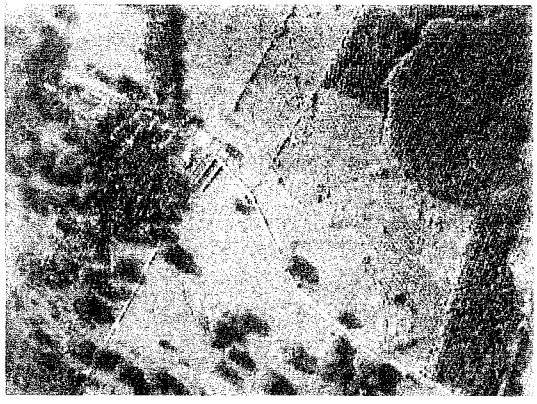
BASIC SYSTEM OVERVIEW

Typical video frame acquisition rate is in the order of 1 frame per second but may be user selected from a range of 1 frame/second to 1 frame every 10 seconds, in increments of 1.0 second. This will allow for variations in flight height above ground, aircraft ground speed and the viewing angle of the camera. Cameras typically used have 47° to 96° angle-of-view.

The system will import a serial data string from a GPS receiver (NEMA format GPGGA string). Rather than overlay the data string on the border of each image frame, a separate GPS data file is created with the same file name as the video frame but with the file extension GEO. The GPS data is available at rates of up to 10 HZ. The GPS receiver has several RS-232 serial ports available to transmit data strings to other equipment should the user so desire.

The video frames are stored on a large capacity hard disk. A naming convention for each frame has been developed utilizing GPS time as the reference. The frames are numbered in the format YYYYMMDDHHMMSSS.XXX where YYYY represents the year, MM the month, DD the day, HH the hour, MM, the minutes, SSS the seconds and decimal seconds of GPS time when the frame was captured. The system includes a CD-RW writer and appropriate software to allow storage of the imagery on CD media for long-term archival purposes.

The primary focus of this product is to replace the traditional "VCR" with a digital picture recording mechanism. Any standard image display software may be used to view the frame or frames of choice on a computer.



Figures 6 & 7: Digital images acquired over farmland in South America

Figures 8 & 9: Digital images acquired over desert village in North Africa

System Specifications:

OPERATING SYSTEM & DEDICATED SOFTWARE

Operating System:	Microsoft Windows 2000 PRO or ME
Video Acquisition Software:	GEOIMAGE LITE

POWER REQUIREMENTS: 24 –32 Volts DC at 50 watts power consumption
12 VDC or 115 / 230 VAC optionally available

GEO-iMAGe LITE:

Frame capture rate:	frame / second to 1 frame every 60 seconds, software selectable
Video format:	JPG, TIF, BMP, PNG, user selectable (JPG recommended)
GPS data:	internal dedicated GPS receiver, Novatel OEM-4, 12 channel L1 - NMEA 0183 GPGGA data string GPS data collected at same rate as video frame data User selectable baud rate for GPS data
File naming:	
Video file:	YYYYMMDDHHMMSSS.XXX, where: YYYY= Year MM= Month DD= Day HH= Hour MM= Minute SSS= seconds,tenths of seconds XXX= video extension, JPG, BMP, PNG etc (automatic)
GPS data:	same as above except file extension automatically selected as GEO

Digital Camera:

Model:	Sony DFW-V500 or equivalent
Interface Format:	IEEE 1394
Data format:	640x480 YUV (4.2.2) 640x480 YUV(4.1.1) 320x240 YUV(4.2.2) 160x120 YUV(4.4.4) all formats user selectable
Image Device:	CCD
White Balance:	Automatic or Manual
Hue:	variable
Saturation:	variable
Lens focal length:	5.64 to 64.8 mm, F:1.18
Wide angle adapter:	VCL-0637H (0.6 X increase in view angle)
Zoom:	12X range, manual, user selectable
Focus:	manual, user selectable
CCD Iris:	ON/OFF selectable
Shutter Speed:	1/30 to 1/100000 sec
Gain:	Automatic or manual
Power:	8-30 VDC (supplied through 1394 cable)
Power Consumption:	4 watts
Operating Temp:	-20 to +50 DEG C
Dimensions:	60 x 61 x 118 mm (w/h/d)
Mass:	335 grams

LCD display and keyboard

Full keyboard function
SynapticsTouchpad
Microsoft Mouse compatible with PS/2 mouse interface
15.1" high brightness TFT LCD display

Resolution :	1024 x 768 (36-bit colors)
Brightness :	200 cd/m2
LCD MTBF :	50,000 hrs
On Screen Display:	built-in OSD for user adjustment, including H/V position, Color, size, etc.
Power Supply :	Built-in universal AC input adapter (LKM-926x / 9265x) -48VDC (LKM-926xT / 9265xT)
Operating Temp:	0° ~ 50°C

Up to five VGA / Keyboard / Mouse / Audio inputs (5 PCs)
Built-in Manual or Auto Scan function

CPU Processor and Peripherals:

CPU :	Socket-370 base support CeleronTM / Pentium® III up to 1.33GHz FSB
System Memory :	One 168-pin DIMM socket up to 512MB SDRAM / VCM
System Chipset :	SiS 630
Video Controller :	up to 1600 x 1200, 16 bits colors, resolution 1394: Fully supports provisions of IEEE 1394-1995 standard for high performance serial bus and the P1394a supplement. Two P1394a fully compliant cable ports at 100/200/400 Mbps
Super I/O :	3 x RS-232 and one RS-232/422/485 (auto-direction RS-485) One parallel port Floppy Disk Controller
USB Ports :	Two ports meets USB ver.1 standard by pin header
Digital I/O :	4 DI and 4 DO
Ethernet :	Dual 10/100Mbps LANS with one integrated in
	Support ATX function
	PC/104 expansion by LPC to ISA controller
	Support one PCI slot
SSD :	Support CompactFlash Type II socket
IDE :	ATA66 interface by one 40-pin connector
Power:	6.5A/5V, 170mA/12V (PIII-933MHz and 256MB SDRAM)
Operating temp:	0 ~ 60°C (CPU needs cooler)
CD-WRITER:	HP 8200 CD-RW
MEDIA:	20 GB, 2.5 INCH DRIVE Optional 250 MB IOMEGA ZIP DRIVE

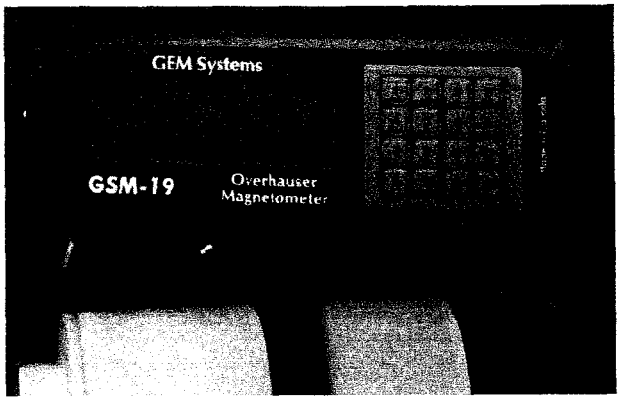
NovAtel OEM-4 GPSCard:

position accuracy - single point	
SA off:	11 m CEP 3
SA on:	48 m CEP 4
DGPS:	(L1, C/A)5 0.45 m CEP
measurement precision	
L1 C/A code:	6 cm RMS
L1 carrier phase:	0.75 mm RMS (differential channel)
data rates	
measurements:	10 Hz
position:	10 Hz
time to first fix - cold start:	60 seconds (typical)
signal re-acquisition:	0.5 s (typical)
time accuracy:	
SA off:	102 ns RMS 3
SA on:	173 ns RMS
Size:	85 mm x 125 mm x 16 mm
Weight:	120 g
Input Voltage:	6.0 -18.0 VDC
Power Consumption:	2.7 W typical, 3.2 W max

GSM-19 Overhauser Magnetometer

Features of the magnetometer

- **Sensitivity = 0.02 nT**
- **Absolute Accuracy = 0.2 nT**
- **Sample Rates up to 5 Hz**
- **Low Power Consumption**



General

"Overhauser" Once you experience it, you'll never go back to proton. Overhauser technology brings you sensitivities one to two orders of magnitude better than proton, yet in a light weight package. This is because the overhauser magnetometer consumes an order of magnitude less power than proton magnetometer, allowing a lighter weight for batteries.

What is the Overhauser technique? The Overhauser sensor contains the electrons' fluid that has been added to a hydrogen rich in the form of "free radial". The resulting mixture yields a sensor with 5000 times gain in proton polarization. Since the Overhauser polarization effect does not require static magnetic fields, but uses radio frequency fields transparent to protons, measurement can be done concurrently with polarization. The result is a sensor with much greater sensitivity, that can be sampled much more rapidly than the standard proton sensor.

Overhauser magnetometer systems therefore maximize resolution while minimizing power consumption. Even with Walking Gradiometer systems, sampling at rates of once per second or betterare posible; Even in cold temperatures of minus 40 zero degrees Celsius and greater, the internal rechargeable battery can still be relied on for a 10 hour day, or longer.

The GSM-19 Overhauser magnetometer is thus truly a State-of-the-Art Magnetometer / VLF system. The GSM-19 offers the data quality, reliability, and extensive list of capabilities, and options, that allow it to meet a very wide spectrum of applications.

Standard Features of the magnetometer

The GSM-19 magnetometer console features a real time graphic display of the current profile. In addition digital display of the current reading, current position, and warning messages are provided. The console design, with internal rechargeable battery pack, allows the unit to be completely sealed against the elements. With the built in heater for the display the GSM-19 magnetometer is ready to go wherever your surveys may take you.

Tuning is automatic worldwide, with provision for manual override. In high gradient conditions the GSM-19 magnetometer monitors the signal decay rate and displays a warning message when the gradient becomes too great. Filters for rejection of 50 or 60 Hz noise are provided.

Diurnal corrections may be done in traditional fashion with one magnetometer unit as a base station and a second unit used as the mobile field unit. At the end of the survey the two units are connected and the field unit creates a corrected data file (which still includes the raw data file) based on the temporal drift recorded by the base station.

As a standard feature GSM-19 magnetometer also offer the capability of making tie point measurements for automatic diurnal corrections. To use this feature the operator records a base value and then loops back to this point periodically during the survey to record another measurement, and thus build a file of the drift. In this way a single instrument may be used to make diurnal corrections.

The RS-232 port on the GSM-19 magnetometer will output data as it is collected. This allows interface to GPS loggers that will accept RS232 data. The standard GSM-19 magnetometer may be operated in a remote mode via computer. Memory storage is 512 K in the standard unit, and may be upgraded to 2 MB.

Grid coordinates are stored with either numeric or compass designations. A seven digit number may be used to designate lines and positions. Line and position spacing is entered so that with every reading the position may be automatically updated. An End of Line feature allows the next line to be quickly selected, plus changes the sign on the position spacing. If the previous line had been adding positions as the operator moved, then on the next line, positions will be subtracted as the operator moves. The operator may also easily manually enter his grid position for cases where gaps in the line are necessary.

SPECIFICATIONS

Performance

	Overhauser	Proton
Resolution:	0.01 nT	0.01 nT
Relative Sensitivity:	0.02 nT	0.2 nT
Absolute Accuracy:	0.2 nT	1 nT
Range:	20,000 to 120,000 nT	20,000 to 120,000 nT
Gradient Tolerance:	Over 10,000 nT/m	Over 7,000 nT/m

Storage Capacity (readings)

	Overhauser	Proton
Std. Magnetometer:	32,000 to 131,000	16,000 to 32,000
With 3 VLF stations:	12,000 to 58,000	6,000 to 12,000
Base Station:	170,000 to 700,000	84,000 to 170,000
Gradiometer:	25,000 to 110,000	12,000 to 25,000
With 3 VLF stations:	12,000 to 46,000	6,000 to 12,000

Operating Modes

Manual: Coordinates, time, date and reading stored automatically at a minimum 3 second interval.

Base Station: Time, date and reading stored at 3 to 60 second interval (higher speeds available).

Walking: Time, date and reading stored at coordinates of fiducial with 0.5, 1 or 2 second cycle time.

Hip Chain: Equidistant coordinates, time, date and reading stored automatically. Distance interval of readings is programmable.

Remote Control: Optional remote control using RS-232 interface.

Input/Output: RS-232 or analog (optional) output using 6 pin weatherproof connector.

Operating Parameters

Power Consumption: Only 2 Ws per reading for Overhauser, and 12 Ws per reading for Proton magnetometer. Will operate continuously for 45 hours on standby.

Power Source: 12V 2.6 Ah sealed lead acid battery standard, other batteries available.

Operating Temperature: Overhauser: -50°C to +60°C. Proton: -40°C to +60°C.

Dimensions and Weight

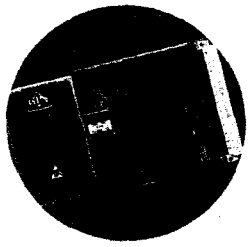
Dimensions:
- Console 223 x 69 x 240 mm.
- Sensor 170 x 71 mm diameter cylinder. Omnidirectional sensor 180 x 80mm.

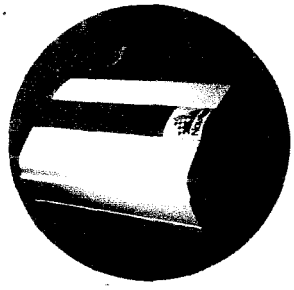
Weight:
- Console 2.1 kg.
- Sensor and staff assembly 2.0 kg.

A Standard package includes a console with batteries, harness, battery charger, case, sensor with 2m cable, and staff.

Look into NovAtel's Performance Series

They're a range of advanced technology, high performance L1 GPSCards featuring NovAtel's patented Narrow Correlator™ technology and providing sub-meter differential accuracy in real-time. High data output rates, fast signal reacquisition, and superior multipath mitigation techniques support even the most demanding GPS applications.



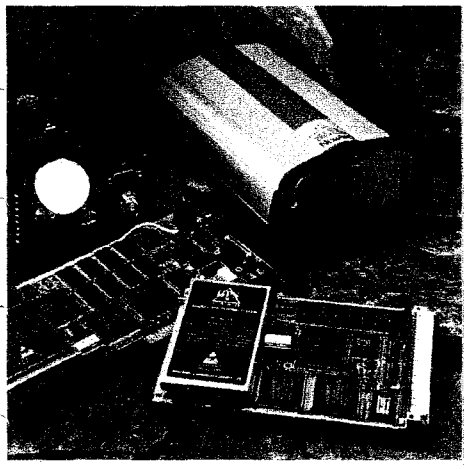


ADVANTAGES

- 12 channel "all in view" parallel tracking
- L1-C/A code and carrier measurements
- Narrow Correlator technology
- Multipath Elimination Technology (MET™)
- Sub-meter real-time DGPS accuracy
- High data output rates
- Low data latency
- High dynamics
- Ease of use
- OEM, PC Card, or standalone configurations
- Flexible integration
- Upgradable

NovAtel

Performance Series



Performance Series

NovAtel's PC Performance 3900 Series features a 2/3 length personal computer card designed for installation in PC compatible computers. This series offers a choice of two full DGPS Card models – the 12 channel 3911R, providing core functionality common to all GPSCard™ models, and the full data model 3951R.

NovAtel's OEM Performance 3100 Series features a Eurocard form-factor designed for standalone and embedded applications. This series offers a selection of GPSCard models ranging from the 12 channel 3111R, providing core functionality, to the advanced full data model 3151R. All OEM Performance Series receivers are DGPS capable and are rated for use at -40°C to +85°C temperatures. Available as a software option is NovAtel's Multipath Elimination Technology (MET) which reduces pseudorange multipath error by a further 25% to 50% over NovAtel's existing multipath resistant Narrow Correlator.

NovAtel's PowerPak™ Performance 3100 Series provides GPS integrators with an effective, self-contained system. Each PowerPak includes an OEM Performance Series GPSCard and a power supply.

NovAtel ProPak® Performance 3100 Series provides a rugged water, shock and vibration resistant housing for outdoor applications which provides all the same functionality of PowerPak.

Features

- 0.75 meter real-time differential accuracy
- L1-C/A code and carrier tracking
- 12 channel "all in view" parallel tracking
- Fast reacquisition
- Patented Narrow Correlator technology
- Optional Multipath Elimination Technology (MET)
- 10 Hz position output rate
- 20 Hz raw data output rate
- 1 PPS output
- E[illegible]rker
- R[illegible]C104 v 2.1/2.2
- RTCA SC159
- RINEX v. 2.0
- NMEA 0183 v 2.0
- GPSolution™ – Windows® compatible graphical user interface

Specifications[1]

• position accuracy	
standalone	
SA off	15 m CEP
SA on	40 m CEP
differential	0.75 m CEP
• post-processed (3151RE/3951R models only)	±5mm +2ppm ±5mm +1ppm (horizontal) ±10mm +1ppm (vertical)
• time to first fix	
cold start	70 s (typical)
• reacquisition	
warm start	1 s (typical)
• data rates	
raw measurements	20 Hz
computed position	10 Hz
• time accuracy	
SA off	50 ns RMS
SA on	250 ns RMS
• velocity accuracy	
standalone	0.20 m/s RMS
differential	0.03 m/s RMS
• measurement precision	
C/A code phase	10 cm RMS
carrier phase	
single channel	3 mm RMS
differential channel	0.75 mm RMS
• dynamics (OEM Card Series only)	
acceleration	4 g
velocity	515 m/s

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PC Card 3900 Series

• physical	
size	21.6 cm x 10.7 cm x 1.9 cm
weight	220 g
• temperature	
operating	0°C to +70°C
storage	-40°C to +85°C
• interface	
PC ISA bus	8 bit/8 MHz
dual RS232 ports	
connectors	DB-9 male
baud rates	300 to 115,200 bps
TTL Strobes I/O	DB-9 female
RF input	SMA female
• power consumption	6 watts

OEM Card 3100 Series

• physical (Eurocard)	
size	16.7 cm x 10.0 cm x 1.5 cm
weight	175 g
• temperature	
operating	-40°C to +85°C
storage	-40°C to +85°C
• humidity	95% non-condensing
• interface	
types	RS232/RS422/NMEA
baud rates	300 to 115,200 bps
strobe I/O	TTL level
• connector type	
edge	64 pin 0.1" DIN 41612 type B
antenna	SMB male
• input voltage	5 VDC, ±12 VDC
• power consumption	5 watts

PowerPak 3100 Series

• physical	
size	20.8 cm x 11.1 cm x 4.7 cm
weight	1 Kg
• temperature	
operating	-40°C to +65°C
storage	-40°C to +85°C
• humidity	95% non-condensing
• interface	
communications	RS232/RS422/NMEA
baud rate	300 to 115,200 bps
strobe I/O	TTL level
• connector type	
communications	2 x DB9P
strobes I/O	DB9S
antenna	TNC female
power	2.1 mm threaded plug (center +)
• input voltage range	10-36 VDC
• power consumption	8 watts
• accessories include	
RS232 "Y" type null modem cable	
automotive power cable	
• optional accessories	
110/220 Volt AC acaptor	

ProPak 3100 Series

• physical	
size	24.5 cm x 13.0 cm x 6.2 cm
weight	1.2 Kg
• temperature	
operating	-40°C to +65°C
storage	-40°C to +85°C
• humidity	95% non-condensing
• interface	
communications	RS232
baud rates	300 to 115,200 bps
strobes I/O	TTL level
• connector type	
communications	2 x 10 pin LEMO
strobes I/O	8 pin LEMO
antenna	TNC female
power	4 pin LEMO
• input voltage range	10-36 VDC
• power consumption	8 watts
• accessories include	
RS232 null modem and straight cable	
strobe I/O cable	
automotive power cable	
• optional accessories	
110/220 Volt AC adaptor	

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For detailed product technical specifications, please call:

1-800-NovAtel

in U.S. or Canada or +1-403-295-4900
email: sales@novatel.ca
internet: www.novatel.ca

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NovAtel

Now, what's tomorrow's challenge?

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WebSite: www.mgssurveys.com

FIELD DATA PROCESSING WORKSTATIONS

Our Field Data Processing Workstations (FWS) are dedicated PC-based microcomputer systems for use at the technical base in the field. The workstations are designed for use with Geosoft OASIS, MPS and MONTAJ, ENCOM, and other data processing software, as well as in-house developed software and utilities.

The FWS has a data replot capability, and may be used to produce pseudo analog charts from the recorded digital data within less than 12 hours after the completion of a survey flight, if this is necessary. It is also capable of processing and imaging all the geophysical and navigation data acquired during the survey, producing semi-final, preliminary-levelled maps in either black-line contours on Mylar or full colour contours on paper.

FWS FEATURES

- **Portability** - the workstations can be packaged and transported to the field with a minimum of effort
- **Digital Data Verification** - flight data quality and completeness can be assured by both statistical and graphical means
- **Flight Path Plots** - flight path plots can be quickly generated from the GPS satellite data to verify the completeness and accuracy of a day's flying
- **Versatility** - the FWS can be used in both the field and the office. Data pre-processed in the field can be up-loaded to the computers at the Data Processing Centre to speed data turnaround.
- **QC and Preliminary Maps** - the software will permit preliminary maps of the magnetic and gamma-ray spectrometer data to be quickly and efficiently created in the field, providing a quick and efficient method to undertake QC Verification of newly acquired data.

THE HARDWARE

The workstations are PC-compatible PENTIUM microcomputers with a 2GHz or faster processor, 512 MB of memory, a large capacity hard disk drive, an extended VGA graphics card with VGA monitor and a colour inkjet plotter for generating maps and/or profiles, and ZIP, JAZZ and writeable CD-ROM drives to backup data.

