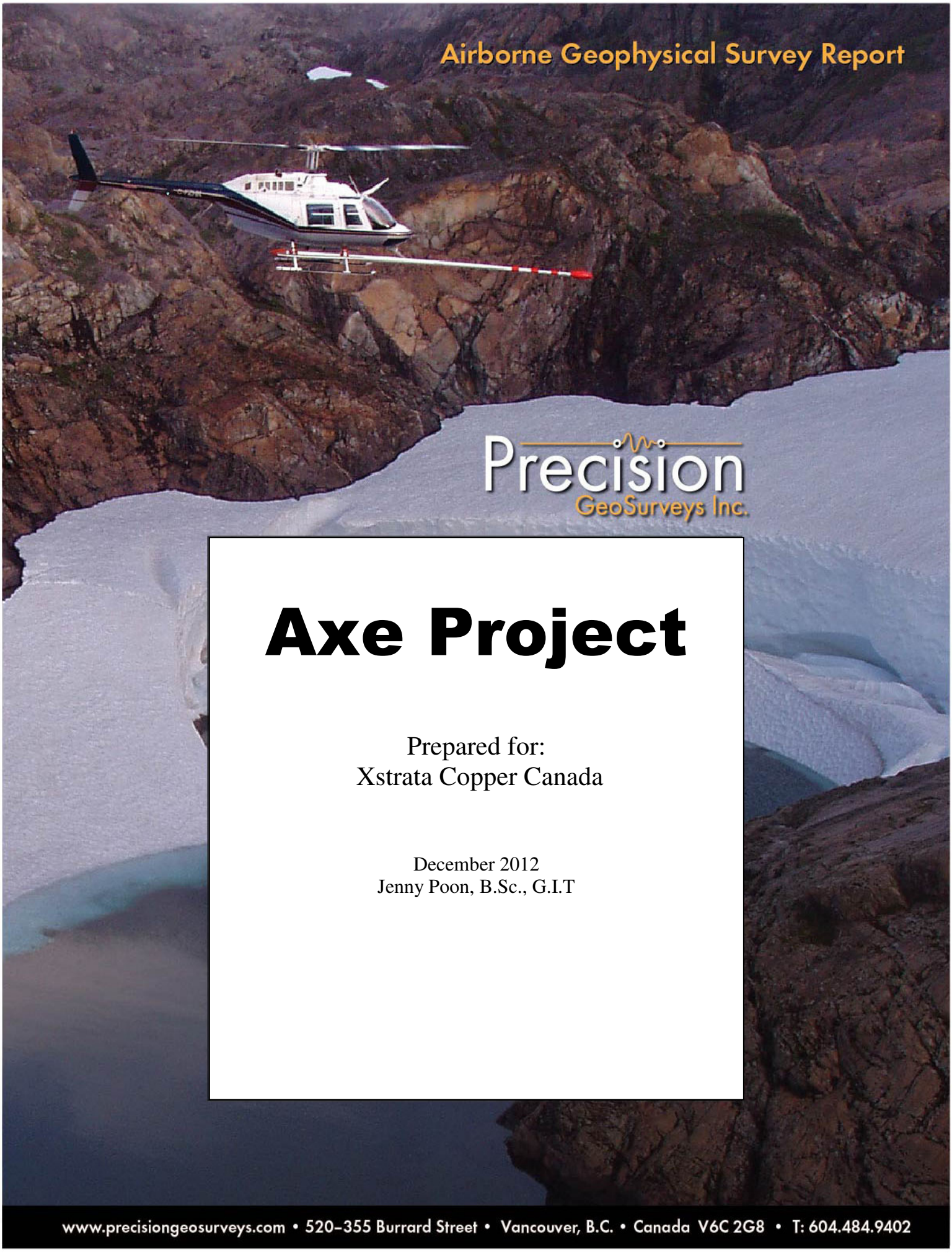
Appendix D

Airborne Magnetics and Radiometrics Maps



Axe Project

Prepared for:
Xstrata Copper Canada

December 2012
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1.0 Introduction:

This report outlines the survey operations and data processing actions taken during the airborne geophysical survey flown at the Axe property. The survey area is located north of Princeton, British Columbia, Canada (Figure 1). The airborne geophysical survey was flown by Precision GeoSurveys Inc. for Xstrata Copper Canada. The geophysical survey, carried out from November 30, 2012 to December 02, 2012, saw the acquisition of high resolution magnetic data.

Radiometric data were collected simultaneously along with the acquisition of magnetic data. However, with variable snow cover the radiometric data were compromised, therefore the data were corrected for to the best approximate concentrations and should be used with discretion.

Figure 1: Block location map.

1.1 Survey Area

The Axe property is located approximately 20 km north of Princeton (Figure 2) and approximately 56 km south east of Merritt.

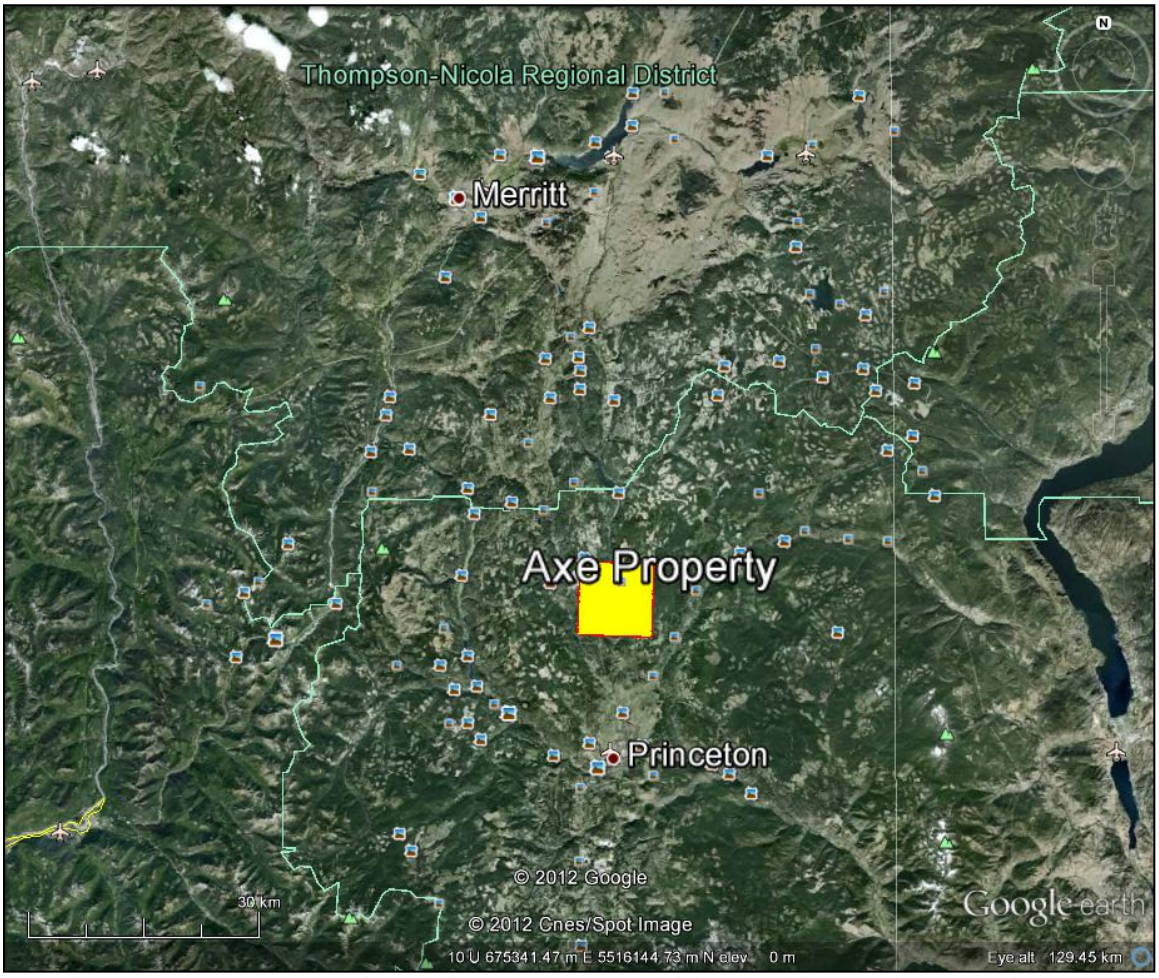

Figure 2: Axe property location relative to Princeton, British Columbia, Canada on Google Earth.

The survey block is approximately 9.4 km by 9.1 km (Figure 3). A total of 954 line kilometers of magnetic and radiometric data were flown for this survey; this total includes tie lines and survey lines.

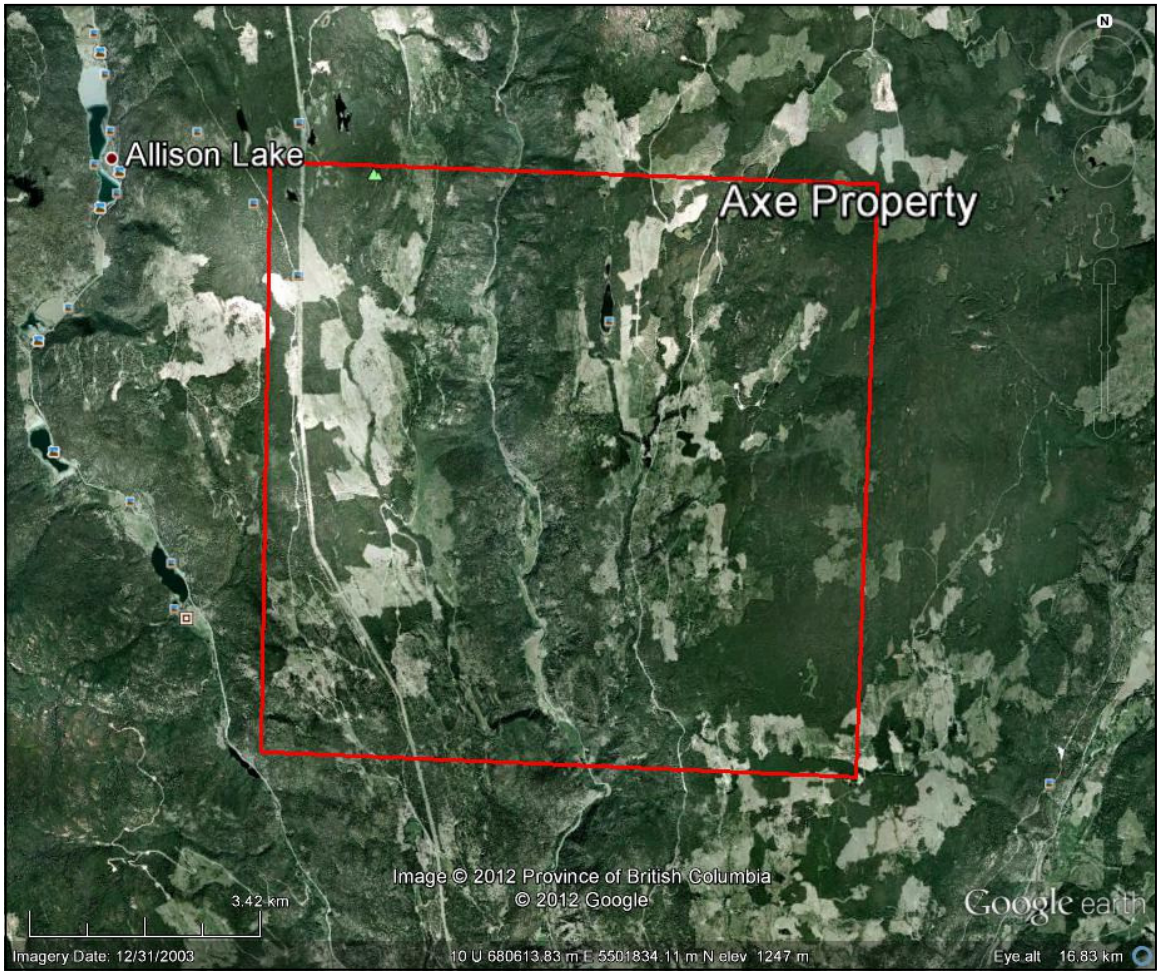

Figure 3: Axe property survey boundary in red.

The Axe property survey lines were flown at 100 meter spacing at a 090°/270° heading; the tie lines were flown at 1 km spacing at a heading of 000°/180° (Figures 4 and 5).

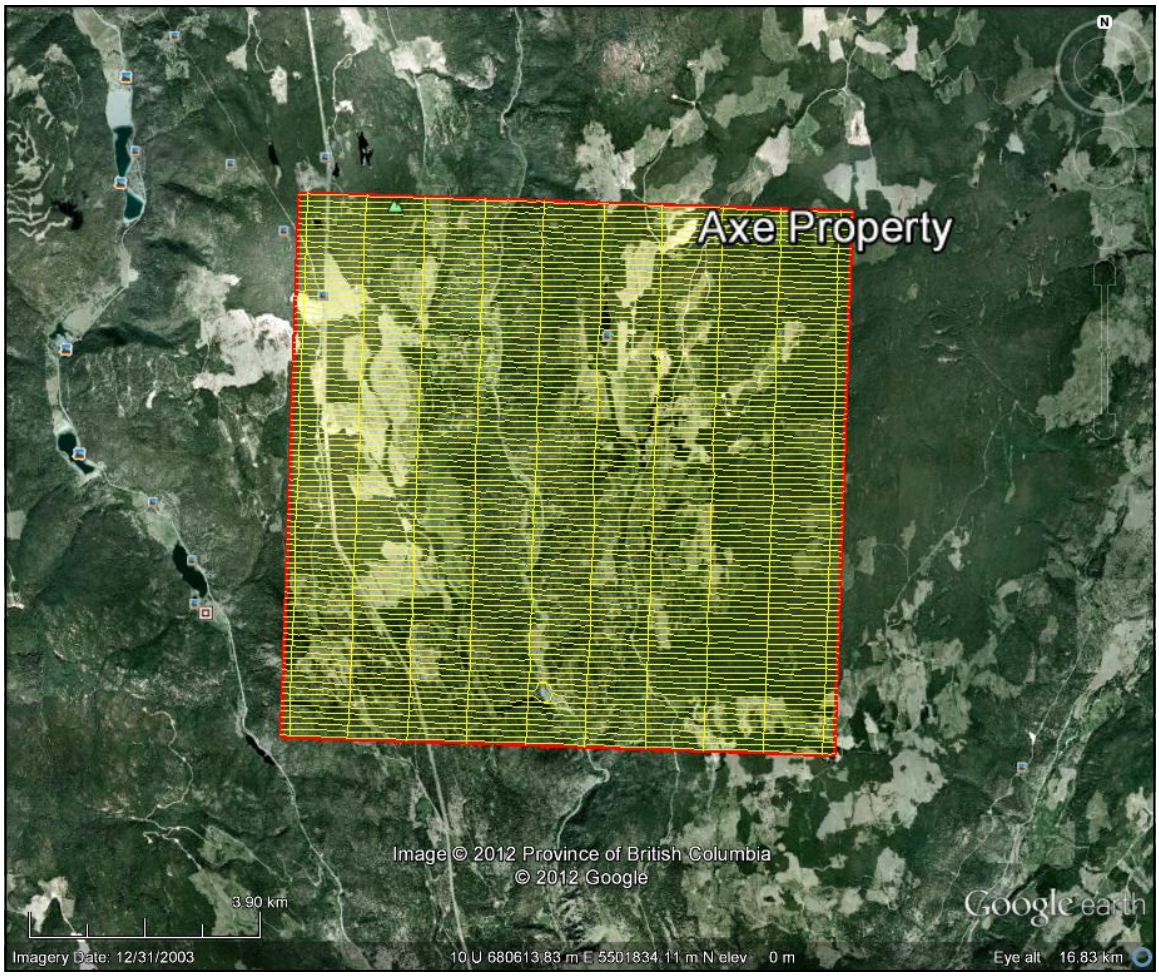

Figure 4: Plan View - Axe property with survey and tie lines outlined in yellow and the boundary in red.

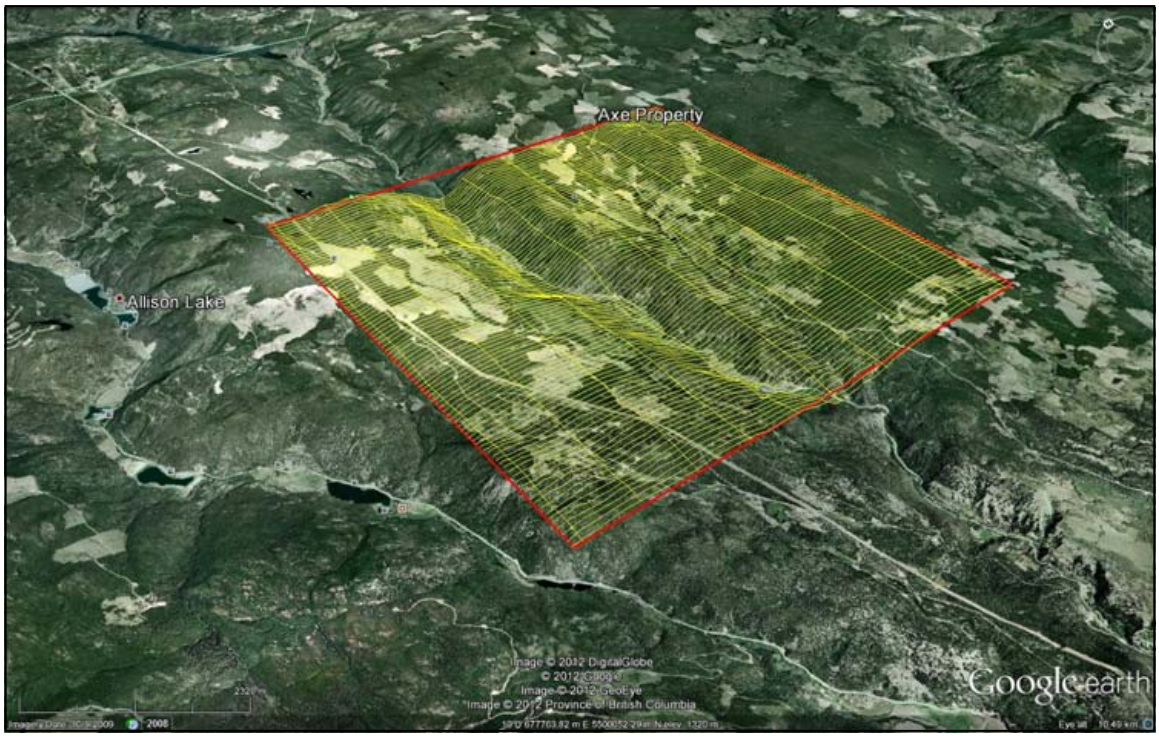

Figure 5: Terrain View - Axe property with survey and tie lines outlined in yellow and the boundary in red.

On Line 90 and Line 100, the pilot deviated off course and flew around a ranch to avoid disturbance to the occupants and livestock.

1.2 Survey Specifications:

The geodetic system used for this survey is NAD 83 and the area is contained in zone 10N (Figure 6). The survey data acquisition specifications and coordinates for the Axe property survey are specified as follows (Tables 1 and 2).

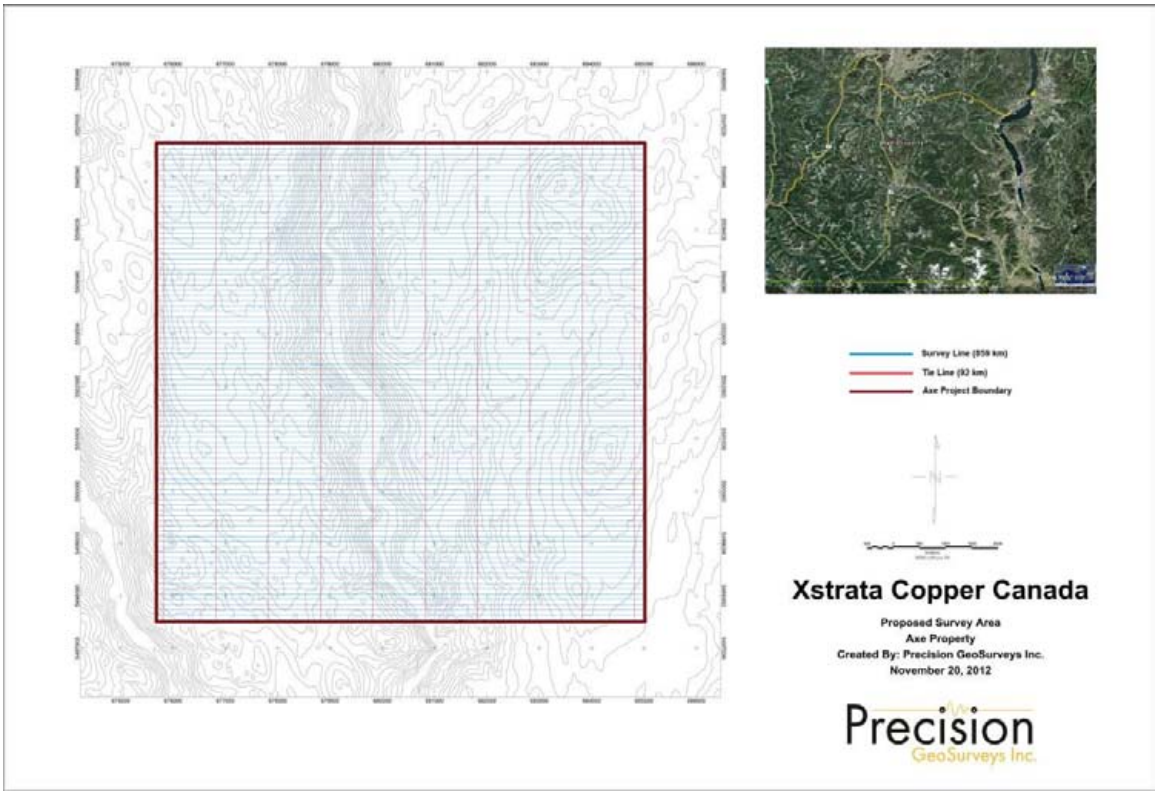

Figure 6: Survey map of Axe property showing proposed survey lines, tie lines and the block boundary.

Survey block	Line Spacing m	Planned Survey Line km	Planned Tie Line km	Total Planned Line km	Total Actual Flown km	Survey Line Orientation	Nominal Survey Height m
Axe	100	859	92	951	954	090°/270°	50
Total				951	954		

Table 1: Axe property survey acquisition specifications.

Longitude	Latitude	Easting	Northing
120.56840639	49.60455722	675682.03	5497505.03
120.56430510	49.68678355	675682.03	5506655.07
120.43501592	49.68399053	685017.03	5506655.07
120.43933434	49.60177226	685017.03	5497505.03

Table 2: Axe property survey polygon coordinates using NAD 83 in zone 10N.

2.0 Geophysical Data:

Geophysical data are collected in a variety of ways and are used to aid in the exploration and determination of geology, mineral deposits, oil and gas deposits, contaminated land sites and UXO detection.

For the purposes of this survey, airborne magnetic and radiometric data were collected to serve in the exploration of the Axe property.

2.1 Magnetic Data:

Magnetic surveying is probably the most common airborne survey type to be conducted for both mineral and hydrocarbon exploration. The type of survey specifications, instrumentation, and interpretation procedures, depend on the objectives of the survey. Typically magnetic surveys are performed for:

1. Geological Mapping to aid in mapping lithology, structure and alteration in both hard rock environments and for mapping basement lithology, structure and alteration in sedimentary basins or for regional tectonic studies.
2. Depth to Basement mapping for exploration in sedimentary basins or mineralization associated with the basement surface.

2.2 Radiometric Data:

Radiometric surveys detect and map natural radioactive emanations, called gamma rays, from rocks and soils. All detectable gamma radiation from earth materials come from the natural decay products of three primary elements; uranium (U), thorium (Th), and potassium (K). The purpose of radiometric surveys is to determine either the absolute or relative amounts of U, Th, and K in surface rocks and soils.

