

**Assessment Report
2006**

Describing
Air-FTG Survey
Geophysical Work
on the

Logan Project

Logan 1 – 106
Under option to Yukon Zinc Corporation from
Almaden Minerals Ltd. (100%)

Logan 107 – 152, Strip 1-4
Owned by Yukon Zinc Corporation (100%)

NTS 105B/07, 08, 09 and 10

In the Watson Lake Mining District, Yukon Territory
Prepared by:

Jason K. Dunning, B.Sc., M.Sc., P.Geo.

2007

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INTRODUCTION

Bell Geospace was retained by Yukon Zinc Corporation (Yukon Zinc), in the fall of 2006 to perform an Air-FTG survey on the Logan claims in the Watson Lake Mining District, Yukon Territories. The location of the Logan project is shown in Figure 1 with a complete Quartz Mining Claims listing in Table 1.

The Air-FTG survey work was completed between November 15, 2006 and December 31, 2006. The exploration target is an 8,000 m long NE-trending fault-related structure within which a Main Zone and two flanking zones were identified through programs of trenching, drilling, and geological investigations. The principal Main Zone is tabular, dips 70 degrees to the NW, extends for 1,100 m along strike, and has been traced by drilling to depths of up to 275 m at widths varying from 50 m to 150 m.

LOCATION AND DESCRIPTION

The Logan project is located 108 kilometres north-west of Watson Lake in south central Yukon. Figure 1 presents the location of the Logan project and Yukon Zinc's Wolverine project. The Logan project consists of 156 contiguous quartz mining claims located in the Watson Lake Mining District, Yukon. The project is currently being operated under a 60:40 Joint Venture between Yukon Zinc and Almaden Minerals Ltd. (Almaden); noting that Almaden is carried through to feasibility. Logan 1 to 106 quartz mining claims are currently in the name of Almaden. Logan 107 to 152 and Strip 1 to 4 are in the name of Yukon Zinc.

The property can currently be accessed via helicopter directly to the site since the original winter road used for the 1988 drill program is no longer passable (although it can be re-established along its original trace). Access to the Logan project would be achieved by constructing a 55 km gravel road heading north off the Alaska Highway at a point approximately 80km west of Watson Lake. The town of Watson Lake is a southern Yukon transportation hub with roads connecting to Whitehorse (441 km), the port at Skagway (615 km) and the rail head at Fort Nelson (531 km).

The Logan and Wolverine projects are within the traditional territory of the Ross River Kaska Dena First Nation. The Ross River Kaska are part of the Kaska Nation that includes the Liard Kaska and Kaska Dena Council in north-central British Columbia. The Kaska are negotiating their land claim as a nation involving the governments of Canada, Yukon, and British Columbia. The Yukon Umbrella Agreement provides clear guidelines with regard to access across First Nations settlement lands and mechanisms to resolve any disputes related to access for development. In general, the First Nations have been supportive to development that addresses their social and economic needs.

The Logan project climate is cold continental with a mean daily summer temperature of 15°C and a mean daily winter temperature of -25°C. Precipitation falls fairly evenly throughout the year, predominantly as rain from May through September, and snow for the balance of the year. The mean annual precipitation is 655 mm. The area of the project falls into the Pelly River and Pelly Mountain ecoregions. The major part of the Pelly River ecoregion is underlain by metamorphic rock; however, large areas of volcanic and intrusive rocks and small areas of sedimentary rocks occur throughout. During the last glacial period, ice moved across the eastern part of the ecoregion (including the general area of the project site) in a northwesterly to westerly direction and extended to heights of about 1525 m.

The region has intermittent permafrost with moist depressional areas containing peat plateaus, patterned fen and bog complexes. Scree covered slopes are most prominent in sedimentary rock. Deep colluvium occurs on steeper mid to lower slopes. The project area is mostly a forest region, except for topographic peaks, which are in the tundra region. White and black spruce are the most common tree types. Black spruce is usually dominant in wetter areas, white spruce dominates in drier areas. Paper birch, aspen,

balsam and lodgepole pine also occur. Alpine fir occurs at the treeline (1350 m to 1500 m). In dense coniferous stands, feathermoss dominates the understorey, but in more open areas willows and heath-like shrubs become prevalent. Sedge or sphagnum tussocks are common in wetlands and under black spruce. Shrub birch and willow occur in the sub-alpine and extend well above the treeline.

Regionally significant wildlife resources occur in the Wolverine project area, notably the Finlayson caribou herd. The herd uses the uplands around the project area from the spring to the fall, and the lowlands of the Pelly River in the winter. These caribou provide a valuable food source for the Ross River Dena First Nation and are also of economic significance to sport hunters and the guiding industry. Moose are also a significant wildlife resource. Furbearer populations are also utilized by the Ross River Dena First Nation. Fish in the larger lakes (including Finlayson Lake) and streams include arctic grayling, whitefish, lake trout and Dolly Varden char.