THE SOFTWARE

The FWS software enables the user to read the FLASH cards, ZIP cartridges or PCMCIA removable hard disks from the airborne system, check the data for gaps, spikes or other defects and permits editing where necessary.

The base station GPS/magnetometer data is checked and edited, and where necessary merged with the airborne data. Post-survey differential GPS corrections are made using either C^{3}NAV and/or WAYPOINT software. GPS flight path plots may be created and plotted. Multi-channel stacked profiles of the recorded and edited data may be produced on the dot-matrix printer.

The Software includes:

- Geosoft OASIS/Montaj Airborne Processing Software
- PC-based airborne data compilation and binary database system for in-field processing and compilation of large volumes of time or fiducial based airborne data
- Proprietary data for processing HEM data
- GrafNAV GPS processing/differential GPS correction software
- McPhar's proprietary software and utilities
- General Utility software (WINDOWS 200 PRO, Norton Utilities, Norton Anti-virus, Xtree Gold, LapLink, etc.)

APPENDIX 4

Personnel Resumes

- Tim Bodger
- Robert Hearst
- Henrik T. Anderson
- Barry Levy
- Tonia Bojkova
- Asif Mirza

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Ontario, Canada L3Y 7V1
Tel: (905) 830-6880, Fax: (905) 898-0336
E-Mail: info@mgssurveys.com
WebSite: www.mgssurveys.com

RÉSUMÉ

Name: Timothy R. Bodger

Profession: Manager, Administrator, Sales and Marketing

RELEVANT EMPLOYMENT HISTORY:

2003 – present **McPhar Geosurveys Ltd., Newmarket, Ontario, Canada – General Manager** - responsible for the day-to-day administration, operations and sales and marketing activities of the company.

1998 – 2002 **EDCON Aero Surveys, Inc., Denver, USA - Vice President, Sales & Marketing** - a joint venture company between Aero Surveys Inc. and EDCON Inc., responsible for sales and marketing activities of the company.

1996 – 2002 **Aero Surveys Inc., Uxbridge, Canada - Vice President, Sales & Marketing** - In August 1996, Aero Surveys was acquired by GeoeXperT Geosciences C.A., and at that time, Bodger became the Vice President responsible for sales and marketing activities of the company. In 1997, was instrumental in introducing Aero Surveys to Airborne Gravity surveys, and assisted in the creation of the EDCON Aero Surveys joint venture to undertake Airborne Gravity Surveys.

1995 - 1996 **Aero Surveys Inc., Richmond Hill, Canada - Founder, Director and Vice-President** - Joined the newly formed company as President, responsible for the day-to-day management of the company, determining the company's future business plans, sales and marketing of its services and products, supervising a staff of 12 plus employees, and maintaining budgets and cash-flow.

1994 - 1995: **Scintrex Limited, Toronto, Canada - Promoted to General Manager, Systems & Surveys Division**, a new division of Scintrex created to provide contract airborne and ground geophysical surveys. Responsible for budgets, sales and marketing of the division, project costs and profits, supervising staff of 30 persons, including a Joint Venture Company in Cuba (Scintrex-Caribe).

1992 - 1994: **Scintrex Limited, Toronto, Canada - Promoted to Director of Sales**, responsible for the sales and marketing of all Scintrex Products and Services, including contract airborne and ground geophysical surveys. Supervised a staff of 16 persons, and a network of 74 agents and representatives, worldwide.

1989 - 1991: **Scintrex Limited, Toronto, Canada - Promoted to General Sales Manager, Earth Science Products**, responsible for the sales and marketing of all products and services of the Earth Science Division. Supervised sales and marketing staff of 9 persons.

1985 - 1989:	**Scintrex Limited, Toronto, Canada - Airborne Instrumentation Sales Manager,** responsible for the sales and marketing of Scintrex' airborne geophysical instrumentation and services.
1982 - 1985:	**Questor Surveys Ltd., Mississauga - Projects Manager** of 210,000 km aeromagnetic survey of the Philippines from 1982 to 1984, and various small projects around Canada/USA in 1984/85.
1981 - 1982:	**Geosurvey International, Kenya -Assistant Project Manager**, assisted in managing a large nation-wide regional survey in Guinea, West Africa, responsible for the operations of 3 aircraft and a crew of 25 persons.
1977 - 1980:	**Questor Surveys Ltd., Mississauga, Canada - Data Compilation Manager,** responsible for supervising Datamen in field on INPUT (TDEM) surveys, as well as for the compilation of all INPUT survey data into maps and other products. Worked primarily in Canada, USA and South Africa.
1974 - 1977:	**Northway Survey Ltd., Toronto, Canada - Dataman and Crew Chief** on various airborne projects in Canada, Niger, Nigeria, Venezuela, Dominican Republic, Lesotho, South Africa, Senegal and USA.
1973 - 1974:	**Geometrics Inc., California, USA - Dataman** on various airborne projects in USA, Alaska, Zambia and Australia.
1971 - 1973:	**Aero Service Corporation, Philadelphia, USA - Dataman** on large airborne regional survey of Algeria.

PROFESSIONAL AFFILIATIONS:

- Past President, Currently Member, Canadian Exploration Geophysical Society (KEGS)
- Member, Society of Exploration Geophysicists (SEG)
- Member, Prospectors & Developers Association of Canada (PDAC)

TECHNICAL PAPERS/PUBLICATIONS:

Between 1994 and 1998, has written and/or published eight technical papers on airborne geophysical surveying topics.

LANGUAGES:

English and French

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WebSite: www.mgssurveys.com

RÉSUMÉ

NAME: **Robert Hearst**

PROFESSION: Geophysicist

EDUCATION:

1996 M.Sc., Geophysics and Geology, McMaster University
1983 B.Sc. (Honours), Geophysics and Geology, University of Western Ontario

WORK EXPERIENCE:

2004 - present **McPhar Geosurveys Ltd., Senior Geophysicist/Data Processing Manager** – Responsible for supervising McPhar's Data Processing Dept., responsible for processing data acquired by ground and airborne (installed in either rotary- or fixed-wing aircraft) electromagnetic, magnetic, radiometric, or other geophysical survey systems at the company's Data Processing Centre in Newmarket, using OASIS, MONTAJ, INTREPID and other software; quality control (QC) of acquired geophysical data; geophysical interpretations; operational logistics

2002 – 2004 **Consulting Geophysicist, Toronto** - servicing various international and local clients. Quality Control / Quality Assurance for Saudi Aramco on the World's largest multiple gradient airborne magnetic survey (approx. 1.7 million line-kms of data acquisition). Supervision and field quality control of data acquired by multiple aircraft on a daily basis including the acceptability and necessary re-flights / modifications required to meet contract specifications. Evaluation and specification of all final deliverable products including acceptability of final products and processing steps. Design, Quality Control / Quality Assurance and Interpretation of several smaller airborne and ground geophysical surveys completed in Canada and Venezuela for several Junior Mining Companies.

1997 - 2002 **Stratagex Ltd., Geophysical Consulting, Toronto, Senior Geophysicist** - Survey design, management, interpretation and client liaison for numerous mining companies involved in geophysical exploration for diamonds, gold and base metals in Canada, Central America, South America and Africa. Including the selection of contractor(s), writing of survey specifications, review of contracts, quality control (QC)/quality assurance (QA) activities for ground and airborne data sets and interaction with project geologists.

1995 - 1997 **Guaniamo Mining Company Limited, C/O Toco Mining Company Limited, Fort Lauderdale, Florida, USA, Chief Geophysicist and Project Manager** - Design and management of an integrated geological and geophysical grassroots exploration program for hard rock and alluvial gold and diamonds in the Guyana Shield of Venezuela. Responsibilities included the assembly of a balanced geological and geophysical exploration team; selection of contractors and consultants (international and local); planning and execution of ground follow-up areas for geological, geochemical and geophysical surveying; analysis of results; selection of drill sites, selection of bulk

sampling sites; selection of possible alluvial plant sites; preparation of exploration budgets. Selection of appropriate geological and geophysical methodologies for the follow-up of high resolution aeromagnetic and radiometric surveys on the concessions. Analysis of country-wide and concession-scale aeromagnetic, radiometric, and satellite databases with selection of prospective areas for gold and diamond potential.

1983 – 1995 **Paterson, Grant & Watson Limited, Consulting Geophysicists, Toronto - Senior Staff Geophysicist (1987-1995) Staff Geophysicist (1983-1987)** - Development of new client base; responsible for the design, implementation, acquisition, compilation, processing, interpretation and presentation of geophysical and geological exploration and development surveys for precious metals, diamonds, base metals and petroleum. Management of government contracts. Assembly and coordination of field work crews (worldwide) and data processing teams. Geophysical data processing and interpretation; organization, supervision, coordination and participation in geophysical data processing projects conducted by teams of three to four individuals. Responsible for scheduling assigned projects, team selection, quality control of the product and presentation and delivery of final products to the clients.

ACADEMIC AWARDS:

- McMaster University Department of Geology Graduate Scholarship 1991 - 1992, 1992 - 1993.
- Canadian Society of Exploration Geophysicists Trust Fund Scholarship, donated by Chevron Standard Limited, 1982.

PROFESSIONAL AFFILIATIONS:

- Society of Exploration Geophysicists (SEG).
- Past President, Canadian Exploration Geophysicists Society (KEGS).
- Environmental and Engineering Geophysicists Society (EEGS)
- Canadian Institute of Mining and Metallurgy (CIM) (National and Toronto Branch).
- Prospectors and Developers Association of Canada (PDAC).
- Registered Professional Geophysicist, NAPEGG.

PROFESSIONAL EXPERIENCE:

- 22 years of continuous experience in the geophysical survey industry
- Good management skills
- Extensive international experience
- Extensive experience processing and interpreting airborne magnetic and/or magnetics/ radiometric data
- Excellent computer skills, experienced programmer

TECHNICAL PUBLICATIONS:

More than 15 technical publications between 1983 and 2003, list available on request.

LANGUAGES:

English, working knowledge of French and Spanish

RÉSUMÉ

NAME: **HENRIK TOFT ANDERSEN**

PROFESSION: Geophysicist

EDUCATION:

1987	Ph.D. Geophysics, Colorado School of Mines, Golden, Colorado.
1978	M.S. Geophysics, Colorado School of Mines, Golden, Colorado.
1973	B.S.(hons) Geophysics, Bernard Price Inst. for Geoph. Research, University of the Witwatersrand, Johannesburg, South Africa.
1968	B.S. Geology, University of Pretoria, Pretoria, South Africa.

WORK EXPERIENCE:

2003 - **McPhar Geosurveys Ltd., Newmarket, Ontario, Canada - Consulting Chief Geophysicist** - supervising all geophysical activities of the company, including research and development of instrumentation and software; data processing, interpretation and reporting.

1996 - 2002 **Aero Surveys Inc., President and Chief Geophysicist** - responsible for the day-to-day management of the company; determining the company's future business plans; strategic planning; supervising a staff of 12 plus employees; maintaining budgets and cash-flow; supervising all geophysical activities of the company, including data processing, interpretation and reporting.

1998 - 2002 **EDCON Aero Surveys, Inc., Vice President and Chief Geophysicist** – a joint-venture company between Aero Surveys Inc. and EDCON Inc. Responsible for the day-to-day geophysical activities of the company, including data processing, interpretation and reporting.

1993 - 1996 **GeoeXperT C.A. and Digitus International, Ltd., Vice President.** Research Project: Imaging and Pattern recognition in the interpretation of Transient Electromagnetic data for Idaho National Engineering Labs. **Consultant to GeoeXperT, Venezuela**, on mineral exploration in tropical terranes, **Consultant to: (a) TerraSoft**, Sunnyvale, California, on interpretation of Electromagnetic Offset Logging, (b) **Sandia National Labs.**, Albuquerque, New Mexico, on application of electrical methods to

map and characterize the disturbed rock zone around underground excavations and its associated fluid redistribution.

1990 - 1993 **Department of Geophysics, Colorado School of Mines, Assist. Research Professor.** Research Projects: (a) Imaging and Pattern recognition in the interpretation of Transient Electromagnetic data for Idaho National Engineering Labs, (b) Mapping of fluid redistribution in the Disturbed Rock Zone around underground excavations for Sandia National Lab. Vice President and consultant to GeoeXperT, Venezuela, on precious- and base metal exploration in tropical terranes.

1988 - 1990 **Department of Geophysics, Colorado School of Mines, Professional Research Assistant.** Research Projects: (a) Characterization of the Disturbed rock Zone around underground excavations for Sandia National Labs., test of exploration methods for oil and gas beneath the pre-Cambrian overthrust in upstate New York, (c) application of electrical exploration methods for oil and gas exploration in Venezuela. Consultant to MINDECO and The Nuclear Fuels and Reactor Corp. of Japan.

1987 - 1988: **Department of Geophysics, Colorado School of Mines, Post Doctoral Fellow.** Research Projects: (a) Application of Electrical methods to Oil and Gas exploration in Venezuela, (b) Geothermal exploration in Iceland, and (c) Site characterization of the Waste Isolation Pilot Plant in SE New Mexico. Consultant to GeoPacific Resources for MINDECO on geothermal exploration in Japan.

1981- 1987 **Department of Geophysics, Colorado School of Mines, Teaching and Research Assistant.** (a) Teaching assistant for Electrical Exploration Methods during Summer Field Camp, (b) Research assist. on Electromagnetic and Gravity project over pre-Cambrian overthrust in New York, (b) Research assist. on the development of multi-component electromagnetic application and interpretation systems, and (c) Project Manager on Transient Electromagnetic studies of deep structural features below volcanic cover in the states of Washington and Colorado. Consultant to Newmont Overseas Exploration in Spain and Peru.

1970 - 1981 **Tsumeb Corporation Ltd. (Newmont Mining), Senior Exploration Geophysicist** for base metals in Namibia and Namaqualand. Commonly used methods on integrated surveys included ground- and airborne magnetics, radiometrics, IP/resistivity, frequency and transient electromagnetics and gravimetry.

1969 - 1970 **Falconbridge Exploration (South Africa); Field Geologist/ Geophysicist** on base metal exploration in Namibia and Zimbabwe.

1968 - 1969 **Kennecott Exploration (South Africa); Field Geologist** on base metal exploration in Namibia.

1963 - 1968	**Geological Survey of South Africa; Geophysical Field Technician** on gravity surveying and electrical logging of shallow wells.
1962 - 1963	**Federal Vanadium Corp. (South Africa); Laboratory Technician** in chemical production control laboratory.

PUBLICATIONS:

Authored/co-Authored and published more than 20 technical papers. List available on request.

PROFESSIONAL EXPERIENCE:

- More than thirty years professional experience in the collection, processing and interpretation of ground and airborne geophysical data for a wide range of applications, including: oil and gas exploration; mineral exploration; ground water exploration; and environmental studies.
- Considerable management experience, supervising staff of up to 20 persons, as well as extensive experience as an in-field Project Manager and/or consultant.
- Extensive computer skills, experienced with AutoCAD, GEOSOFT OASIS/MPS/MONTAJ data processing software, and FORTRAN, C, and other programming languages.
- Experienced in the planning and design of geological and geophysical exploration programs for both oil and gas and minerals exploration.
- Extensive experience in teaching and training personnel to do data processing and in the application of geophysical surveying techniques.
- Considerable experience in designing and managing Research and Development programs.

PROFESSIONAL SOCIETIES:

- American Geophysical Union
- Geological Society of America
- Venezuelan Geophysical Society
- Sigma Xi
- Aircraft Owners and Pilots Association

LANGUAGES:

English, Danish, Afrikaans, some Spanish

RÉSUMÉ

NAME: Barry Levy

PROFESSION: Electronic Technologist

EDUCATION: Seneca College, Toronto
Carnegie Institute

LANGUAGES: English

WORK EXPERIENCE

2003 - **Contract / Consulting Electronics Technologist/Operator** - responsible for installing, maintaining and operating airborne geophysical systems in the field. Experienced in operating both helicopter-borne EM systems and fixed-wing magnetometer and multi-sensor systems, including aerogravity/magnetics and HEM/Magnetics/Radiometrics.

1995 - 2002 **Aero Surveys Inc., Uxbridge, Canada - Electronics Technologist/Operator** - responsible for maintaining and operating airborne geophysical systems in the field. Experienced in operating both helicopter-borne EM systems and fixed-wing magnetometer and multi-sensor systems, including aerogravity/magnetics. Has worked in Angola, Argentina, Bolivia, Botswana, Chile, Ecuador, Eritrea, Libya, Mexico, Oman, South Africa, Peru, USA.

1994 - 1995 **Independent Contractor/Consultant** - worked on several contracts providing services and consulting to clients in Canada, USA and England.

1993 - 1994 **Premier Telecom, West Sussex, England - Electronics Technologist** - responsible for the purchase, integration, testing and set-up of GSM telephones for clients in Hong Kong and England.

1990 - 1994 **NovAtel Communications Ltd., Ontario - Field Support Representative** - selected and set-up service centres for NovAtel Products and cellular systems. Conducted service seminars, approved warranty claims from dealers, assisted in setting-up variety of cellular networks with Northern Telecom, Ericsson and Cantel. Re-designed and re-installed a Rural Radiotelephone network in Republic of Rwanda under UN contract. Set-up Service Centre for NovAtel UK in Wiltshire, England.

1986 - 1990 **Canadian Marconi Company, Burlington Regional Office, Ontario - Service Manager** operated and serviced CMC's VHF and UHF RCC's in Mississauga.

1983 - 1986 **Motorola, Toronto - Field Tech. Rep.** - responsible for servicing Gulf and BP's Motorola Data Acquisition and Control Systems at bulk loading terminals in Toronto, Ottawa and Montreal.

1980 - 1983 **Scintrex Limited, Toronto - Shop Technician** - worked on the repair, calibration and testing of magnetometers and electromagnetic systems and small lasers. Built coils for electromagnetic systems, operated and tested airborne systems for delivery to clients.

1976 - 1980 **Motorola, Toronto - Special Products Service** - installed and service "Voice Privacy" Scrambler systems, Voting Receiver Systems, CCD camera systems, Image Intensifier and Low-Light Products.

PROFESSIONAL EXPERIENCE

- Seven years experience as a technologist/operator of airborne geophysical systems.
- More than twenty five years professional experience in the installation, repair and service of sophisticated electronic systems
- Eight years experience in the installation, repair and operation of geophysical systems
- Extensive experience working in Europe, Canada, Africa and South and Central America
- Good computer skills, familiar with DOS, WINDOWS, AutoCAD and a variety of other software.

McPhar Geosurveys Ltd.
1256B Kerrisdale Blvd., Newmarket
Ontario, Canada L3Y 7V1
Tel: (905) 830-6880, Fax: (905) 898-0336
E-Mail: info@mgssurveys.com
WebSite: www.mgssurveys.com

RÉSUMÉ

NAME: **Tonia Bojkova**

PROFESSION: Geophysicist

EDUCATION:

2001	Geosoft Data Processing and Analysis Software, Guildford, United Kingdom
1998	GeoPak Data Processing Software, HSG Ltd., Toronto, Canada
1978 – 1980	M.Sc., Applied Mathematics, Technical University, Sofia, Bulgaria
1973 – 1978	M.Sc., Geophysics, University of Mining and Geology, Sofia, Bulgaria

WORK EXPERIENCE:

2004 - **McPhar Geosurveys Ltd., Geophysicist/Data Processor** - responsible for processing of airborne geophysical data; quality control (QC) of acquired geophysical data; geophysical interpretations; operational logistics

2000 – 2002 **Fugro Airborne Survey (FAS), United Kingdom – Office in Sofia, Bulgaria, Geophysicist** - Processed and analyzed radiometric and magnetic data, and produced corresponding maps in Bulgaria and in the UK (Guildford). Prepared final reports.