The amount of attenuating material such as snow, between the radioactive source and the gamma ray spectrometer affects the measured radiation. Each survey day, there was a new layer of fresh snow. Therefore, the U, Th, K, and TC counts have been affected by the variable snow cover at the survey property area. Snow cover can significantly attenuate radiation from the ground. 10 cm of fresh snow will attenuate gamma rays as

effectively as 10 m of air. For example, 2 cm of snow cover can reduce the penetration of gamma ray radiation by 35 %. The change in temperatures and pressures can lead to a change in air density by up to 30%. This effects the attenuation of gamma rays to the same extent. Atmospheric radon trapped in temperature inversion layers close to the ground can also adversely affect estimates of background radiation in airborne surveying (*IAEA, 2003).*

3.0 Survey Operations:

Precision GeoSurveys flew the survey out of Princeton, British Columbia. The experience of the pilot helped to ensure that the data quality objectives were met and that the safety of the flight crew was never compromised given the potential risks involved in airborne surveying. Field processing and quality control checks were done daily.

3.1 Operations Base and Crew:

The base of operation for this survey was at the Princeton Airport, British Columbia, Canada. The Precision crew consisted of three members:

Harmen Keyser– Pilot
Stian Vaage – Operator
Jenny Poon –Geophysicist

The survey was started on November 30, 2012 and completed on December 02, 2012. The survey encountered several minor delays due to poor weather conditions; snow storms and foggy conditions.

3.2 Base Station Specifications:

Two magnetic base stations were set up before the survey to ensure that diurnal activity was recorded during the survey flight. In this case, two GEM GSM 19T base stations GEM 3 (Serial # 5081669) and GEM 5 (Serial # 1094678) were set up and located close to the Princeton airport terminal, British Columbia, Canada (see Table 3).

Station name	Easting/ Northing	Longitude/ Latitude	Datum/ Projection
GEM 3 (Serial # 5081669)	0679974E, 5482346N	120° 30' 57.52" W 49° 28’ 01.46" N	NAD 83, Zone 10N
GEM 5 (Serial # 1094678)	0679974E, 5482348N	120° 30' 57.52" W 49° 28’ 01.52" N	NAD 83, Zone 10N

Table 3: Base station specifications.

Base station readings were reviewed at regular intervals to ensure that no data were collected during periods with high diurnal activity (greater than 5 nT per minute). The

base station was installed at a magnetically noise-free area, away from metallic items such as steel objects, vehicles, or power lines (Figure 7) that could affect the survey data.

Figure 7: GEM3 (left) and GEM5 (right) base station locations.

The diurnal magnetic variations recorded from the stationary base stations were removed from the magnetic data recorded in flight to ensure that the anomalies seen were real and not due to solar activity.

3.3 Field Processing and Quality Control:

On a flight-by-flight basis, the survey data were transferred from the helicopter's data acquisition system onto a USB flash drive and copied onto a field data processing laptop. The raw data files were in PEI binary data format and were converted into Geosoft GDB database format. Using Geosoft Oasis Montaj 7.5, the quality of the data was inspected to see if it met the contract specifications (see Table 4). If survey and tie lines exhibit excessive navigational deviation (left/right or up/down) from the contract specifications,

or were considered to be inferior quality, the lines were re-flown. All suspect anomalies, especially those found on a single flight line, were re-flown. Any re-flight lines were a minimum of 1500 m long, survey line re-flights crossed at least two tie lines, and tie line re-flights crossed at least 15 survey lines where applicable. For this survey project, no re-flights were required due to navigational error or excessive diurnal activity but re-flights were required due to spectrometer drop outs. All data were confirmed and verified by a geophysicist before the survey helicopter and crew demobilized on December 03, 2012.

Specification	Technology	Details
Line Spacing	Position	Flight line deviation from flight path by more than +/- 15 m left/ right for 1 km or more.
Height		Flight line deviation from height by more than +/- 10 up/down (with a nominal flight height of 50 m above ground) for 1 km or more.
Diurnal Variations	Magnetics	Non-linear magnetic diurnal variations exceed 10nT from a linear chord of length one (1) minute
Normalized 4th Difference		Magnetic data exceeding 0.25 nT peak to peak for distances greater than 1 km or more (provided noise is not due to geological or cultural features).
Test Line Data	Radiometrics	Test lines were not flown for this survey due to snow cover.

Table 4: Contract re-flight specifications.

4.0 Aircraft and Equipment:

All geophysical and subsidiary equipment are carefully installed and calibrated on Precision's aircraft. For this survey, a magnetometer, spectrometer, a data acquisition system, two base stations, a laser altimeter, a pilot guidance unit (PGU), and a GPS navigation system were required to carry out the survey and collect quality, high resolution data. The survey magnetometer was carried in an approved "stinger" configuration to enhance flight safety and improve data quality in this mountainous terrain.

4.1 Aircraft:

Precision GeoSurveys flew the Axe property using a Eurocopter AS350 helicopter (Figure 8), registration C-GOHK. The survey lines were flown at a nominal line spacing of one hundred (100) meters and the tie lines were flown at 1 km spacing for both the magnetometer and spectrometer. The average survey elevation was 54 meters vertically above ground.

Figure 8: Eurocopter AS350 equipped with mag stinger for magnetic data acquisition, and internal spectrometer crystals for radiometric data acquisition.

4.2 Equipment:

4.2.1 AGIS:

The Airborne Geophysical Information System, AGIS, (Figure 9), is the main computer used in data recording, data synchronizing, displaying real-time QC data for the geophysical operator, and the generation of navigation information for the pilot and operator display system.

Figure 9: AGIS installed in the Eurocopter AS350.

The AGIS was manufactured by Pico Envirotec; therefore the system uses standardized Pico software and external sensors are connected to the system via RS-232 serial communication cables. The AGIS data format is easily converted into Geosoft or ASCII file formats by a supplied conversion program called PEIView. Additional Pico software allows for post real time magnetic compensation and survey quality control procedures.

4.2.2 Magnetometer:

The magnetometer used by Precision GeoSurveys is a Scintrex cesium vapor CS-3 magnetometer. The system was housed in a front mounted "stinger" (Figure 10). The CS-3 is a high sensitivity/low noise magnetometer with automatic hemisphere switching and a wide voltage range, the static noise rating for the unit is +/- 0.01 nT. On the AGIS screen the operator can view the raw magnetic response, the magnetic fourth difference, aircraft position, and the survey altitude for immediate QC of the magnetic data. The magnetic data are recorded at 10 Hz. A magnetic compensator is also used to remove noise created by the movement of the helicopter as it pitches, rolls and yaws within the Earth's geomagnetic field.

Figure 10: View of the mag stinger.

4.2.3 Spectrometer:

The IRIS, or Integrated Radiometric Information System is a fully integrated, gamma radiation detection system containing 8.4 litres of NaI (T1) synthetic downward looking crystals (Figure 11) with 256 channel output at 1 Hz sampling rate. The IRIS is equipped with upward-shielding high density RayShield® gamma-attenuating material to minimize cosmic and solar gamma noise. Real time data acquisition, navigation and communication tasks are integrated into a single unit that is installed in the rear of the aircraft as indicated below. Information such as total count, counts of various radioelements (K, U, Th, etc.), temperature, cosmic radiation, barometric pressure, atmospheric humidity and survey altitude can all be monitored on the AGIS screen for immediate QC.

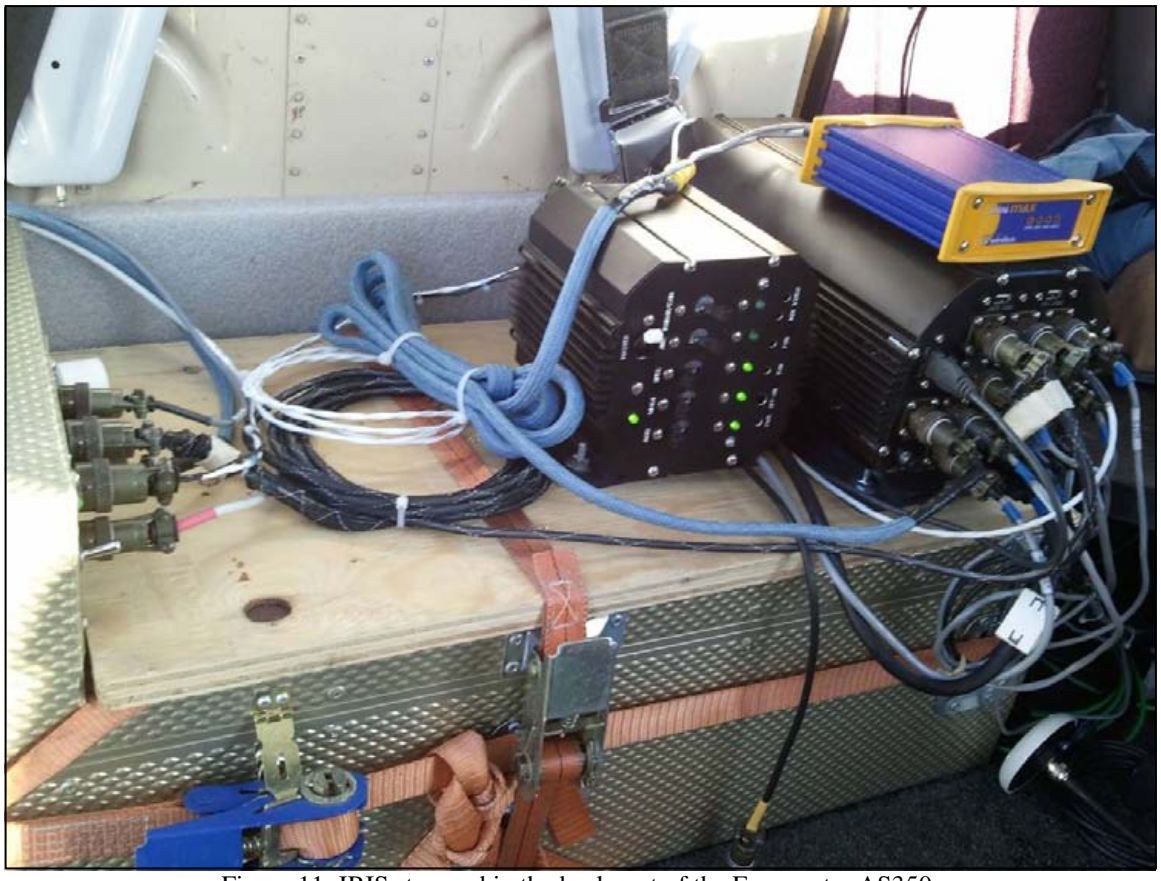

Figure 11: IRIS strapped in the back seat of the Eurocopter AS350.

4.2.4 Base Station:

For monitoring and recording of the Earth's diurnal magnetic field variation, Precision GeoSurveys operates two magnetometer base stations continuously throughout the airborne data acquisition survey. Precision GeoSurveys operates two GEM GSM-19T magnetometer base stations. The base stations were mounted as close to the survey block, and in an area with as low magnetic gradient, as possible to give accurate magnetic field data. Both of the base stations were located in an area away from electric transmission power lines and moving ferrous objects, such as aircraft and motor vehicles that could affect the survey data integrity.

The GEM GSM-19T magnetometer with GPS (Figure 12) uses the proton precession technology sampling at a rate of 0.5 Hz. The GSM-19T has an accuracy of +/- 0.2 nT at 1 Hz. Base station data recorded in the solid-state memory of the base station, are downloaded onto a field laptop using GEMLink 5.0 software. Profile plots of the base station readings are generated and updated at the end of each survey day.

Figure 12: GEM GSM-19T proton precession magnetometer.

4.2.5 Laser Altimeter:

The pilot is provided with terrain guidance and clearance information from an Acuity AccuRange AR3000 laser altimeter (Figure 13). This is attached at the aft end of the magnetometer boom. The AR3000 sensor is a time-of-flight sensor that measures distance by a rapidly-modulated and collimated laser beam that creates a dot on the target surface. The maximum range of the laser altimeter is 300 m off of natural surfaces with 90% reflectance and 3 km off special reflectors. Within the sensor unit, reflected signal light is collected by the lens and focused onto a photodiode. Through serial communications and digital outputs, the ground clearance data are transmitted and collected by the AGIS at 10 Hz.

Figure 13: Acuity AccuRange AR3000 laser altimeter.

4.2.6 Pilot Guidance Unit:

The PGU (Pilot Guidance Unit) is a graphical display type unit that provides continuous steering and elevation information to the pilot (Figure 14). It is mounted remotely from the data system on top of the instrument panel. The PGU assists the pilot to keep the helicopter on the flight path and at the desired ground clearance.

Figure 14: Pilot Guidance Unit.

The LCD monitor measures 7 inches, with a full VGA 800 x 600 pixel display. The CPU for the PGU is housed in the PC-104 console and uses Windows XP Embedded operating system control, with input from the GPS antenna, laser altimeter, and AGIS.

4.2.7 GPS Navigation System:

A Hemisphere GPS Mini Max navigation system integrated with the pilot display (PGU) and AGIS provided navigational information and control. The Hemisphere GPS Mini Max is composed of a receiver with an MGL-3 antenna (Figure 15). It has a position accuracy to within 1 meter and supports SBAS (WAAS, EGNS, and others), Beacon, and Satloc's patented e-Dif.

Figure 15: Hemisphere GPS – Mini Max

A differential correction signal (DGPS –Differential GPS) is applied to the GPS signal received through the MGL-3 antenna and can be applied up to 5 times per second (5 Hz). Therefore, the high- performance Mini Max differential correction provides positional accuracy on the order of 1 meter or less.

5.0 Data Acquisition Equipment Checks and Calibration:

Airborne equipment tests were conducted at the start of the survey. There are three tests conducted for the airborne magnetometer: compensation flight, lag test, and the heading error test (clover leaf test). Gamma ray spectrometer checks and calibrations are also conducted prior to the start of the survey. The three tests conducted were the calibration pad test, cosmic flight test, and the Breckenridge test range.

5.1 Magnetometer Checks:

5.1.1 Compensation Flight Test:

During aeromagnetic surveying noise is introduced to the magnetic data by the aircraft itself. Movement in the aircraft (roll, pitch and yaw) and the permanent magnetization of the aircraft parts (engine and other ferric objects) are large contributing factors to this noise. To remove this noise a process called magnetic compensation is implemented. The magnetic compensation process starts with a test flight at the beginning of the survey where the aircraft flies in the four orthogonal headings required for the survey ($090^o/270^o$ and $000^o/180^o$ in the case of this survey) at an altitude (typically > 1,500 m AGL) where there is no ground effect in the magnetic data. In each heading, three specified roll, pitch, and yaw maneuvers are performed by the pilot; these maneuvers provide the data that are required to calculate the necessary parameters for compensating the magnetic data.

5.1.2 Lag Test:

A lag test was performed to determine the relationship between the time the digital reading was recorded by the instrument and the time for the position fix that the fiducial of the reading was obtained by the GPS system.

The test was flown in the four orthogonal headings over an identifiable magnetic anomaly (ie. Truck, Trailer, etc.) at survey speed and height. A lag of 10 fiducials (1.0 seconds) was determined from the lag test.

5.1.3 Heading Error Test:

To determine the magnetic heading effect a cloverleaf pattern flight test was conducted. The cloverleaf test was flown in the same orthogonal headings as the survey and tie lines at >1000 m AGL in area with low magnetic gradient. For all four directions it must pass over the same mid-point all four times at the same elevation.

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/
/Direction Correction
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 180     -2.5429
 270     18.6047
 360     6.8219
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Table 5: Heading error test data results in Geosoft table format.

5.2 Gamma-ray Spectrometer Checks and Calibrations:

Pre-survey calibrations and testing of the GRS-10 airborne gamma-ray spectrometry system were carried out prior to the start of the survey. The calibration of the spectrometer system involved three tests which enabled the conversion of airborne data to ground concentration of natural radioactive elements. These tests were the calibration pad test, cosmic flight test, and the Breckenridge test range. The measurements were made in accordance with IAEA technical report series No. 323, “Airborne Gamma Ray Spectrometer Surveying”, and AGSO Record 1995/60, “A Guide to the Technical Specification for Airborne Gamma-Ray Surveys”.

5.2.1 Calibration Pad Test:

The calibration pad test was conducted by Pico Envirotec at the GSC (Geological Survey of Canada) testing facility in Ottawa, Ontario over the approved GSC calibration pad. It is a slab of concrete containing known concentrations of the radioelements (K, Th, and U) and is ideally used to stimulate a geological source of radiation. The measurements collected from the calibration pad test are used to determine the Compton scattering and Grasty Backscatter (spectral overlap between element windows) coefficients.

5.2.2 Cosmic Flight Test:

As the height of the aircraft increases, radiation in each spectral window increases exponentially due to radiation of cosmic origin. Also, the background source of radiation from the aircraft itself is constant. The cosmic flight test is conducted to determine the aircraft's background attenuation coefficients for the detector crystal packs and the cosmic coefficients.

The pilot is required to fly over the same location repeatedly in opposite directions starting from 1,500 m to 3,000 m at every 500 m interval for approximately 2 minutes each. Due to extremely high elevation in the survey area and low cloud cover, the test was not carried out within the survey area for safety reasons. Therefore, the standard values recommended for a single crystal pack were obtained from the IAEA Technical report.

5.2.3 Breckenridge Test Range:

The Breckenridge test range is very similar to the cosmic flight test but is conducted at lower elevations (from ground level). The pilot is required to fly over the same location at the following elevations in meters above ground; 30, 50, 100, 150, 200, 250, and 300. As the distance of the aircraft increases away from the radioactive source, the source signature exponentially degrades. As a result, this test is used to determine the altitude attenuation coefficients and the radio-element sensitivity of the airborne spectrometer system.

6.0 Data Processing:

After all the data were collected from a survey flight several procedures were undertaken to ensure that the data met a high standard of quality. All data were processed using Pico Envirotec software and Geosoft Oasis Montaj 7.5 geophysical processing software.

6.1 Magnetic Processing:

Before any processing and editing of the raw magnetic data, the data obtained from the compensation flight test must be applied to the raw magnetic data. A computer program called PEIComp was used to create a model from the compensation flight test for each survey to remove the noise induced by aircraft movement; this model was applied to each survey flight so the data can be further processed.

Over water or fog, the laser altimeter is unable to record a valid reading; therefore all data points recorded at zero were replaced with a nominal height of 50 m. Filtering was then applied to the laser altimeter data to remove vegetation clutter and to show the actual ground clearance. To remove vegetation clutter a Rolling Statistic filter was applied to the laser altimeter data and a low pass filter was used to smooth out the laser altimeter profile to remove isolated noise. As a result, filtering the data will yield a more uniform surface in close conformance with the actual terrain. A digital terrain model channel was calculated by subtracting the filtered laser altimeter data from the filtered GPS altimeter data defined by the WGS 84 ellipsoidal height.

The processing of the magnetic data first involved the correction for diurnal variations. The base station data were edited, plotted and merged into a Geosoft (.gdb) database daily. The airborne magnetic data were corrected for diurnal variations by subtracting the observed magnetic base station deviations. Following the diurnal correction, a lag correction was applied. A lag correction of 1.0 seconds was applied to the total magnetic field data to compensate for the lag in the recording system as the magnetometer sensor flies 5.70 m ahead of the GPS antenna. Lastly, a heading correction was applied to the data. As a result, after all corrections have been applied the initial Total Magnetic Intensity (TMI) data was generated.

The initial Total Magnetic Intensity (TMI) data from the survey and tie lines were used to level the entire survey dataset. Two forms of leveling were applied to the corrected data: conventional leveling and micro-leveling. There were two components to conventional leveling; the first involved statistical leveling of magnetic data to correct miss ties (intersection errors) followed by specific patterns or trends. For the second component, tie lines were brought to a common regional base value using the mean value of the cross-level error. To obtain the best possible leveled data, individual corrections were edited at selected intersections. Lastly, micro-leveling was applied to the corrected conventional leveled data. This will remove any residual noise related to flight line direction, and any low amplitude component of flight line noise, that still remained in the data after tie line leveling.

6.1.1 IGRF Removal and Calculation of the First Vertical Derivative

The International Geomagnetic Reference Field (IGRF) model is the empirical representation of the Earth's magnetic field (main core field without external sources) collected and disseminated magnetic field data from satellites and from observatories around the world. The IGRF is generally revised and updated every five years by a group of modelers associated with the International Association of Geomagnetism and Aeronomy (IAGA). In this case, the IGRF values were calculated from model year 2010 and the actual survey dates were obtained from the "Date" channel.

A Residual Magnetic Intensity (RMI) will have resulted with the removal of the IGRF from the observed Total Magnetic Intensity (TMI). This will create a more valid model of individual near surface anomalies and the data will not be referenced to a time which can be easily incorporated into databases of magnetic data acquired in the past or in the future.

The first vertical derivative is computed from the Residual Magnetic Intensity (RMI) data. The filter suppresses the long wavelengths and computes the vertical rate of change in the magnetic field. Therefore, it enhances and highlights the edges of magnetic anomalies and increases spatial resolution.

6.2 Radiometric Processing:

Radiometric surveys map the concentration of radioelements in the upper thin layer of the earth's surface; typically up to 1.5 meters below surface. Therefore, radiometric surveys are not effective over water bodies or snow covered area as the surficial features can effectively mask and attenuate the radiometric source signals. Furthermore radon gases, occurring naturally as an indirect decay product of uranium can also affect the measured counts. Daughter products of the decay of radon gases are created and unlike the gaseous radon itself, radon daughters are solids and stick to surfaces, such as dust particles in the atmosphere. Snow, rain, or fog conditions can cause the radioactive particles to precipitate which will lead to an increase in apparent uranium concentration hence giving a false representation of the true ground concentration.

Under the Axe project survey conditions, the corrected concentration of U, Th, K, and TC should be used with caution.

Calibrating the spectrometer system in the helicopter was the first and vital step before the airborne radiometric data can be processed. Once calibration of the system has been complete, the radiometric data are processed by windowing the full spectrum to create channels for U, K, Th and total count. A 5-point Hanning filter was applied to the Cosmic window before going any further with processing the radiometric data.

Aircraft background and cosmic stripping corrections were applied to all three elements, and total count using the following formula:

$$C_{ac} = C_{lt} - (a_c + b_c * \mathrm{Cos}_f)$$

where: C_{ac} is the background and cosmic corrected channel
C_{lt} is the live time corrected channel
a_c is the aircraft background for this channel
b_c is the cosmic stripping coefficient for this channel
Cos_f is the filtered cosmic channel

The radon backgrounds are first removed followed by Compton stripping. Spectral overlap corrections are applied on to potassium, uranium, and thorium as part of the Compton stripping process. This is done by using the stripping ratios that have been calculated for the spectrometer by prior calibration; this breaks the corrected elemental values down into the apparent radioelement concentrations. Lastly, attenuation corrections are applied to the data which involves nominal survey altitude corrections, in this case 54 metres is applied to total count, potassium, uranium, and thorium data.

With all corrections applied to the radiometric data, the final step is to convert the corrected potassium, uranium, and thorium to apparent radioelement concentrations using the following formula:

$$eE = C_{cor} / s$$

where: eE is the element concentration K(%) and equivalent element concentration of U(ppm) & Th(ppm)
s is the experimentally determined sensitivity
C_{cor} is the fully corrected channel

The corrected U, Th, K, and TC were then normalized between different survey flights to adjust and remove to the best estimate of the average noise contributed from different thickness of snow per flight and other noise sources. A three-point Hanning filter was applied to the final U, Th, K, and TC before radiometric ratios were calculated.

Calculation of radiometric ratios follow the guidelines of the IAEA. Due to statistical uncertainties in the individual radioelement measurements, some care was taken in the calculation of the ratio in order to obtain statistically significant values. Following IAEA guidelines, the method of determining ratios of the eU/eTh, eU/K and eTh/K was as follows:

1. Any data points where the potassium concentration was less than 0.25% were neglected.

2. The element with the lowest corrected count rate was determined.
3. The element concentrations of adjacent points on either side of each data point were summed until they exceeded a certain threshold value. This threshold was set to be equivalent to 100 counts of the element with the lowest count rate. Additional minimum thresholds of 1.6% for potassium, 20 ppm for thorium, and 30 ppm for uranium were set up to insure meaningful ratios.
4. The ratios were calculated using the accumulated sums.

With this method, the errors associated with the calculated ratios will be similar for all data points.