Land use in the immediate area is currently limited to hunting and fishing for food by First Nations, and for recreation by visitors to local lodges. Previous and existing mines are common in the Ross River - Watson Lake area (Sa Dena Hes near Watson Lake and both Ketz River and Faro near Ross River, for example).

DESCRIPTION OF WORK

See Appendix.

Figure 1: Location of Logan Project

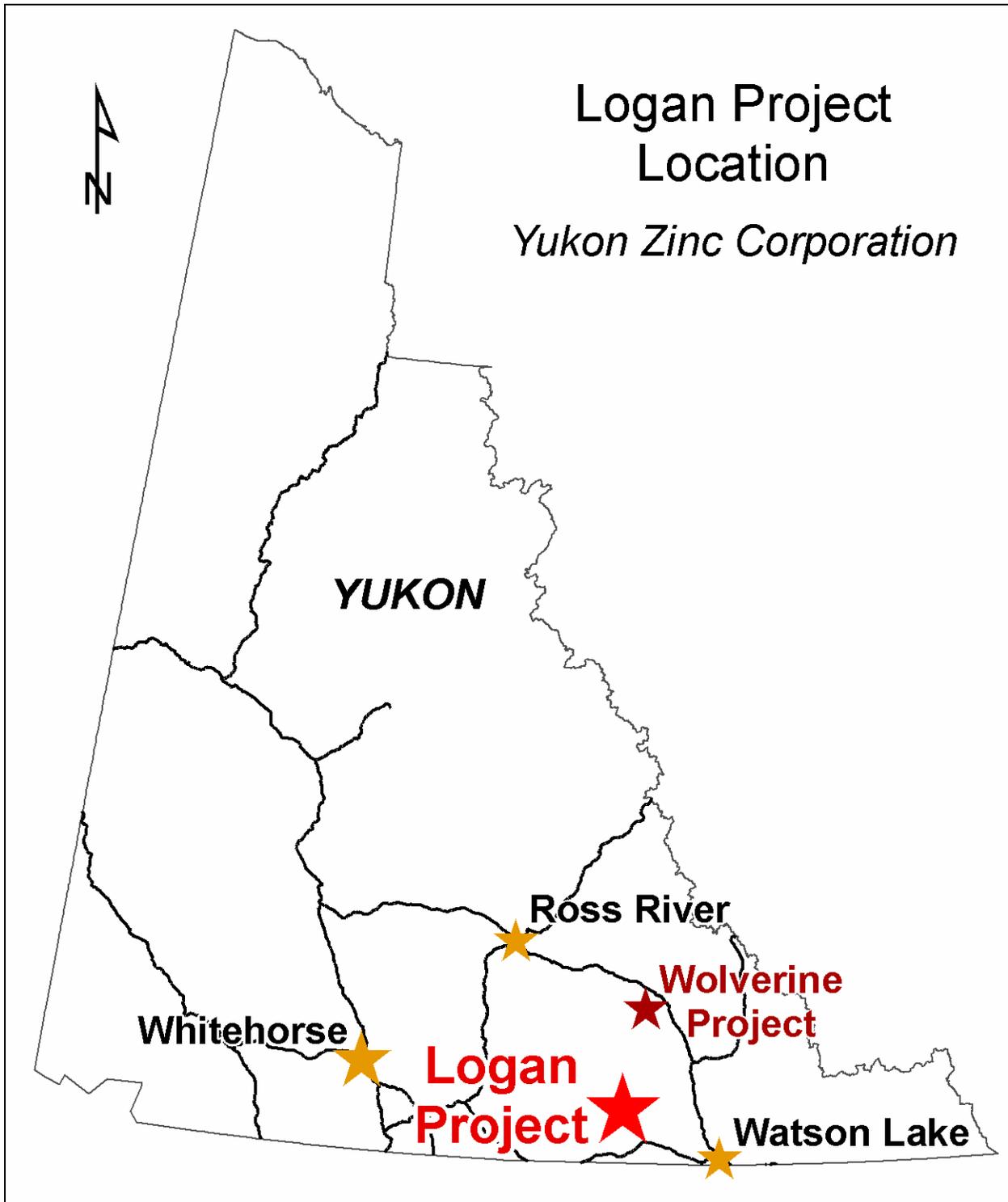


Table 1: Logan Project Claim List

Grant Number	Type	Claim Name	Expiry Date	NTS Sheet
YA45047	Quartz	LOGAN 1	12/31/2013	105B09
YA45048	Quartz	LOGAN 2	12/31/2013	105B09
YA45049	Quartz	LOGAN 3	12/31/2013	105B09
YA45050	Quartz	LOGAN 4	12/31/2013	105B09
YA45051	Quartz	LOGAN 5	12/31/2013	105B09
YA45052	Quartz	LOGAN 6	12/31/2013	105B09
YA46254	Quartz	LOGAN 7	12/31/2013	105B09
YA46255	Quartz	LOGAN 8	12/31/2013	105B09
YA46256	Quartz	LOGAN 9	12/31/2013	105B09
YA46257	Quartz	LOGAN 10	12/31/2013	105B09
YA46258	Quartz	LOGAN 11	12/31/2013	105B08
YA46259	Quartz	LOGAN 12	12/31/2013	105B08
YA46260	Quartz	LOGAN 13	12/31/2013	105B08
YA46261	Quartz	LOGAN 14	12/31/2013	105B08
YA46262	Quartz	LOGAN 15	12/31/2013	105B08
YA46263	Quartz	LOGAN 16	12/31/2013	105B08
YA46264	Quartz	LOGAN 17	12/31/2013	105B07
YA46265	Quartz	LOGAN 18	12/31/2013	105B07
YA46266	Quartz	LOGAN 19	12/31/2013	105B08
YA46267	Quartz	LOGAN 20	12/31/2013	105B08
YA46268	Quartz	LOGAN 21	12/31/2013	105B08
YA46269	Quartz	LOGAN 22	12/31/2013	105B08
YA46270	Quartz	LOGAN 23	12/31/2013	105B09
YA46271	Quartz	LOGAN 24	12/31/2013	105B09
YA46272	Quartz	LOGAN 25	12/31/2013	105B08
YA46273	Quartz	LOGAN 26	12/31/2013	105B08
YA46274	Quartz	LOGAN 27	12/31/2013	105B08
YA46275	Quartz	LOGAN 28	12/31/2013	105B08
YA46276	Quartz	LOGAN 29	12/31/2013	105B08
YA46277	Quartz	LOGAN 30	12/31/2013	105B08
YA46278	Quartz	LOGAN 31	12/31/2013	105B08