1992 - 2000 **Airborne Geophysical Survey (AGS) Ltd., Bulgaria** (a Joint Venture between the Government of Bulgaria and High-Sense Geophysics Ltd., Toronto, Canada), **Geophysicist** - Planned and managed airborne surveys; collected, processed, and analyzed airborne radiometric and magnetic data, produced the corresponding maps and prepared final reports; reprocessed archive data from Namibia, performed environment projects - gamma-ray monitoring of the Bulgarian NPP, Kozloduy using 2048-channel gamma-ray spectrum analyzer

1980 – 1992 **Airborne Geophysical Department of the Enterprise for Geophysical Explorations and Geological Mapping, Sofia, Bulgaria, Geophysicist** - collected, processed, and analyzed airborne radiometric and magnetic data; produced the corresponding maps and prepared final reports; performed gamma-ray monitoring of Bulgaria after Chernobyl NPP fallout

INTERNATIONAL EXPERIENCE:

Canada, Bulgaria, Macedonia, Congo, Zimbabwe, Zambia, Botswana

PROFESSIONAL EXPERIENCE:

- 24 years of continuous experience in the geophysical survey industry
- Extensive international experience
- Extensive experience processing and interpreting airborne magnetic and/or magnetics/ radiometric data
- Excellent computer skills, experienced programmer

LANGUAGES: Bulgarian, English

McPhar Geosurveys Ltd.
1256B Kerrisdale Blvd., Newmarket
Ontario, Canada L3Y 8Z9
Tel: (905) 830-6880, Fax: (905) 898-0336
E-Mail: info@mgssurveys.com
WebSite: www.mgssurveys.com

Name: **ASIF M. MIRZA**
Profession: **Geophysicist**

HIGHLIGHTS OF QUALIFICATION

- Experience as a field geophysicist
- Airborne geophysical data management and processing
- Seismic reflection data processing experience in Geophysical Investigations for the demarcation of overburden from the bedrock and concerning oil resources
- Extensive experience in 2-D seismic reflection data interpretation
- Experience in seismic data interpretation with the help of Seismic Straitigraphy, Borehole logging, Gravity and Resistivity methods
- Data acquisition with the help of different environmental instruments
- Research about new environmental issues
- Risk assessments and cost estimates related to environmental clean up
- Evaluation of groundwater potential along sea shoreline, environmental investigations, remedial activities
- Master's in Environmental Science, Master's in Geophysics and Bachelor of Applied Geology
- Knowledge and work experience of the software's, Geosoft Montaj, DOS, Windows XP/NT/2000, M.S.Office, Corel DRAW 9, Arc view GIS
- Well organized, self motivated, honest and goal oriented
- Excellent team player with proven communication and interpersonal skills

PROFESSIONAL EXPERIENCE

Geophysical Technician
McPhar Geosurveys Ltd, Newmarket, Ont, Canada 2004

- Airborne geophysical field data management and preliminary processing, of different projects, using Geosoft Oasis Montaj
- Quality control decisions of survey data within the specification laid down with clients and McPhar's standards
- Gridding, contouring and leveling of magnetic and electromagnetic geophysical data to produce profiles and contours maps
- Set up and operate ground base station system, comprising magnetometer and GPS system
- Producing of backup CD-ROM's of the processed data for forwarding clients via internet or company network site
- Making final reports of the processed geophysical data for clients

Field Geophysicist 2000-2001
SEFEC (Pvt.) Ltd, Karachi, Pakistan

- Seismic reflection data acquisition with the help of dynamite in Attock Area, Pakistan
- Seismic reflection data recorded in the field using well-defined field parameters, i.e. source and spread configuration
- Seismic spread and geophone arrays designed using walk away test and spectral analysis
- Performed field seismic data processing Attock Area, Pakistan

EDUCATION

- Master's in Applied Environmental Measurement Techniques, Chalmers University of Technology, Sweden
- Master's in Applied Geophysics Dept. of Earth Science, Quaid-I-Azam University, Islamabad, Pakistan
- Bachelor of Applied Geology, Institute of Geology, University of the Punjab, Lahore, Pakistan

GEOLOGICAL & ENVIRONMENTAL FIELD EXCURSIONS

- Fieldwork about the Local Human Stresses on three lakes in Molandal Area, Sweden.
- Field about Soil Farmation Analysing Aten Kapell, Vastergotland, Sweden.
- Field study of the Air Quality at Universeum and Chalmers, Gothenburg, Sweden.
- Geological & Geophysical Field Works in Northern Pakistan.

TRAINING

Internship:

- Seismic Data Processing, OGDCL, Islamabad, Pakistan

Technical Courses:

- Evaluation of Aggregates as constructional material, Course arranged by the Kent State University, Ohio, USA and Institute of Geology, University of the Punjab, Lahore, Pakistan
- Course on Geographical Information System (GIS), Course arranged by the National University of Science and Technology, Islamabad, Pakistan
- Course on Seismic Stratigraphy and Tectonics (Basin Analysis and Computer Modelling), Course arranged by Petroleum Geology Investigators ApS, Copenhagen, Denmark and the Dept. of Earth Sciences, Quaid-i-Azam University, Islamabad, Pakistan
- Well Logging interpretation, Course arranged by Petroleum Geology Investigators ApS, Copenhagen, Denmark and the Dept. of Earth Sciences, Quaid-i-Azam University, Islamabad, Pakistan

SCHOLASTIC ACHIEVEMENTS

- 2nd position in Fieldwork, B.Sc. Geology
- 4th position in B.Sc. Applied Geology

EXTRA CURRICULAR ACTIVITIES

- Member Quaid-I-Azam Blood Donor Society (QBDS)
- Member Dramatic Club QAU
- Member of the University Cricket Team
- Class representative during M.Sc. in University
- Certificate of 2nd position in Cricket, Annual Sports 95
- Certificate of service for National Cadet Corp. (NCC)

LANGUAGES

English, Urdu, Hindi and Punjabi

APPENDIX 5

Digital Data Specifications

FILE: CORDILL_MAG_EM.XYZ (NAME OF CHANNELES)

Name of channel	Explanation
X	X Coordinate (Easting, metres, NAD83 UTM Zone 8N)
Y	Y Coordinate (Northing, metres, NAD83 UTM Zone 8N)
Galt_m -	GPS Height (metres, NAD83 UTM Zone 8N)
GPStm_sec -	GPS time in seconds (UTC)
Ralt_meters	Radar altimeter in meters
Mag_raw	Raw mag
Mag_IGRF	Mag IGRF removed
IGRF	International Geophysical Reference Field
TMI	Mag leveled and microleveled
IP2_f	In-Phase component of Hor. Coplanar coil 6600 Hz (edited)
Q2_f	Quadrature component of Hor. Coplanar coil 6600 Hz (edited)
IP3_f	In-Phase component of Coaxial coil 980 Hz (edited)
Q3_f	Quadrature component of Coaxial coil 980 Hz (edited)
IP4_f	In-Phase component of Hor. Coplanar coil 880 Hz (edited)
Q4_f	Quadrature component of Hor. Coplanar coil 880 Hz (edited)
IP2_6600Hz	In-Phase component of Hor. Coplanar coil 6600 Hz (leveled)
Q2_6600Hz	Quadrature component of Hor. Coplanar coil 6600 Hz (leveled)
IP3_980Hz	In-Phase component of Coaxial coil 980 Hz (leveled)
Q3_980Hz	Quadrature component of Coaxial coil 980 Hz (leveled)
IP4_880Hz	In-Phase component of Hor. Coplanar coil 880 Hz (leveled)
Q4_880Hz	Quadrature component of Hor. Coplanar coil 880 Hz (leveled)
Conductivity	Calculated by Apparent Resistivity of coil 6600 Hz
Base_Mag	Base Mag Yukon Base Station

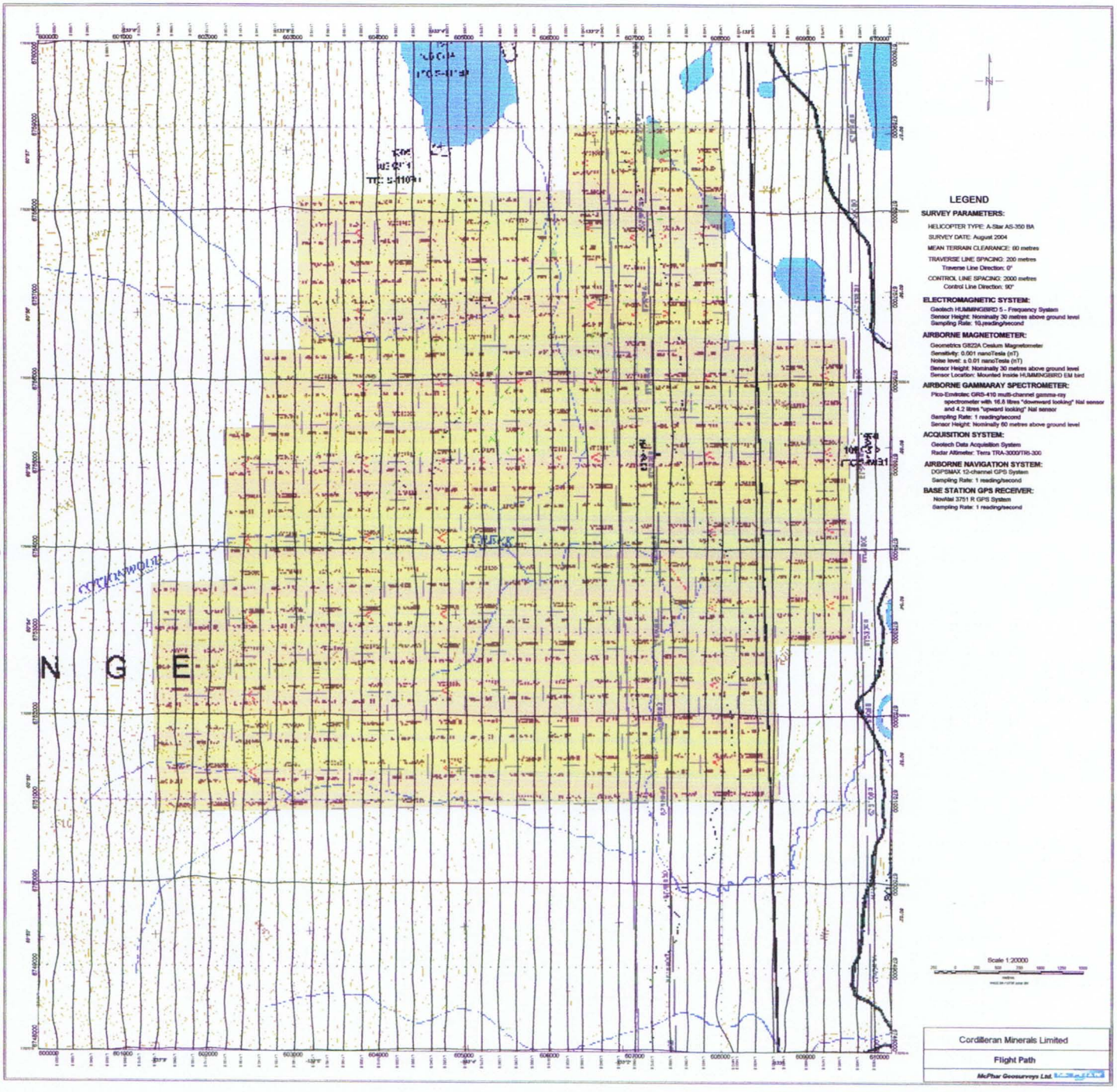
FILE: CORDILLERAN_SPEC.XYZ

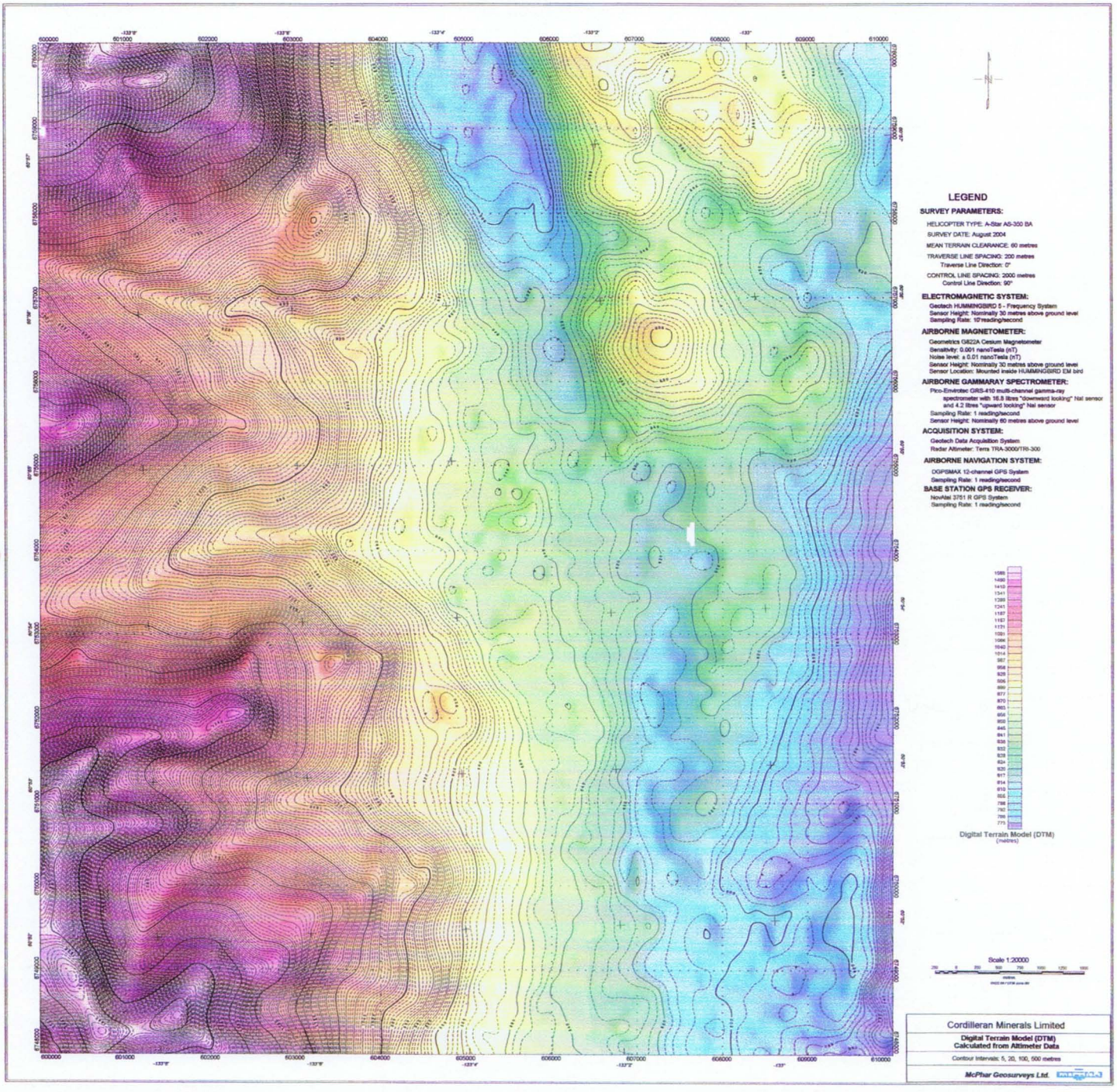
Name of channel	Explanation
X	X Coordinate (Easting, metres, NAD83 UTM Zone 8N)
Y	Y Coordinate (Northing, metres, NAD83 UTM Zone 8N)
Galt_m	GPS Height (metres, NAD83 UTM Zone 8N)
Gpstime_sec	gps time in seconds (UTC)
Ralt_meters	radar altimeter in meters
K_cps	Potassium raw
U_cps	Uranium raw
Th_cps	Thorium raw
TC_cps	Total count raw
Uru_cps	Uranium Upward-looking
K_percent	Corrected K %
U_ppm	Corrected U ppm eU
Th_ppm	Corrected Th ppm eTh
TC_corr_cps	Corrected TC ppm
Th_K_ratio	Th/K Ratio

APPENDIX 6

Page Size Maps

- Flight Path (on a topographic and claim base)
- Digital Terrain Model (DTM) Calculated from Altimeter Data
- Total Magnetic Intensity (IGRF removed)
- Reduction to the Magnetic Pole (RTP) of the Total Magnetic Intensity
- Calculated First Vertical Derivative (1VD) of the Total Magnetic Intensity
- Calculated Second Vertical Derivative (2VD) of the Total Magnetic Intensity
- Analytic Signal of the Total Magnetic Intensity
- Total Count
- Thorium
- Potassium
- Uranium
- Thorium/Potassium (Th/K) Ratio
- Offset Profiles of Horizontal Coplanar 6600 Hz Coil
- Offset Profiles of Horizontal Coplanar 800 Hz Coil and Vertical Coaxial 980 Hz Coil
- Conductivity of Horizontal Coplanar 6600 Hz Coil with Vertical Coaxial 980 Hz Coil Conductance Anomalies


LEGEND
SURVEY PARAMETERS:
HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004
MEAN TERRAIN CLEARANCE: 60 metres
TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°
CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°
ELECTROMAGNETIC SYSTEM:
Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second
AIRBORNE MAGNETOMETER:
Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird
AIRBORNE GAMMARAY SPECTROMETER:
Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level
ACQUISITION SYSTEM:
Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300
AIRBORNE NAVIGATION SYSTEM:
DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second
BASE STATION GPS RECEIVER:
Novitel 3751 R GPS System
Sampling Rate: 1 reading/second
N
Scale 1:20000
Cordilleran Minerals Limited
Flight Path
McPhar Geosurveys Ltd.



LEGEND

SURVEY PARAMETERS:

HELICOPTER TYPE: A-Star AS-350 BA

SURVEY DATE: August 2004

MEAN TERRAIN CLEARANCE: 60 metres

TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°

CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ≤ 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TR-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

1585
1490
1410
1341
1289
1247
1187
1163
1125
1083
1066
1042
1014
987
958
929
906
899
877
870
863
856
850
845
841
838
833
828
824
820
817
814
810
805
798
792
789
775

Digital Terrain Model (DTM)
(metres)

Scale 1:20000

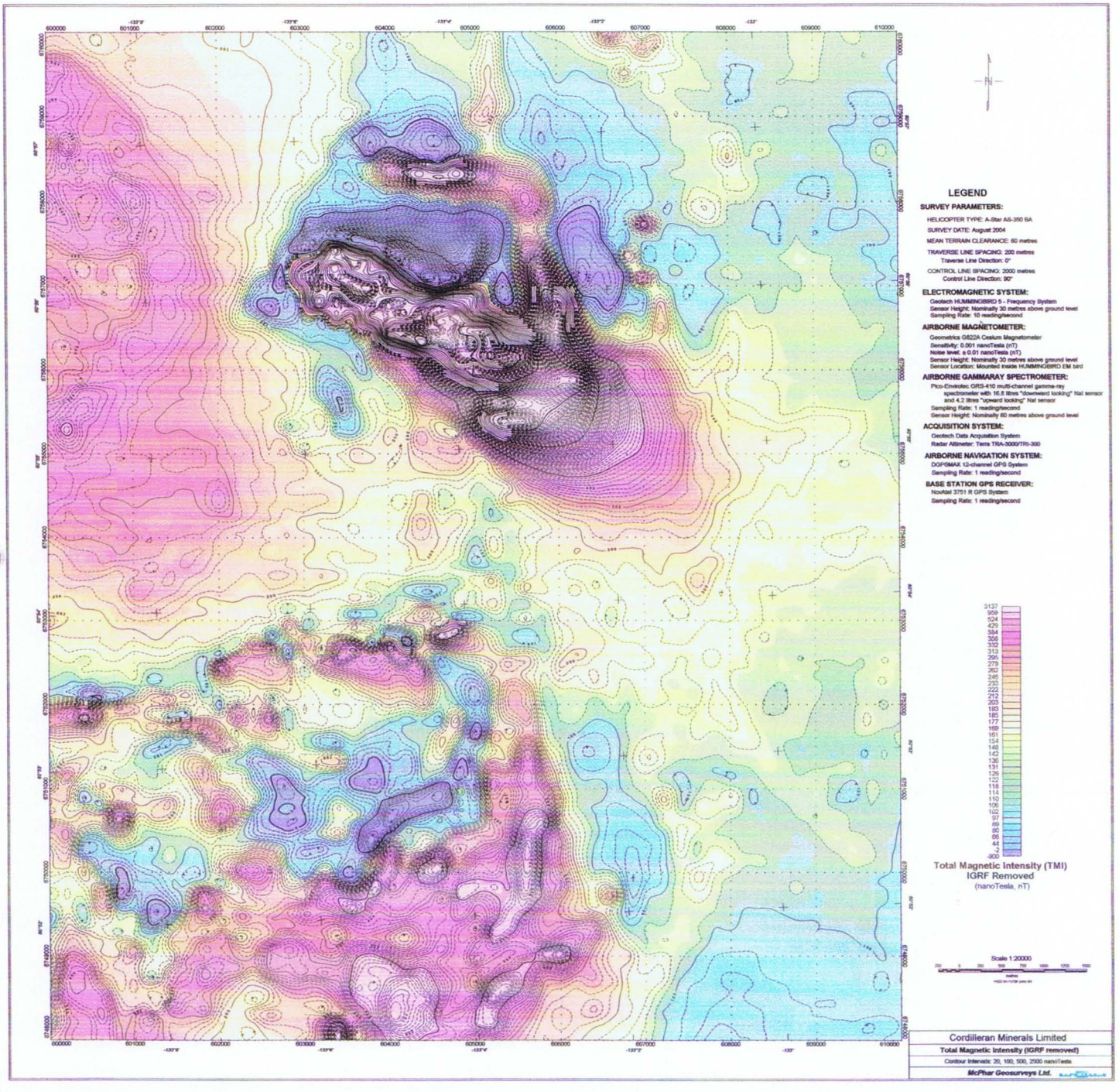
200 0 200 400 600 800 1000 1200 1600
metres
NAD 83 / UTM zone 9N

Cordilleran Minerals Limited

Digital Terrain Model (DTM)
Calculated from Altimeter Data

Contour Intervals: 5, 20, 100, 500 metres

McPhar Geosurveys Ltd.