7.0 Deliverables:

All digital data are presented on a compact disc (CD) with the logistic report. The survey data are presented as digital databases, maps, and a report.

7.1 Digital Data:

The file format will be provided in two (2) formats, the first will be a .GDB file for use in Geosoft Oasis Montaj, the second format will be a .XYZ file, this is text file. A complete file provided in each format will contain both magnetic and radiometric data. Full description of the digital data and contents are included in the report (Appendix B).

The digital data are represented into grids. The following grids prepared for the Axe property are listed below:

- Digital terrain model (DTM)
- Total magnetic intensity (TMI)
- Residual Magnetic Intensity (RMI) – removal of IGRF from TMI
- Calculated vertical gradient (CVG) - first vertical derivative of RMI
- Potassium (Kcor) - radiometric data in percentage
- Thorium (Thcor) - radiometric data in concentrations
- Uranium (Ucor) - radiometric data in concentrations
- Total count (TCcor) – radiometric data in concentrations
- Thorium over Potassium ratio (eTh/%K ratio) – radiometric ratios
- Uranium over Potassium ratio (eU/%K ratio) – radiometric ratios
- Uranium over Thorium ratio (eU/%Th ratio) – radiometric ratios

7.2 KMZ Grids:

The digital data represented into grids are exported into kmz files which can be displayed using Google Earth. The grids are draped onto topography and rendered to give a 3D view.

7.3 Maps:

Digital maps were created for the Axe property. The following map products were prepared:

Survey Overview Maps (colour images with elevation contour lines):

- Flight lines
- Digital terrain model

Magnetic Maps (colour images with elevation contour lines):

- Total magnetic intensity
- Residual magnetic intensity
- Residual magnetic intensity with plotted flight lines
- Calculated vertical gradient of the residual magnetic intensity

Gamma-ray Spectrometry Maps (colour images with elevation contour lines):

Radiometric data were collected with variable snow cover. Please use with discretion.

- Potassium – percentage
- Thorium – equivalent concentration
- Uranium – equivalent concentration
- Total Count – equivalent dose rate
- Thorium over Potassium ratio
- Uranium over Potassium ratio
- Uranium over Thorium ratio

All maps were prepared in North American Datum 83 (NAD 83), and UTM zone 10N.

7.4 Report:

The report provides information about the acquisition procedures, magnetic and radiometric processing, and presentation of the Axe property survey data. A pdf copy of the report is included along with the digital data and maps that are provided on the CD.

Appendix A

Equipment Specifications

- GEM GSM-19T Proton Precession Magnetometer (Base Station)
- Hemisphere GPS – Mini Max
- Scintrex CS-3 Survey Magnetometer
- Bartington Mag-03 three-axis fluxgate magnetic field sensor
- Pico Envirotec GRS-10 Gamma Spectrometer
- Pico Envirotec AGIS data recorder system (for Navigation, Gamma spectrometer, VLF-EM and Magnetometer Data Acquisition)

GEM GSM-19T Proton Precession Magnetometer (Base Station)

Configuration Options	15
Cycle Time	999 to 0.5 sec
Environmental	-40 to +60 ° Celsius
Gradient Tolerance	7,000 nT/m
Magnetic Readings	299,593
Operating Range	10, 000 to 120,000 nT
Power	12 V @ 0.62 A
Sensitivity	0.1 nT @ 1 sec
Weight (Console/ Sensor)	3.2 Kg
Integrated GPS	Yes

Hemisphere GPS – MiniMax

GPS Sensor Specifications	Receiver Type	LI, C/A code, with carrier phase smoothing
	Channels	I2-channel, parallel tracking (10-channel when tracking SBAS)
	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
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	2.5µV for 6dB SNR @ 200 bps
	Dynamic Range	100dB
	Frequency Offset	±8 Hz (~ 27 ppm)
	Adjacent Channel Rejection	61 dB ± 1dB @ fo ± 400 Hz
Communications	Serial ports	2 full duplex
	Interface Level	RS-232C
	Baud Rates	4800, 9600, 19200
	Correction Input/ Output Protocol	RTCM SC-104
	Raw Measurement Data	Proprietary binary (RINEX utility available)
	Timing Output	1 PPS (HCMOS, active high, rising edge sync, 10kΩ, 10pF load)
Environmental	Operating Temperature	-32^{0}C to +74°C
	Storage Temperature	-40^{0}C to +85°C
	Humidity	95% non-condensing
	EMC	FCC Part I 5, Subpart B, Class B CISPR 22
Power	Input Voltage Range	9 to 32 VDC
	Reverse Polarity Protection	Yes
	Power Consumption	3W
	Current Consumption	<250 mA @ 12 VDC
	Antenna Short Circuit Protection	Yes

Scintrex CS-3 Survey Magnetometer

Operating Principal	Self-oscillation split-beam Cesium Vapor (non-radioactive Cs-133)
Operating Rage	15,000 to 105,000 nT
Gradient Tolerance	40,000 nT/metre
Operating Zones	10° to 85° and 95° to 170°
Hemisphere Switching	a) Automatic b) Electronic control actuated by the control voltage levels (TTL/CMOS) c) Manual
Sensitivity	0.0006 nT √Hz rms.
Noise Envelope	Typically 0.002 nT P-P, 0.1 to 1 Hz bandwidth
Heading Error	+/- 0.25 nT (inside the optical axis to the field direction angle range 15° to 75° and 105° to 165°)
Absolute Accuracy	<2.5 nT throughout range
Output	a) continuous signal at the Larmor frequency which is proportional to the magnetic field (proportionality constant 3.49857 Hz/nT) sine wave signal amplitude modulated on the power supply voltage b) square wave signal at the I/O connector, TTL/CMOS compatible
Information Bandwidth	Only limited by the magnetometer processor used
Sensor Head	Diameter: 63 mm (2.5”) Length: 160 mm (6.3”) Weight: 1.15 kg (2.6 lb)
Sensor Electronics	Diameter: 63 mm (2.5”) Length: 350 mm (13.8”) Weight: 1.5 kg (3.3 lb)
Cable, Sensor to Sensor Electronics	3m (9’ 8”), lengths up to 5m (16’ 4”) available
Operating Temperature	-40°C to +50°C
Humidity	Up to 100%, splash proof
Supply Power	24 to 35 Volts DC
Supply Current	Approx. 1.5A at start up, decreasing to 0.5A at 20°C
Power Up Time	Less than 15 minutes at -30°C

Bartington Mag-03 three-axis fluxgate magnetic field sensor

Number of axes	3
Bandwidth	0 to 3kHz at 50µT peak
Internal Noise: **Basic version** **Standard version** **Low Noise version**	 >10 to 20pTrms/√Hz at 1Hz 6 to ≤10pTrms/√Hz at 1Hz <6pTrms/√Hz at 1Hz
Scaling error (DC)	<±0.5%
Orthogonality error	<0.1°
Alignment error (Z axis to reference face)	<0.1°
Linearity error	<0.0015%
Frequency response	0 to 1kHz maximally flat, ±5% maximum at 1kHz
Input voltage	±12V to ±17V
Supply current	+30mA, -10mA (+1.4mA per 100µT for each axis)
Power supply rejection ratio	5µV/V (-106dB)
Analog output	±10V (±12V supply) swings to within 0.5V of supply voltage
Output impedance	10 Ω
Operating temperature range	-40°C to +70°C
Environmental protection	IP51
Dimensions (W x H x L)	32 x 32 x 152mm
Weight	160g
Enclosure material	Reinforced epoxy
Connector	ITT Cannon DEM-9P-NMB
Mating connector	ITT Cannon DEM-9S-NMB
Mounting	2 x M5 fixing holes

Pico Envirotec GRS-10 Gamma Spectrometer

Crystal volume	8.4 litres of NaI (T1) downward crystals
Resolution	256/512 channels
Tuning	Automatic using peak determination algorithm
Detector	Digital Peak
Calibration	Fully automated detector
Real Time	Linearization and gain stabilization
Communication	RS232
Detectors	Expandable to 10 detectors and digital peak
Count Rate	Up to 60,000 cps per detector
Count Capacity per channel	65545
Energy detection range:	36 KeV to 3 MeV
Cosmic channel	Above 3 MeV
Upward Shielding	RayShield® non-radioactive shielding on downward looking crystals
Spectra	Collected spectra of 256/512 channels, internal spectrum resolution 1024
Software	**Calibration:** High voltage adjustment, linearity correction coefficients calculation, and communication test support **Real Time Data Collection:** Automatic Gain real time control on natural isotopes, and PC based test and calibration software suite
Sensor	Each box containing two (2) gamma detection NaI(Tl) crystals – each 4.2 liters. (256 cu in.) (approx. 100 x 100 x 650 mm) Total volume of approx 8.4 litres or 512 cu in with detector electronics
Spectra Stabilization	Real time automatic corrections on radio nuclei: Th, Ur, K. No implanted sources.

Pico Envirotec AGIS data recorder system
(for Navigation, Gamma spectrometer, VLF-EM and Magnetometer Data Acquisition)

Functions	Airborne Geophysical Information System (AGIS) with integrated Global Positioning System Receiver (GPS) and all necessary navigation guidance software. Inputs for geophysical sensors - portable gamma ray spectrometer GRS-10, MMS4 Magnetometer, Totem 2A EM, A/D converter, temperature probe, humidity probe, barometric pressure probe, and laser altimeter. Output for the 2 line Pilot Indicator
Display	Touch screen with display of 800 x 600 pixels; customized keypad and operator keyboard. Multi-screen options for real-time viewing of all data inputs, fiducial points, flight line tracking, and GPS channels by operator.
GPS Navigation	Garmin 12-channel, WAAS-enabled
Data Sampling	Sensor dependent
Data Synchronization	Synchronized to GPS position
Data File	PEI Binary data format
Storage	80 GB
Supplied Software	**PEIView:** Allows fast data Quality Control (QC) **Data Format:** Geosoft GBN and ASCII output **PEIConv**: For survey preparation and survey plot after data acquisition
Software	**Calibration:** High voltage adjustment, linearity correction coefficients calculation, and communication test support **Real Time Data Collection:** Automatic Gain real time control on natural isotopes and PC based test and calibration software suite
Power Requirements	24 to 32 VDC
Temperature	Operating:-10 to +55 deg C; storage:-20 to +70 deg C

Appendix B

Digital File Descriptions

- Magnetic database description
- Radiometric database description
- Grids
- Maps

Magnetic Database:

Abbreviations used in the GDB files listed below:

Channel	Units	Description
X_NAD83	m	UTM Easting – NAD 83 Zone 10 North
Y_NAD83	m	UTM Northing – NAD 83 Zone 10 North
Lon_deg	deg	Longitude
Lat_deg	deg	Latitude
Date	yyyy/mm/dd	Dates of the survey flight(s)
FLT		Flight Line numbers
LineNo		Line numbers
Galt	m	GPS height – NAD 83 Zone 10 North
Lalt	m	Laser Altimeter readings
DTM	m	Digital Terrain Model
GPStime	Hours:min:secs	GPS time (UTC)
basemag	nT	Base station diurnal data
TMI	nT	Total Magnetic Intensity
IGRF		International Geomagnetic Reference Field 2010
Declin		Calculated declination of magnetic field
Inclin		Calculated inclination of magnetic field
RMI	nT	Residual Magnetic Intensity

Radiometric Database:

Abbreviations used in the GDB files listed below:

Channel	Units	Description
X_NAD83	m	UTM Easting – NAD 83 Zone 10 North
Y_NAD83	m	UTM Northing – NAD 83 Zone 10 North
Lon_deg	deg	Longitude
Lat_deg	deg	Latitude
Date	yyyy/mm/dd	Dates of the survey flight(s)
FLT		Flight numbers
LineNo		Line numbers
Galt	m	GPS height – NAD 83 Zone 10 North
Lalt	m	Laser Altimeter readings
DTM	m	Digital Terrain Model
BaroSTP_Kp	KiloPascal	Barometric Altitude (Press and Temp Corrected)
Temp_degC	Degrees C	Air Temperature
COSFILT	counts/sec	Spectrometer - Filtered Cosmic
K_cps	cps	Raw counts – Potassium
TH_cps	cps	Raw counts – Thorium
Ur_cps	cps	Raw counts – Uranium
TC_cps	cps	Raw counts – Total Count
IS1D_cps	cps	Summer spectrum for down looking crystals: 256 channels
Kcor	%	Percentage – Potassium
Thcor	ppm	Equivalent Concentration – Thorium
Ucor	ppm	Equivalent Concentration – Uranium
TCcor	µR	Equivalent Dose Rate
THKratio		Spectrometer – eTh/%K ratio
UKratio		Spectrometer – eU/%K ratio
UTHratio		Spectrometer – eU/eTh ratio

Grids: NAD83 Datum, Zone 10N

File Name	Description
AxeProperty_DTM.grd	Axe property digital terrain model
AxeProperty_TMI.grd	Axe property total magnetic intensity
AxeProperty_RMI.grd	Axe property residual magnetic intensity
AxeProperty_CVG.grd	Axe property calculated vertical gradient
AxeProperty_Kcor.grd	Axe property potassium (Kcor) percentage
AxeProperty_Thcor.grd	Axe property Thorium (Thcor) equivalent concentration
AxeProperty_Ucor.grd	Axe property Uranium (Ucor) equivalent concentration
AxeProperty_TCcor.grd	Axe property Total Count (TCcor) equivalent dose rate
AxeProperty_THKratio.grd	Axe property thorium over potassium ratio (eTh/%K)
AxeProperty_UKratio.grd	Axe property uranium over potassium ratio (eU/%K)
AxeProperty_UThratio.grd	Axe property uranium over thorium ratio (eU/eTh)

Maps: NAD83 Datum, Zone 10N

File Name	Description
AxeProperty_FlightLines.pdf	Axe property flight lines flown
AxeProperty_DTM.pdf	Axe property digital terrain model
AxeProperty_TMI.pdf	Axe property total magnetic intensity
AxeProperty_RMI.pdf	Axe property removal of IGRF from TMI to create residual magnetic intensity
AxeProperty_RMI_with_Flightlines.pdf	Axe property total magnetic intensity with flight lines flown
AxeProperty_CVG.pdf	Axe property calculated vertical gradient of RMI
AxeProperty_Potassium_Percentage.pdf	Axe property potassium (Kcor) precentage
AxeProperty_Thorium_EquivalentConcentration.pdf	Axe property Thorium (Thcor) equivalent concentration
AxeProperty_Uranium_EquivalentConcentration.pdf	Axe property Uranium (Ucor) equivalent concentration
AxeProperty_TotalCount_EquivalentDoseRate.pdf	Axe property Total Count (TCcor) equivalent dose rate
AxeProperty_Thorium_over_Potassium_Ratio.pdf	Axe property thorium over potassium ratio
AxeProperty_Uranium_over_Potassium.pdf	Axe property uranium over potassium ratio
AxeProperty_Uranium_over_Thorium_Ratio.pdf	Axe property uranium over thorium ratio

Appendix C

Axe property Maps

Survey Overview Maps (colour image with elevation contour lines):

- Flight Lines (FL)
- Digital Terrain Model (DTM)

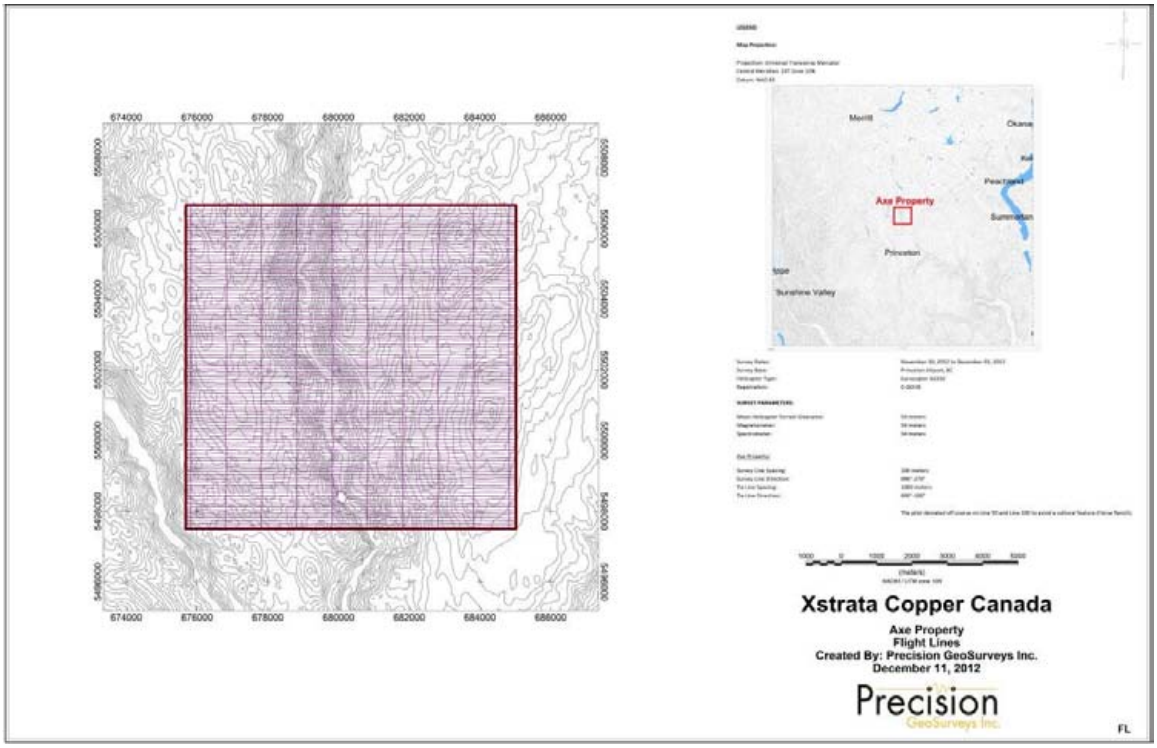
Magnetic Maps (colour image with elevation contour lines):

- Total Magnetic Intensity (TMI)
- Residual Magnetic Intensity (RMI)
- Residual Magnetic Intensity (RMI) with flight lines
- Calculated Vertical Gradient (CVG)

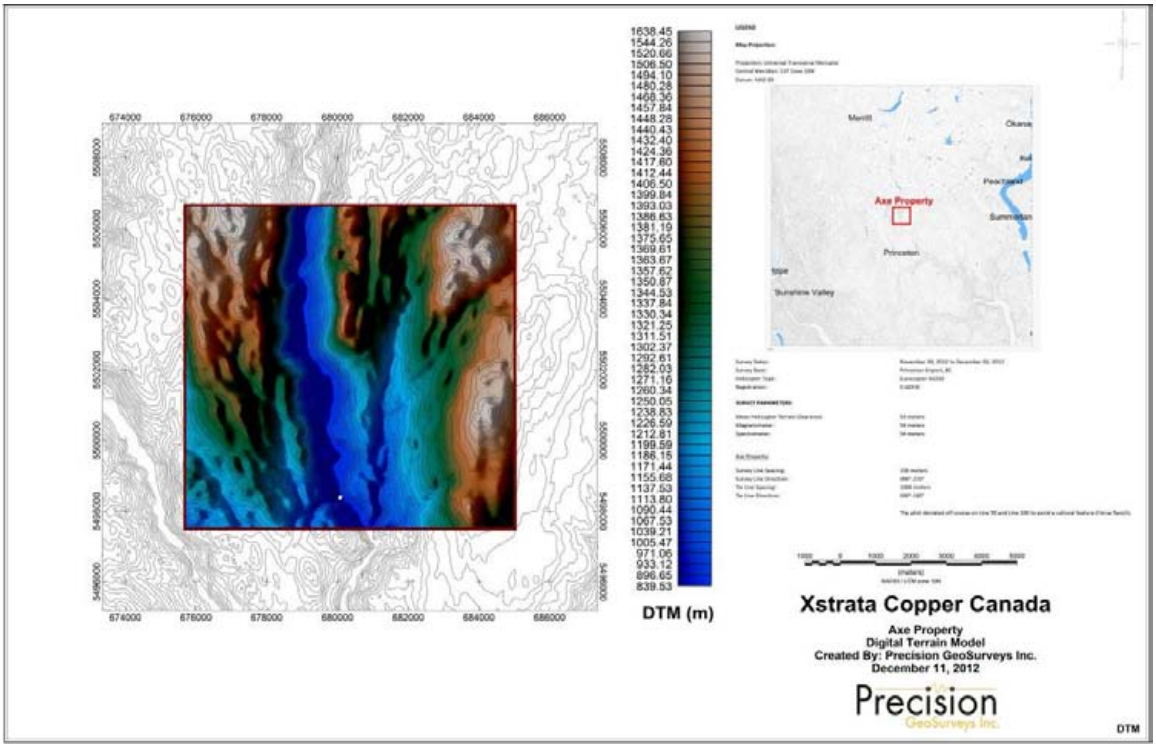
Gamma-Ray Spectrometry Maps (colour image with elevation contour lines):

Radiometric data were collected with variable snow cover. Please use with discretion.

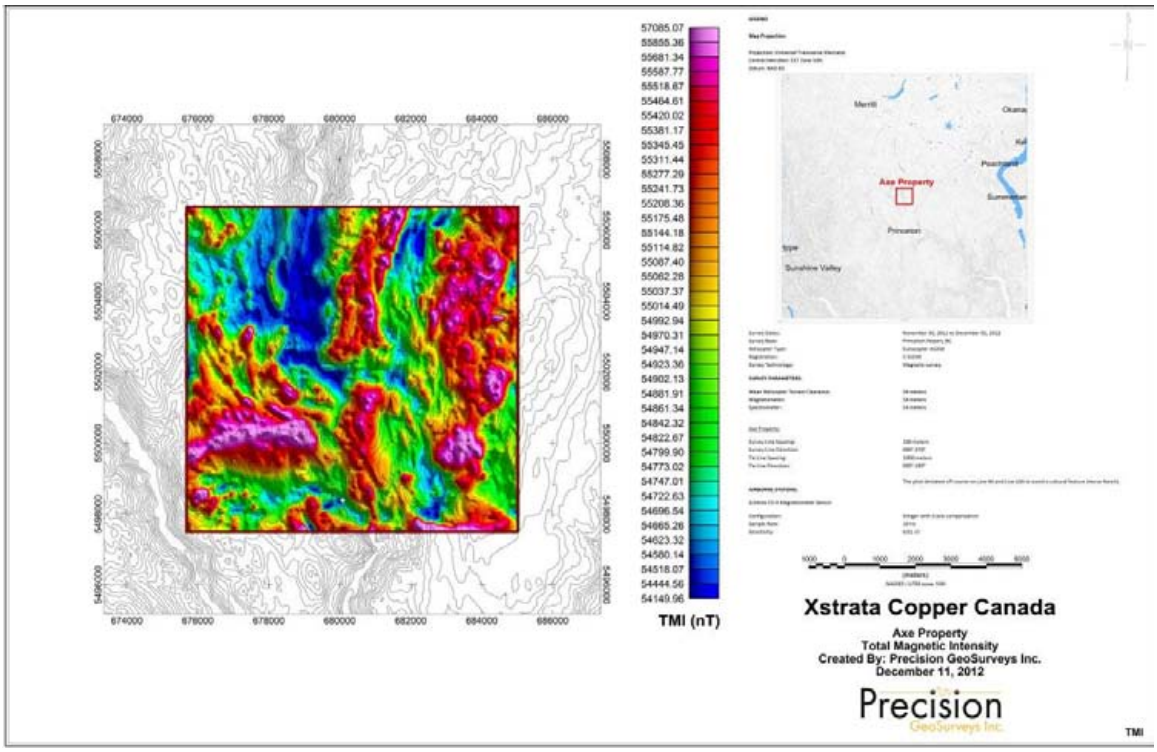
- Potassium – Percentage (% K)
- Thorium – Equivalent Concentration (eTh)
- Uranium – Equivalent Concentration (eU)
- Total Count –Equivalent Dose Rate (TC)
- Thorium over Potassium Ratio - Spectrometer - eTh/%K ratio
- Uranium over Potassium Ratio - Spectrometer - eU/%K ratio
- Uranium over Thorium Ratio - Spectrometer - eU/eTh ratio



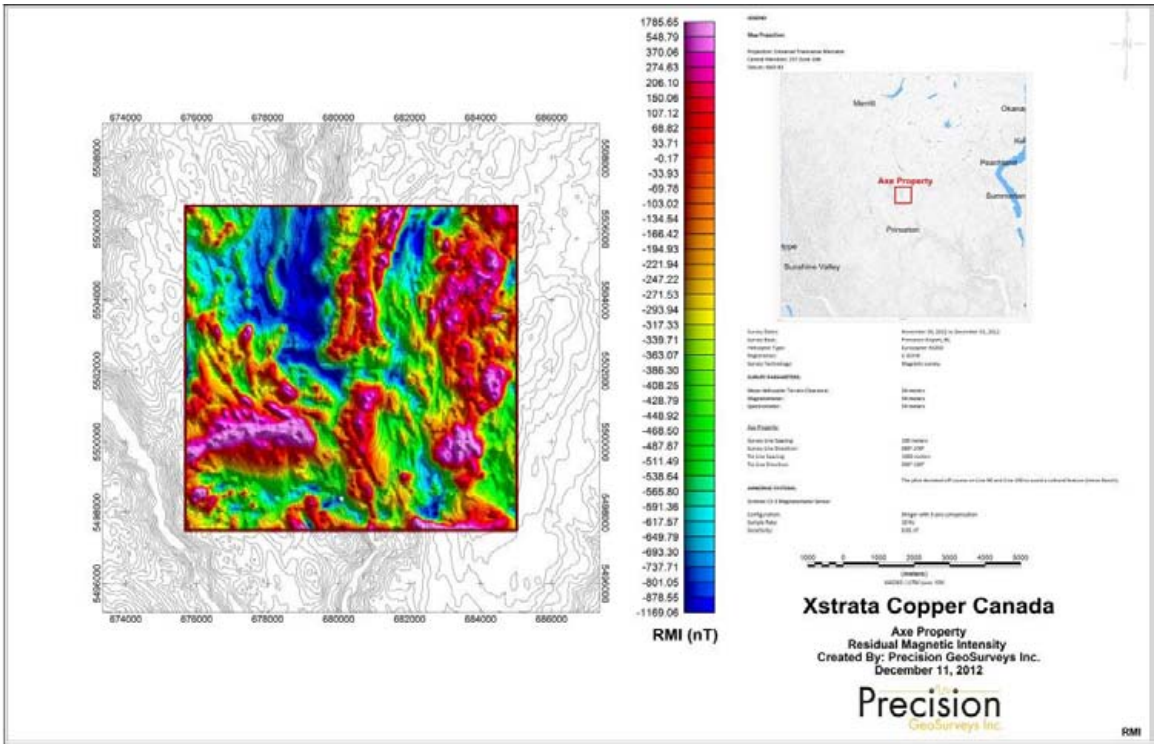
Map 1: Axe property flight lines.