YA46279	Quartz	LOGAN 32	12/31/2013	105B08
YA46280	Quartz	LOGAN 33	12/31/2013	105B08
YA46281	Quartz	LOGAN 34	12/31/2013	105B08
YA46282	Quartz	LOGAN 35	12/31/2013	105B08
YA46283	Quartz	LOGAN 36	12/31/2013	105B08
YA71027	Quartz	LOGAN 37	12/31/2014	105B09
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YA71029	Quartz	LOGAN 39	12/31/2014	105B09
YA71030	Quartz	LOGAN 40	12/31/2014	105B09
YA71031	Quartz	LOGAN 41	12/31/2014	105B09
YA71032	Quartz	LOGAN 42	12/31/2014	105B09
YA71033	Quartz	LOGAN 43	12/31/2014	105B09
YA71034	Quartz	LOGAN 44	12/31/2014	105B09
YA71035	Quartz	LOGAN 45	12/31/2014	105B09

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YA71045	Quartz	LOGAN 55	12/31/2014	105B10
YA71046	Quartz	LOGAN 56	12/31/2014	105B10
YA71047	Quartz	LOGAN 57	12/31/2014	105B07
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DATA PROCESSING

See Appendix.

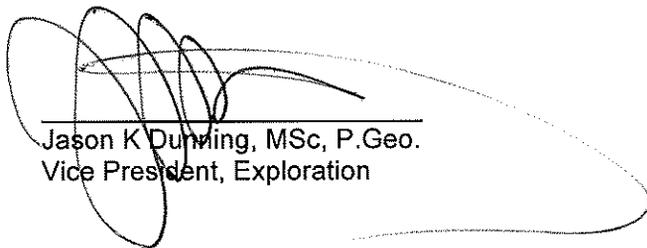
DISCUSSION

See Appendix.

RECOMMENDATIONS

It is recommended that the Logan project claims described within this Assessment Report undergo further geological and geophysical review for new targets.

Respectfully submitted,
YUKON ZINC CORPORATION



 Jason K Dunning, MSc, P.Geo.
 Vice President, Exploration

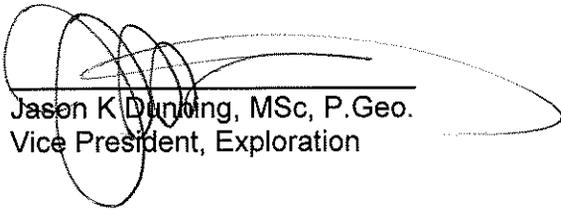
STATEMENT OF EXPENDITURES

I, Jason Dunning, as agent for Yukon Zinc Corporation, #701-475 Howe Street, Vancouver, B.C. do solemnly declare that the Geophysical work carried out on the Logan Property over all claims (Logan 1-152 & Strip 1-4) was performed between the dates of November 15th, 2006 and December 31st, 2006.

Airborne Geophysical Work	\$73,892.89
Total	\$73,892.89

I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath and by virtue of the Canada Evidence Act.

Declared before me at Vancouver in the Province of British Columbia this 21st day of December 2006.