LEGEND
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HELICOPTER TYPE: A-Star AS-350 BA
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CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°
ELECTROMAGNETIC SYSTEM:
Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second
AIRBORNE MAGNETOMETER:
Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird
AIRBORNE GAMMARAY SPECTROMETER:
Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level
ACQUISITION SYSTEM:
Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300
AIRBORNE NAVIGATION SYSTEM:
DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second
BASE STATION GPS RECEIVER:
NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second
3137
956
524
429
384
356
332
313
295
279
262
246
233
222
212
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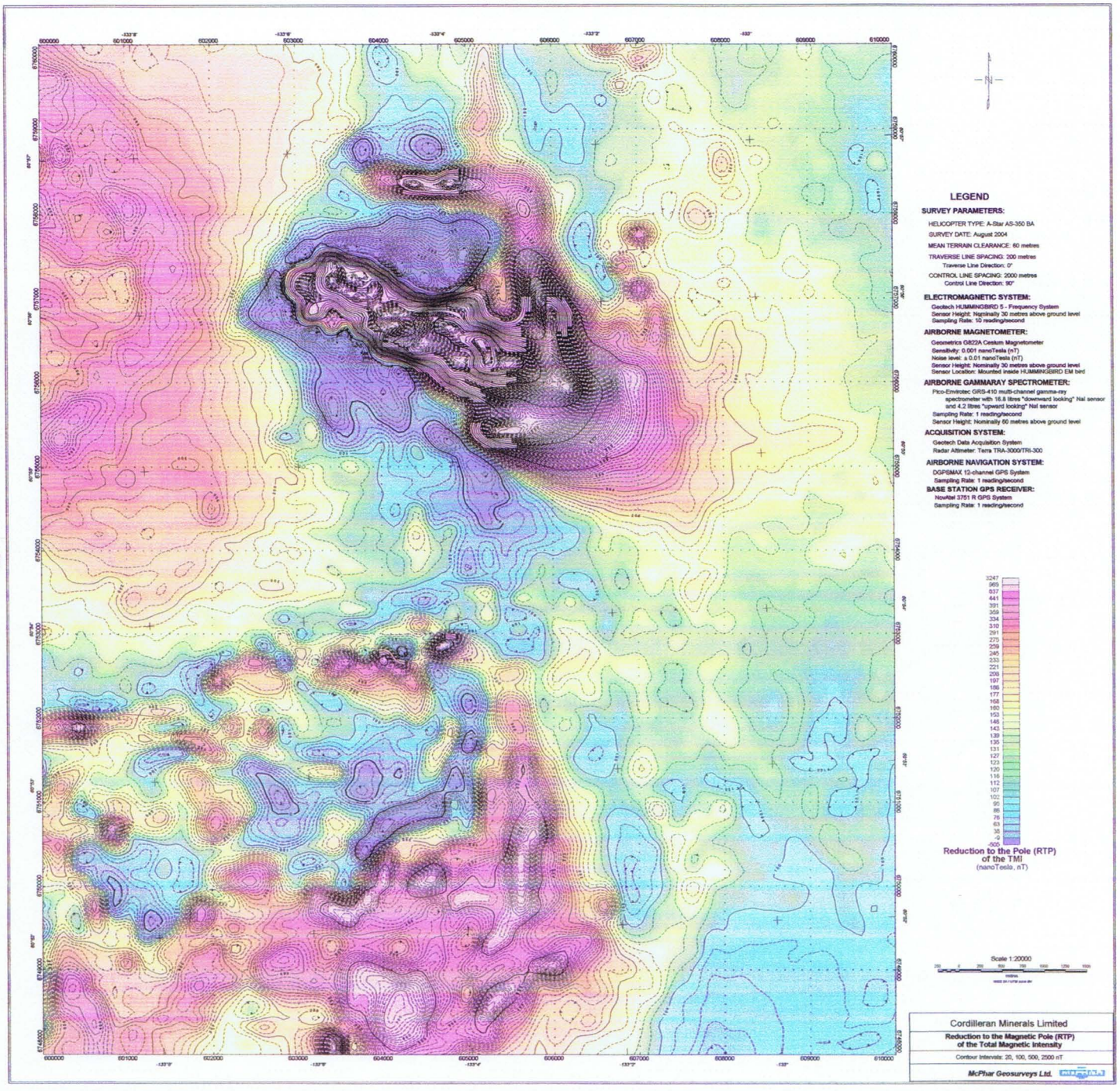
146
142
136
131
126
122
118
114
110
106
102
97
89
80
66
44
2
-800
Total Magnetic Intensity (TMI)
IGRF Removed
(nanoTesla, nT)
Scale 1:20000
Cordilleran Minerals Limited
Total Magnetic Intensity (IGRF removed)
Contour Intervals: 20, 100, 500, 2500 nanoTesla
McPhar Geosurveys Ltd.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AIRBORNE NAVIGATION SYSTEM:
DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second
BASE STATION GPS RECEIVER:
NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second
3247
965
637
441
391
359
334
310
291
275
259
245
233
221
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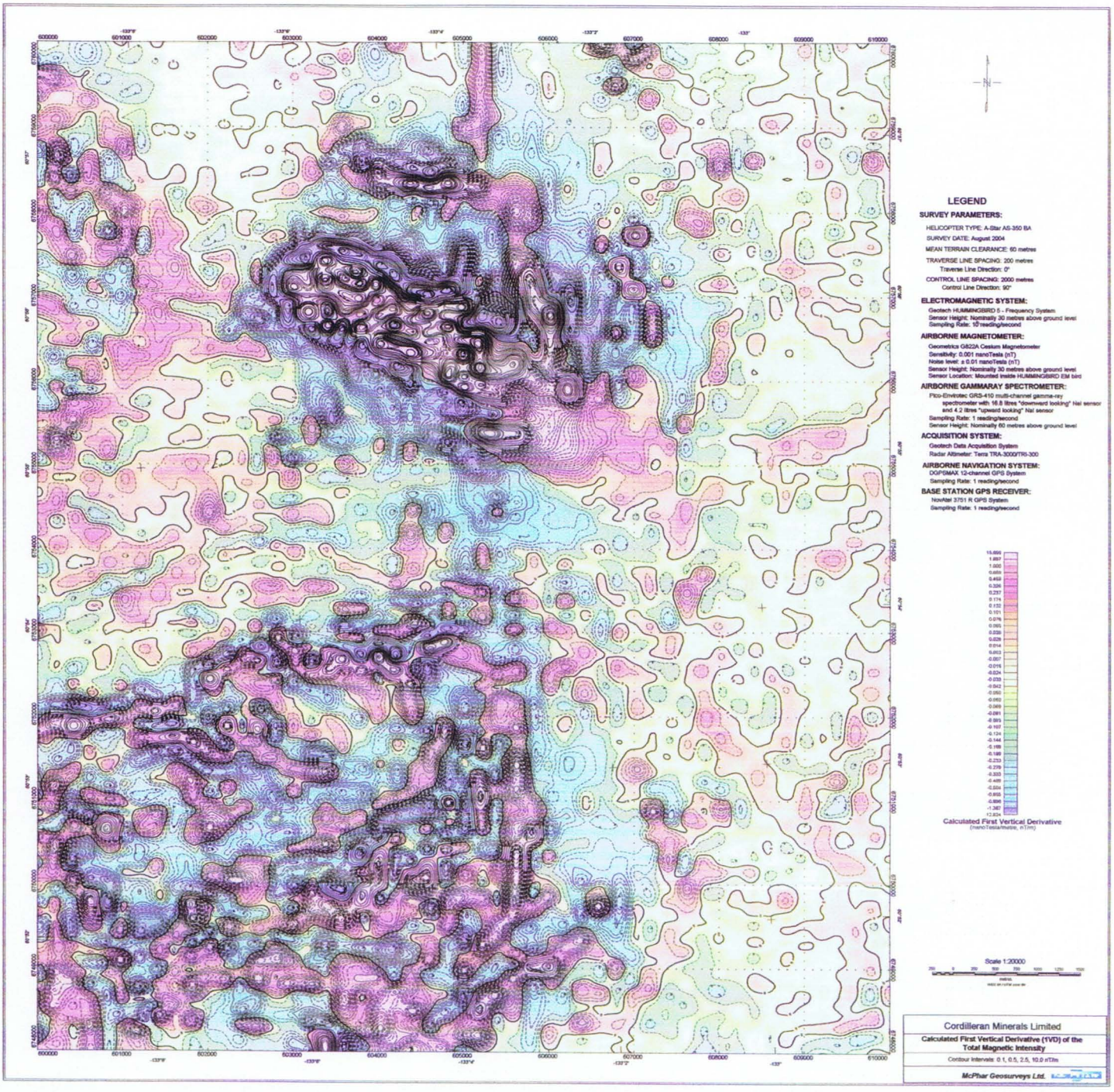
153
146
143
139
135
131
127
123
120
116
112
107
102
95
86
76
63
35
-9
-505
Reduction to the Pole (RTP) of the TMI
(nanoTesla, nT)
Scale 1:20000
Cordilleran Minerals Limited
Reduction to the Magnetic Pole (RTP) of the Total Magnetic Intensity
Contour Intervals: 20, 100, 500, 2500 nT
McPhar Geosurveys Ltd.



LEGEND

SURVEY PARAMETERS:

HELICOPTER TYPE: A-Star AS-350 BA

SURVEY DATE: August 2004

MEAN TERRAIN CLEARANCE: 60 metres

TRAVERSE LINE SPACING: 200 metres
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ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

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Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

Calculated First Vertical Derivative
(nanoTesla/metre, nT/m)

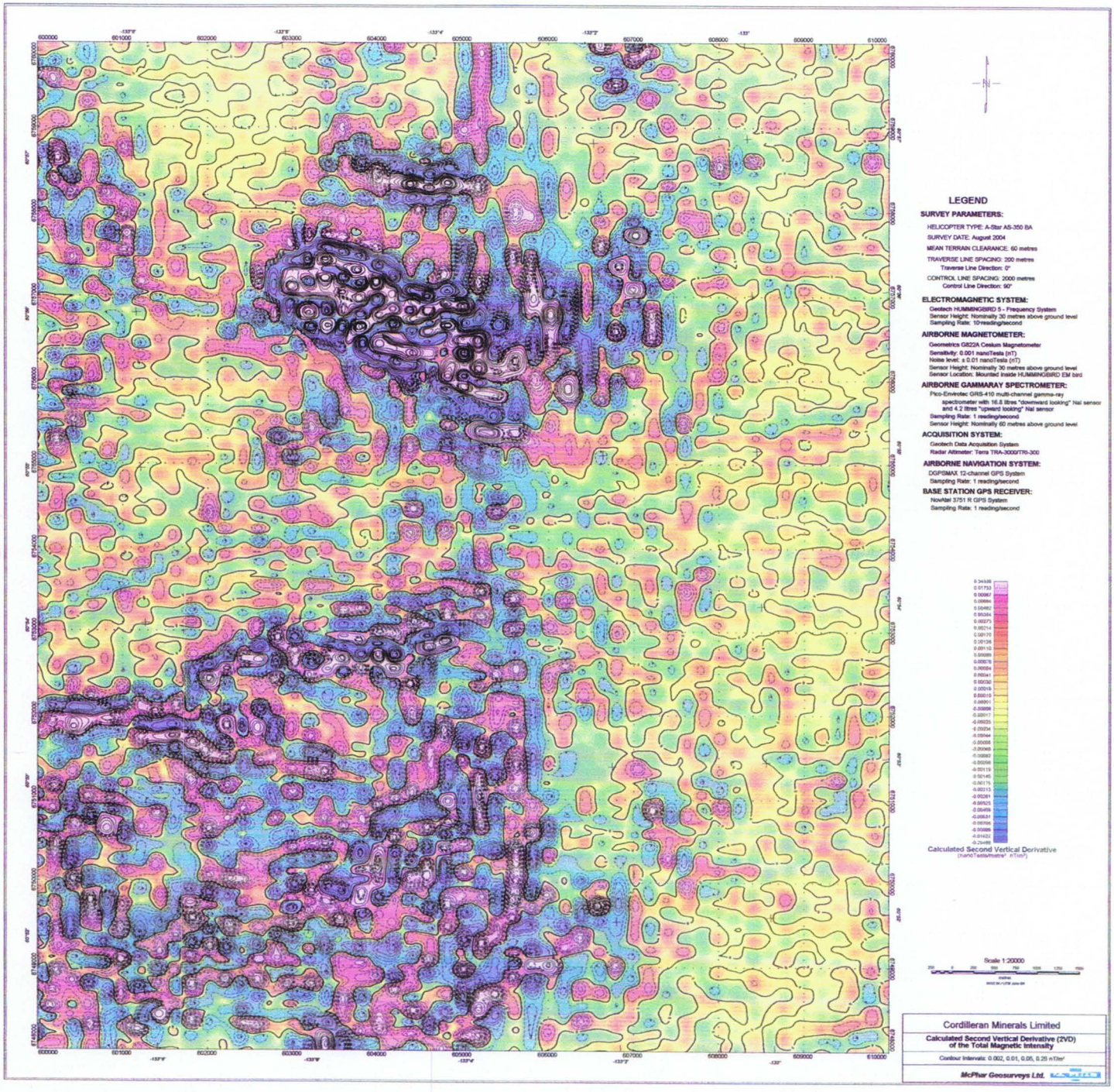
Scale 1:20000

Cordilleran Minerals Limited

Calculated First Vertical Derivative (1VD) of the Total Magnetic Intensity

Contour Intervals: 0.1, 0.5, 2.5, 10.0 nT/m

McPhar Geosurveys Ltd.



LEGEND

SURVEY PARAMETERS:

HELICOPTER TYPE: A-Star AS-350 BA

SURVEY DATE: August 2004

MEAN TERRAIN CLEARANCE: 60 metres

TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°

CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

Calculated Second Vertical Derivative
(nanoTesla/metre² nT/m²)

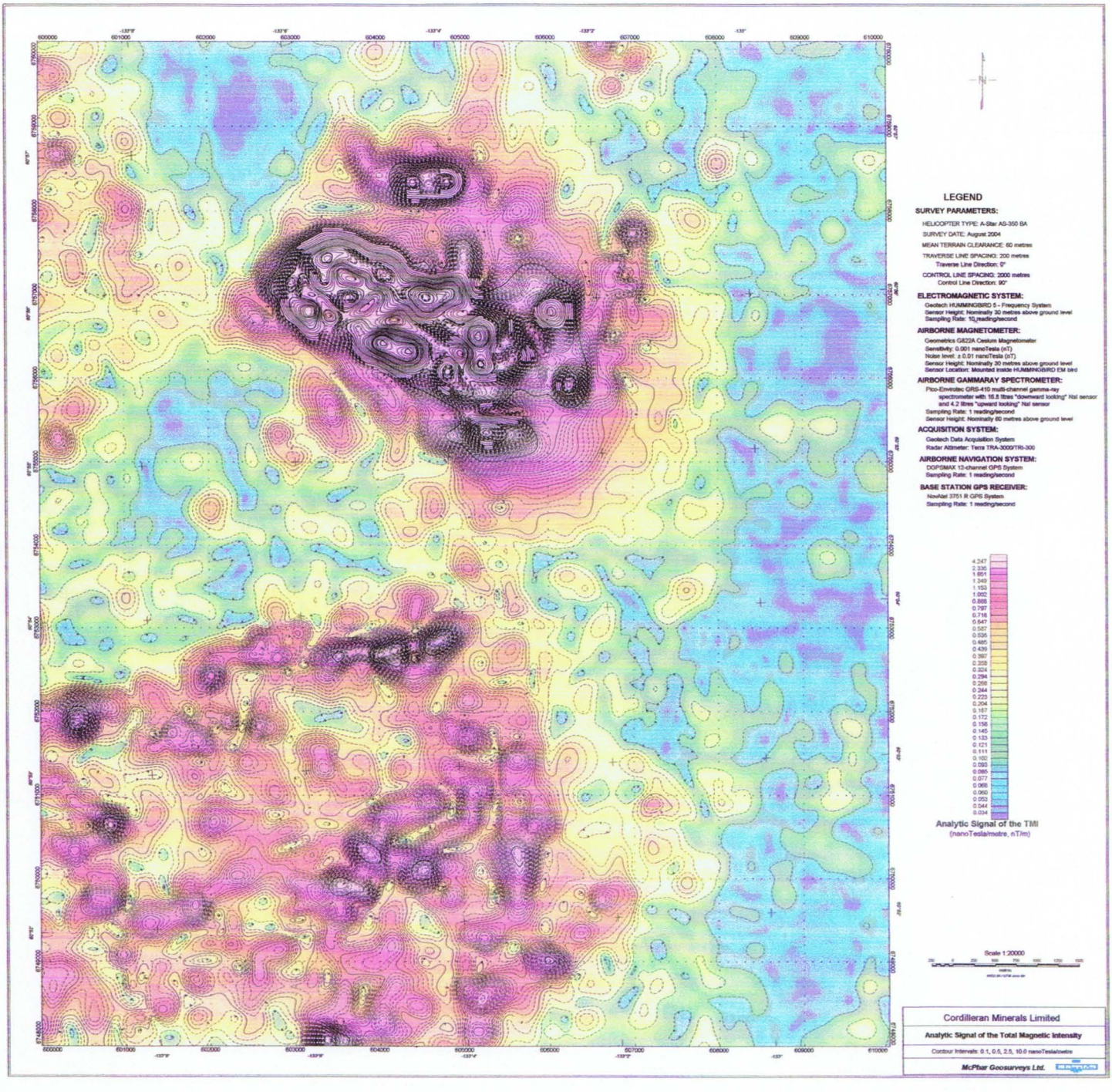
Scale 1:20000

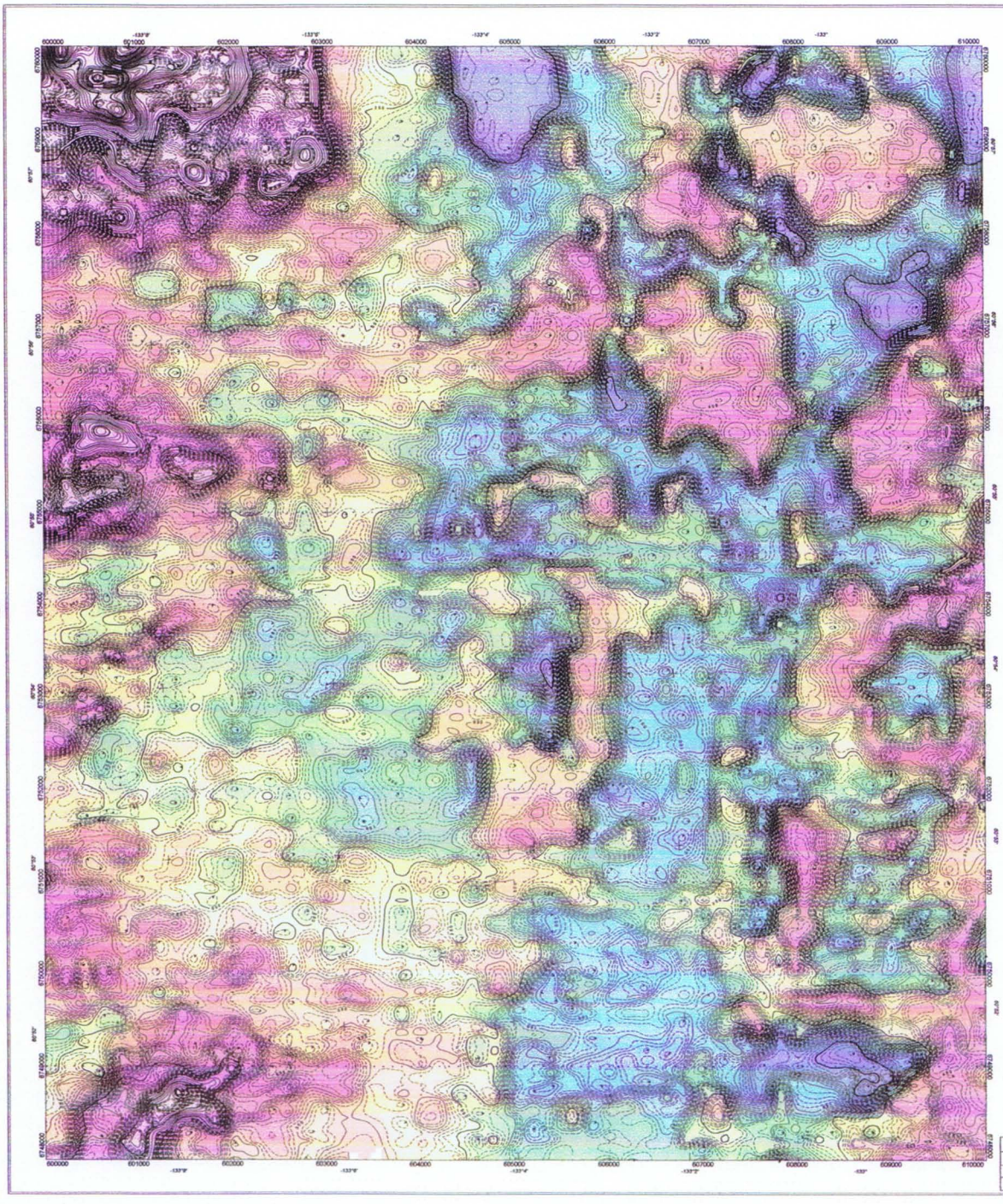
Cordilleran Minerals Limited

Calculated Second Vertical Derivative (2VD) of the Total Magnetic Intensity

Contour Intervals: 0.002, 0.01, 0.05, 0.25 nT/m²

McPhar Geosurveys Ltd.


LEGEND
SURVEY PARAMETERS:
HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004
MEAN TERRAIN CLEARANCE: 60 metres
TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°
CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°
ELECTROMAGNETIC SYSTEM:
Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second
AIRBORNE MAGNETOMETER:
Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird
AIRBORNE GAMMARAY SPECTROMETER:
Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level
ACQUISITION SYSTEM:
Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TR6-300
AIRBORNE NAVIGATION SYSTEM:
DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second
BASE STATION GPS RECEIVER:
NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second
4.247
2.335
1.851
1.349
1.153
1.002
0.888
0.797
0.718
0.647
0.587
0.535
0.485
0.439
0.397
0.359
0.324
0.294
0.266
0.244
0.223
0.204
0.187
0.172
0.158
0.145
0.133
0.121
0.111
0.102
0.093
0.085
0.077
0.069
0.060
0.053
0.044
0.034
Analytic Signal of the TMI
(nanoTesla/metre, nT/m)
Scale 1:20000
Cordilleran Minerals Limited
Analytic Signal of the Total Magnetic Intensity
Contour Intervals: 0.1, 0.5, 2.5, 10.0 nanoTesla/metre
McPhar Geosurveys Ltd.