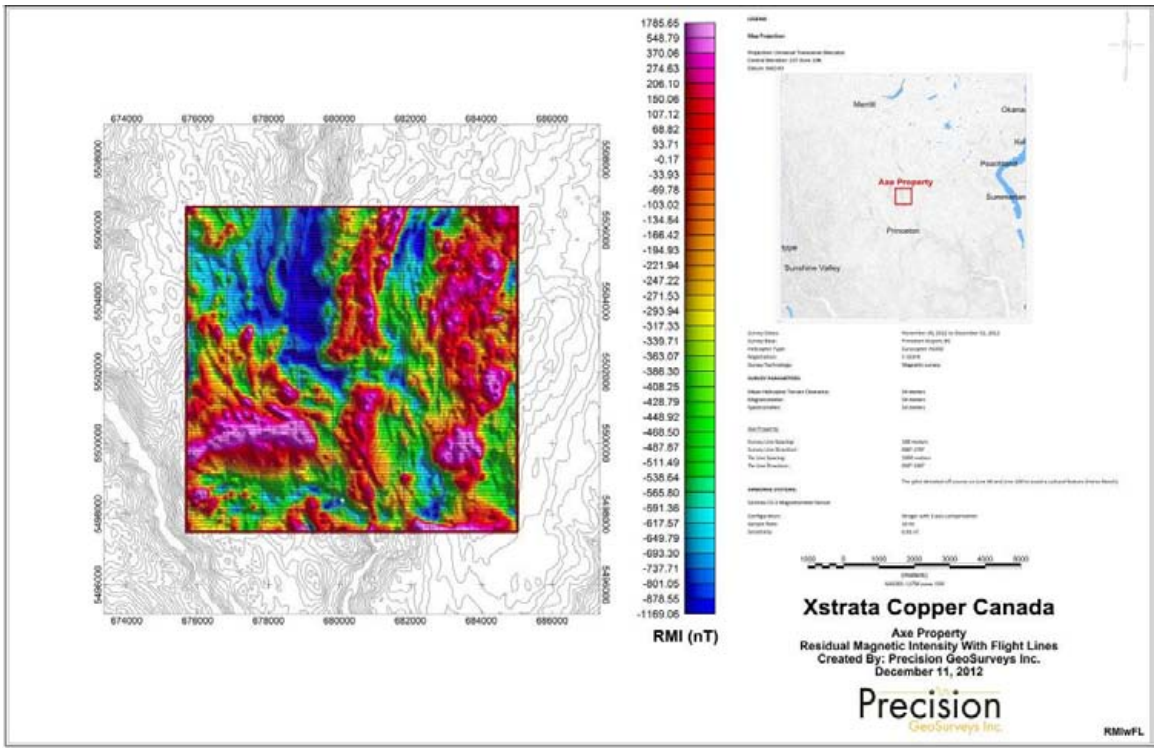
Map 2: Axe property digital terrain model.



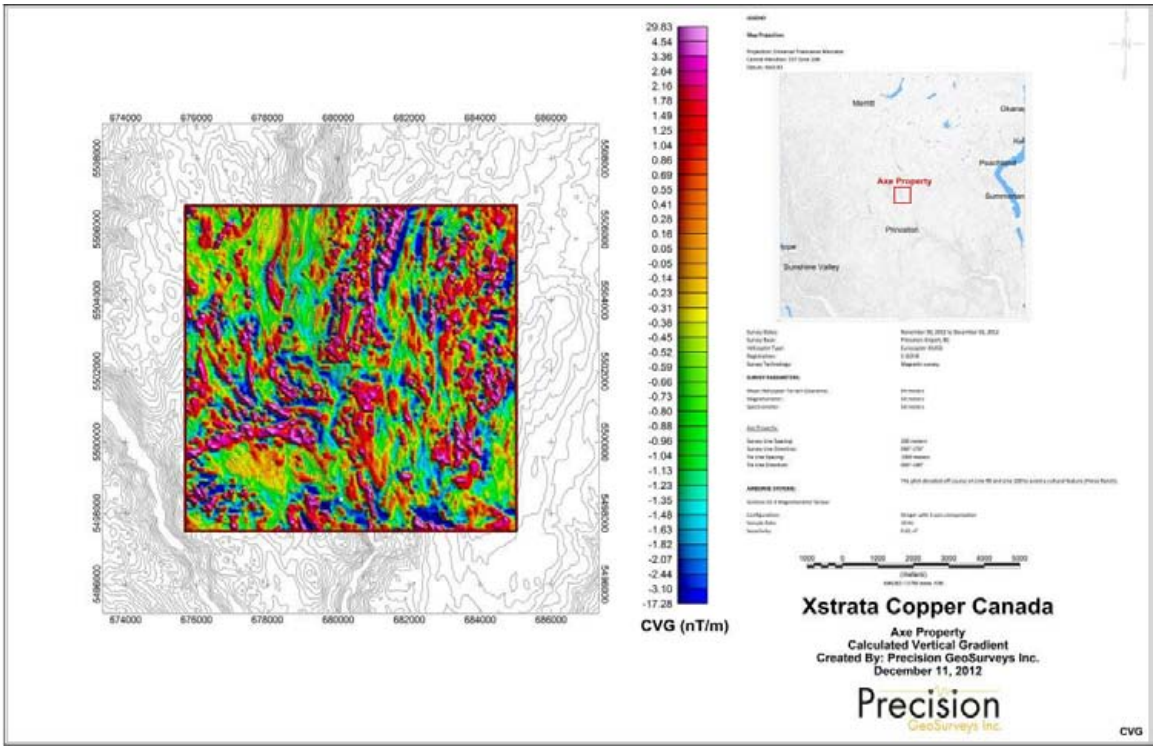
Map 3: Axe property total magnetic intensity.



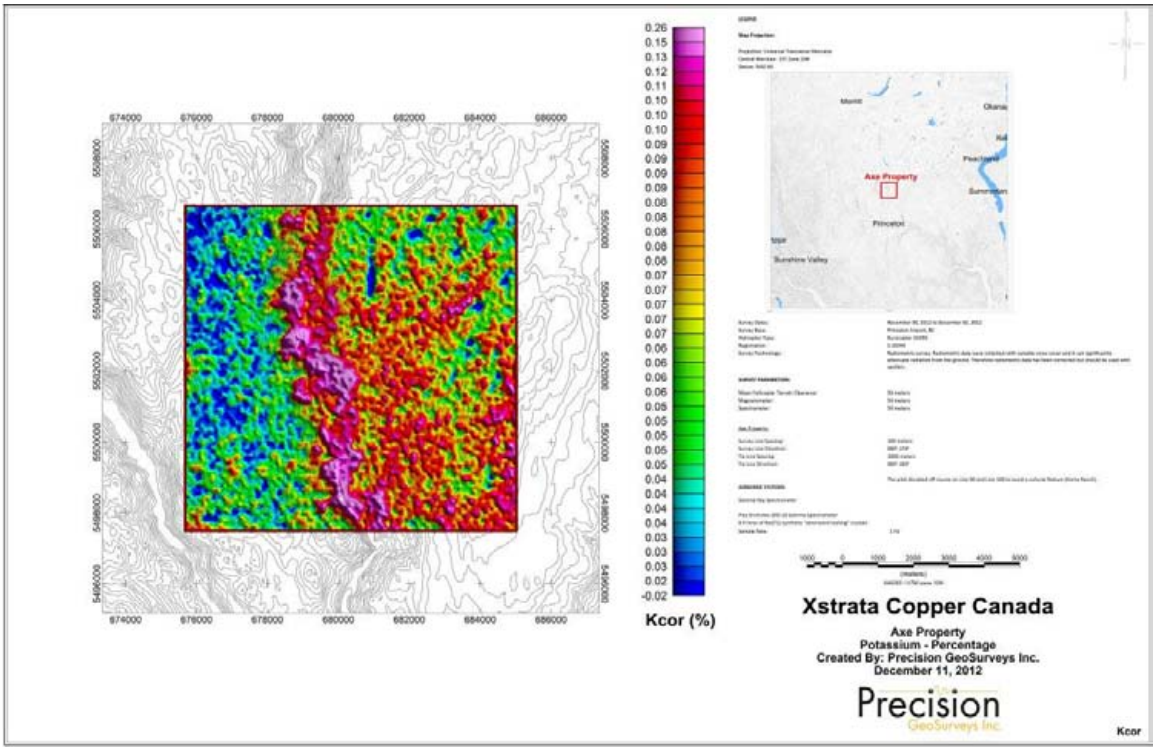
Map 4: Axe property residual magnetic intensity.



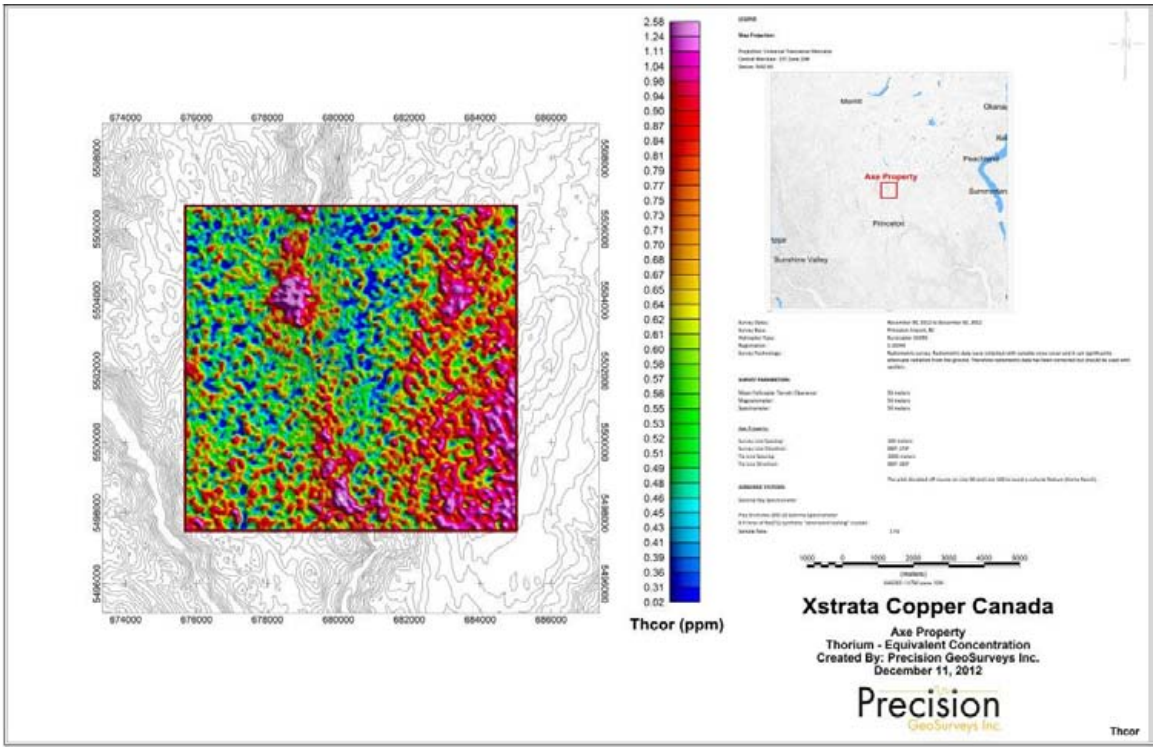
Map 5: Axe property residual magnetic intensity with plotted flight lines



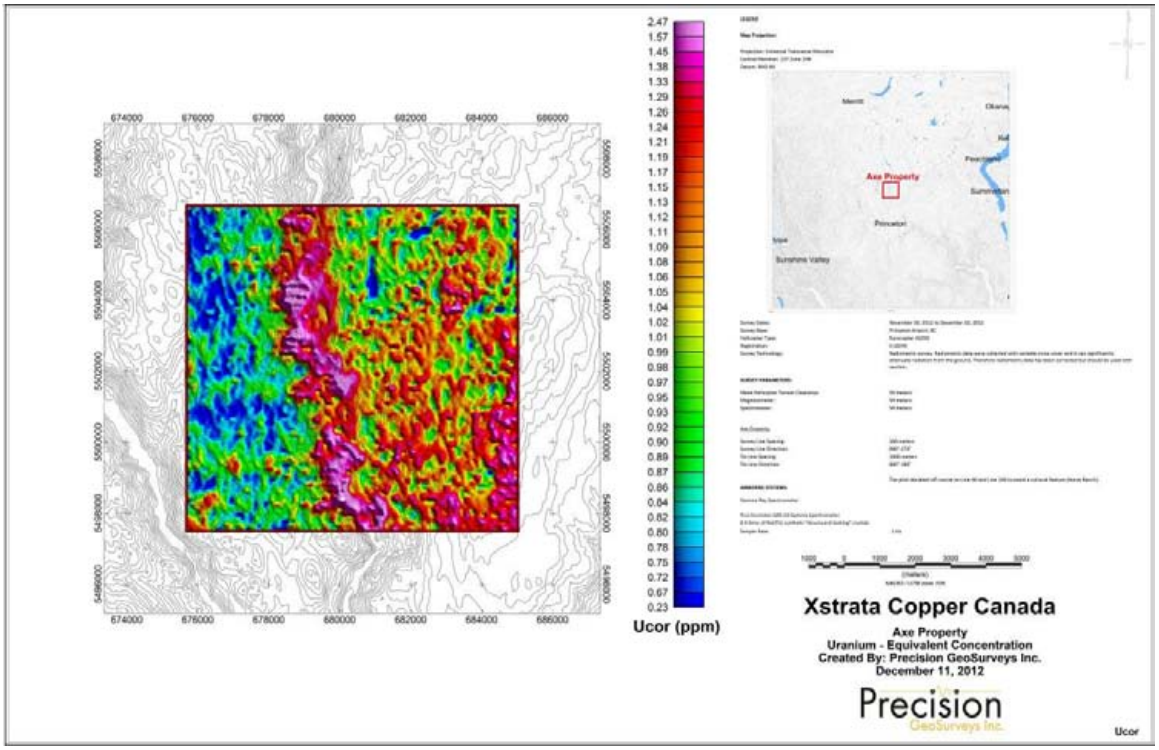
Map 6: Axe property calculated vertical gradient of the residual magnetic intensity.



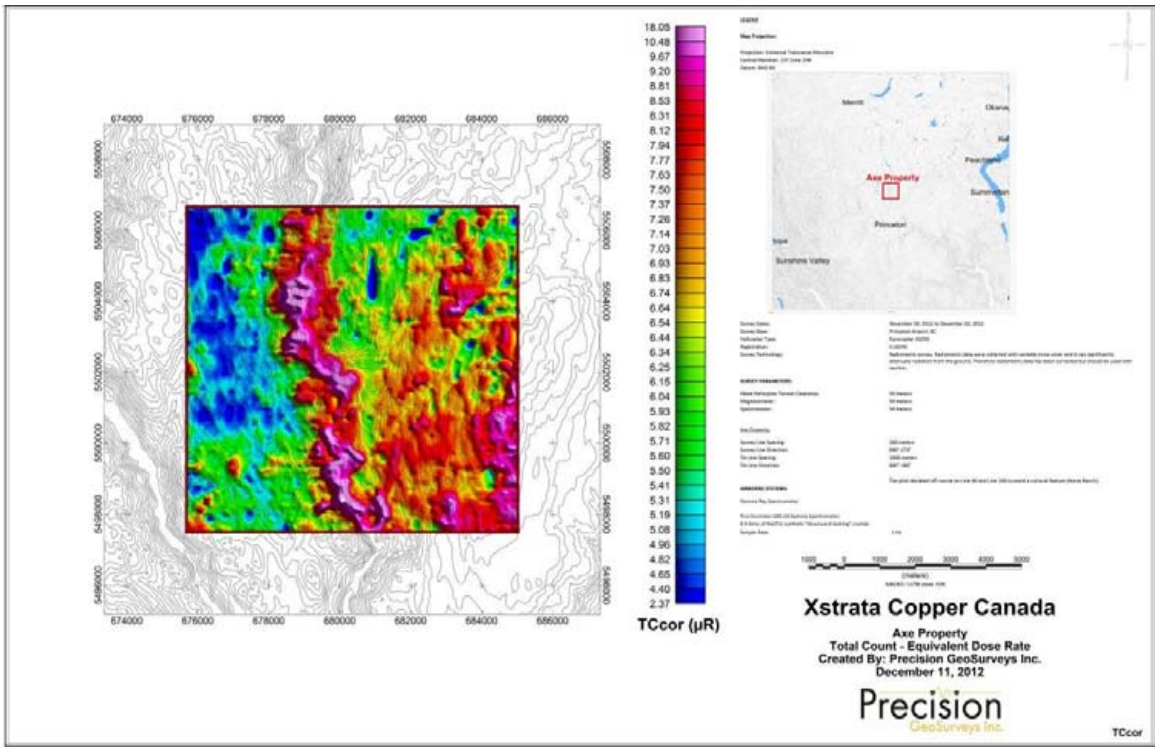
Map 7: Axe property potassium – precentage.



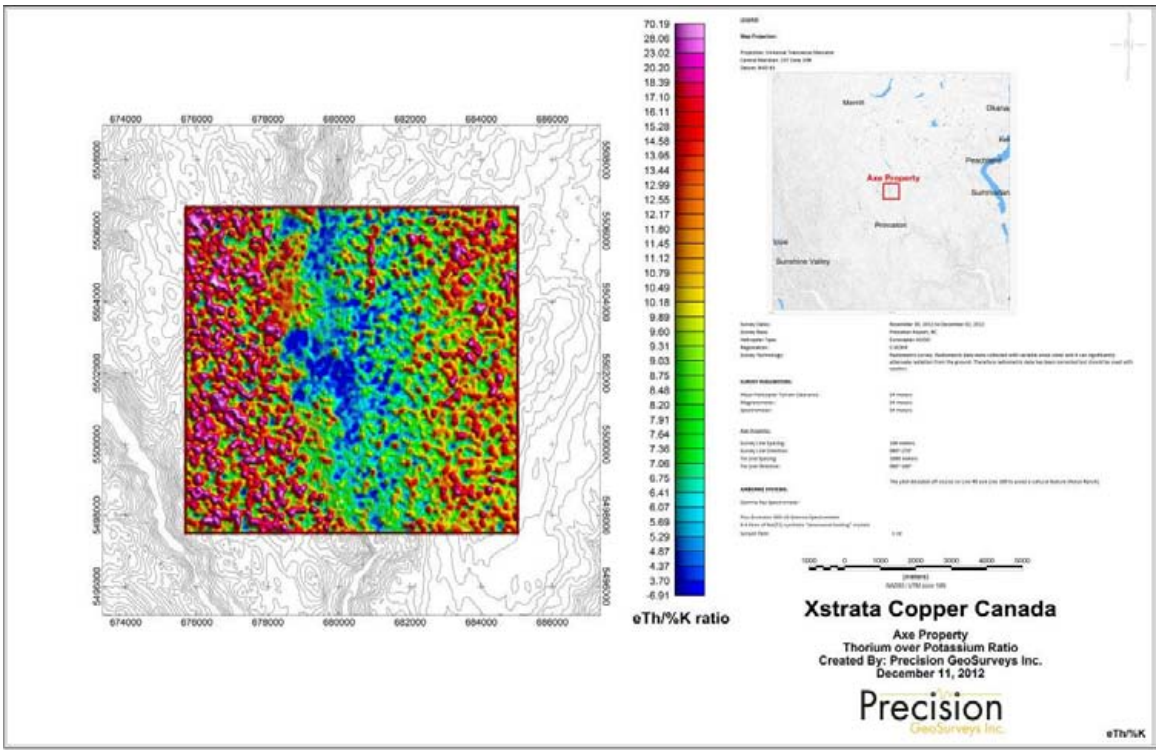
Map 8: Axe property thorium – equivalent concentration.



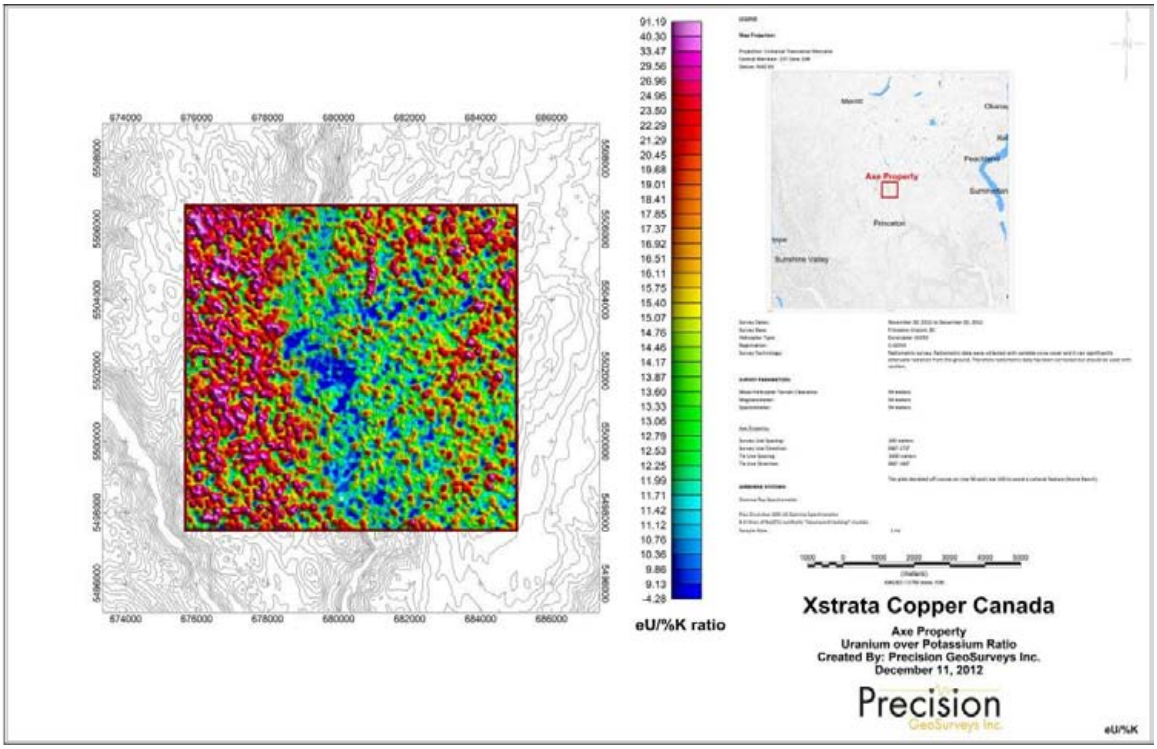
Map 9: Axe property uranium – equivalent concentration.