Jason K Dunning, MSc, P. Geo.
Vice President, Exploration

CERTIFICATE OF QUALIFICATIONS

1. I, **Jason K Dunning**, of 208 East 5th Street, North Vancouver, British Columbia, V7L 9K7, Canada, hereby state – that I am the Vice President of Exploration for Yukon Zinc Corporation with offices at Suite 701, 475 Howe Street, Vancouver, British Columbia, V6C 2B3, Canada:
2. I hold a B.Sc. (Honours Geology) from Carleton University, Ontario (1994) and a M.Sc. (Geology) from the Mineral Exploration Research Centre at Laurentian University, Ontario (1997).
3. I have 13 years experience with various research institutions and mining companies in Canada and the United States, not including my summer field season work during my undergraduate degree. My primary employment since 1994 has been in the field of mineral exploration.

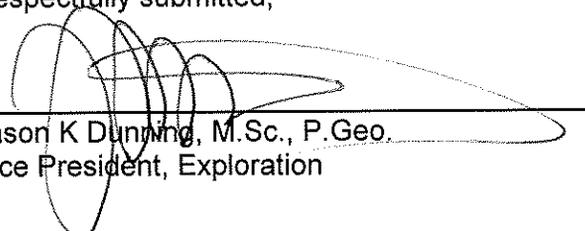
2003-Present	Vice President	Yukon Zinc Corporation
2002-2003	Project Geologist	Anglo American Exploration (Canada) Ltd.*
1999-2002	Project Geologist	Hudson Bay Exploration & Development Co. Ltd*
1996-1999	Geologist	Pamicon Developments Ltd.
1994-1996	Geologist	Teck Exploration Ltd./Laurentian University

* denotes same organization

4. I am a Professional Geoscientist in good standing with the Association of Professional Geoscientists of Ontario (0725).
5. I am also a member in good standing with the Society of Economic Geologists (222555), as well as a Fellow of the Geological Association of Canada (F6819).
6. I hold a valid Manitoba Prospector Licence (4077) and Free Miner Certificate in British Columbia.
7. I have specialized training in the areas of volcanology, ore deposit geology and hydrothermal alteration through academic training, numerous short-courses, and exploration project experience. My experience has allowed me to become familiar with the evaluation of both regional and property geology, prospecting, geophysical surveys, geochemical analysis, diamond core drilling, and the various facets of the permitting process in British Columbia, Manitoba, Nunavut Territory, Ontario, Saskatchewan, and Yukon Territory, as well as Idaho and Alaska, USA and Portugal.
8. This report is based upon data collected from data collected during November and December 2006 Air-FTG survey in the Logan project area, Yukon Territory, Canada.

DATED at Vancouver, British Columbia; Wednesday, May 9th, 2007

Respectfully submitted,



 Jason K Dunning, M.Sc., P. Geo.
 Vice President, Exploration

REFERNCES

Hatch (2004): Logan Zinc-Silver Mineral Property (Confidential Independent Technical Report)

YUKON ZINC CORPORATION

Final Report Acquisition & Processing

Air-FTG[®] Survey

Swift and Logan Projects Yukon, Canada

January 2007

By



2 Northpoint Drive, Suite 250
Houston, TX 77060
Ph. 281-591-6900
Fax 281-591-1985
www.bellgeo.com

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INTRODUCTION

For the past six years Bell Geospace has been acquiring airborne full tensor gravity gradiometry (Air-FTG[®]) data in Africa, New Zealand, Australia, North America, South America, and Europe. This report summarizes the results of Air-FTG[®] data acquired over prospects belonging to Yukon Zinc Corporation, in the south-eastern Yukon, Canada. A total of two prospects namely, Swift, and Logan were Air-FTG[®] surveyed.

The main body of this report provides general information on Air-FTG[®] and the ongoing surveys that are being conducted by Bell Geospace, Inc, for Yukon Zinc Corporation. Appendices 1, 2, 3, and 4 give a general overview of the processing procedures and products for Air-FTG[®] data. Thereafter, the report contains addendum A and B with detailed information for the individual surveys.

THE SURVEY AREA

The insert in figure 1 shows the general location of the survey areas. The survey area is comprised of two prospects and lies between latitudes 60° 05' N and 60° 35' N and longitudes 131° 15' W and 130° 15' W.