LEGEND

SURVEY PARAMETERS:

HELICOPTER TYPE: A-Star AS-350 BA

SURVEY DATE: August 2004

MEAN TERRAIN CLEARANCE: 60 metres

TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°

CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

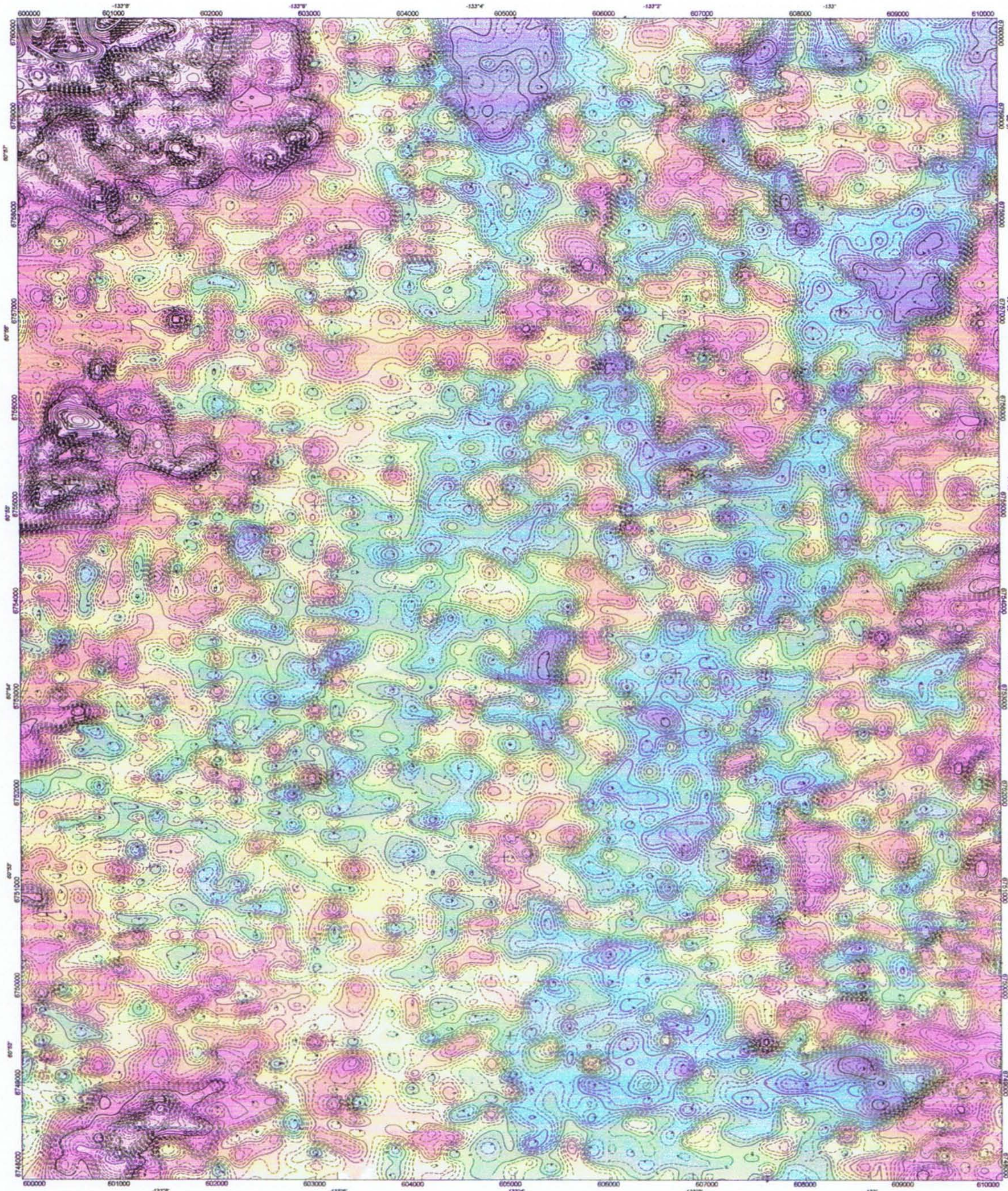
BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

Total Count
(Counts per second, cps)

Scale 1:20000

Cordilleran Minerals Limited
Total Count Map
Contour Intervals: 10, 50, 250, 1000 cps
McPhar Geosurveys Ltd.



LEGEND

SURVEY PARAMETERS:

HELICOPTER TYPE: A-Star AS-350 BA

SURVEY DATE: August 2004

MEAN TERRAIN CLEARANCE: 60 metres

TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°

CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level

ACQUISITION SYSTEM:

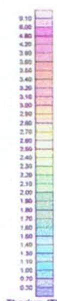
Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

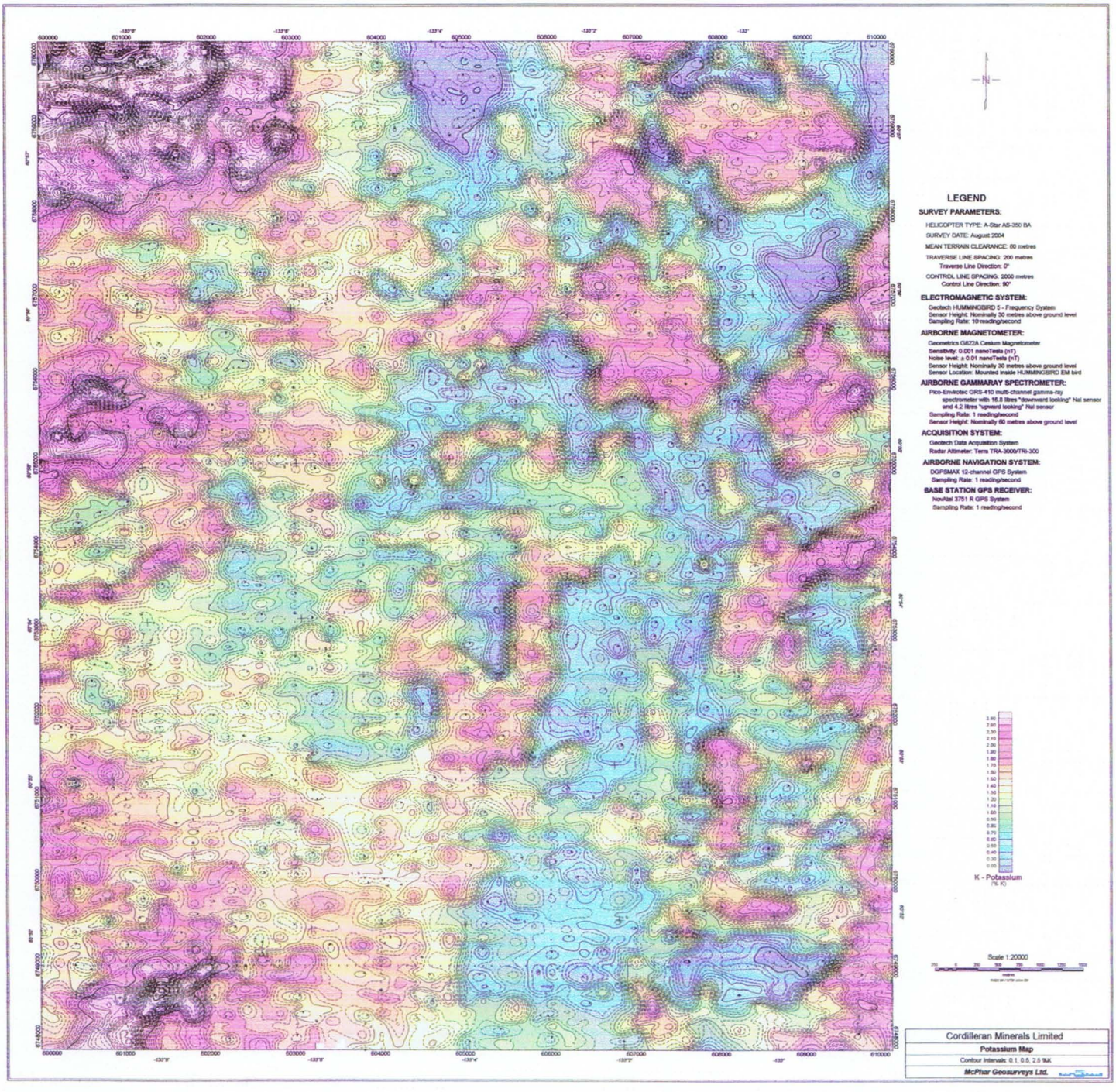


Thorium (Th)
(ppm eTh)

Scale 1:20000

metres

Cordilleran Minerals Limited
Thorium Map
Contour Intervals: 0.2, 1.0, 5.0 ppm eTh
McPhar Geosurveys Ltd.


600000
601000
602000
603000
604000
605000
606000
607000
608000
609000
610000
-132°9'
-132°8'
-132°6'
-132°4'
-132°2'
-132'
6791000
6790000
6789000
6788000
6787000
6786000
6785000
6784000
6783000
6782000
6781000
6780000
6779000
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6616000
6615000
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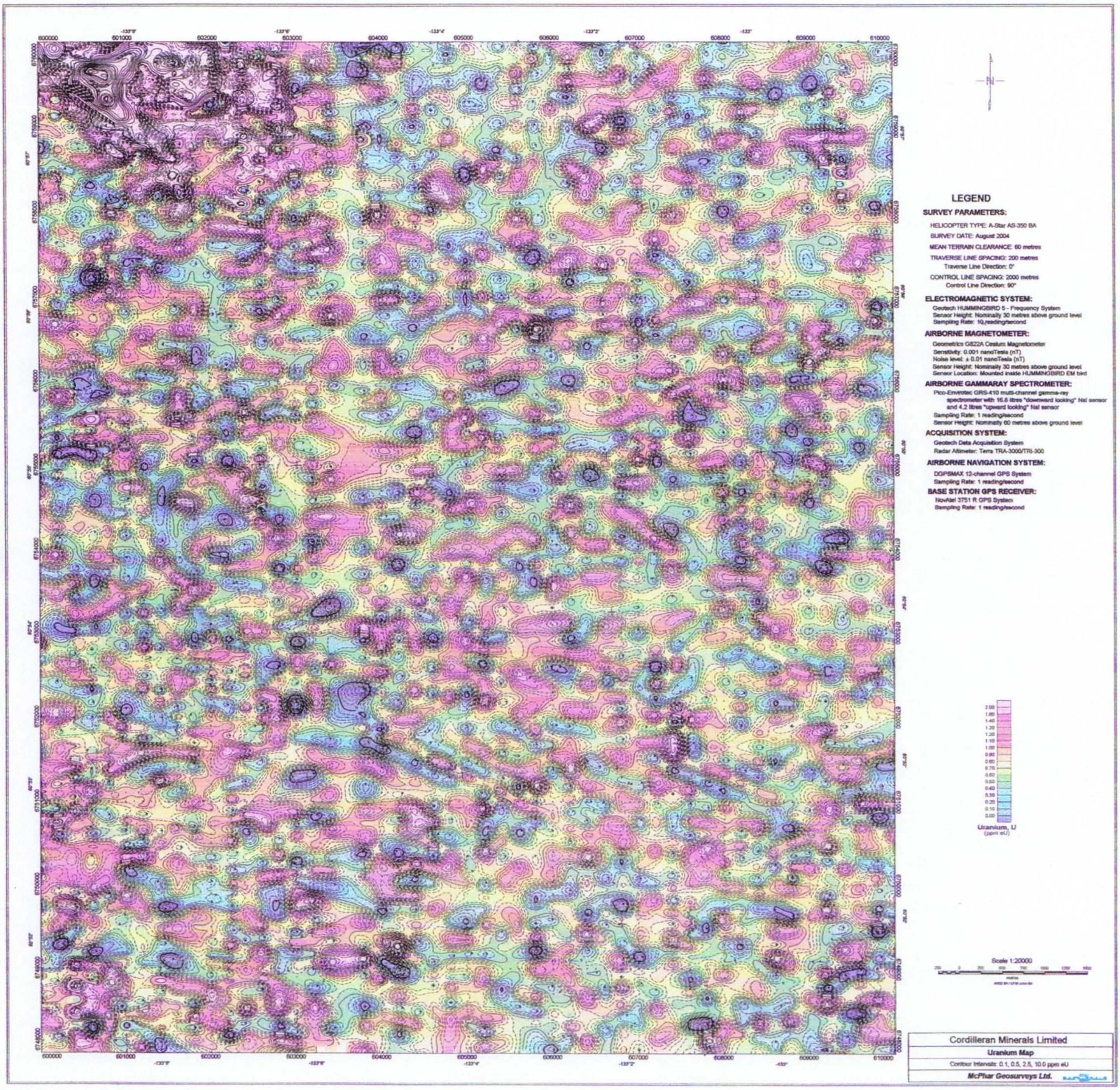
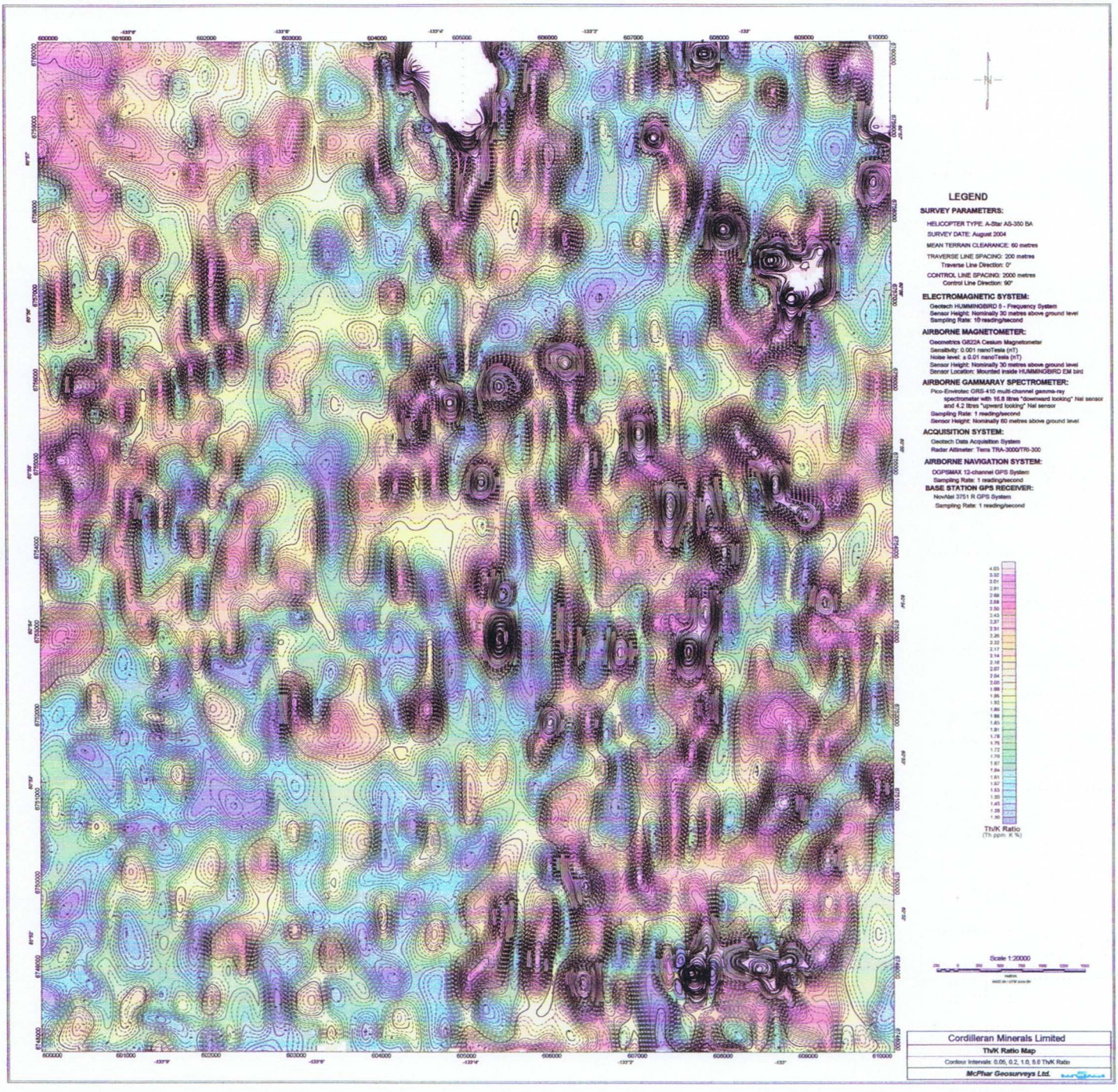
6613000
6612000
6611000
6610000
6609000
6608000
6607000
6606000
6605000
6604000
6603000
6602000
6601000
6600000
-132°8'
-132°6'
-132°4'
-132°2'
-132'
LEGEND
SURVEY PARAMETERS:
HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004
MEAN TERRAIN CLEARANCE: 60 metres
TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°
CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°
ELECTROMAGNETIC SYSTEM:
Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second
AIRBORNE MAGNETOMETER:
Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird
AIRBORNE GAMMARAY SPECTROMETER:
Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level
ACQUISITION SYSTEM:
Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TR-300
AIRBORNE NAVIGATION SYSTEM:
DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second
BASE STATION GPS RECEIVER:
Novatel 3751 R GPS System
Sampling Rate: 1 reading/second
2.60
2.40
2.30
2.10
2.00
1.90
1.80
1.70
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.00
K - Potassium
(% K)
Scale 1:20000
Cordilleran Minerals Limited
Potassium Map
Contour Intervals: 0.1, 0.5, 2.5 %K
McPhar Geosurveys Ltd.


600000
601000
602000
603000
604000
605000
606000
607000
608000
609000
610000
LEGEND
SURVEY PARAMETERS:
HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004
MEAN TERRAIN CLEARANCE: 60 metres
TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°
CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°
ELECTROMAGNETIC SYSTEM:
Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second
AIRBORNE MAGNETOMETER:
Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird
AIRBORNE GAMMARAY SPECTROMETER:
Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level
ACQUISITION SYSTEM:
Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300
AIRBORNE NAVIGATION SYSTEM:
DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second
BASE STATION GPS RECEIVER:
NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second
2.00
1.60
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Uranium, U
(ppm eU)
Scale 1:20000
Cordilleran Minerals Limited
Uranium Map
Contour Intervals: 0.1, 0.5, 2.5, 10.0 ppm eU
McPhar Geosurveys Ltd.



LEGEND

SURVEY PARAMETERS:

HELICOPTER TYPE: A-Star AS-350 BA

SURVEY DATE: August 2004

MEAN TERRAIN CLEARANCE: 60 metres

TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°

CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

4.03
3.82
3.61
2.81
2.68
2.58
2.50
2.43
2.37
2.31
2.26
2.22
2.17
2.14
2.10
2.07
2.04
2.00
1.98
1.96
1.92
1.89
1.86
1.83
1.81
1.78
1.75
1.72
1.70
1.67
1.64
1.61
1.57
1.53
1.50
1.45
1.38
1.30

Th/K Ratio
(Th ppm, K %)

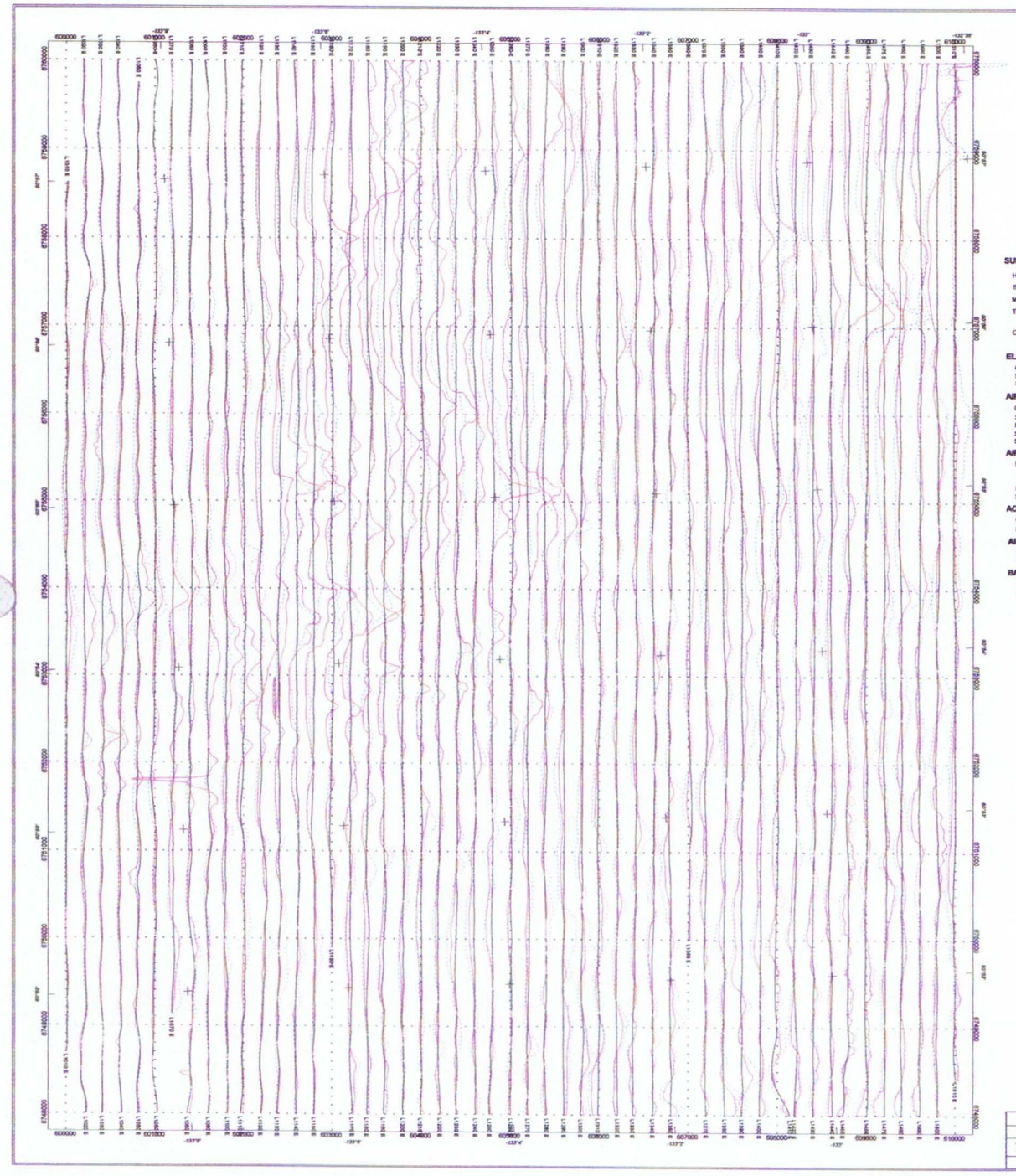
Scale 1:20000

Cordilleran Minerals Limited

Th/K Ratio Map

Contour Intervals: 0.05, 0.2, 1.0, 5.0 Th/K Ratio

McPhar Geosurveys Ltd.