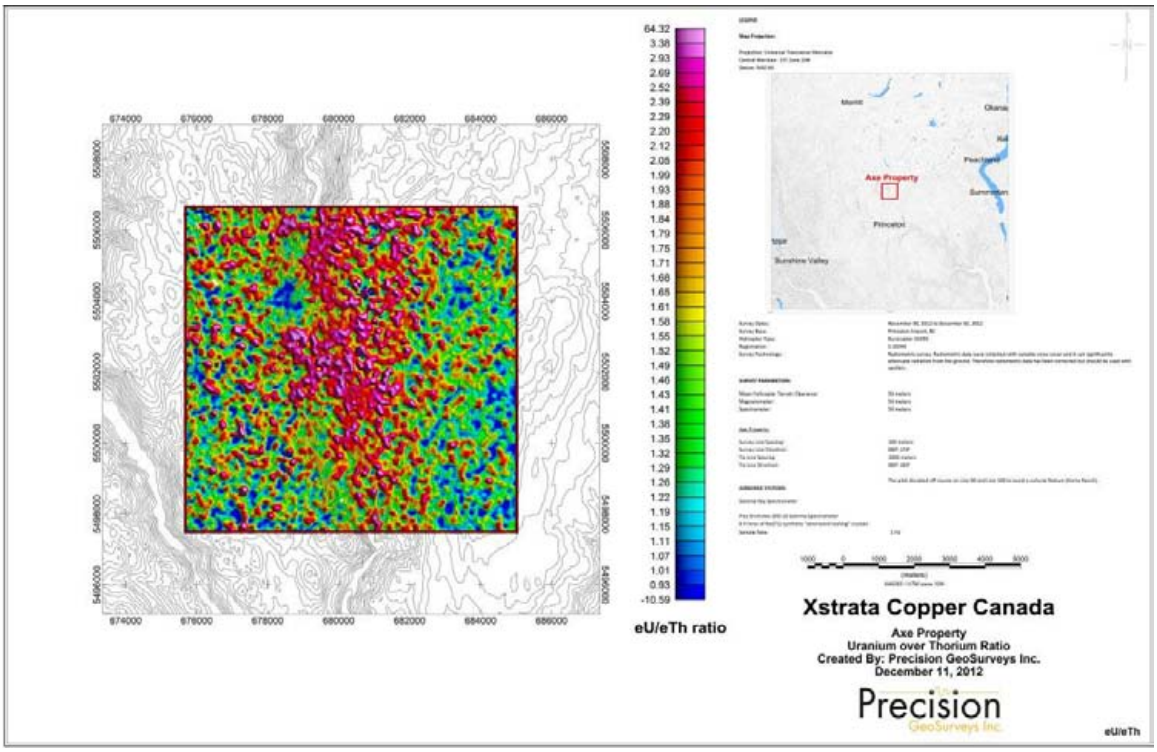
Map 10: Axe property total count – equivalent dose rate.



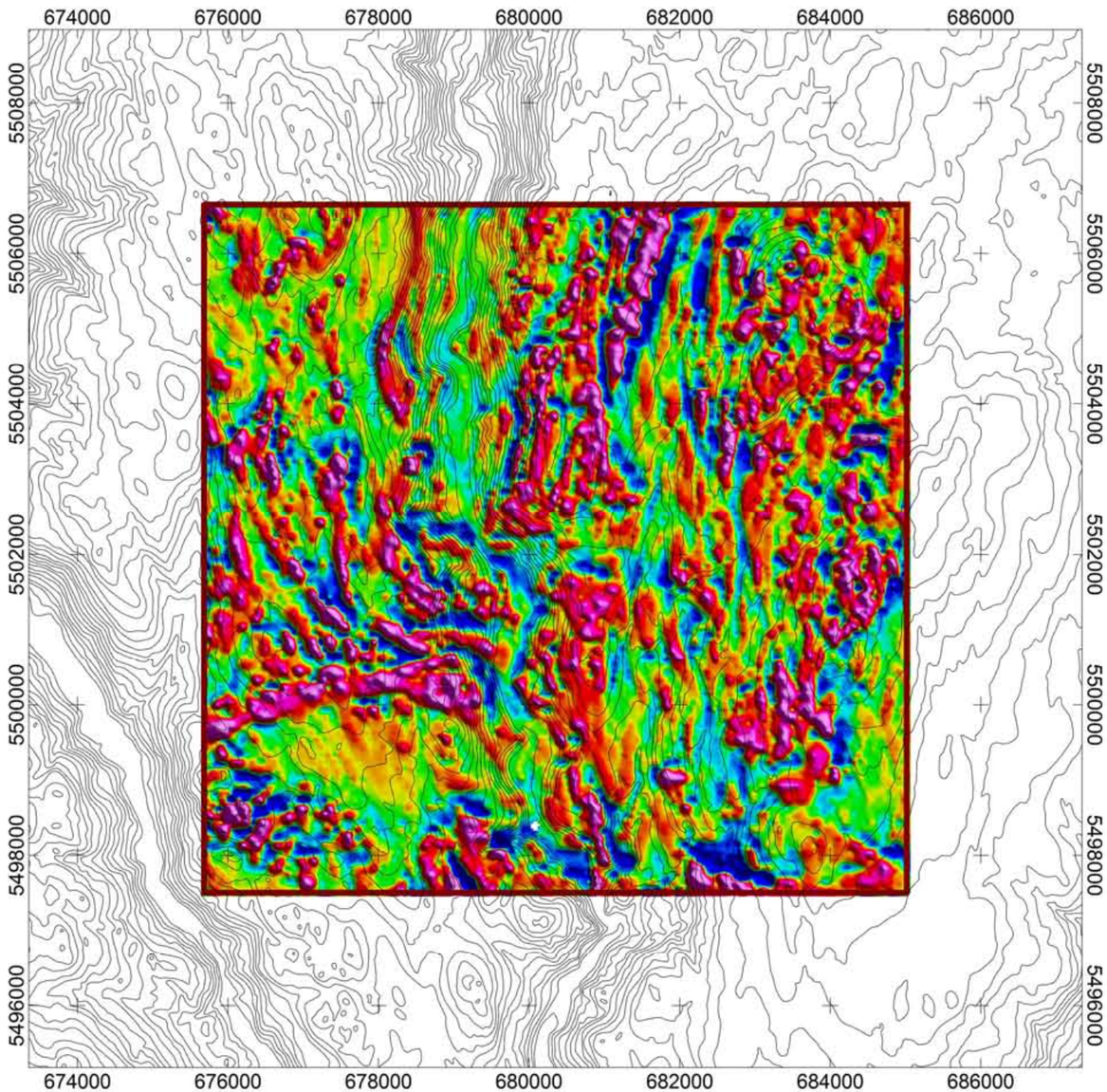
Map 11: Axe property thorium over potassium ratio.

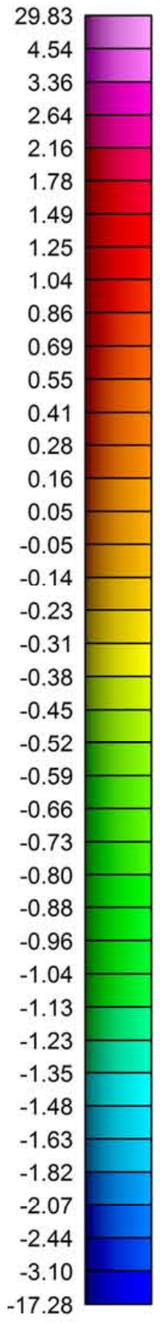


Map 12: Axe property uranium over potassium ratio.



Map 13: Axe property uranium over thorium ratio.





CVG (nT/m)

LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK
Survey Technology:	Magnetic survey.

SURVEY PARAMETERS:

Mean Helicopter Terrain Clearance:	54 meters
Magnetometer:	54 meters
Spectrometer:	54 meters

Axe Property:

Survey Line Spacing:	100 meters
Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

AIRBORNE SYSTEMS:

Scintrex CS-3 Magnetometer Sensor

Configuration:	Stinger with 3 axis compensation
Sample Rate:	10 Hz
Sensitivity:	0.01 nT

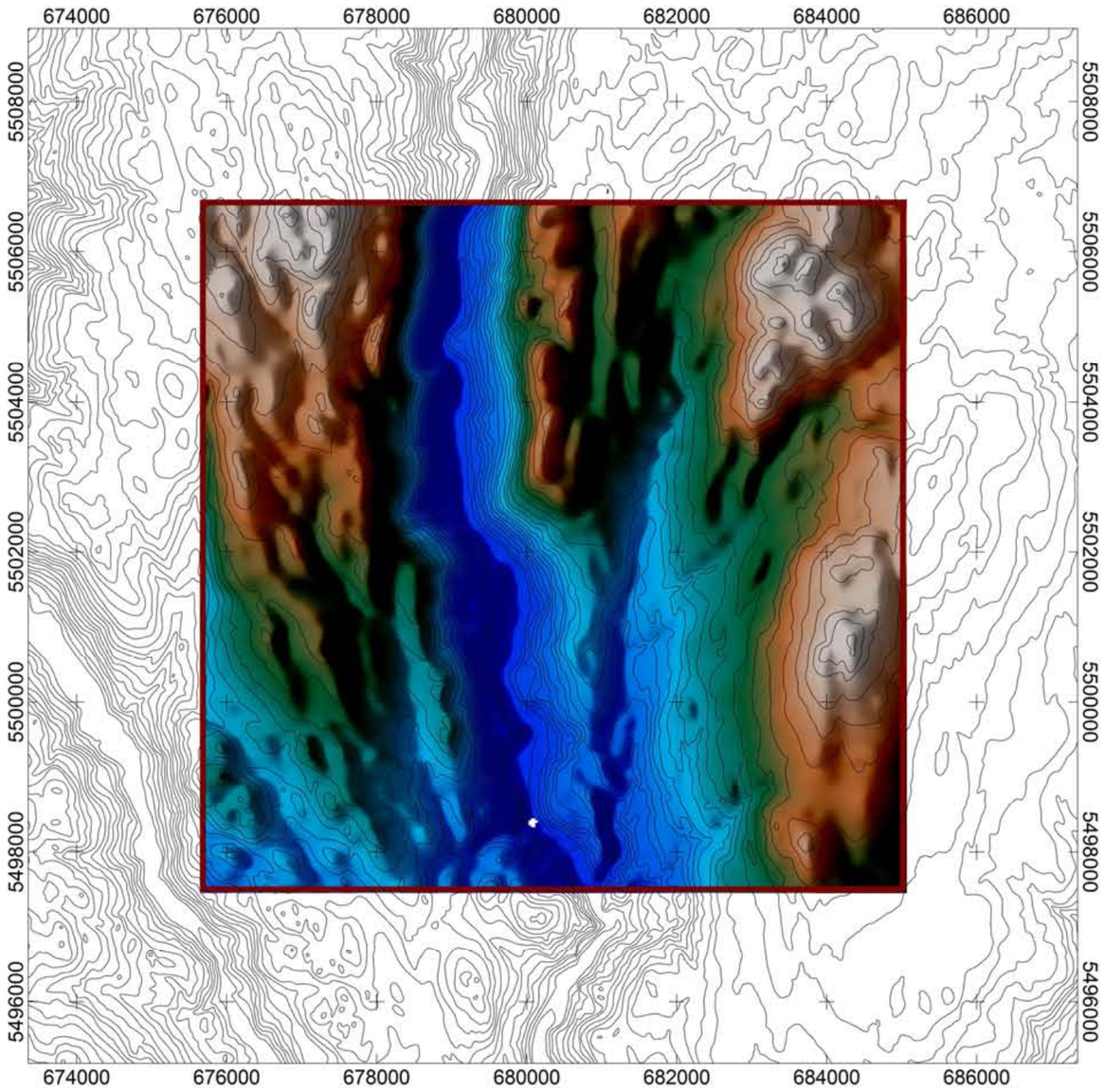
1000 0 1000 2000 3000 4000 5000
(meters)
NAD83 / UTM zone 10N

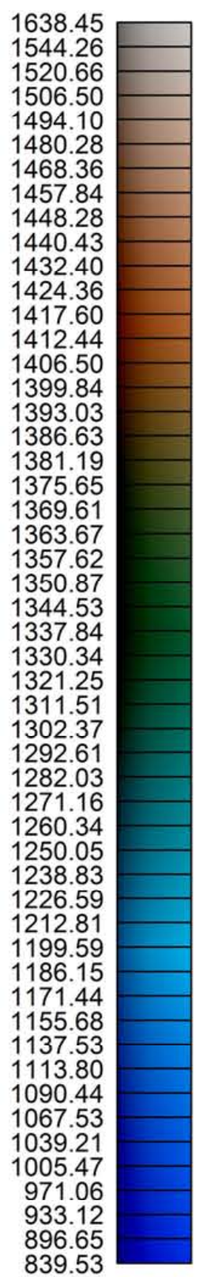
Xstrata Copper Canada

Axe Property
Calculated Vertical Gradient
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

CVG





DTM (m)

LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK

SURVEY PARAMETERS:

Mean Helicopter Terrain Clearance:	54 meters
Magnetometer:	54 meters
Spectrometer:	54 meters

Axe Property:

Survey Line Spacing:	100 meters
Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

1000 0 1000 2000 3000 4000 5000

(meters)

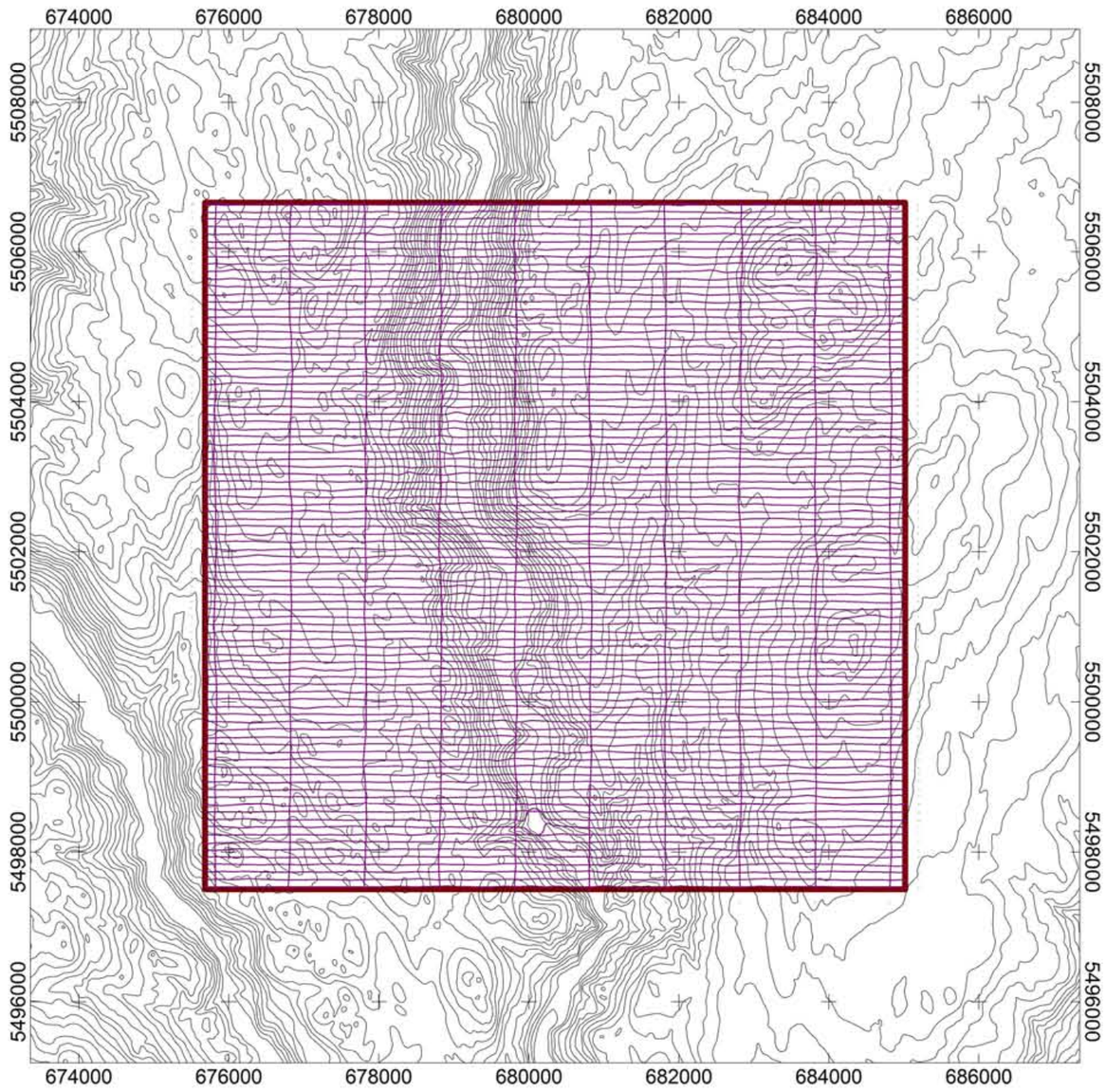
NAD83 / UTM zone 10N

Xstrata Copper Canada

Axe Property
Digital Terrain Model
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

DTM



LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK

SURVEY PARAMETERS:

Mean Helicopter Terrain Clearance:	54 meters
Magnetometer:	54 meters
Spectrometer:	54 meters

Axe Property:

Survey Line Spacing:	100 meters
Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

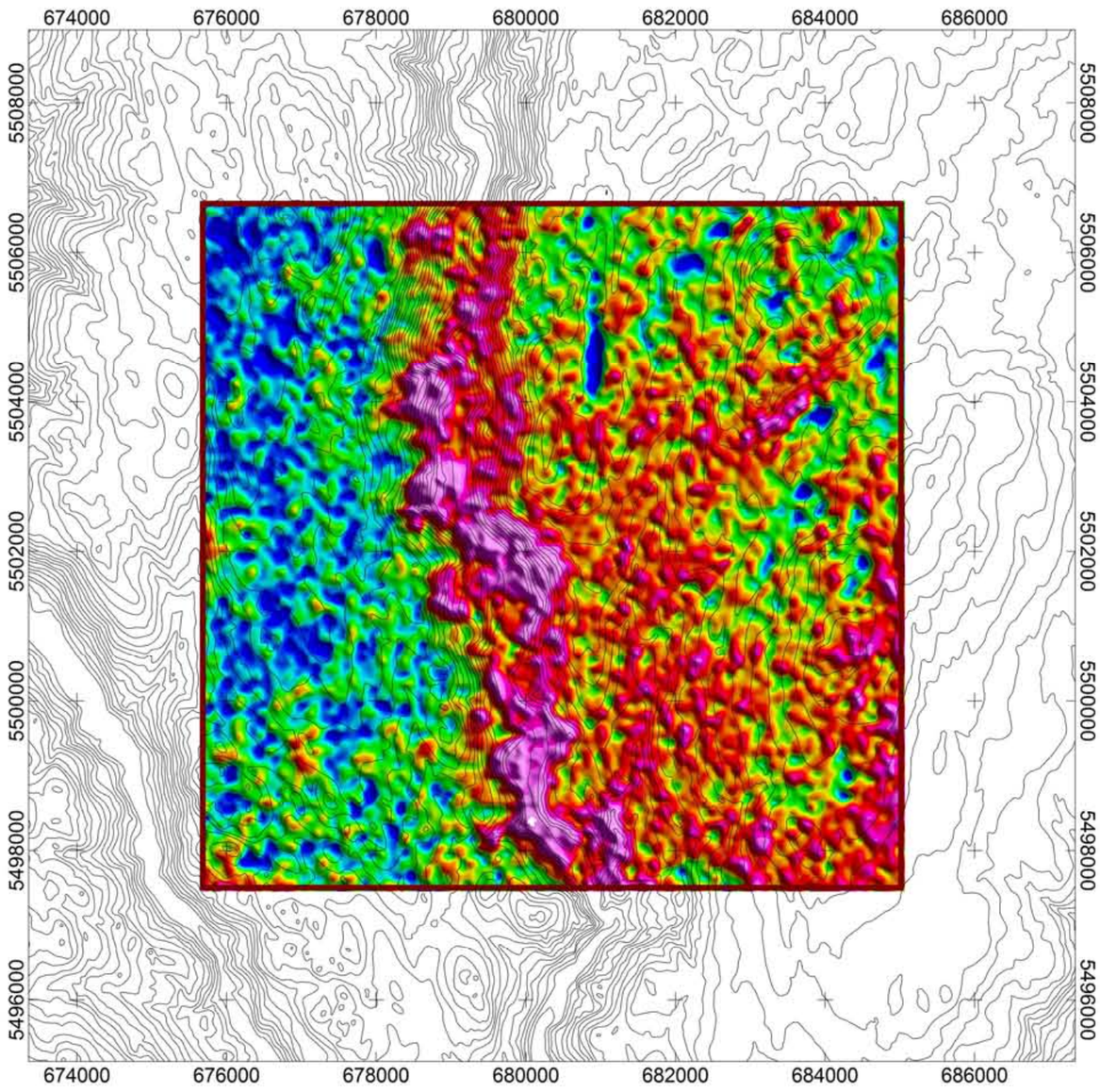
1000 0 1000 2000 3000 4000 5000
(meters)
NAD83 / UTM zone 10N

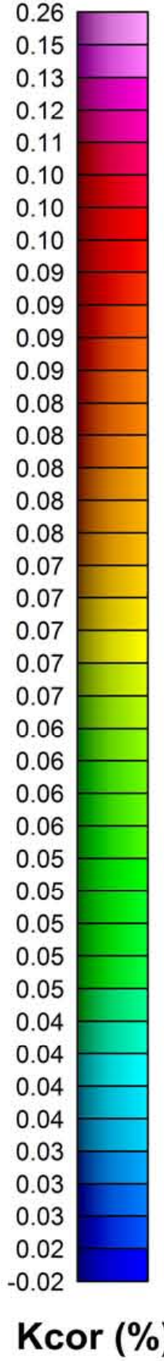
Xstrata Copper Canada

Axe Property
Flight Lines
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

FL





Kcor (%)

LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK
Survey Technology:	Radiometric survey. Radiometric data were collected with variable snow cover and it can significantly attenuate radiation from the ground. Therefore radiometric data has been corrected but should be used with caution.