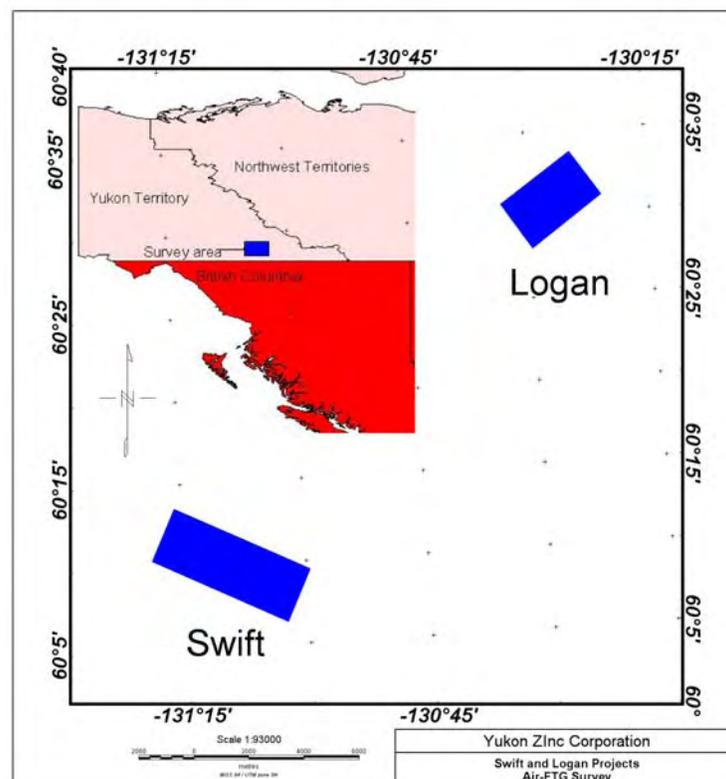


Figure 1. This map indicates the position of the individual survey blocks, along with an insert that shows the general location of the survey area in Yukon Territory.

WEATHER

The Swift and Logan prospects are located in the southeastern part of Yukon, approximately 120 km west of Watson Lake city. The Yukon has a sub-arctic climate with average temperatures rising above 10 C for no more than four months a year. Winters are cold with long dark nights. Summers are mild with long sunny days.

Climatic influences vary across the territory. Cold air masses from the Arctic dominate the northern part of the Yukon. Warmer air masses from the North Pacific moderate temperatures in the southwestern Yukon.

The weather during data acquisition varied from relatively clear sky to low ceiling clouds to rainy. In most cases flight operations were prevented or delayed in the presence of windy conditions, or poor visibility due to fog. Gradient data does not degrade as quickly as gravity data in rough weather, but gradient data quality is affected by extreme weather conditions. Data acquisition was usually halted when vertical accelerations were sustained above the 60 mill-g range. Lines acquired in the most turbulent conditions were re-acquired later during better weather. Most of the final data were acquired in the 20-40 milli-g range.

EQUIPMENT DESCRIPTIONS

THE FULL TENSOR GRADIOMETER (FTG)

The Full Tensor Gradiometry (FTG) system is a high precision, high-resolution, multiple accelerometers, rotating platform that measures the gradient of the gravity field. The FTG system contains three Gravity Gradient Instruments (GGIs) each consisting of two opposing pairs of accelerometers arranged on a disc.

The FTG system used by Bell Geospace (see Figure 2) is one of the few operational FTGs available for a moving vehicle. The gradiometer is installed in the aircraft along with all the required support equipment including the control electronics, computers, monitors, printers, air conditioning and other peripheral devices needed to support FTG data acquisition. The FTG is contained in an airtight case while in operation. The case is approximately 1 cubic meter and weighs 227 kg with the GGIs installed. The electronics cabinet is approximately the same size and weighs 160 kg. The case provides a temperature, pressure, and humidity controlled environment for the FTG during data acquisition.



Figure 2. Bell Geospace's FTG-01 marine instrument prior to airborne conversion; support equipment not shown.

MAGNETOMETER

One Geometrics cesium vapour high sensitivity magnetometer was used. The magnetometer was mounted within the “tail stinger”. The following table describes the technical characteristics of the airborne magnetometers:

Manufacturer	Geometrics
Type and Model	Cesium vapour G-822A
Ambiant Range (nT)	20 000 - 100 000
Sensitivity (nT)	± 0.0005
Absolute Accuracy	< 3 nT
Noise Envelope (nT)	0.01
Sampling Rate (Hz)	0.1
Sampling Interval	9 m at typical survey speed
Heading Error	± 0.15 nT

An RMS AARC500 Adaptive Aeromagnetic Real-Time Compensator was used to correct the magnetic response from the aircraft for changes in flight attitude (i.e. Pitch, Roll and Yaw). The system includes a Tri-Axial fluxgate magnetometer installed in the stinger to monitor the aircraft’s orientation within the earth’s magnetic field and the compensator digitally corrects the

input magnetic signal from the airborne magnetometer. The technical specifications of the compensator are given in the following table:

Manufacturer	RMS
Resolution	0.032 pT
Absolute Accuracy	± 10 nT
Noise Level	0.1 pT
Range	20,000 – 100,000 nT
Sampling	160Hz
Standard F.O.M.	<1.5 nT

Base station magnetometer

Base station magnetometer was not installed for the two surveys. For very short lines, as in these surveys, diurnal variation is essentially linear and can be removed in statistical levelling.

Therefore the absence of a base station magnetometer has little or no effect on the final magnetic data.