LEGEND

SURVEY PARAMETERS:

HELICOPTER TYPE: A-Star AS-350 BA

SURVEY DATE: August 2004

MEAN TERRAIN CLEARANCE: 60 metres

TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°

CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

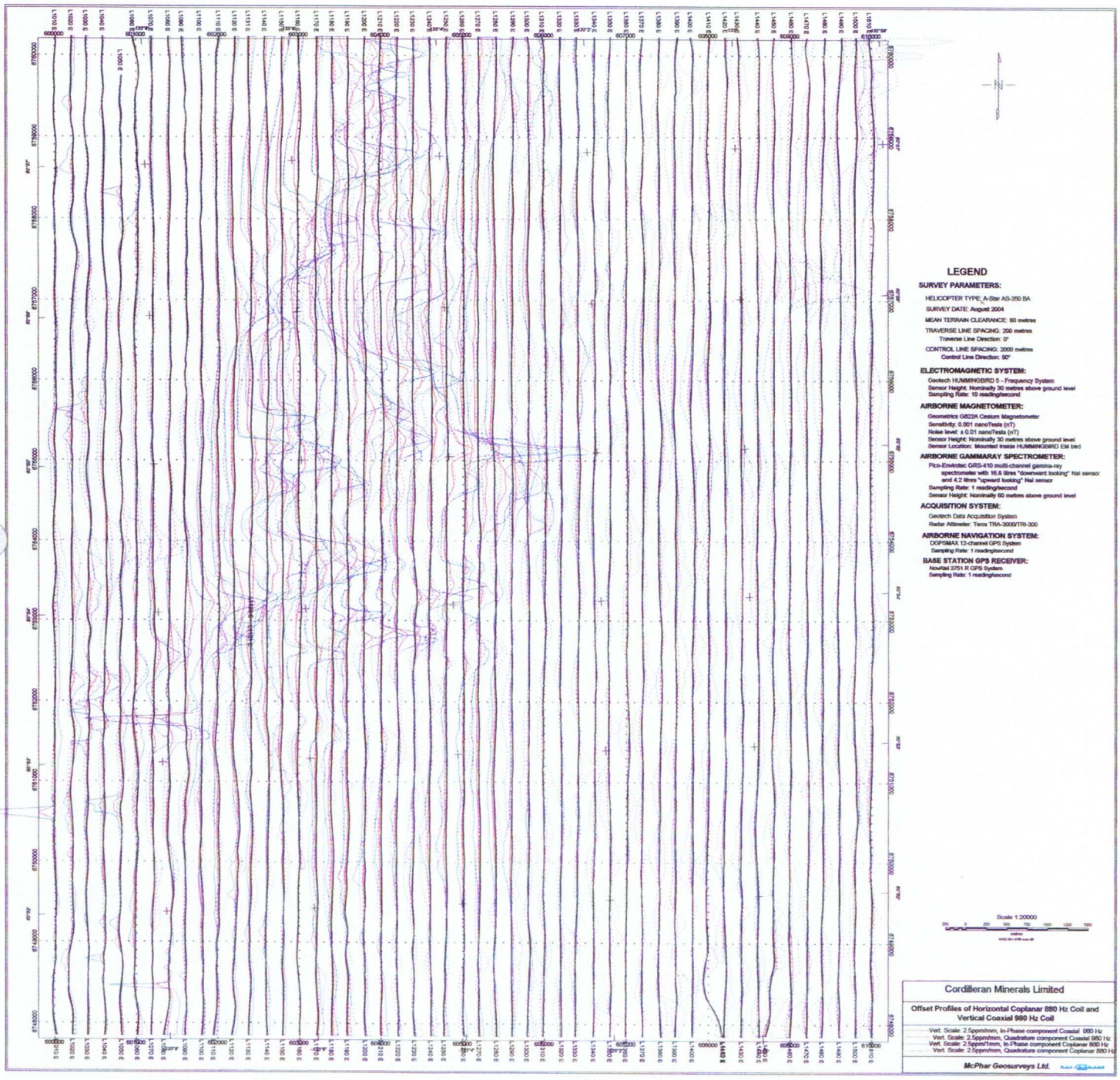
Scale 1:20000

Cordilleran Minerals Limited

Offset Profiles of Horizontal Coplanar 6800 Hz Coil

Vert. Scale: 15ppm/1mm In-Phase component
Vert. Scale: 15ppm/1mm Quadrature component

McPhar Geosurveys Ltd.



LEGEND

SURVEY PARAMETERS:

HELICOPTER TYPE: A-Star AS-350 BA

SURVEY DATE: August 2004

MEAN TERRAIN CLEARANCE: 60 metres

TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°

CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 readings/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" Nal sensor and 4.2 litres "upward looking" Nal sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TR-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 readings/second

BASE STATION GPS RECEIVER:

Novatel 2751 R GPS System
Sampling Rate: 1 readings/second

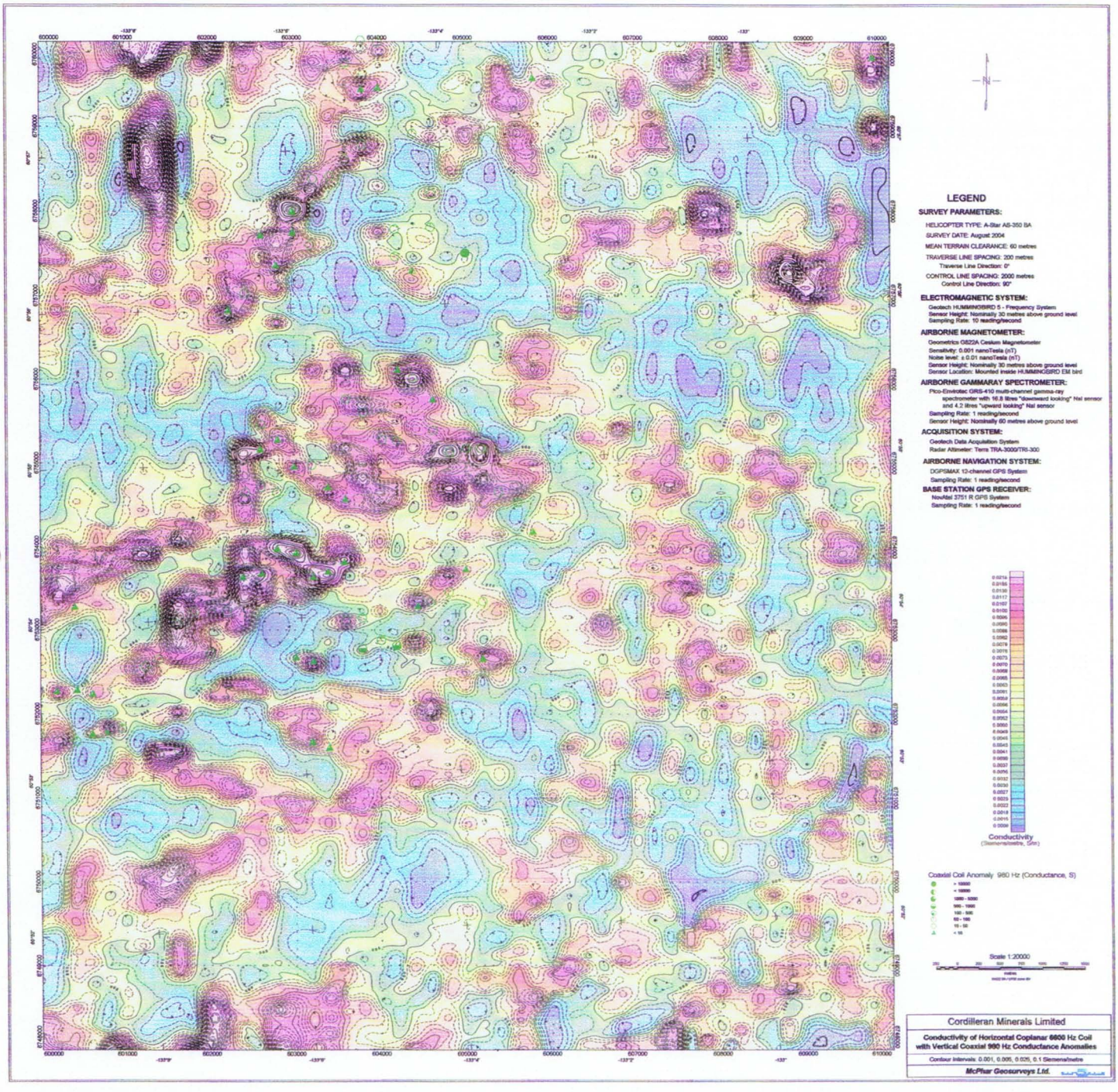
Scale 1:20000

Cordilleran Minerals Limited

Offset Profiles of Horizontal Coplanar 880 Hz Coil and Vertical Coaxial 980 Hz Coil

Vert. Scale: 2.5ppm/mm, In-Phase component Coaxial 980 Hz
Vert. Scale: 2.5ppm/mm, Quadrature component Coaxial 980 Hz
Vert. Scale: 2.5ppm/1mm, In-Phase component Coplanar 880 Hz
Vert. Scale: 2.5ppm/mm, Quadrature component Coplanar 880 Hz

McPhar Geosurveys Ltd.



LEGEND

SURVEY PARAMETERS:

HELICOPTER TYPE: A-Star AS-350 BA

SURVEY DATE: August 2004

MEAN TERRAIN CLEARANCE: 60 metres

TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°

CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

Conductivity
(Siemens/metre, S/m)

Coaxial Coil Anomaly 980 Hz (Conductance, S)

Scale 1:20000

Cordilleran Minerals Limited

Conductivity of Horizontal Coplanar 6600 Hz Coil with Vertical Coaxial 980 Hz Conductance Anomalies

Contour Intervals: 0.001, 0.005, 0.025, 0.1 Siemens/metre

McPhar Geosurveys Ltd.

McPhar Geosurveys Ltd.
1256B Kerrisdale Blvd.
Newmarket, Ontario
L3Y 8Z9

Cordilleran Minerals Limited Cost Recap
Canol Project Helicopter-borne Geophysics Survey - 2004

Invoice #	Date	Details	Mob/Demob	Data Acq	GST	Total
1st payment MCP0414.01	08-Jul-04	1/2 (50%) of Mob charge	12,500.00			
		30% of data acq/process		19,948.50		
		GST			2,271.39	34,719.89
2nd payment MCP0414.02	10-Aug-04	1/2 (50%) of Mob charge	no charge			
		30% of data acq/process REVISED		17,902.50		
		CREDIT payment of 30% of Data Ac charges previously		-19,948.50		
		Revised payment of 30% of Data Ac re MCP0410.01		17,902.50		
		GST			1,109.96	16,966.46
3rd payment MCP0414.03	10-Aug-04	30% of data acq/process REVISED		17,902.50		
		GST			1,253.18	19,155.68
4th payment MCP0414.04	23-Nov-04	Final payment 10% of Data acq/process		5,967.50		
		GST			417.73	6,385.23
		SUBTOTAL	**12,500.00**	**59,675.00**	**5,052.26**	**77,227.26**
		TOTAL				**77,227.26**

- 3125.00
74,102.26

NOTE:
The mobilisation/demobilisation included was based on costs from Edmonton to Whitehorse and from Whitehorse to Johnson's Crossing. The system remained in the Yukon Territory upon completion of the Cordilleran project. Prorated cost for mob/demob charges incurred in the Yukon Territory was approximately 75% of $12,500 or $9375.

McPhar Geosurveys Ltd.

Rob Hearst, M.Sc., P.Geoph. (NAPEG)
Senior Geophysicist / Data Processing Manager

12,500.00
9375.00
$3125.00

McPhar Geosurveys Ltd.
1256B Kennisdale Blvd., Newmarket
Ontario, Canada L3Y 7V1
Tel: (905) 830-6880, Fax: (905) 898-0336
E-Mail: info@mgssurveys.com
Web Site: www.mgssurveys.com

To: Cordilleran Minerals Ltd. 100 Platinum Road Whitehorse, Yukon Y1A 6A9 Attention: Mark Lindsay	**Invoice** Number: MCP0414.01 REVISED Date: July 8, 2004

Quantity	Description	Unit Price	Qty.	Amount CDN$
	CONTRACT FOR HELICOPTER-BORNE ELECTROMAGNETIC/MAGNETOMETER/RADIOMETRIC SURVEY IN SOUTH CENTRAL YUKON			
1	Payment of ½ Mobilization & Demobilization charge		1	$12,500.00
1	Payment of 30% of Data Acquisition/Processing		1	$19,948.50
				$32,448.50
		GST		$2,271.39
		TOTAL DUE		**$34,719.89**

Mail invoice to :
Mark Lindsay
60 Fireweed Drive
Whitehorse, Yukon
Y1A 5T8

Please make payment by Telegraphic Bank Transfer to:
McPhar Geosurveys Ltd.
Bank of Montreal
1111 Davis Drive
Newmarket, Ontario
Canada L3Y 2R9
Tel: 1.905.853.2744
CDN$ Account # 39562.001.1027.762
SWIFT CODE: BOFMCAM2

Timothy R. Bodger
General Manager

McPhar Geosurveys Ltd.
1256B Kennisdale Blvd., Newmarket
Ontario, Canada L3Y 7V1
Tel: (905) 830-6880, Fax: (905) 898-0336
E-Mail: info@mgssurveys.com
Web Site: www.mgssurveys.com

To: Cordilleran Minerals Ltd. ***100 Platinum Road*** ***Whitehorse, Yukon*** ***Y1A 6A9*** ***Attention: Mark Lindsay***	**Invoice** ***Number:*** ***MCP0414.02 REVISED*** ***Date:*** August 10, 2004

Quantity	*Description*	*Unit Price*	*Qty.*	*Amount CDN$*
	CONTRACT FOR HELICOPTER-BORNE ELECTROMAGNETIC/MAGNETOMETER/RADIOMETRIC SURVEY IN SOUTH CENTRAL YUKON			
	Second payment REVISED			
1	Payment of 50% Mobilization/Demobilization-no charge		1	$ 0.00
1	Payment of 30% of Data Acquisition/Processing REVISED		1	$17,902.50
1	CREDIT Payment of 30% of Data Acquisition charged previously		-1	($19,948.50)
1	REVISED Payment of 30% of Data Acquisition re MCP0410.01		-1	$17,902.50
	REVISED SUB-TOTAL			$15,856.50
		GST		$1,109.96
		TOTAL DUE		**$16,966.46**

Mail invoice to :
Mark Lindsay
60 Fireweed Drive
Whitehorse, Yukon
Y1A 5T8

Please make payment by Telegraphic Bank Transfer to:
McPhar Geosurveys Ltd.
Bank of Montreal
1111 Davis Drive
Newmarket, Ontario
Canada L3Y 2R9
Tel: 1.905.853.2744
CDN$ Account # 39562.001.1027.762
SWIFT CODE: BOFMCAM2

Susanne Hall
Office Manger

McPhar Geosurveys Ltd.
1256B Kerrisdale Blvd., Newmarket
Ontario, Canada L3Y 7V1
Tel: (905) 830-6880, Fax: (905) 898-0336
E-Mail: info@mgssurveys.com
Web Site: www.mgssurveys.com

To: Cordilleran Minerals Ltd. 100 Platinum Road Whitehorse, Yukon Y1A 6A9 Attention: Mark Lindsay	**Invoice** Number: MCP0414.03 Date: August 10, 2004

Quantity	Description	Unit Price	Qty.	Amount CDN$
	CONTRACT FOR HELICOPTER-BORNE ELECTROMAGNETIC/MAGNETOMETER/RADIOMETRIC SURVEY IN SOUTH CENTRAL YUKON			
	Third payment due on completion of flying			
1	Payment of 30% of Data Acquisition/Processing REVISED		1	$17,902.50
	SUB-TOTAL			$17,902.50
		GST		$ 1,253.18
		TOTAL DUE		**$19,155.68**

Mail invoice to :
Mark Lindsay
60 Fireweed Drive
Whitehorse, Yukon
Y1A 5T8

Please make payment by Telegraphic Bank Transfer to:
McPhar Geosurveys Ltd.
Bank of Montreal
1111 Davis Drive
Newmarket, Ontario
Canada L3Y 2R9
Tel: 1.905.853.2744
CDN$ Account # 39562.001.1027.762
SWIFT CODE: BOFMCAM2

Susanne Hall
Office Manger

McPhar Geosurveys Ltd.
1256B Kerrisdale Blvd., Newmarket
Ontario, Canada L3Y 7V1
Tel: (905) 830-6880, Fax: (905) 898-0336
E-Mail: info@mgssurveys.com
Web Site: www.mgssurveys.com

To: Cordilleran Minerals Ltd. 100 Platinum Road Whitehorse, Yukon Y1A 6A9 Attention: Mark Lindsay	**Invoice** Number: MCP0414.04 Date: November 23, 2004

Quantity	Description	Unit Price	Qty.	Amount CDN$
	CONTRACT FOR HELICOPTER-BORNE ELECTROMAGNETIC/MAGNETOMETER/RADIOMETRIC SURVEY IN SOUTH CENTRAL YUKON			
	Final payment due upon completion of the Data Processing and Delivery of the final products		1	$5,967.50
	SUB-TOTAL			$ 5,967.50
		GST		$ 417.73
		TOTAL DUE		**$6,385.23**

Mail invoice to :
Mark Lindsay
60 Fireweed Drive
Whitehorse, Yukon
Y1A 5T8

Please make payment by Telegraphic Bank Transfer to:
McPhar Geosurveys Ltd.
Bank of Montreal
1111 Davis Drive
Newmarket, Ontario
Canada L3Y 2R9
Tel: 1.905.853.2744
CDN$ Account # 39562.001.1027.762
SWIFT CODE: BOFMCAM2

Susanne Hall
Office Manger

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nT
Noise level: ± 0.01 nT
Sensor Height: Norminally 30 above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM sensor

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray
Spectrometer with 16.8 liters "downward looking" Nal sensor
And 4.2 liters "upward looking" Nal sensor
Sampling Rate: 1 reading/second
Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

DTM
meteres

1588
1490
1410
1341
1289
1241
1197
1157
1121
1091
1066
1040
1014
987
958
929
906
889
877
870
863
856
850
845
841
836
832
828
824
820
817
814
810
805
798
792
786
773

Scale 1:20000

250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Digital Terrain Model (DTM)

Contours: 5, 20, 50, 100, 500 m

McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nT
Noise level: ± 0.01 nT
Sensor Height: Norminally 30 above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM sensor

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray
Spectrometer with 16.8 liters "downward looking" Nal sensor
And 4.2 liters "upward looking" Nal sensor
Sampling Rate: 1 reading/second
Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

1.9
1.0
0.7
0.5
0.3
0.2
0.2
0.1
0.1
0.1
0.1
0.0
0.0
0.0
0.0
-0.0
-0.0
-0.0
-0.0
-0.0
-0.1
-0.1
-0.1
-0.1
-0.1
-0.1
-0.1
-0.1
-0.1
-0.2
-0.2
-0.2
-0.3
-0.3
-0.4
-0.5
-0.7
-0.9
-1.4

1VD
nT/m

Scale 1:20000

250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

First Vertical Derivative of the Total Magnetic Intensity

Contours: 0.1, 0.3, 0.5, 1 nT/m

McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nT
Noise level: ± 0.01 nT
Sensor Height: Norminally 30 above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM sensor

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray
Spectrometer with 16.8 liters "downward looking" Nal sensor
And 4.2 liters "upward looking" Nal sensor
Sampling Rate: 1 reading/second
Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

0.0173
0.0097
0.0066
0.0048
0.0035
0.0027
0.0021
0.0017
0.0014
0.0011
0.0009
0.0007
0.0005
0.0004
0.0003
0.0002
0.0001
0.0000
-0.0001
-0.0002
-0.0002
-0.0003
-0.0004
-0.0006
-0.0007
-0.0008
-0.0010
-0.0012
-0.0014
-0.0017
-0.0021
-0.0026
-0.0032
-0.0041
-0.0053
-0.0071
-0.0099
-0.0162

2VD
nT/m

Scale 1:20000

250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Second Vertical Derivative of the Total Magnetic Intensity

Contours: 0.002, 0.03, 0.05, 0.1 nT/m**2

McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nT
Noise level: ± 0.01 nT
Sensor Height: Norminally 30 above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM sensor