SURVEY PARAMETERS:

Mean Helicopter Terrain Clearance:	54 meters
Magnetometer:	54 meters
Spectrometer:	54 meters

Axe Property:

Survey Line Spacing:	100 meters
Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

AIRBORNE SYSTEMS:

Gamma Ray Spectrometer

Pico Envirotec GRS-10 Gamma Spectrometer
8.4 litres of NaI(T1) synthetic "downward looking" crystals
Sample Rate: 1 Hz

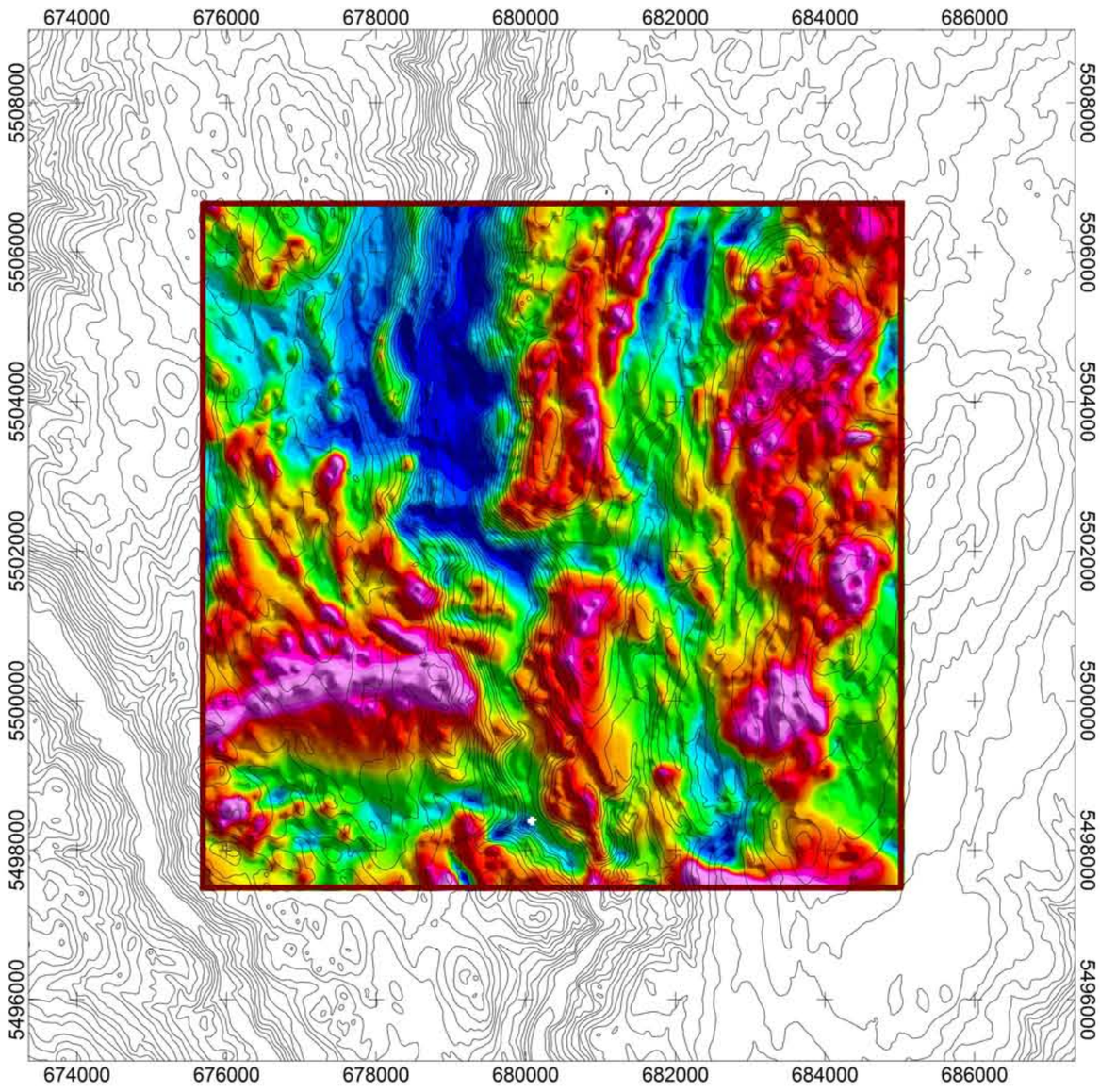
1000 0 1000 2000 3000 4000 5000
(meters)
NAD83 / UTM zone 10N

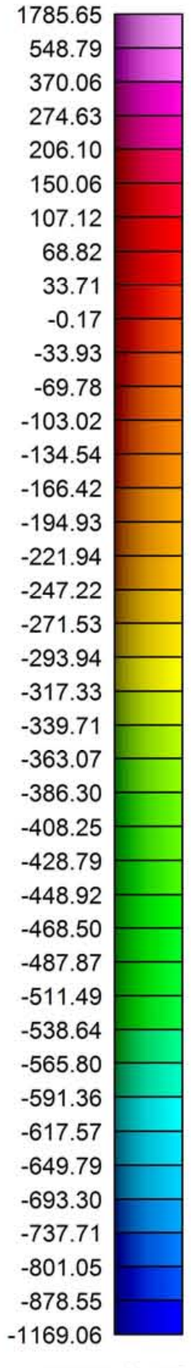
Xstrata Copper Canada

Axe Property
Potassium - Percentage
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

Kcor





RMI (nT)

LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK
Survey Technology:	Magnetic survey.

SURVEY PARAMETERS:

Mean Helicopter Terrain Clearance:	54 meters
Magnetometer:	54 meters
Spectrometer:	54 meters

Axe Property:

Survey Line Spacing:	100 meters
Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

AIRBORNE SYSTEMS:

Scintrex CS-3 Magnetometer Sensor

Configuration:	Stinger with 3 axis compensation
Sample Rate:	10 Hz
Sensitivity:	0.01 nT

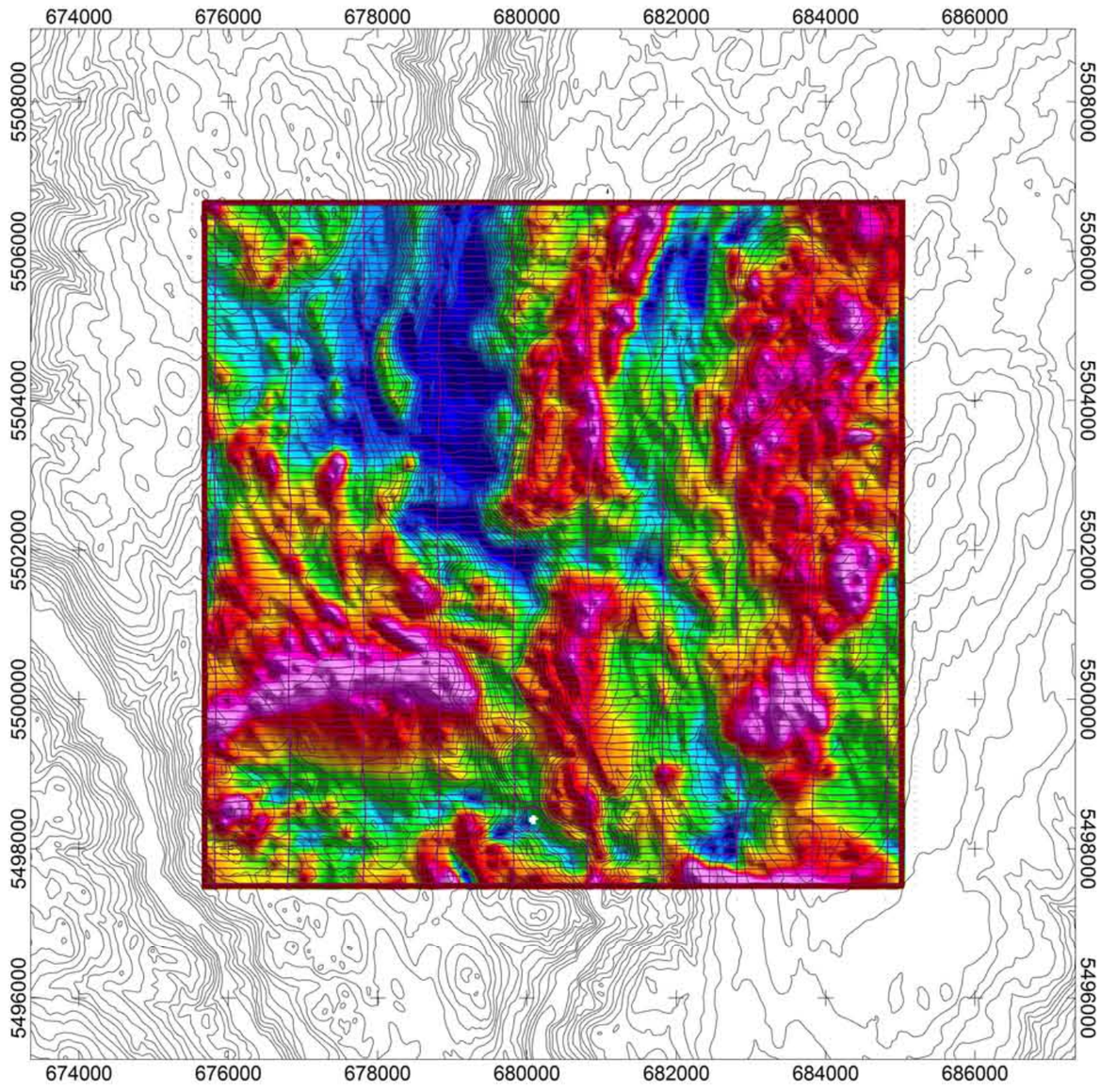
1000 0 1000 2000 3000 4000 5000
(meters)
NAD83 / UTM zone 10N

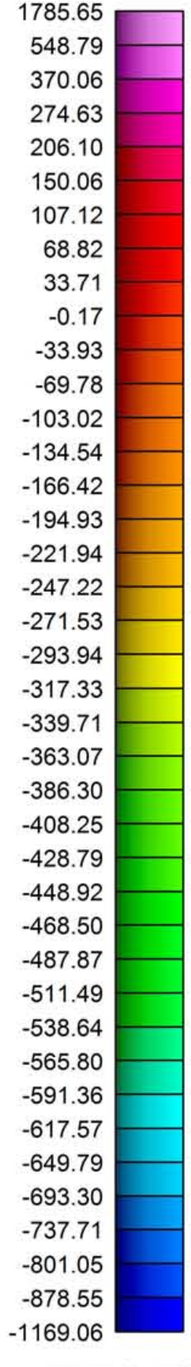
Xstrata Copper Canada

Axe Property
Residual Magnetic Intensity
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

RMI





RMI (nT)

LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK
Survey Technology:	Magnetic survey.

SURVEY PARAMETERS:

Mean Helicopter Terrain Clearance:	54 meters
Magnetometer:	54 meters
Spectrometer:	54 meters

Axe Property:

Survey Line Spacing:	100 meters
Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

AIRBORNE SYSTEMS:

Scintrex CS-3 Magnetometer Sensor

Configuration:	Stinger with 3 axis compensation
Sample Rate:	10 Hz
Sensitivity:	0.01 nT

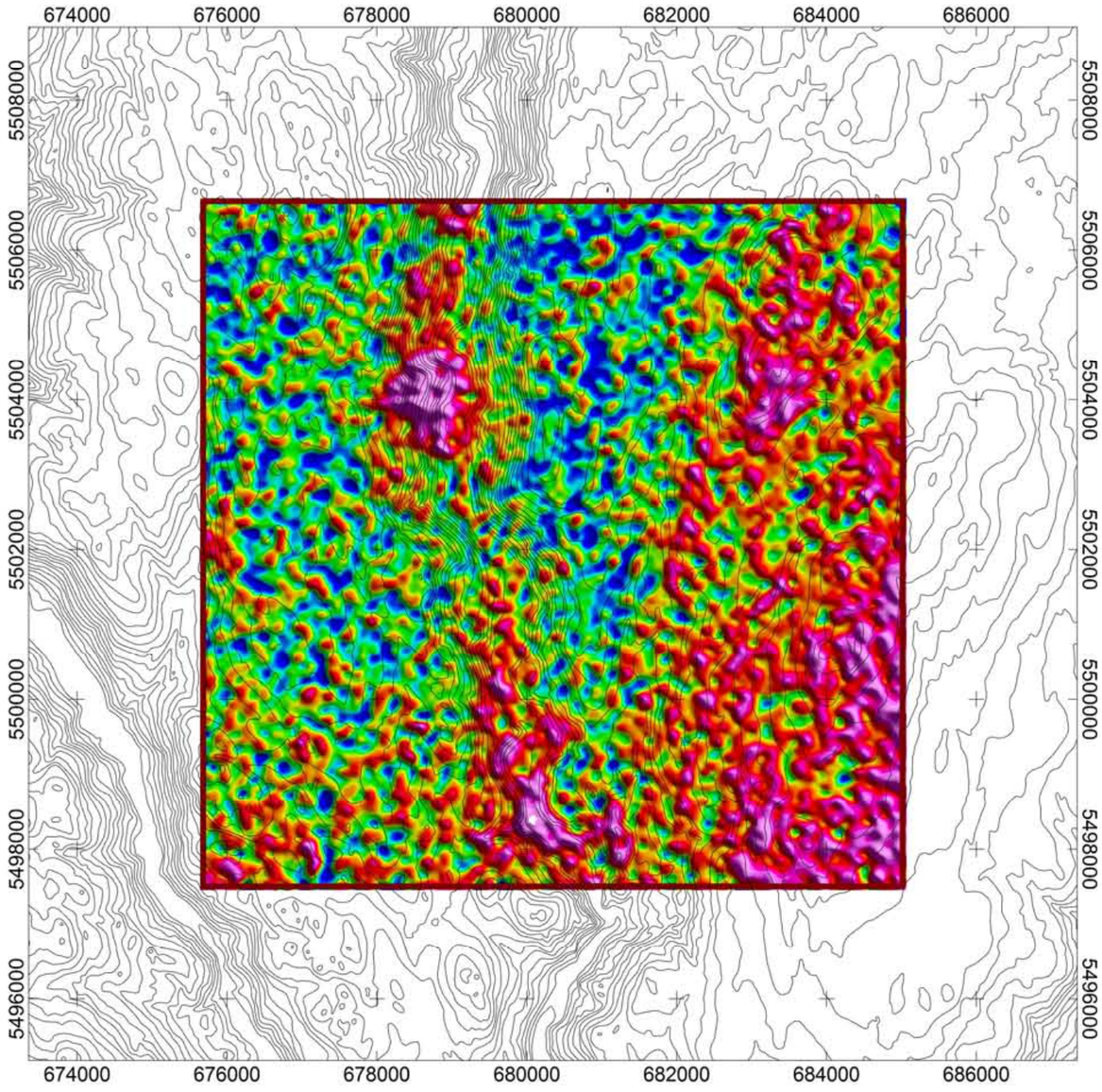
1000 0 1000 2000 3000 4000 5000
(meters)
NAD83 / UTM zone 10N

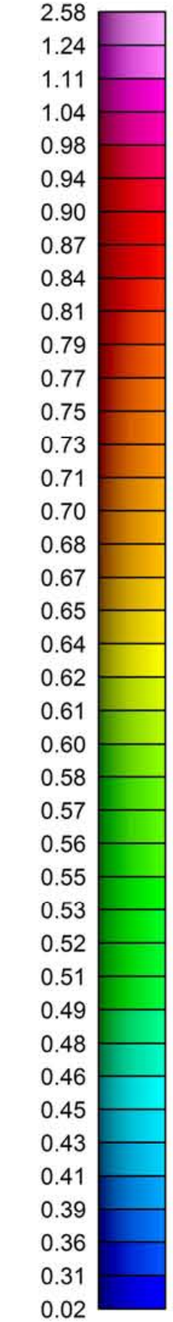
Xstrata Copper Canada

Axe Property
Residual Magnetic Intensity With Flight Lines
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

RMIwFL





Thcor (ppm)

LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK
Survey Technology:	Radiometric survey. Radiometric data were collected with variable snow cover and it can significantly attenuate radiation from the ground. Therefore radiometric data has been corrected but should be used with caution.

SURVEY PARAMETERS:

Mean Helicopter Terrain Clearance:	54 meters
Magnetometer:	54 meters
Spectrometer:	54 meters

Axe Property:

Survey Line Spacing:	100 meters
Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

AIRBORNE SYSTEMS:

Gamma Ray Spectrometer

Pico Envirotec GRS-10 Gamma Spectrometer
8.4 litres of NaI(T1) synthetic "downward looking" crystals
Sample Rate: 1 Hz

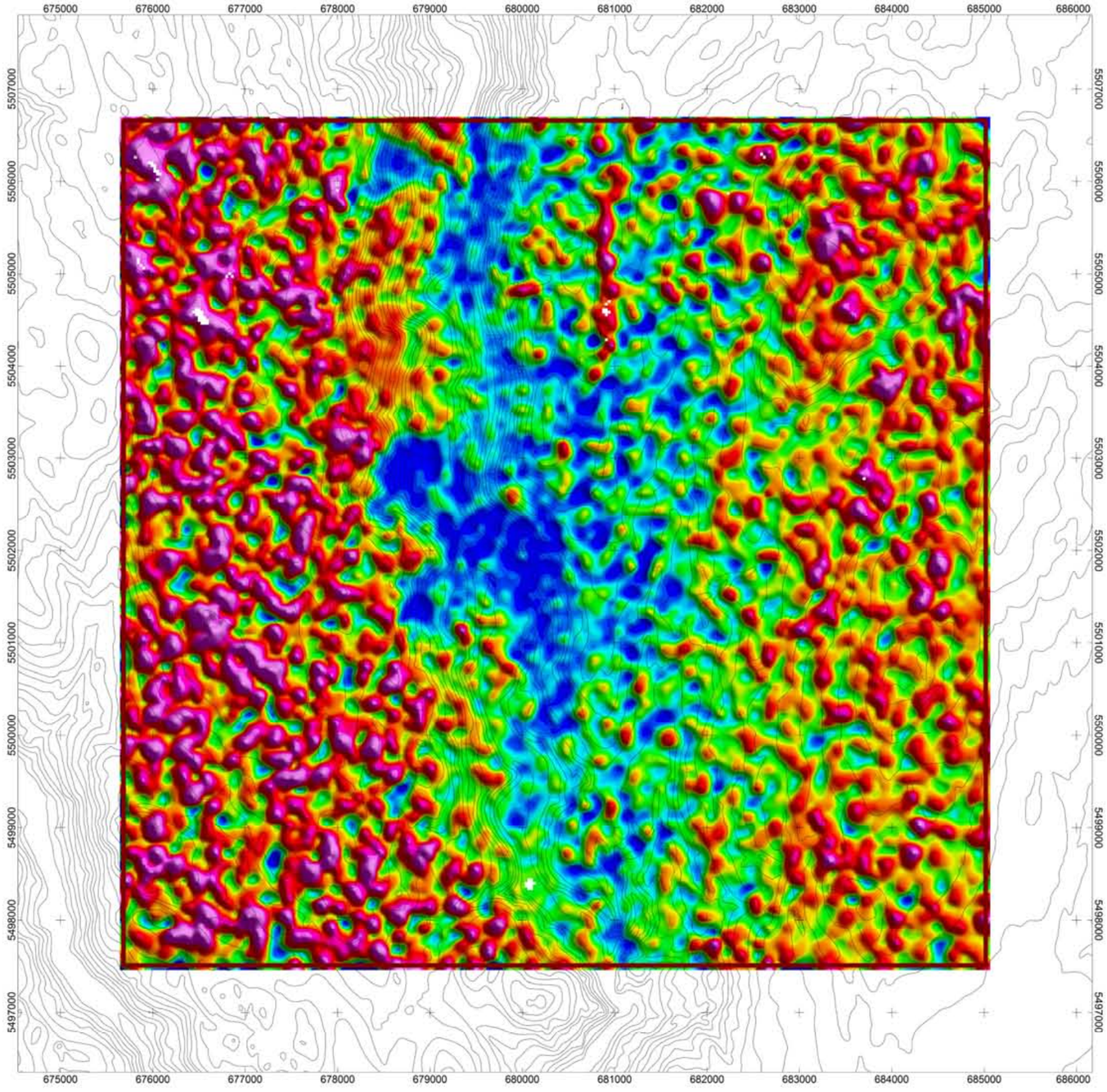
1000 0 1000 2000 3000 4000 5000
(meters)
NAD83 / UTM zone 10N

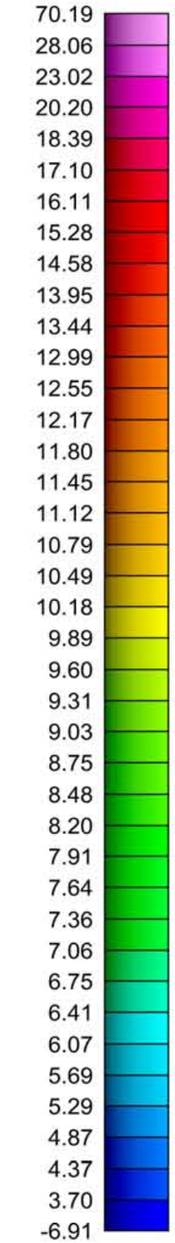
Xstrata Copper Canada

Axe Property
Thorium - Equivalent Concentration
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

Thcor





eTh/%K ratio

LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 and December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK
Survey Technology:	Magnetic and Radiometric survey. Radiometric data were collected with variable snow cover and it can significantly attenuate radiation from the ground. Therefore radiometric data has been corrected but should be used with caution.

SURVEY PARAMETERS:

Mean Terrain Clearance:	54 meters
Helicopter:	50 meters
Magnetometer:	50 meters
Spectrometer:	50 meters

Axe Property:

Survey Line Spacing:	100 meters
Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

AIRBORNE SYSTEMS:

Scintrex CS-3 Magnetometer Sensor

Configuration:	Stinger with 3 axis compensation
Sample Rate:	10 Hz
Sensitivity:	0.01 nT

Gamma Ray Spectrometer

Pico Envirotec GRS-10 Gamma Spectrometer
8.4 litres of NaI(T1) synthetic "downward looking" crystals
Sample Rate: 1 Hz

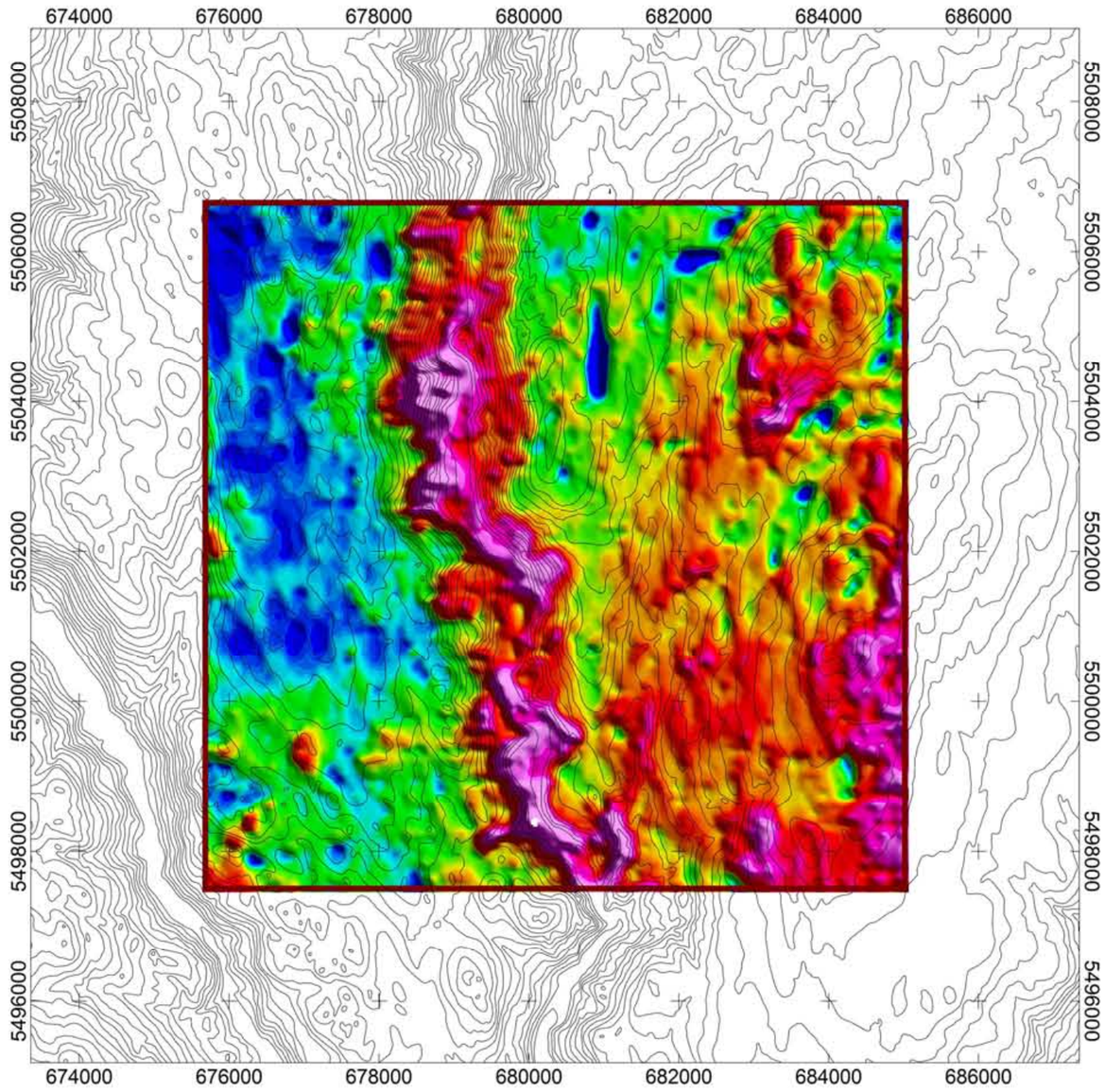
500 0 500 1000 1500 2000 2500
(meters)
NAD83 / UTM zone 10N

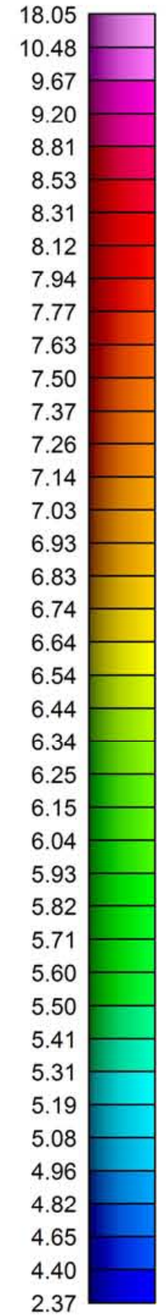
Xstrata Copper Canada

Axe Property
Thorium over Potassium Ratio
Created By: Precision GeoSurveys Inc.
December 10, 2012

Precision GeoSurveys Inc.

eTh/%K





LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK
Survey Technology:	Radiometric survey. Radiometric data were collected with variable snow cover and it can significantly attenuate radiation from the ground. Therefore radiometric data has been corrected but should be used with caution.