Base station magnetometers record GPS time to facilitate the merge with the field data. The following table presents the technical specifications of the commonly used base station magnetometer:

Manufacturer	Geometrics
Type	Proton precession
Model	G-856AX
Dynamic Range (nT)	20 000 – 90 000
Accuracy (nT)	± 0.5
Precision (nT)	0.1
Resolution (nT)	0.1
Sampling Rate per second	1.5

GRADIENT DATA ACQUISITION

Gradiometry data is initially acquired in an internal coordinate system that is referenced to the axes of the three GGIs that are the primary measurement components of the FTG. This data is later transformed into a left handed coordinate system with x and y in the plane of the earth's surface and z perpendicular to that plane but pointed down into the earth.

Prior to acquisition, a self-calibration procedure is performed with the aircraft on the ground. This creates a table of calibration factors that will be used during data processing to remove the gradient effects of the variations in pitch, roll, and yaw experienced by the aircraft in flight. Data is acquired continuously throughout the flight, usually at ground speeds of around 215 km/h. The system generates approximately 400 megabytes of data per hour including the navigation data and data on the plane's accelerations. The data is stored on a computer hard drive and backed up

to AIT tape cartridges. Two sets of backup tapes are made which are sent to Bell Geospace's processing office in separate shipments. One set is used for final processing and engineering analysis while the other is stored offsite as backup.

OPERATIONS

The gradiometry data is collected with Bell Geospace's FTG installed on a Cessna Grand Caravan C-GSKT (Figure 3). The FTG is installed in the main cabin as near as possible to the center of pitch, roll and yaw of the plane. Both GPS and DGPS systems are used for positioning with latitude and longitude coordinates acquired on the WGS-84 ellipsoid. During processing the data is locally projected in x and y in the appropriate Universal Transverse Mercator (UTM) zone. A radar altimeter system is deployed to measure the distance between the airplane and the ground. Along with the plane's altitude acquired via GPS, radar altimetry data can be used to produce a digital elevation model (DEM) which may be useful in terrain correction applications.



Figure 3. Cessna Grand Caravan C-GSKT.

GLOBAL POSITIONING SYSTEM (GPS) AND ONBOARD NAVIGATION SYSTEM

The Global Positioning System consists of a constellation of 24 active satellites orbiting the Earth. Each satellite has a period of approximately 12 hours and an altitude of approximately 20,000 km. Each satellite contains a very accurate cesium clock that is synchronized to a common clock by the ground control stations operated by the U.S. Air Force.

Each satellite transmits individually coded radio signals that are received by the user's GPS receiver. Along with timing information, each satellite transmits ephemerides (astronomical almanac or table) information that enables the receiver to compute the satellite's precise spatial position. The receiver decodes the timing signals from the satellites in view (4 satellites or more for a 3-dimensional fix) and, knowing their respective locations from the ephemerides information, the GPS system computes a latitude, longitude, and altitude for the user.

A Novatel Propak OEM4 airborne differential GPS Systems (dual-frequency) was used on the aircraft. It provides an accuracy of ± 5 meters and positions were real-time differentially corrected with the Omni-Star system. The GPS systems were used in conjunction with a PNAV-2001 Navigation System. The main features of this system are:

- Real-time graphical and numerical display of flight path with survey-area and grid-line overlay
- Distance-from-line and distance-to-go indicators
- Operation in survey-grid or waypoint navigation mode
- Recording of raw range-data for all satellites from both the aircraft-borne and base-station GPS receivers, for post-flight refinement of GPS position

FTG ONBOARD QUALITY CONTROL

Accelerations measured by the instrument during data acquisition are closely monitored along with many other indicators of instrument performance. On the main FTG screen, the operators visually inspect the inline sums and cross gradients, position and temperature of the gyros, GGI case and block temperatures and the north, east, and vertical accelerations. Any variances beyond the norm are closely watched and if an error is detected the acquisition is interrupted and appropriate action is taken. Duplicate sets of spares are available in case of suspected hardware failure. Many other factors are also monitored that will help alert the operator to any unusual performance of the FTG. These include strip charts, coefficient tables and onsite offline analysis of the data. In addition to the onboard QC checks, final survey data is sent to a Bell Geospace processing office electronically for preliminary processing. Any substandard data will be identified by cross tie analysis and other methods. As soon as the source of the data degradation is identified and corrected, the suspect line(s) are re-acquired and again transmitted into the office for approval before the aircraft leaves the survey area.

FTG DATA PROCESSING

The acquired FTG survey undergoes a series of processing steps to obtain the final measured gravity gradient data used for interpretation. Specific processing methods may vary slightly depending upon survey layout, weather conditions, and other factors affecting the data. A generalized FTG data processing schematic is provided in Appendix 1. But in all cases, flight line tensor data is processed to completion before any grid operations are performed, and flight line data is considered as the primary deliverable.