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray
Spectrometer with 16.8 liters "downward looking" Nal sensor
And 4.2 liters "upward looking" Nal sensor
Sampling Rate: 1 reading/second
Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

3247
969
537
441
391
359
334
310
291
275
259
245
233
221
208
197
186
177
168
160
153
148
143
139
135
131
127
123
120
116
112
107
102
95
86
76
63
38
-9
-505

RTP
nT

Scale 1:20000

250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Total Magnetic Intensity Reduced to Magnetic Pole

Contours: 15, 50, 100, 500 nT

McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nT
Noise level: ± 0.01 nT
Sensor Height: Norminally 30 above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM sensor

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray
Spectrometer with 16.8 liters "downward looking" Nal sensor
And 4.2 liters "upward looking" Nal sensor
Sampling Rate: 1 reading/second
Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:
DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:
NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

3137
959
524
429
384
356
332
313
295
279
262
246
233
222
212
203
193
185
177
169
161
154
148
142
136
131
126
122
118
114
110
106
102
97
89
80
66
44
-2
-900

TMI
nT

Scale 1:20000

250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Total Magnetic Intensity (IGRF removed)

Contours: 15, 50, 100, 500 nT

McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nT
Noise level: ± 0.01 nT
Sensor Height: Norminally 30 above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM sensor

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray
Spectrometer with 16.8 liters "downward looking" Nal sensor
And 4.2 liters "upward looking" Nal sensor
Sampling Rate: 1 reading/second
Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

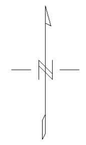
Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

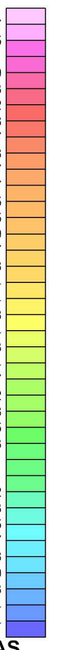
AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second





Scale 1:20000

250 0 250 500 750 1000 1250 1500

metres

WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Analytic Signal of Total Magnetic Intensity

Contours: 0.1, 0.3, 0.5, 1 nT/m

McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nT
Noise level: ± 0.01 nT
Sensor Height: Norminally 30 above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM sensor

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray
Spectrometer with 16.8 liters "downward looking" Nal sensor
And 4.2 liters "upward looking" Nal sensor
Sampling Rate: 1 reading/second
Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

0.0215
0.0155
0.0130
0.0117
0.0107
0.0100
0.0095
0.0090
0.0086
0.0082
0.0079
0.0076
0.0073
0.0070
0.0068
0.0065
0.0063
0.0061
0.0059
0.0056
0.0054
0.0052
0.0050
0.0048
0.0045
0.0043
0.0041
0.0039
0.0037
0.0035
0.0032
0.0030
0.0027
0.0025
0.0022
0.0019
0.0015
0.0009

Conductivity
S/m

Coaxial Coil Anomaly 980 Hz (Conductance, S)

- > 10000
- < 10000
- 1000 - 5000
- 500 - 1000
- 100 - 500
- 50 - 100
- 10 - 50
- < 10

Scale 1:20000

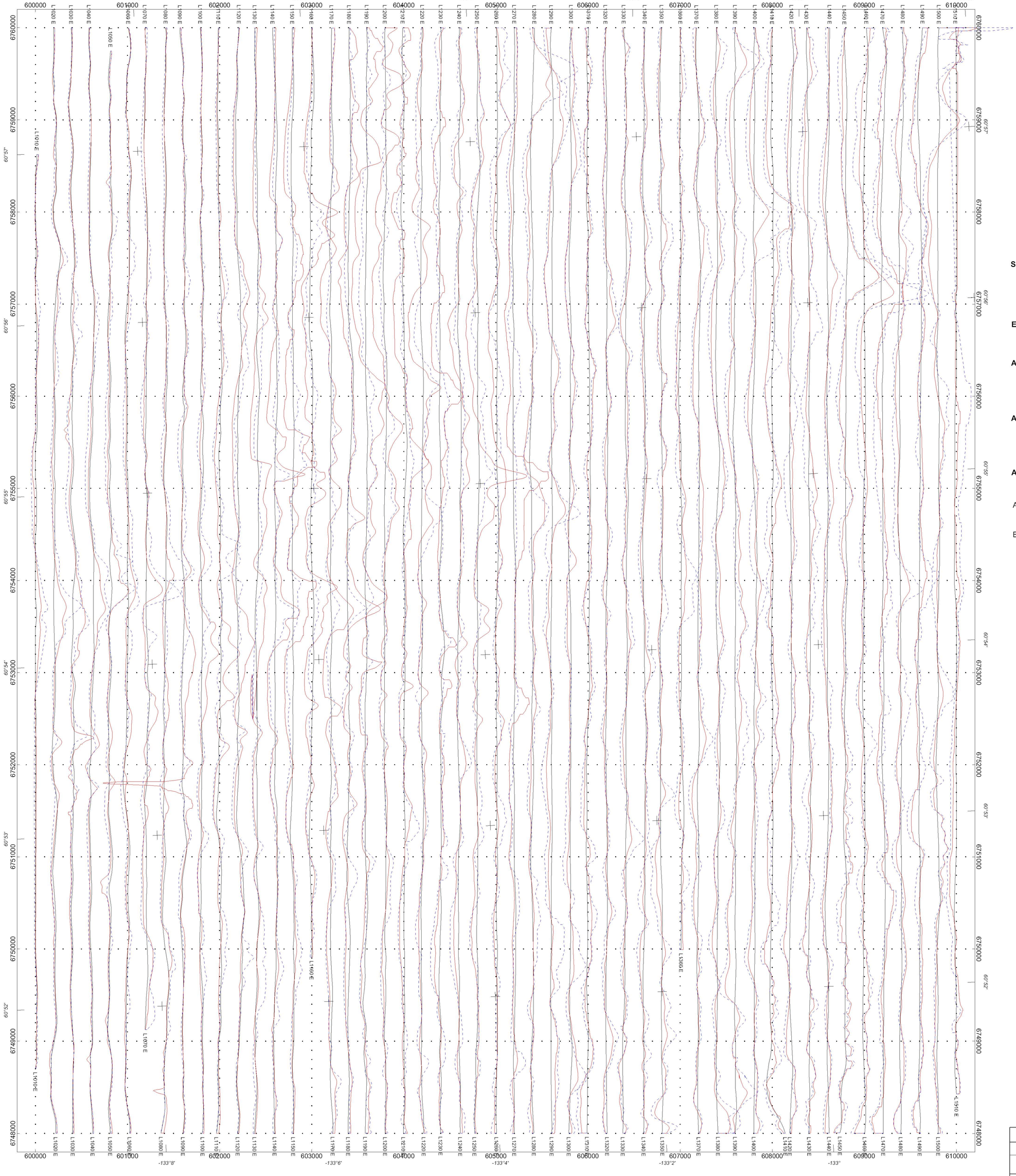
250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Conductivity of Coil HC6600hZ

Contours: 0.001, 0.005, 0.01, 0.05 Simence/meter

McPhar Geosurveys Ltd.



LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nT
Noise level: ± 0.01 nT
Sensor Height: Norminally 30 above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM sensor

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray
Spectrometer with 16.8 liters "downward looking" Nal sensor
And 4.2 liters "upward looking" Nal sensor
Sampling Rate: 1 reading/second
Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

Scale 1:20000

250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Offset Profiles of Hor. Coplanar coil 6600 Hz

Ver. Scale: 15ppm/1mm InPhase component
Ver. Scale: 15ppm/1mm Quadrature component

McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nT
Noise level: ± 0.01 nT
Sensor Height: Norminally 30 above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM sensor

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray
Spectrometer with 16.8 liters "downward looking" Nal sensor
And 4.2 liters "upward looking" Nal sensor
Sampling Rate: 1 reading/second
Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

Scale 1:20000

250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Offset Profiles of Hor. Coplanar coil 880 Hz Offset Profiles of Coaxial

Ver. Scale: 2.5ppm/mm InPhase component coil 980Hz
Ver. Scale: 2.5ppm/mm Quadrature component 980Hz
Ver. Scale: 2.5ppm/1mm InPhase component coil 880Hz
Ver. Scale: 2.5ppm/mm Quadrature component coil 880Hz

McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
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ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
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Sensitivity: 0.001 nT
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Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

3.80
2.80
2.30
2.10
2.00
1.90
1.80
1.70
1.60
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.00

K
% K

Scale 1:20000

250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Potassium Map

Contours: 0.1, 0.5,1 %K

McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

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Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

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Sensitivity: 0.001 nT
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AIRBORNE GAMMARAY SPECTROMETER:

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Spectrometer with 16.8 liters "downward looking" Nal sensor
And 4.2 liters "upward looking" Nal sensor
Sampling Rate: 1 reading/second
Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

880.00
630.00
485.00
415.00
385.00
365.00
350.00
340.00
330.00
320.00
315.00
305.00
300.00
290.00
285.00
280.00
270.00
265.00
260.00
250.00
245.00
235.00
230.00
220.00
215.00
205.00
195.00
185.00
170.00
160.00
150.00
140.00
130.00
115.00
105.00
90.00
65.00
5.00

Total Count
cps

Scale 1:20000

250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Total Count Map

Contours: 10, 25, 50 cps

McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

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Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

Th
ppm eTh
9.10
6.00
4.80
4.20
3.90
3.60
3.50
3.40
3.20
3.10
3.00
2.90
2.80
2.70
2.60
2.50
2.40
2.30
2.20
2.10
2.00
1.90
1.80
1.70
1.60
1.50
1.40
1.30
1.10
1.00
0.70
0.30

Scale 1:20000
250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Thorium Map

Contours: 0.3, 0.7, 1 ppm eTh

McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
CONTROL LINE SPACING: 2000 m
CONTROL LINE DIRECTION: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5- Frequencey System
Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nT
Noise level: ± 0.01 nT
Sensor Height: Norminally 30 above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM sensor

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray
Spectrometer with 16.8 liters "downward looking" Nal sensor
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Sampling Rate: 1 reading/second
Sensor Height: Norminally 60 m above ground level

ACQUISITION SYSTEM:

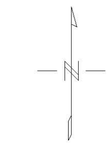
Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

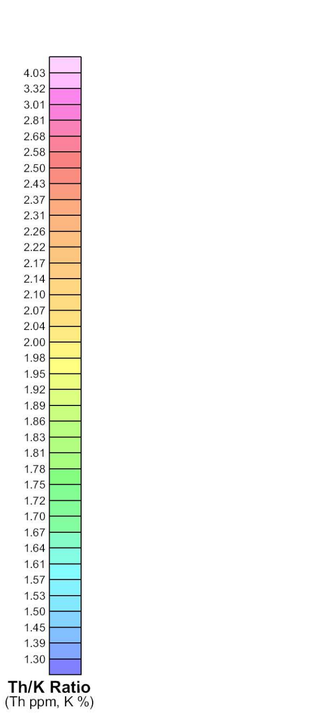
AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second





Th/K Ratio
(Th ppm, K %)

Scale 1:20000

250 0 250 500 750 1000 1250 1500

metres

WGS 84 / UTM zone 8N

Cordilleran Minerals Limited
Th/K Ratio Map
Contours: 0.1, 0.5, 1, 5 Th/K Ratio
McPhar Geosurveys Ltd.

LEGEND

HELICOPTER TYPE: A-Star AS-350 BA
SURVEY DATE: August 2004

SURVEY PARAMETERS:

MEAN TERRAIN CLEARANCE: 60 m
TRAVERSE LINE SPACING: 200 m
TRAVESE LINE DIRECTION: 0°
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CONTROL LINE DIRECTION: 90°

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Sensor Height: Norminally 30 m above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

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DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:

NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

U
ppm eU
2.00
1.60
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00

Scale 1:20000
250 0 250 500 750 1000 1250 1500
metres
WGS 84 / UTM zone 8N

Cordilleran Minerals Limited

Uranium Map

Contours: 0.2, 0.5, 0.7, 1 ppm eU

McPhar Geosurveys Ltd.

095294

INTERPRETATION REPORT

HELICOPTER-BORNE GEOPHYSICAL SURVEY

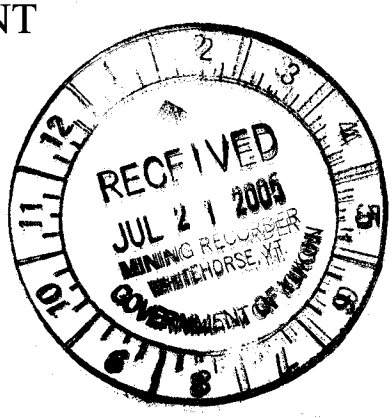
CANOL SURVEY AREA
QUIET LAKE, YUKON TERRITORY
WHITEHORSE MINING DISTRICT

FOR

CORDILLERAN MINERALS LIMITED

BY

MICHAEL ZANG
ZANG GEOPHYSICAL CONSULTANT



095294

MIKLIN CLAIMS 1-248 YC26755-YC39138
NTS MAPS 105C-14/15 - UTM COORDINATE 605400E – 6754750N
WORK COMPLETED AUGUST 1ST – 7TH, 2004

FEBRUARY 8, 2005

Costs associated with this report have been approved in the amount of $ 4280.00 for assessment credit under Certificate of Work No. QV027778

Mining Recorder
Whitehorse Mining District

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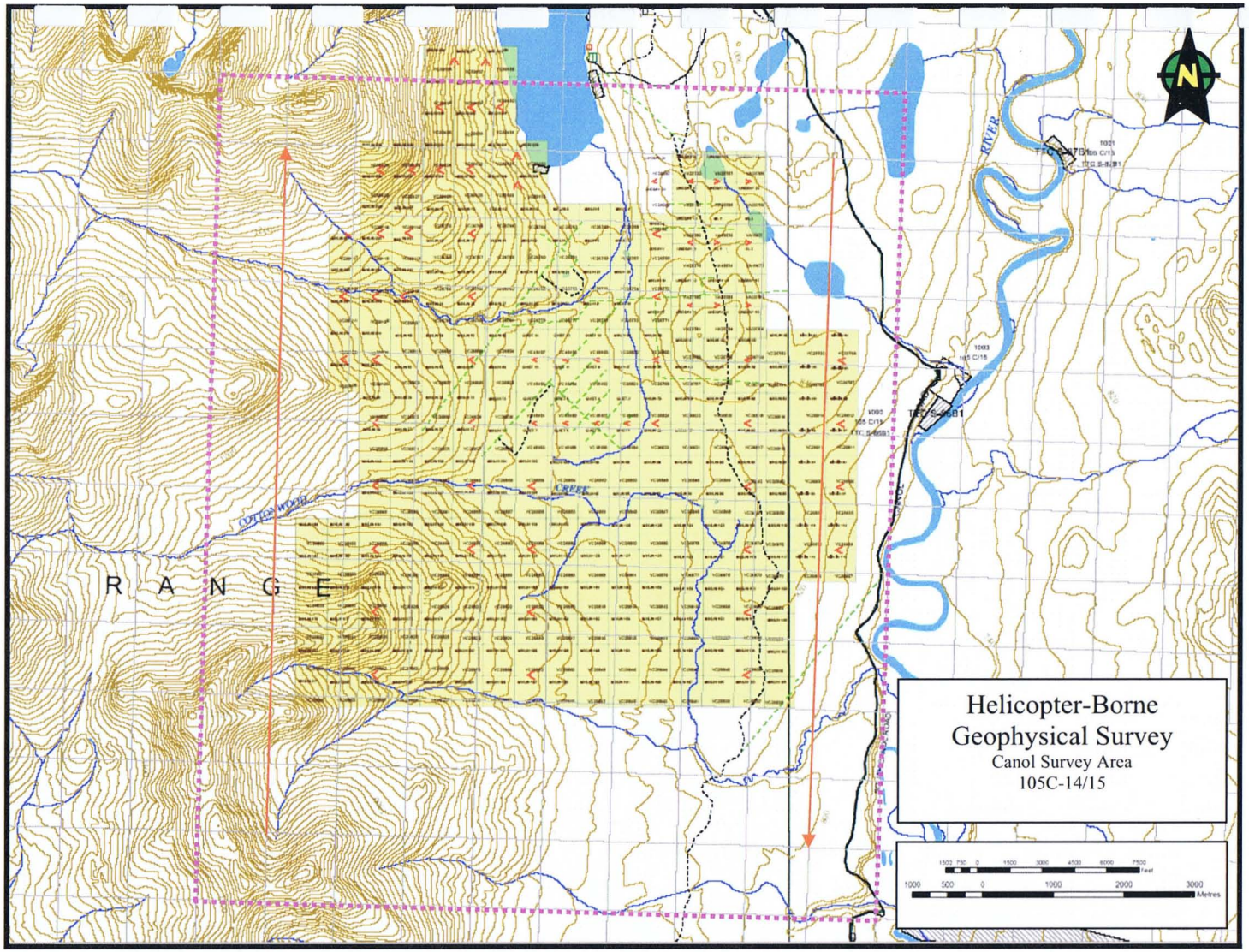
GEOMAGNETIC MAP OF SURVEY AREA – CDROM --	MAP POCKET



Mining
- Staking Direction
- Placer Baselines
- Mining District Boundaries

Claim Status
- Active Quartz Claim
- Active Placer Claim
- Expired Claim

Coal
- Coal Exploration Licence
- Coal Mining Lease
- Expired Licence or Lease

Areas Withdrawn from Staking
- First Nation Interim Protected Lands
- Parks and Special Management Areas

First Nation Settlement Land
Category
- A
- B
- FS

First Nations Surveyed Lands
Category
- A
- B
- FS

NRCan Legal Survey Cadastral
- First Nations Community Lots
- Special Access Rights through FN Lands
- Mineral Claims
- Community Land Transfers (Order in Council)
- Land Dispositions (Lots)
- Easements

EMR Lands
- Land Disposition
- Land Application
- Agricultural Disposition
- Agricultural Application
- Privy Council Orders

Mapsheet Index
- 1:10000 Mineral Index
- 1:50000 Mineral Index

Base Map Features
Hydrographic
- Watercourse
- Waterbody
- Intermittent waterbody
- Underwater sand
- Dry river bed

Topography
- Contours

Transportation Routes
- Highway
- Main
- Secondary
- Street
- Limited-use road
- Trail
- Cut line
- Railway
- Bridge
- Foot Bridge
- Ferry route

- Air Survey Boundary
- Flight Direction

Zang Geophysical Consultant

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12579 Taylor Place
Summerland, B.C.
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February 8, 2005

Cordilleran Minerals Limited
100 Platinum Road
Whitehorse, Yukon Territory
Y1A 6A9

Subject: First pass interpretation of helicopter-borne geophysical survey Canol Survey Area

As requested the aeromagnetic, radiometric and electromagnetic data from the Hummingbird helicopter airborne survey on the Canol survey area, Yukon was reviewed. A first pass geomagnetic map was created to determine if prospective conductive anomalies may be present in the area.

The figure 1 shows the preliminary geomagnetic map generated.

The main geological units identified in the map are ultramafic, a volcanic/sedimentary sequence, granite, a meta-sedimentary sequence, near surface high magnetic intensity units and a few main structures.

The ultramafic has been identified by its shallow easterly dip and very high magnetic susceptibility. One of the distinctive effects of this unit on the Hummingbird EM system is the negative effect on the in-phase data. This makes the final picking of targets and accurate calculation of the physical properties of the target difficult.

The volcanic/sedimentary sequence has been identified by is moderate to high magnetic susceptibility.

The granite has been identified by is moderate magnetic susceptibility and coincidence with a high potassium and total count radiometric anomalies.
The meta-sedimentary sequence is a low magnetic susceptibility unit and makes up the background response.

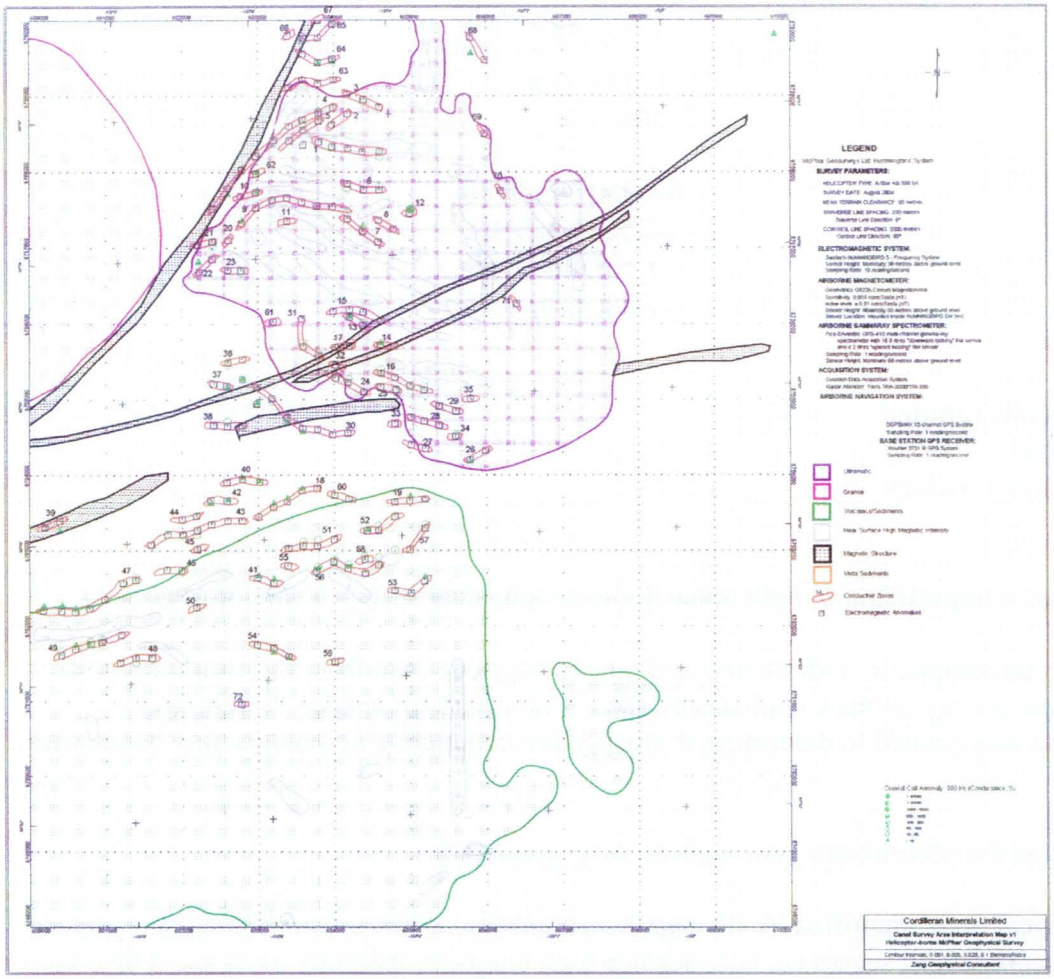

Figure 1 – Geomagnetic Map of Canol Survey Area

Table 1 presents the location of the conductive zones identified in the survey area. The east and north coordinates are the UTM limits of the zones and the zone number corresponds to the grouping found in the attached Montaj map. The grouping of the anomalies into zones was based on the similarity of the profiles and the corresponding magnetic trend.