SURVEY PARAMETERS:

Mean Helicopter Terrain Clearance:	54 meters
Magnetometer:	54 meters
Spectrometer:	54 meters

Axe Property:

Survey Line Spacing:	100 meters
Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

AIRBORNE SYSTEMS:

Gamma Ray Spectrometer

Pico Envirotec GRS-10 Gamma Spectrometer
8.4 litres of NaI(T1) synthetic "downward looking" crystals
Sample Rate: 1 Hz

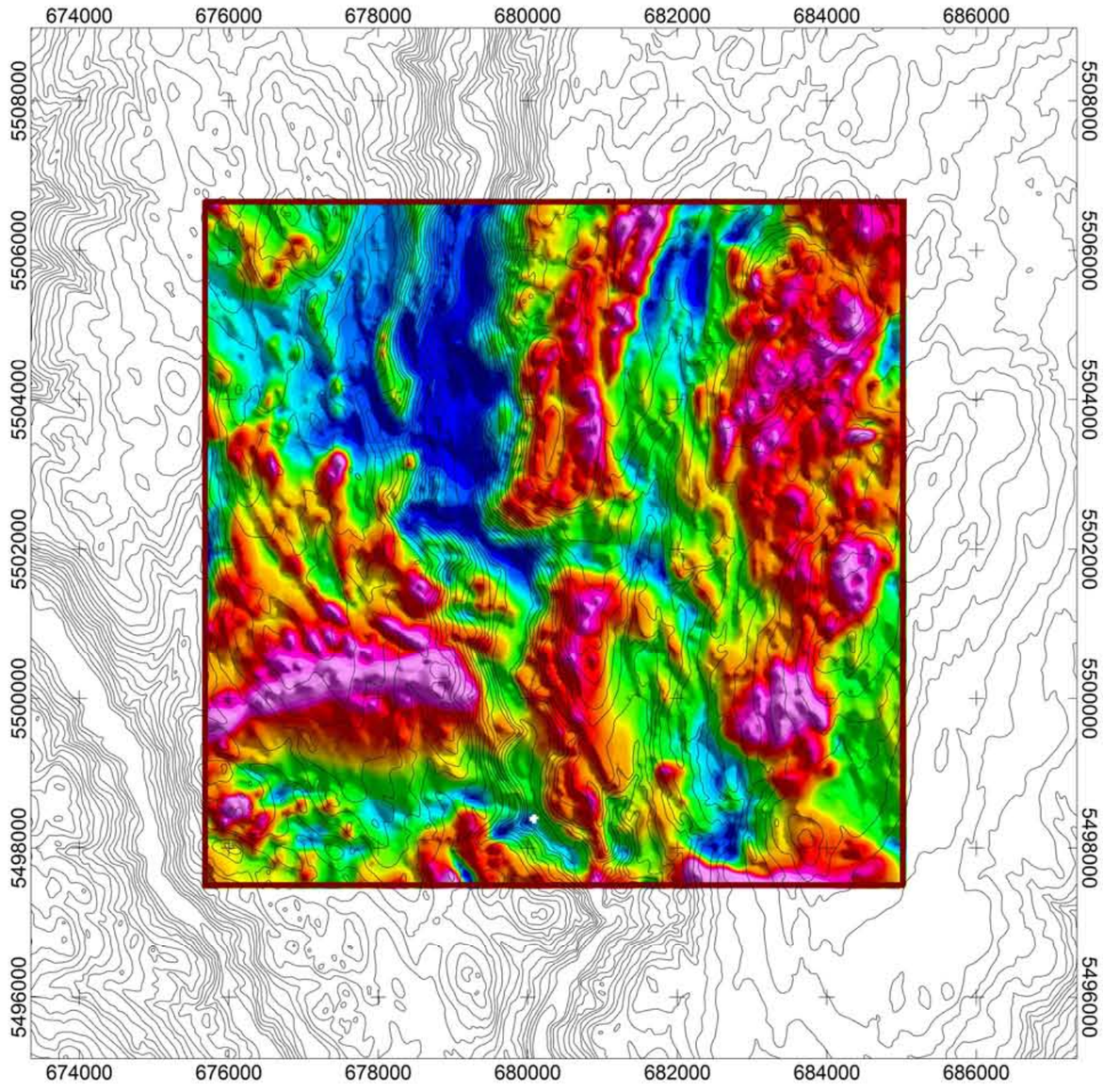
1000 0 1000 2000 3000 4000 5000
(meters)
NAD83 / UTM zone 10N

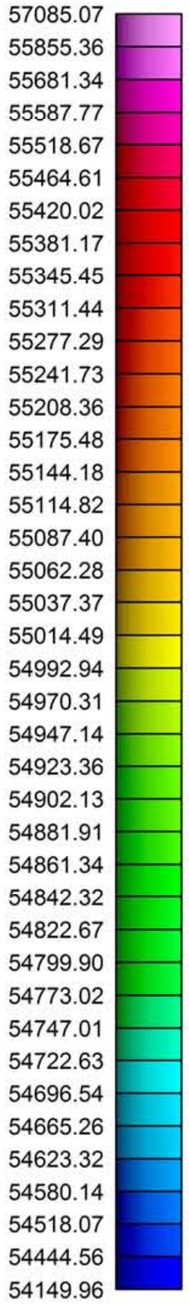
Xstrata Copper Canada

Axe Property
Total Count - Equivalent Dose Rate
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

TCcor





TMI (nT)

LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK
Survey Technology:	Magnetic survey.

SURVEY PARAMETERS:

Mean Helicopter Terrain Clearance:	54 meters
Magnetometer:	54 meters
Spectrometer:	54 meters

Axe Property:

Survey Line Spacing:	100 meters
Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

AIRBORNE SYSTEMS:

Scintrex CS-3 Magnetometer Sensor

Configuration:	Stinger with 3 axis compensation
Sample Rate:	10 Hz
Sensitivity:	0.01 nT

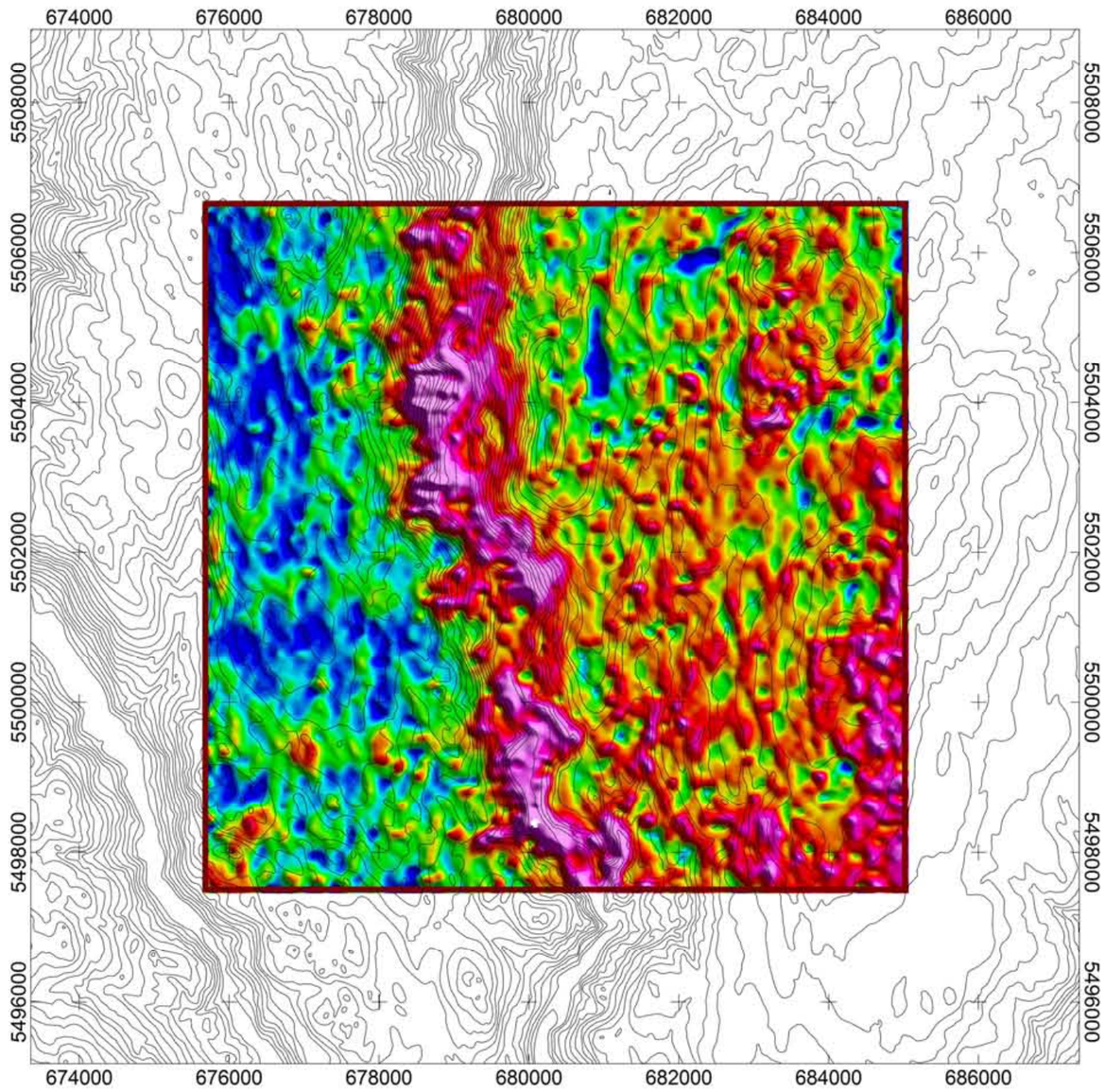
1000 0 1000 2000 3000 4000 5000
(meters)
NAD83 / UTM zone 10N

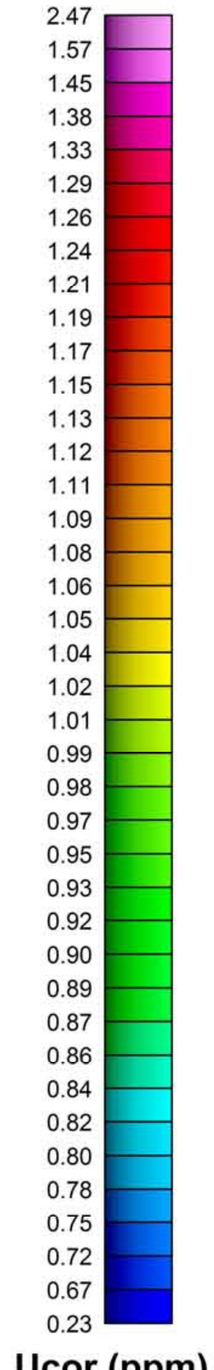
Xstrata Copper Canada

Axe Property
Total Magnetic Intensity
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

TMI





Ucor (ppm)

LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK
Survey Technology:	Radiometric survey. Radiometric data were collected with variable snow cover and it can significantly attenuate radiation from the ground. Therefore radiometric data has been corrected but should be used with caution.

SURVEY PARAMETERS:

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Magnetometer:	54 meters
Spectrometer:	54 meters

Axe Property:

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Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

AIRBORNE SYSTEMS:

Gamma Ray Spectrometer

Pico Envirotec GRS-10 Gamma Spectrometer
8.4 litres of NaI(T1) synthetic "downward looking" crystals
Sample Rate: 1 Hz

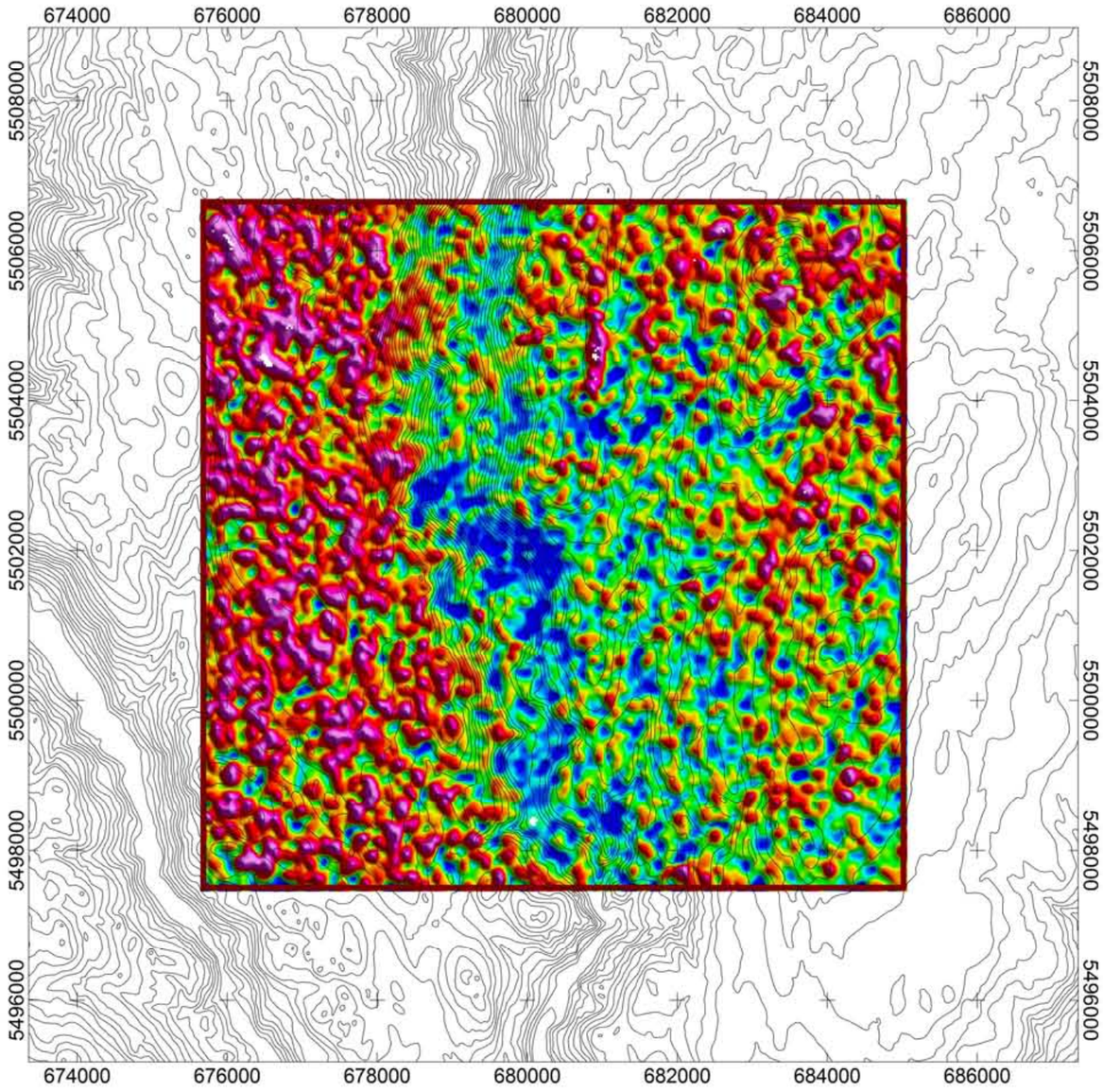
1000 0 1000 2000 3000 4000 5000
(meters)
NAD83 / UTM zone 10N

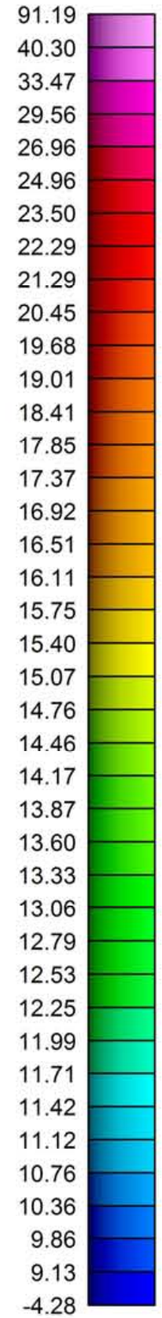
Xstrata Copper Canada

Axe Property
Uranium - Equivalent Concentration
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

Ucor





eU/%K ratio

LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK
Survey Technology:	Radiometric survey. Radiometric data were collected with variable snow cover and it can significantly attenuate radiation from the ground. Therefore radiometric data has been corrected but should be used with caution.

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Spectrometer:	54 meters

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Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

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AIRBORNE SYSTEMS:

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Sample Rate: 1 Hz

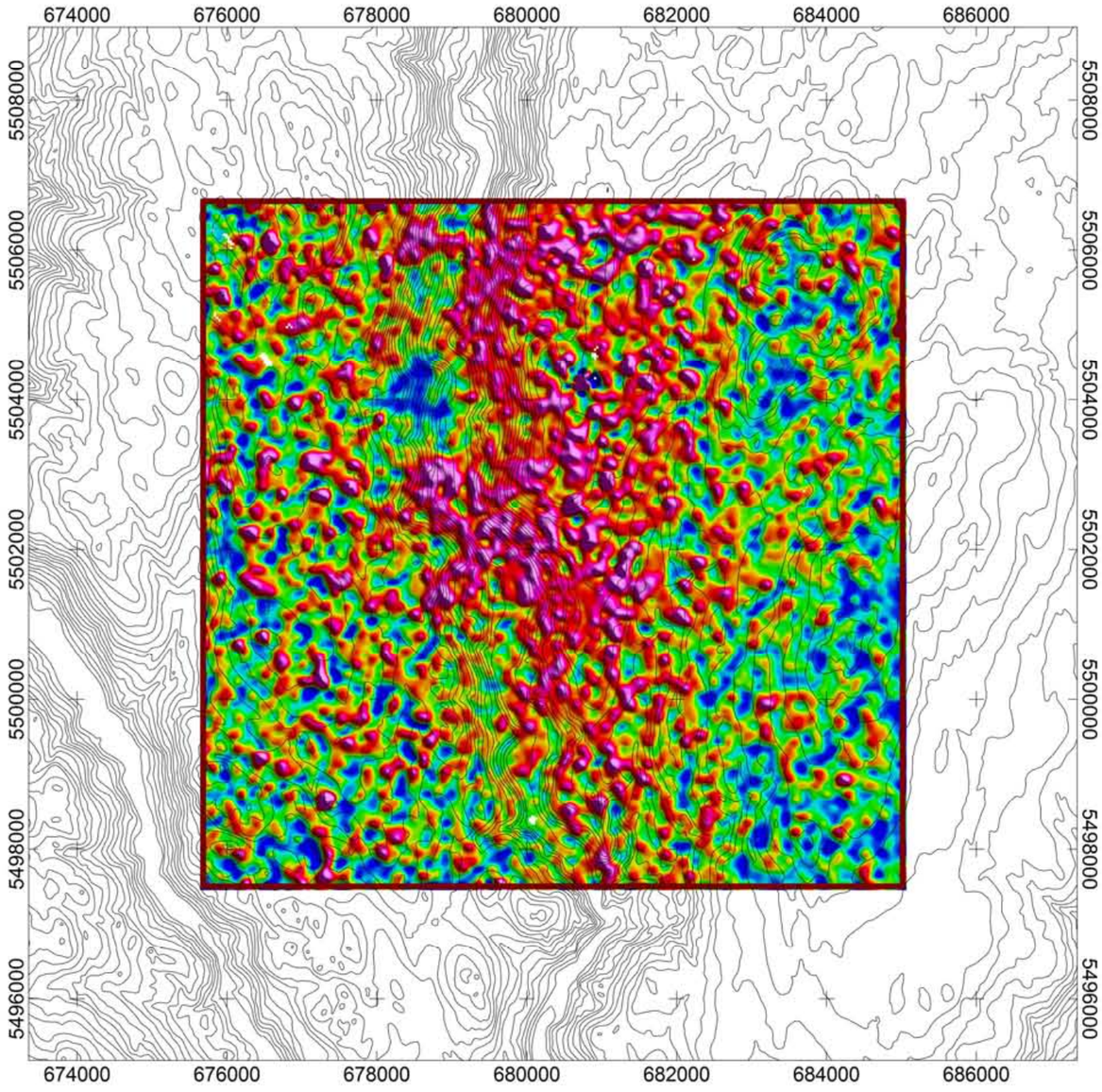
1000 0 1000 2000 3000 4000 5000
(meters)
NAD83 / UTM zone 10N

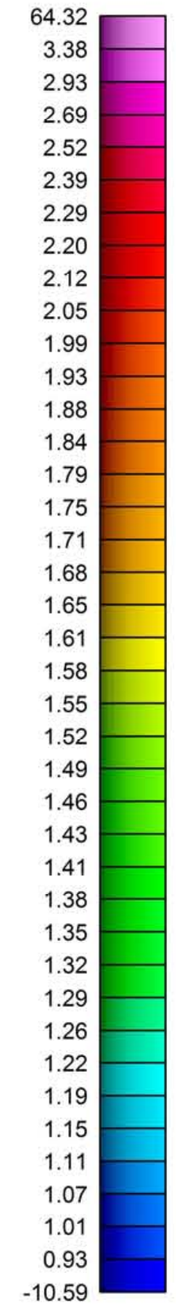
Xstrata Copper Canada

Axe Property
Uranium over Potassium Ratio
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

eU/%K





eU/eTh ratio

LEGEND

Map Projection:

Projection: Universal Transverse Mercator
Central Meridian: 237 Zone 10N
Datum: NAD 83

Survey Dates:	November 30, 2012 to December 02, 2012
Survey Base:	Princeton Airport, BC
Helicopter Type:	Eurocopter AS350
Registration:	C-GOHK
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Survey Line Direction:	090°-270°
Tie Line Spacing:	1000 meters
Tie Line Direction:	000°-180°

The pilot deviated off course on Line 90 and Line 100 to avoid a cultural feature (Horse Ranch).