HIGH RATE POST MISSION COMPENSATION

Raw data recorded by the instrument consists of two signals from each of three **Gravity Gradient Instruments (GGI)**, these being referred to as the Cross and Inline signals. The three sets of signal data are run through proprietary software referred to as **High-Rate Post Mission Compensation (HRPMC)**. This step operates on the most highly sampled data, using the gyro outputs at 1024 hertz and GGI outputs at 128 hertz. HRPMC compensates the data for most of the physical conditions during signal acquisition. This includes corrections for the gradients of the aircraft and the gradients of the instrument itself. Files monitoring GGI platform status are logged in real time and used to create tables of coefficients that are used later to compute corrections.. A series of complex algorithms within the program use these files to generate coefficients for each 2 hour segment of acquisition. These coefficients are then used to calculate corrections for aircraft motion and position relative to the instrument during the entire survey. Another set of corrections are made to remove gradients due to the centripetal accelerations that result from the rotation of each of the three GGIs.

Upon completion of HRPMC, the data are subject to another step referred to as SAR, which strips out the necessary elements, averages the values and reformats it into a 24-column binary file. The averaging process in SAR allows the processor to choose the data sample rate for all subsequent processing and final data. The final sample rate is currently limited to 1 second or greater. The SAR files are comprised of daily blocks of data and are combined to create one file containing all the data for the entire survey. Since FTG data is recorded continuously, this file also contains data recorded during traverses, turns, and on lines that were later re-acquired for various reasons. The data recorded in these instances are removed from the data file before final processing.

It is during the SAR procedure that navigation and aircraft attitude data are merged with the gradient data. Gravity is also merged in at this point if applicable.

TERRAIN CORRECTION METHOD

The terrain corrections are computed with a 3-D prism based modelling package. The program uses grids and prisms to compute the gravity effect of each defined layer. The computation assumes a density of 1.0 gm/cc and calculates the gravity response of a model that represents the mass of the Earth between the terrain surface and the ellipsoid. The result of the computation is a terrain correction for each tensor component that can be subtracted from the measured data. This produces a set of tensor components that contain primarily the gravitational effects of the sub-

surface geology only. This correction can be easily scaled to any density desired and applied using the following channels and formula:

$$T_{zz_TC_267} = T_{zz_FA} - 2.67 * TC_T_{zz_100}$$

Where

$T_{zz_TC_267}$ is the terrain corrected Tzz component at a density of 2.67 gm/cc

T_{zz_FA} is the Free Air Tzz component

$TC_T_{zz_100}$ is the terrain correction factor for Tzz at a density of 1.00 gm/cc

Similar equations hold for the other components. The suffix “MCP” indicates de-noising through Multi-Channel Processing.

FTG-SPECIFIC LINE CORRECTIONS

The next process is another proprietary method referred to as FTG-Specific Line Correction. This step calculates the tensor components from the measured inline and cross data sets. Bulk linear and low frequency errors in the tensors are determined and appropriate corrections are applied to the inline and cross signals. This is a time based levelling method that optimizes the correlated GGI output. This approach makes it possible to analyze data from each GGI separately, and construct processing techniques to independently address each instrument’s noise characteristics. Once tensors are computed this distinction is no longer possible, as the noise from each instrument is “smeared” throughout the tensors. This process assumes that there is no correlation between the error we want to remove and the signal that we want to keep. Details of this procedure are included in the following paragraphs.

The DGPS provides highly accurate aircraft position, heading, and speed measurements. The exact position of each GGI relative to the umbrella frame is provided from the servomotors that induce the rotations, and from the gyros on the stabilized platform. From this information the measured accelerations in the inline and cross signals from each GGI can be converted to directional gradients and provides the tensor elements T_{xx} , T_{xy} , T_{xz} , T_{yy} , T_{yz} and T_{zz} . In this survey the carousel was not rotating so only the rotation of the GGI’s must be compensated for. The carousel rotation rate is normally 360 degrees per hour, so due to the relatively short lines (in time) typical of airborne speeds a complete rotation would not occur while online and would not assist in noise compensation. Feed back from the gyros and GPS data allows the servomotors to keep each GGI in the same horizontal and vertical orientation relative to the ground throughout the survey.

The FTG data record is synchronized and time stamped with the GMT time at one second intervals. The differentially corrected GPS data is also GMT time stamped. Based on a match in GMT time, the umbrella frame coordinates in the FTG data are replaced with real world coordinates in the WGS-84 ellipsoid. Various projection methods are available at the client’s request.

The GGI drift poses a special problem because it is not linear, so traditional line levelling techniques are inadequate to correct for this error, and, since GGI drift is time dependent, levelling is best done in the time domain. Because of the nature of gradient data and the Laplace equation ($T_{xx} + T_{yy} + T_{zz} = 0$), complicated levelling procedures must be used to keep all components levelled both to themselves and to each of the other components so that this relationship is preserved during correction. This process is generally executed as follows:

First, the data on the turns and traverses outside the survey area are deleted. Secondly, time-varying heading and roll corrections are applied. Using the position and attitude of the aircraft relative to the carousel, line groups with the same heading and carousel angle are used to compute corrections that are linear over small sections of lines.

These iterative processes are applied to the GGI output signals (Inlines and Crosses), and tensors are computed and analyzed to evaluate degree of fit.

After this procedure, the data is free of DC shift and most of the low frequency error and can be mapped with a very little line error.