Of the 72 zones identified, 45 are considered to be due to highly conductive material in all or part of the zone. The highly conductive zones are indicated in the table.

As can be seen in the maps the highly conductive zones fit into three main groupings. The north group located between 603000E, 6757000N and 605000E, 6760000N is coincident with north-

west limit of the ultramafic. The central group located between 602000E, 6754000N and 606000E, 6756000N is coincident with the south-west limit of the ultramafic. These two areas represent the most prospective areas for follow-up exploration. The northern area is highlighted primarily for its nickel potential and the central area for its nickel and gold potential.

The last grouping is located between 601000E, 6752000N and 605000E, 6754000N is coincident with the contact between the volcanic/sedimentary sequence and the meta-sediments. This area is considered to be of less importance than the first two groups.

Table 1

Conductive Zone #	East	North	Highly Conductive Zones
1	603805	6758454	
1	603985	6758394	
1	604188	6758357	
1	604378	6758330	
1	604595	6758325	
1	604687	6758302	
1	604687	6758233	
1	604595	6758219	
1	604387	6758219	
1	604193	6758260	
1	603976	6758279	
1	603805	6758334	
1	603727	6758371	
1	603722	6758450	
1	603763	6758464	
1	603805	6758454	
2	603948	6758547	
2	604174	6758699	
2	604253	6758782	
2	604202	6758833	
2	604091	6758759	
2	603985	6758685	
2	603920	6758625	
2	603902	6758584	
2	603920	6758547	
2	603948	6758547	
3	604165	6759087	Yes
3	604410	6758990	Yes
3	604632	6758893	Yes
3	604655	6758861	Yes
3	604632	6758801	Yes
3	604572	6758824	Yes
3	604382	6758907	Yes
3	604179	6758990	Yes
3	604114	6759032	Yes

3	604114	6759087	Yes
3	604165	6759087	Yes
4	603994	6758912	Yes
4	603800	6758815	Yes
4	603593	6758727	Yes
4	603417	6758644	Yes
4	603223	6758454	Yes
4	602979	6758256	Yes
4	602605	6757831	Yes
4	602411	6757563	Yes
4	602346	6757508	Yes
4	602346	6757443	Yes
4	602415	6757485	Yes
4	602600	6757739	Yes
4	602794	6757974	Yes
4	602979	6758159	Yes
4	603223	6758371	Yes
4	603422	6758556	Yes
4	603593	6758648	Yes
4	603800	6758741	Yes
4	603990	6758815	Yes
4	604054	6758861	Yes
4	604050	6758902	Yes
4	604017	6758912	Yes
4	603994	6758912	Yes
5	603800	6758713	Yes
5	603602	6758584	Yes
5	603413	6758441	Yes
5	603325	6758357	Yes
5	603279	6758311	Yes
5	603302	6758279	Yes
5	603413	6758367	Yes
5	603597	6758510	Yes
5	603800	6758630	Yes
5	603874	6758676	Yes
5	603879	6758718	Yes
5	603842	6758727	Yes
5	603800	6758713	Yes
6	604595	6757729	Yes
6	604391	6757729	Yes
6	604253	6757771	Yes
6	604184	6757813	Yes
6	604101	6757836	Yes
6	604101	6757891	Yes
6	604174	6757891	Yes
6	604294	6757845	Yes
6	604387	6757808	Yes
6	604502	6757808	Yes
6	604585	6757803	Yes
6	604673	6757803	Yes
6	604687	6757753	Yes
6	604659	6757734	Yes

6	604595	6757729	Yes
7	604590	6757037	Yes
7	604378	6757180	Yes
7	604179	6757342	Yes
7	604110	6757369	Yes
7	604077	6757392	Yes
7	604082	6757420	Yes
7	604137	6757429	Yes
7	604179	6757425	Yes
7	604373	6757254	Yes
7	604493	6757180	Yes
7	604590	6757120	Yes
7	604664	6757074	Yes
7	604659	6757028	Yes
7	604595	6757028	Yes
7	604590	6757037	Yes
8	604590	6757406	
8	604789	6757286	
8	604858	6757245	
8	604862	6757185	
8	604784	6757212	
8	604659	6757282	
8	604595	6757319	
8	604525	6757374	
8	604521	6757416	
8	604562	6757411	
8	604590	6757406	
9	602789	6757282	
9	602979	6757494	
9	603191	6757600	
9	603376	6757628	
9	603583	6757559	
9	603777	6757522	
9	603976	6757508	
9	604101	6757485	
9	604193	6757466	
9	604244	6757494	
9	604188	6757540	
9	603971	6757586	
9	603773	6757596	
9	603588	6757642	
9	603385	6757697	
9	603205	6757679	
9	602979	6757573	
9	602877	6757452	
9	602780	6757351	
9	602729	6757300	
9	602720	6757240	

9	602771	6757268	
9	602789	6757282	
10	602785	6757651	Yes
10	602979	6757693	Yes
10	603057	6757720	Yes
10	603076	6757762	Yes
10	602997	6757776	Yes
10	602923	6757748	Yes
10	602789	6757720	Yes
10	602683	6757679	Yes
10	602683	6757628	Yes
10	602771	6757651	Yes
10	602785	6757651	Yes
11	603389	6757402	
11	603269	6757365	
11	603269	6757300	
11	603385	6757323	
11	603486	6757328	
11	603519	6757379	
11	603468	6757397	
11	603399	6757397	
11	603389	6757402	
12	605079	6757517	
12	604992	6757526	
12	604927	6757494	
12	604885	6757462	
12	604936	6757420	
12	605024	6757406	
12	605089	6757448	
12	605098	6757494	
12	605079	6757517	
13	604202	6756057	Yes
13	604386	6755943	Yes
13	604443	6755914	Yes
13	604483	6755960	Yes
13	604397	6756029	Yes
13	604299	6756103	Yes
13	604219	6756138	Yes
13	604144	6756149	Yes
13	604116	6756109	Yes
13	604161	6756080	Yes
13	604202	6756057	Yes
14	604610	6755690	
14	604793	6755673	
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15	604483	6756178	Yes
15	604397	6756213	Yes
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26	605991	6754362	Yes
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26	605745	6754171	Yes
26	605779	6754164	Yes
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27	605014	6754437	Yes
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57	604897	6753023	Yes
57	604891	6752975	Yes
57	604959	6752982	Yes
57	604993	6752988	Yes
58	604310	6752893	Yes
58	604405	6752934	Yes
58	604501	6752934	Yes
58	604515	6752886	Yes
58	604494	6752852	Yes
58	604392	6752838	Yes
58	604330	6752818	Yes
58	604269	6752852	Yes
58	604310	6752893	Yes
59	603907	6751492	
59	604016	6751492	
59	604098	6751526	
59	604132	6751567	
59	604118	6751581	
59	604077	6751581	
59	603989	6751574	
59	603920	6751560	
59	603893	6751526	
59	603907	6751492	
60	603913	6753726	
60	604009	6753699	
60	604118	6753665	

60	604194	6753644	
60	604282	6753644	
60	604303	6753679	
60	604276	6753699	
60	604194	6753726	
60	604132	6753754	
60	604084	6753767	
60	604016	6753774	
60	603961	6753795	
60	603913	6753774	
60	603913	6753747	
60	603913	6753726	
61	603126	6756057	
61	603200	6756080	
61	603274	6756097	
61	603314	6756040	
61	603297	6755994	
61	603217	6755989	
61	603148	6755972	
61	603086	6755994	
61	603074	6756029	
61	603126	6756057	
62	602904	6757931	Yes
62	602978	6757943	Yes
62	603069	6757988	Yes
62	603103	6758028	Yes
62	603086	6758056	Yes
62	603052	6758056	Yes
62	602983	6758022	Yes
62	602915	6757999	Yes
62	602892	6757971	Yes
62	602892	6757954	Yes
62	602904	6757931	Yes
63	604100	6759213	
63	603997	6759184	
63	603804	6759127	
63	603701	6759156	
63	603581	6759184	
63	603513	6759150	
63	603467	6759105	
63	603410	6759082	
63	603336	6759076	
63	603314	6759105	
63	603410	6759167	
63	603507	6759236	
63	603593	6759264	
63	603712	6759241	
63	603792	6759218	
63	603895	6759218	
63	603963	6759258	

63	604026	6759258	
63	604077	6759258	
63	604100	6759224	
63	604100	6759213	
64	604071	6759503	Yes
64	603980	6759458	Yes
64	603860	6759418	Yes
64	603798	6759412	Yes
64	603707	6759446	Yes
64	603644	6759486	Yes
64	603598	6759515	Yes
64	603541	6759555	Yes
64	603507	6759606	Yes
64	603598	6759606	Yes
64	603695	6759543	Yes
64	603781	6759492	Yes
64	603872	6759492	Yes
64	603992	6759532	Yes
64	604077	6759549	Yes
64	604088	6759515	Yes
64	604071	6759503	Yes
65	603974	6759925	Yes
65	603872	6759805	Yes
65	603792	6759743	Yes
65	603718	6759743	Yes
65	603604	6759725	Yes
65	603564	6759743	Yes
65	603604	6759811	Yes
65	603667	6759811	Yes
65	603798	6759811	Yes
65	603889	6759908	Yes
65	603963	6759982	Yes
65	603997	6760010	Yes
65	604066	6760027	Yes
65	604066	6759976	Yes
65	604014	6759948	Yes
65	603974	6759925	Yes
66	603325	6759777	
66	603393	6759839	
66	603479	6759891	
66	603502	6759817	
66	603416	6759754	
66	603382	6759748	
66	603319	6759754	
66	603325	6759777	
67	603792	6760056	Yes
67	603872	6760084	Yes
67	603883	6760033	Yes
67	603786	6759965	Yes
67	603712	6759959	Yes
67	603724	6760016	Yes
67	603758	6760033	Yes

67	603792	6760056	Yes
68	605797	6759743	Yes
68	605900	6759520	Yes
68	605985	6759435	Yes
68	606025	6759429	Yes
68	606014	6759463	Yes
68	605985	6759515	Yes
68	605934	6759629	Yes
68	605877	6759714	Yes
68	605849	6759765	Yes
68	605792	6759817	Yes
68	605740	6759845	Yes
68	605752	6759777	Yes
68	605780	6759748	Yes
68	605797	6759743	Yes
69	605905	6758626	
69	605991	6758529	
69	606048	6758478	
69	606059	6758432	
69	605962	6758467	
69	605917	6758535	
69	605894	6758586	
69	605888	6758615	
69	605905	6758626	
70	606119	6757823	
70	606191	6757713	
70	606240	6757642	
70	606262	6757680	
70	606223	6757746	
70	606196	6757795	
70	606169	6757834	
70	606136	6757839	
70	606119	6757823	
71	606322	6756379	
71	606366	6756264	
71	606405	6756215	
71	606448	6756171	
71	606459	6756226	
71	606426	6756275	
71	606399	6756314	
71	606377	6756352	
71	606350	6756374	
71	606322	6756379	
72	602689	6750946	
72	602777	6750946	
72	602865	6750946	
72	602865	6751001	
72	602799	6751012	
72	602766	6751012	
72	602700	6751012	
72	602678	6750979	
72	602689	6750946	

Table 2 presents the location of the conductive anomalies identified in the survey area and grouped into zones in Table 1. The east and north coordinates are the UTM location of the anomalies. The RTP_MAG column represents the reduced to the pole magnetic intensity value corresponding to this location. A background of 57000nT has been removed from each value.

Table 2

East	North	RTP_MAG
602215	6757043	225
602231	6756683	162
602403	6756855	35
602403	6757084	114
602412	6757518	198
602600	6757780	184
602616	6757101	-7
602608	6756708	-54
602780	6756699	-56
602788	6757322	-18
602780	6757682	151
602788	6758026	180
602977	6758206	181
602977	6757977	128
602977	6757731	77
602977	6757527	-47
603198	6757633	-46
603214	6758411	178
603394	6759795	173
603411	6759115	182
603419	6758599	95
603419	6758403	105
603386	6757658	-82
603386	6757346	1588
603583	6757600	-195
603599	6758354	103
603599	6758550	121
603591	6758681	72
603591	6759214	161
603591	6759558	154
603607	6759762	159
603796	6760000	127
603796	6759771	122
603796	6759443	115
603796	6759165	131
603804	6758771	-41
603804	6758665	-33
603804	6758386	201
603779	6757551	-212
603984	6757543	-236
603976	6758329	325
603976	6758616	126

603992	6758845	44
604000	6759214	101
603984	6759492	110
603984	6759951	76
604181	6759025	75
604181	6758763	46
604189	6758305	404
604181	6757846	-88
604181	6757379	-469
604377	6757215	-335
604393	6757764	-160
604377	6758264	505
604393	6758952	12
604598	6758853	-32
604598	6757764	-100
604590	6757363	-366
604582	6757076	-264
604787	6757248	-248
604999	6757453	-302
605794	6759771	112
605982	6759476	119
605982	6758501	124
606195	6757748	98
606400	6756265	856
605786	6754202	39
605794	6755004	434
605605	6754840	120
605597	6754505	33
605384	6754652	-40
605384	6754906	10
605188	6755119	33
605188	6754709	-41
605204	6754349	-24
605196	6753678	54
604991	6753653	63
605016	6754398	33
605016	6754759	-23
604999	6755176	-22
604803	6755291	-118
604819	6755127	15
604803	6754677	33
604795	6753637	91
604795	6753448	70
604615	6755160	52
604623	6755348	-61
604615	6755725	64
604795	6755709	134
604623	6756044	662
604385	6756159	252
604385	6755979	-5
604197	6753678	122
604009	6753727	129

603779	6753817	140
603583	6753792	150
603386	6753645	156
603206	6753571	183
604181	6754554	81
603984	6754529	98
603787	6754603	113
603591	6754611	140
603386	6754759	142
604393	6755094	104
604189	6755225	48
604025	6755283	94
604025	6755463	26
604205	6755709	-76
604017	6755692	-57
604205	6756093	-99
603992	6756167	-27
604205	6756192	-37
603583	6756069	-51
603804	6755577	31
603599	6755700	-15
603206	6756028	14
603190	6755012	148
602985	6754939	194
602993	6755160	116
602796	6755528	165
602608	6755487	194
602796	6755266	148
602592	6755176	200
602420	6755201	235
602420	6754660	232
602600	6754644	220
602788	6754652	191
603026	6753907	178
603009	6753440	170
602993	6752637	174
602985	6751753	115
603206	6751712	92
603403	6751597	24
604009	6751524	24
604795	6752465	46
604582	6752809	475
604410	6752695	187
604181	6752760	11
603992	6752850	112
603771	6752719	172
604582	6753268	100
604434	6753260	117
604000	6753145	95
603779	6753055	98
603591	6753055	85
603403	6753022	137

603394	6752793	273
603206	6752564	192
602190	6752244	143
602788	6753391	163
602796	6753940	176
602592	6753899	175
602592	6753653	194
602600	6753391	173
602387	6753342	161
602379	6753661	183
602190	6753456	175
602199	6753268	161
602199	6753014	158
601994	6752736	100
602010	6753211	145
602002	6753407	179
601814	6753211	148
601797	6752744	131
601601	6751581	49
601593	6753080	161
601388	6752605	119
601224	6752572	113
601183	6751515	71
601388	6751581	40
602780	6750959	-38
600978	6752351	123
600782	6752228	84
600593	6752187	55
600413	6752195	47
600176	6752203	98
600413	6751614	154
600593	6751696	204
600798	6751761	158
600946	6751786	156
601200	6751884	157
600200	6753309	150
600397	6753391	159
604999	6753006	115
605196	6753293	143
605188	6752588	171
605008	6752433	54
605990	6754324	78
604604	6758265	614
604405	6752879	150

A list of the claims (with grant numbers) that were surveyed with the 2004 helicopter-borne geophysical survey is below. The claims are owned by Mike Mickey (50%) and Mark Lindsay (50%). The work on the claims was completed for Cordilleran Minerals Limited. The work was completed between August 1st and 7th, 2004.

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Statement of Qualifications - Michael W. Zang

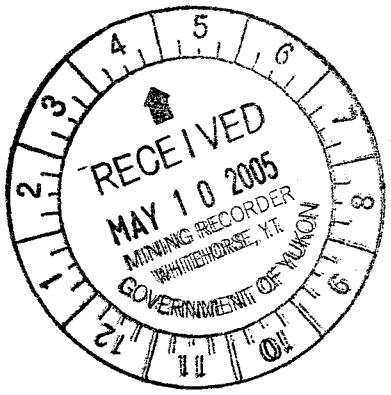
I, Michael W. Zang of 12579 Taylor Place, Summerland, in the Province of British Columbia, I do hereby certify that:

1. I am a graduate of York University, Faculty of Earth Science - degree (B.Sc.).
2. I have been engaged in mining exploration since 1981.
3. I am familiar with the use and interpretation of the airborne geophysical methods that are discussed in this report.
4. I hold no direct or indirect interest in, nor do I expect to receive any benefits from the mineral property or properties described in this report.

Signed by: _____
Michael W. Zang

Date: Feb. 8/05

INVOICE



Zang Geophysical Consultant
12579 Taylor Place
Summerland, B.C. V0H 1Z8
Fax 250 404 0388

Client:
Mark Lindsay
Cordilleran Minerals Ltd.
100 Platinum Road
Whitehorse, Yukon Territory
Y1A 6A9

Invoice #: 2005-002
Date: 9-Feb-2005

Project: Interpretation of Helicopter-borne Geophysical Survey, Canol Area, Yukon Territory

Units	Description	Unit cost		Cost
5	Geophysical Consulting (Airborne Mag, EM, Rad data processing and interpretation)	$800	$	4,000.00
		Sub Total:	$	4,000.00
		GST (7%):	$	280.00
		Total:	**$**	**4,280.00**

GST Reg. No: 85129 2946 RT0001

Payable upon receipt 2% over 30 days

LEGEND

McPhar Geosurveys Ltd. Hummingbird System

SURVEY PARAMETERS:

HELICOPTER TYPE: A-Star AS-350 BA

SURVEY DATE: August 2004

MEAN TERRAIN CLEARANCE: 60 metres

TRAVERSE LINE SPACING: 200 metres
Traverse Line Direction: 0°

CONTROL LINE SPACING: 2000 metres
Control Line Direction: 90°

ELECTROMAGNETIC SYSTEM:

Geotech HUMMINGBIRD 5 - Frequency System
Sensor Height: Nominally 30 metres above ground level
Sampling Rate: 10 reading/second

AIRBORNE MAGNETOMETER:

Geometrics G822A Cesium Magnetometer
Sensitivity: 0.001 nanoTesla (nT)
Noise level: ± 0.01 nanoTesla (nT)
Sensor Height: Nominally 30 metres above ground level
Sensor Location: Mounted inside HUMMINGBIRD EM bird

AIRBORNE GAMMARAY SPECTROMETER:

Pico-Envirotec GRS-410 multi-channel gamma-ray spectrometer with 16.8 litres "downward looking" NaI sensor and 4.2 litres "upward looking" NaI sensor
Sampling Rate: 1 reading/second
Sensor Height: Nominally 60 metres above ground level

ACQUISITION SYSTEM:

Geotech Data Acquisition System
Radar Altimeter: Terra TRA-3000/TRI-300

AIRBORNE NAVIGATION SYSTEM:

DGPSMAX 12-channel GPS System
Sampling Rate: 1 reading/second

BASE STATION GPS RECEIVER:
NovAtel 3751 R GPS System
Sampling Rate: 1 reading/second

- Ultramafic
- Granite
- Volcanics/Sediments
- Near Surface High Magnetic Intensity
- Magnetic Structure
- Meta Sediments
- 14 Conductive Zones
- 1 Electromagnetic Anomalies

Coaxial Coil Anomaly 980 Hz (Conductance, S)

- > 10000
- < 10000
- 1000 - 5000
- 500 - 1000
- 100 - 500
- 50 - 100
- 10 - 50
- < 10

Cordilleran Minerals Limited
Canol Survey Area Interpretation Map v1 **Helicopter-borne McPhar Geophysical Survey**
Contour Intervals: 0.001, 0.005, 0.025, 0.1 Siemens/metre
Zang Geophysical Consultant