AIRBORNE SYSTEMS:

Gamma Ray Spectrometer

Pico Envirotec GRS-10 Gamma Spectrometer
8.4 litres of NaI(T1) synthetic "downward looking" crystals
Sample Rate: 1 Hz

1000 0 1000 2000 3000 4000 5000
(meters)
NAD83 / UTM zone 10N

Xstrata Copper Canada

Axe Property
Uranium over Thorium Ratio
Created By: Precision GeoSurveys Inc.
December 11, 2012

Precision GeoSurveys Inc.

eU/eTh

Axe Property: 2012 Prospecting Field Notes

Sample_Number	Easting_m	Northing_m	Sample_Type	Zone	Lithology
Axe5201	679207	5505222	Grab	Upper East Grid	Crystal-lithic tuff
Axe5202	679334	5505203	Grab	Upper East Grid	Lahar deposit
Axe5203	679412	5505166	Grab	Upper East Grid	Lahar deposit
Axe5204	679552	5505205	Grab	Upper East Grid	Lahar deposit
Axe5205	679646	5505203	Grab	Upper East Grid	Lahar deposit
Axe5206	679726	5505186	Grab	Upper East Grid	Lahar deposit
Axe5207	679834	5505193	Grab	Upper East Grid	Lahar deposit
Axe5208	679956	5505255	Grab	Upper East Grid	Lahar deposit
Axe5209	680092	5505197	Grab	Upper East Grid	Diorite.
Axe5210	680225	5505143	Grab	Upper East Grid	Diorite.
Axe76-1	680131	5501793	Float	1516	Nicola Group Volcanics-Eastern Belt. Mafic Volcanics
Axe76-2	680131	5501793	Grab	1516	Nicola Group Volcanics-Eastern Belt. Mafic Volcanics
Axe76-3	680155	5501902	Grab	1516	Nicola Group Volcanics-Eastern Belt. Mafic Volcanics
Axe76-4	680170	5501964	Grab	1516	Nicola Group Volcanics-Eastern Belt.Intermediate-Mafic Volcanics
Axe76-5	680202	5501973	Grab	1516	Nicola Group Volcanics-Eastern Belt.Intermediate-Mafic Volcanics
Axe76-6	680364	5502076	Grab	1516	Nicola Group Volcanics-Eastern Belt.Intermediate-Mafic Volcanics
Axe76f	680433	5502099	-	1516	Nicola Group Volcanics-Eastern Belt(?)

Sample_Number	Easting_m	Northing_m	Sample_Type	Zone	Lithology
Axe79-1	680435	5502253	Grab	1516	Nicola Group Volcanics-Eastern Belt.Intermediate-Mafic Volcanics
Axe79-2	680001	5502251	Grab	1516	Diorite.
Axe79-3	679930	5502271	Grab	1516	Nicola Group Volcanics-Eastern Belt.Intermediate-Mafic Volcanics
Axe79-4	679454	5502191	Grab	1516	
Axe79-5	679454	5502191	Grab	1516	
Axe710-1	680303	5502036	Grab	1516	Nicola Group Volcanics-Eastern Belt.Intermediate-Mafic Volcanics
Axe710-2	679994	5502040	Grab	1516	Nicola Group Volcanics-Eastern Belt.Intermediate-Mafic Volcanics
Axe710-3	679562	5502088	Grab	1516	
Axe711-1	680684	5502218	Grab	1516	
Axe711-2	680479	5501856	Grab	1516	Granite/Granodiorite.
Axe711-3	680425	5501850	Grab	1516	Felsic intrusive with Quartz eyes
Axe711-4	680292	5501825	Grab	1516	Granite/Granodiorite.
Axe712-1	680186	5501646	Grab	1516	Nicola Group Volcanics-Eastern Belt.Intermediate-Mafic Volcanics
Axe712-2	679927	5501705	Grab	1516	Nicola Group Volcanics-Eastern Belt.Intermediate-Mafic Volcanics
Axe715-1	680741	5504987	Grab	Upper East Grid	
Axe715-2	680542	5504662	Grab	Upper East Grid	Nicola Group Volcanics. Eastern Belt.
Axe715-3	680548	5504569	Grab	Upper East Grid	Nicola Group Volcanics. Eastern Belt.
Axe715-4	680643	5504390	Grab	Upper East Grid	
Axe715-5	680758	5504344	Grab	Upper East Grid	
Axe715-6	680604	5504411	Grab	Upper East Grid	
Axe715-7	680571	5504535	Grab	Upper East Grid	Nicola Group Volcanics. Eastern Belt.

Sample_Number	Easting_m	Northing_m	Sample_Type	Zone	Lithology
Axe715-8	680550	5504601	Grab	Upper East Grid	Nicola Group Volcanics. Eastern Belt.
Axe715-9	680509	5504538	Grab	Upper East Grid	Nicola Group Volcanics. Eastern Belt.
Axe715-10	680561	5504323	Grab	Upper East Grid	Nicola Group Volcanics. Eastern Belt.
Axe715-11	680611	5504220	Grab	Upper East Grid	Nicola Group Volcanics. Eastern Belt.
Axe715-12	680636	5503901	Grab	Upper East Grid	Nicola Group Volcanics. Eastern Belt.
Axe715-14	680628	5503714	Grab	Upper East Grid	Nicola Group Volcanics. Eastern Belt.
Axe715-15	680627	5503814	Grab	Upper East Grid	Nicola Group Volcanics. Eastern Belt.
Axe715-16	680628	5503714	Grab	Upper East Grid	
Axe716-11	682829	5506250	Grab	Upper East Grid	Nicola Group Volcanics. Eastern Belt.
Axe716-13	681657	5499086	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)
Axe717-1	681483	5499085	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)
Axe717-2	681459	5499085	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)
Axe717-3	680330	5499795	Grab	Lower East Grid	13a (Summers Creek Stock)
Axe717-4	680399	5499597	Grab	Lower East Grid	13a (Summers Creek Stock)
Axe717-5	680377	5499661	Grab	Lower East Grid	13a (Summers Creek Stock)
Axe717-6	681555	5499309	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)
Axe717-7	681580	5499202	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)
Axe718-1	681286	5498211	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)
Axe718-2	681139	5498589	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)
Axe718-3	681123	5498517	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)
Axe718-4	681153	5498373	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)
Axe718-5	681251	5498132	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)
Axe718-6	681009	5498465	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)

Axe718-7	680951	5498405	Grab	Lower East Grid	Cretaceous Granite (Summers Creek Stock)

Alteration, Magnetism & Mineralization of Outcrops/Samples

Sample_Number	Alteration	Magnetism	Mineralization
Axe5201	Epidote replacement of plagioclase.		
Axe5202	Pervasive chlorite alteration.		
Axe5203	Pervasive chlorite alteration and epidote.		
Axe5204	Chlorite altered clasts. Minor epidote alteration of plagioclase. Chlorite altered matrix, with calcite veining.		
Axe5205	Propylitic - chlorite and epidote with calcite.		
Axe5206	Propylitic - chlorite and epidote with calcite.		
Axe5207	Chlorite alteration.		
Axe5208	Chlorite alteration.		
Axe5209	Chlorite and epidote.		
Axe5210	Chlorite and epidote.		Tr disseminated Pyrite.
Axe76-1			Cp, Mal (<0.3%), Bor(<0.3%), Cov?(<0.3%), Py (<3-5%)
Axe76-2	Potassic(?)/Ca-na?		Cp (tr-0.3%), Mal (tr-0.5%), Bor, Cov(?), Py (<20%)
Axe76-3	Potassic(?)/Ca-na?		Py (to 15% locally)
Axe76-4	Propylitic		Py (to 5% locally)
Axe76-5	Potassic(??)/Silicified(?)		Py (to 10% locally)
Axe76-6	Propylitic		Py <1%.
Axe76f			Py trace to 0.5%.
Sample_Number	Alteration	Magnetism	Mineralization
Axe79-1	Propylitic.		Py
Axe79-2	Propylitic.		
Axe79-3	Propylitic.		None
Axe79-4			Cp, Mal
Axe79-5			Cp, Mal
Axe710-1	Propylitic.		Cp (tr), Py (to 2%).
Axe710-2	Propylitic.		Py (to 1%).
Axe710-3	Propylitic.		Py (to 3%).

Axe711-1	Propylitic.		Py (to 0.5%).
Axe711-2			Py (to 0.5%), silver sulfide?
Axe711-3			None
Axe711-4			Py (to 1%).
Axe712-1	Propylitic.		Py (to 1%).
Axe712-2	Propylitic.		Py (to 3%).
Axe715-1			
Axe715-2			
Axe715-3		Moderate	
Axe715-4	Chlorite (pervasive weak-moderate)	Weak	
Axe715-5		None-weak	
Axe715-6			
Axe715-7	Chlorite (replacement of Augites, weak P in gm, and Pch). Epidote (very weak - moderate, Pch, F)	Moderate-Strong (green volcanics), None (purple basalt)	

Sample_Number	Alteration	Magnetism	Mineralization
Axe715-8	Epidote (V, F). Chlorite (R of augite).	Strong.	
Axe715-9	Epidote (Pch,F). Chlorite (R of augite).	Strong.	
Axe715-10		Strong.	
Axe715-11	Epidote (mod-strong). Chlorite (moderate, R).	Moderate-strong.	
Axe715-12	Epidote (Pch).	Weak.	
Axe715-14	Epidote (Moderate, Pch). Chlorite (weak)		
Axe715-15		Moderate.	
Axe715-16			
Axe716-11	Chlorite (weak-mod, P)	None.	Py (to 0.5%, Diss)
Axe716-13	Chlorite (weak, V).	None.	Py (to 0.7%, Diss, nucleating on mafics)
Axe717-1		None.	Py (to 1.5%, fg diss).
Axe717-2	Chlorite (weak-moderate, P). Calcite (V).	Moderate.	
Axe717-3		Weak-moderate.	
Axe717-4		Weak-moderate.	
Axe717-5		Moderate-strong.	

Axe717-6		Weak.	
Axe717-7		Weak.	Py (to 0.3%, fg diss).
Axe718-1		None to moderate.	Malachite (to 0.7%), Py (to 25%, F).
Axe718-2		Weak.	
Axe718-3		Weak.	
Axe718-4		None.	Py (to 1.5%, F).
Axe718-5		None.	Malachite (to 1%). Py (tr-1%, F).
Axe718-6		None.	
Axe718-7		None.	Py (to 5%, diss).

Lithology Descriptions (by author: S.Rosset)

Sample_ Number	Comments
Axe5201	Semi-altered (weathered), weakly diffuse texture, ~30-40% plag phyric, almost completely epidote altered. Pebble-lithic fragments to ~6mm (sparse) of oxidized volcanics and green volcanics.
Axe5202	Matrix-supported, finegrained green-grey, moderate hardness, lithic clasts to 1.5cm, polymict. Oxidized bright/dark red volcnaic clasts. Clasts rounded, predominantly red bed volcanics.
Axe5203	As above (5202), but increased hematite. Paler grey-green, and more epidote.
Axe5204	Very poorly sorted, with pebbles up to ~1.7cm, polymict. Predominantly red bed volcanic clasts, matrix supported. Chlorite altered clasts and minor component of intrusive syenitic clasts (<2%). Fragments semi-angular to semi-rounded. Matrix medium green, relatively soft; chlorite altered. Calcite veining.
Axe5205	Subrounded clasts. Same as previous but increase in proportion of clasts.
Axe5206	As above (5205).
Axe5207	Lahar with clast size increase, up to ~2cm. More syenitic clasts, matrix dark green (chlorite rich). No redbed volcanic clasts.
Axe5208	Decrease in grain size (<0.5cm). Sparse clasts (<5%). Plag phyric around ~15% plagioclase phenos.
Axe5209	Diorite, propylitic alteration. Medium grained.
Axe5210	Diorite, finegrained, could be hypabyssal, or volcanic.
Axe76-1	Most likely from adjacent outcrop. Nonmagnetic, highly weathered. Pale grey-green fg sugary gm; altered. Pyrite clots to 3mm, to 3-5%. Trace Chalcopyrite, Malachite and possible bornite/covellite (to 0.3% - Cp, mal). Alteration is magnetite destructive?? Ie. calc-sodic?? Softening: sericite-carb(?)-chlorite??
Axe76-2	Purple-pink tint to groundmass, weathered/altered with a diffuse gm featuring sugary texture. The potassic(?) alteration is patchy and domainal, with sharp contacts visible in areas.Colouration from secondary ksp/biotite? Outcrop features augite phenos visible in areas, to 2mm, subhedral to 7%. Outcrop is very rusty and weathered with Limonite-Goethite-Jarosite and minor Hematite, with up to 0.5% malachite, up to >10% Pyrite and trace-0.3% Chalcopyrite, with possible trace of Covellite/Bornite. Up to 20% Pyrite.
Axe76-3	Very rusty/gossanous outcrop, somewhat friable due to extensive fracturing. Rel hard groundmass, with pink-purple potassic(?) alteration. Diffuse texture, no visible phenos (as on 76-1 and 76-2 except for the augite locally) with a sugary texture. Probably same augite-phyric unit. Highly weathered, so difficult to see anyting fresh but where visible the groundmass is fg. Pyrite is clotty (disseminated), along fractures, and as veins(?), and up to 15% locally. Lim-Jar-Goe. Ouctrop features pale cream green groundmass as well with patchy/domainal ksp(?) alt.
Axe76-4	Nicola Group Volcanics - Eastern Belt. Outcrop 76b. Less altered and less weathered than 76-1 to 76-3. Augite and plagioclase phyric andesitic basalt. Augites subhedral, to 3mm @ 15%, plag to 2mm @5-7%., more anhedral to subhedral. Autobrecciated? Clastic or patchy alteration? Clasts in an augite and plag phyric matrix with dark green groundmass. Clasts feature augite to 4mm @10-15%, appear more euhedral. Matrix may have a subtle purple tint. Unit is much harder/competent than previous otcrops (76-1 to 76-3). Mildly to moderately magnetic, less altered. Pyrite to 5% locally. No cp/mal. Epidote alteration.
Axe76-5	Rusty roadcut. Outcrop 76c. Silicified? Blebby Py with clots to 3mm (up to 10% pyrite with up to 6mm clots on fractures). Lim-Jar-Goe-Hem weathered outcrop. Groundmass is hard with diffuse texture, possibly representing silicification. Sugary texture. May be augite phyric but hard to discern with degree of weathering/alteration. Augites are subhedral, faintly visible where the roundmass is darker and less altered/weathered. Grey-green color. Non-magnetic. Same pink-purple flooding evident in groundmass again with trace epidote, patchy. Epidote flooded clasts?

Axe76-6	Moderately magnetic. Relatively unaltered, wit dark-med green augite and plagioclase phryci andesitic basalt. Disseminated fg Pyrite <1% and minor clots. Very weakly gossanous. Tr-0.5% epidote. Relatively hard.
Axe76f	Pale-medium green, relatively fg, plag phyric, possibly fg intr, or flow/tuff?. Relatively unaltered, with pyrite finely dissemianted trace to 0.5%.

Sample_Number	Comments
Axe79-1	Pyrite disseminated and in fractures, epidote alteration patchy and along fractures/vns. Moderately magnetic. Rusty outcrop, hard, not very altered. Gray plag and augite phyric volcanics(?).
Axe79-2	Grey, soft, moderately magnetic. Specular hematite and hematite, epidote alteration patchy, fracs/veins. Hard to see fresh face. Calcite veining. Trace of a metallic purple-bronze mineral - bornite (trace and very fg!).
Axe79-3	Outcrop extremely hard/competent. Surfaces weathered, soft. Fg grey-green gm. Tuff? No visible Py. Moderately magnetic. Hematite and epidote alteration (mainly fracture controlled).
Axe79-4	Magnetic. Pch Epidote alteration (moderate) on fractures and veins. Medium grained diorite. Cp. Epidote replacement of plag. Very hard, not very altered.
Axe79-5	Magnetic. Pch Epidote alteration (moderate) on fractures and veins. Medium grained diorite. Cp. Epidote replacement of plag. Very hard, not very altered.
Axe710-1	Mild to moderately magnetic. Green-grey plag and augite phyric volcanics(?). Vuggy. Pyrite to 2%, dissemianted and fractures, poss. Py veins. Quite soft, probably chlorite altered - pervasive. Lim-Goe-Jar>Hem. Patchy epidote alteration, mostly fractures and veins. Trace Cp, no malachite.
Axe710-2	Grey with green tint, moderately magnetic. Blebby Pyrite up to 1%. Very limited outcrop, somewhat soft (weathering). Chloritic gm - pervasive. Augite(?) phyric volcanics. Very small phenos, 1-2mm, ~7%. Chlorite replacement of augite. Epidote veining.
Axe710-3	Py to 3%. Patchy epidote. Possible trace Cp. Very hard! Moderately magnetic. Relatively fg, plag phyric with lesser augite to 1mm, random plag to 4mm (euhedral). Rel fg intr?? Not really porpyritic.
Axe711-1	Non-magnetic but probably due to degree of weathering. Blebby Py (<2mm), to 0.5%. Chlorite/epidote alteration. Pervasive? Moderate hardness. Goe-Hem-Jar. Pale green/gray. Clay alt. Possible that clasts or veins are mineralized.
Axe711-2	Disseminated Pyrite ~0.5%. Trace silver sulfide, too small to identify. Granite/granodiorite. Highly weathered, limited outcrop. Biotite booklets to 5mm. Very rusty (Goe-Hem-Jar). Gossanous. Non-magnetic. Mafics 5-10% (biotite), Qtz/feldspar with low to no alkali?Hard to tell since very rusty.
Axe711-3	Quartz eyes to ~6mm in felsic, very hard, white matrix (relatively coarse ie. Med-grained intrusive). Rusty bits, trace Pyrite disseminated, some eroded out - vuggy. Rusty vugs. Feldspar/Quartz matrix med-gr intr.
Axe711-4	Mildly magnetic. Medium-almost coarse grained intrusive granite/granodiorite. Py disseminated to 1%. Biotite booklets to >7mm or more, Quartz rich.
Axe712-1	Medium green/grey matrix with plag and augite phenos. Augite <2mm, Plag <1mm. Semi-diffuse texture. Volcanics? Gossanous, Jar>Goe>Hem>Lim. Patchy, weak epidote alteration. Pyrite to 1% on fractures, and disseminated. Mildly magnetic. Vey hard.
Axe712-2	Very gossanous outcrop. Jar, Goe, Hem > Lim. Outcrop right on road. Very mildly to non-magnetic. Patchy epidote, weak-moderate. Pyrite to 3%, disseminated, fractures, veins. Quite soft - chlorite alteration? Ser/Clay. Diffuse texture, no visible phenos.
Axe715-4	Medium to dark green. Relatively soft.

Axe715-5	Mapped as Quaternary Cover.
Axe715-6	Missing sample.
Axe715-7	Medium to dark green, relatively hard. Also, hematitic purple basalt, with plag (soft).
Sample_Number	Comments
Axe715-8	Pale to medium green, hard, relatively unlaltered. Augite and plag phyric.
Axe715-9	Pale to medium green, hard, relatively unlaltered. Augite and plag phyric.
Axe715-10	Volcanics as above, medium grained (coarser).
Axe715-11	Medium-pale green, coarser volcanics.
Axe715-12	Mapped as Quaternary Cover. Volcanics as above. Contains sharp contact into porphyritic,purple rocks (dyke contact or clast?) no chilled margin, no baked contact.
Axe715-14	Pale green volcanics. Fg gm. Crystal tuff? Plag/augite phyric.
Axe715-15	Quaternary cover mapped. Green-grey lahar? Deposit with microsyenite clasts to ~2cm. Weathered but unaaltered, hard.
Axe715-16	Sample missing.
Axe716-11	Pale green, medium soft, rusty, large plagioclase laths (to 8mm), clastic?? Very weathered with no fresh surfaces - hard to see any texture, very diffuse/weathered). Possible Qtz phenos…
Axe716-13	Near graphic textured granite. Very low mafics.
Axe717-1	Fg intrusive, felsic, very rusty. Grey-white/purple. Very hard. Purple staining Pch/bands, but probably just Hematite - appears opaque.
Axe717-2	No fresh faces. Pale green-blue-gray, very fg, aphyric.
Axe717-3	Medium-grained quartz monzonite, weakly rusty, no alteration, very hard, salmon pink.
Axe717-4	Medium-coarse grained quartz monzonite, weakly rusty, no alteration, very hard, salmon pink.
Axe717-5	Medium-coarse grained granodiorite. White/black, biotite-hornblende. Weakly rusty.
Axe717-6	Medium-grained granite- granodiorite. Very hard. Pale white-green-gray. Unaltered. Microcline likely. (Lower temp margins of intrusion?)
Axe717-7	Fine to medium-grained granite- granodiorite. Very hard. Pale white-green-gray. Unaltered. Increased alkali from 717-6. Microcline likely. (Lower temp margins of intrusion?)
Axe718-1	3 samples. A) No fresh faces, malachite to 0.7%, Py to 0.1%, very rusty, medium grained. B) Very rusty, Py to 25% on fractures, Goethite/Limonite/Jarosite> Hematite. C) Very hard, medium green-gray fg matrix, rusty, porphyritic, plag phyric section, andesite(?). Pyrite to 4% on fractures, rusty.
Axe718-2	Medium-coarse grained quartz monzonite-granite. Rusty.
Axe718-3	As 718-2 but coarser, less rusty.
Axe718-4	Very rusty, no fresh faces, highly weathered. Probably a fine-medium grained granite.
Axe718-5	3 Samples. A) Limonite weathered, felsic intrusive, Quartz vein, Very hard. Non-magnetic, tr Py. B) Can't describe, nothing but weathered rusty (Hem>Goe) faces, tr-1% Pyrite on fracs. C) malachite to 1%, fg, hard grey gm, bit rusty.
Axe718-6	Hard, dark grey fg gm, again so weathered with no fresh faces makes recognition impossible. Goe/Hem weathering. Mafic xenolith?? Possible tuff/volcanic.
Axe718-7	3 Samples. A) Py diss to 5%, fg medium grey gm, non-mag, very hard, plag/qtz phenos?? B) calcite fractures, A/B both) rusty, gossanous with Hem/Goe/Jar>Lim.

Appendix E

Prospecting Tables

Appendix F

Statement of Expenditures

Property Name:	Axe	**Tenure holder:**	Xstrata Canada Corporation
Work Started:	April 24, 2012	**Work End:**	December 2, 2012

Tenure Number(s):

357479, 357482, 248853, 357477, 357478, 357474, 408270, 357475, 357471, 357481, 248851, 357480, 408269, 248850, 408271, 393962, 357472, 357476, 357473, 357483, 357470, 531366, 531369, 531371, 531372

Total Hectares: 4983.07

Description of work completed:

Geochemical Soil Sampling, Ground Geophysics, Airborne Geophysics, and Prospecting

Assessment work completed: **$428,605.78**

Personnel				
Employee	***Day Rate***	***Days***	***Partial Total***	***Total***
Geologist				$77,500.00
S. Rosset	$325.00	75	$24,375.00	
M. Keogh	$350.00	110	$38,500.00	
T. Miller	$325.00	45	$14,625.00	
Student				$23,400.00
J. Zak	$200.00	76	$15,200.00	
J. Wilson	$200.00	41	$8,200.00	
Levert				$54,975.00
T. Quewezance	$300.00	76	$22,800.00	
M. Sam	$300.00	68	$20,400.00	
J. Billy	$325.00	2	$650.00	
J. Tom	$300.00	10	$3,000.00	
I. Tom	$325.00	25	$8,125.00	
Total				**$155,875.00**

Sampling				
Type	***Cost***	***# of samples***	***Partial Total***	***Total***
MMI	$38.50	469	$18,056.50	
B-Horizon	$38.05	469	$17,845.45	
Total				**$35,901.95**

Geophysical Surveying				
Type	***Cost***	***Kilometers***	***Partial Total***	***Total***
Ground - IP	$2,007.14	35	$70,250.00	
Airborne -Mag/Rad.	$59.17	954	$56,451.36	
				$126,701.36

Miscellaneous				
Type	***Cost***	***Days***	***Partial Total***	***Total***
Truck/Gas	$125.00	110		$13,750.00
ATV/Gas	$50.00	15		$750.00
Sat Phone	$5.00	120		$600.00
SPOT	$5.00	120		$600.00
Room and Board				$42,855.00
S. Rosset	$75.00	75	$5,625.00	
M. Keogh	$75.00	114	$8,550.00	

T. Miller	$75.00	45	$3,375.00	
J. Zak	$75.00	66	$4,950.00	
J. Wilson	$75.00	41	$3,075.00	
M. Sam	$120.00	76	$9,120.00	
T. Quewezance	$120.00	68	$8,160.00	
Field Supplies				$12,608.31
Total				**$71,163.31**

Total		
Assessment Work		$389,641.62
Overhead (10% of Assessment Work)		$38,964.16
Total Work		**$428,605.78**