FINAL LINE LEVELLING

After the data is FTG levelled and bulk corrected, some small misties at intersections still remain due to random noise content and non-specific linear errors. At this point a more traditional approach to line levelling can be taken to produce final data suitable for mapping. To best evaluate the remaining misties and noise, a Butterworth filter usually between 0.5 and 1 kilometer in length is applied and misties are calculated at every intersection. The misties in the filtered data are analyzed on a line-by-line basis. Each component is shown in profile form with intersection mistie information from crossing lines displayed as well. In most cases the largest misties are due to a random noise spike near an intersection or from remnant effects from turning on to or off of a line. Usually spikes occur over very few data points but still may affect the filtered trace enough to introduce a mistie. The erroneous unfiltered data is either interpolated across or manually edited for a better fit with the intersecting lines. After each GGI component has been edited by this method on every line, the filter is reapplied and misties are calculated and analyzed again. This procedure is repeated until virtually all errors are removed. After a thorough edit, the data can be levelled by the application of low order polynomials or a tensioned spline.

The adjustments calculated from the filtered trace are also applied to the unfiltered data. This process is completed in several passes, each time re-calculating misties, and applying a successively higher order fit to the data until the misties are very near zero, and well within the noise envelope.

After each polynomial adjustment, the data is gridded and mapped as an additional quality control to aid in mistie evaluation. Intersections that cannot be tied with the polynomial fit are re-examined in profile and map form to determine which line best fits the shape of the surrounding data and is then manually adjusted as necessary. This procedure finally produces mistie adjusted, unfiltered data. The unfiltered data can then be mapped without any apparent line oriented error. Tensors are computed from the levelled GGI data and gridded and examined for remnant errors. Often another pass through the GGI signals is needed to produce the best tensor data possible.

Although this dataset produces quite reasonable maps, additional improvements can sometimes be achieved through Micro-levelling. This is a process in which tie lines are excluded, and only the correlation between parallel lines is analysed. The user can specify various filter lengths, tolerances, and other parameters to fine-tune the process to better address the characteristics of the non-correlateable frequencies. This process attempts to remove or reduce various frequencies in each line that are not present in neighbouring lines. This includes high frequency noise and lower frequency errors between intersections that cannot be removed in the tie line based adjustments. This technique is less effective where line spacing varies or is too great. Generally, lines more than 500 meters apart show only marginal improvement, primarily in the lowest frequencies. All filtering, levelling and mapping is done in Geosoft's Oasis Montaj data analysis package.

FULL TENSOR DATA ENHANCEMENT – Multi-Channel Processing

The nature of the Full Tensor Gradiometer allows for some distinct advantages in noise reduction. The FTG records five independent measurements of the geology from different perspectives. These measurements are related by the fact that they are recording data from the same source. If a signal in one tensor is not supported in the other tensors, that signal is removed from the data. This process produces a greatly improved dataset with a much better signal to noise ratio. The final tensor products contain very little erroneous noise and allows for high confidence in the mapped anomalies throughout the frequency range.

MAGNETIC DATA PROCESSING

The Magnetic data acquired onboard the aircraft must undergo several corrections particular to Airborne Magnetic surveys.

Heading Correction

Heading corrections are computed prior to the survey to allow for the removal of the magnetic field generated by the aircraft. This is done by flying lines in cardinal directions (North-South-East-West) over a common point. The averaged value at that point is the true magnetic reading, and the differences between the average value and the value recorded on each cardinal line is used to determine the heading correction. The tables generated from this exercise are used to remove the aircraft's effect during the survey.

Lag Correction

A correction is necessary to account for the distance from the GPS receiver to the magnetic sensor in the tail stinger. This is called the Lag correction. The magnetometer sensor was 39 feet behind the GPS receiver. The exact amount of lag will vary with aircraft speed, but in this case a 4 fiducial lag was applied and seemed to produce the best alignment between neighboring lines with opposite headings.

Earth's Field Removal

To better isolate local anomalies, the earth's Magnetic Field is removed from the survey data. In this area the Earth's Field is generally a slope of about 36 nT, dipping to the South West. The Earth's Field was computed using Geosoft's Oasis Montage. The IGRF Tables from year 2000 were extrapolated to the time and date of the survey.

Reduction to the Magnetic Pole

The corrected, levelled data is finally reduced to the magnetic pole. This process approximates the magnetic anomaly as it would occur directly over the causative body. This is useful for interpretation because it aligns the magnetic response with the vertical gravity gradient response (Tzz), where there is correlation. The procedure was also performed within Geosoft's Oasis Montage using a Declination of 24.4 Degrees and an Inclination of 76.7 Degrees for Swift prospect and Declination of 23.9 Degrees and an Inclination of 71.1 Degrees for Logan. These are the mean values for the entire survey area.

COMMENTS

Bell Geospace continuously fine-tunes the acquisition and processing parameters for Air-FTG® data. The processes described here produce valuable and dependable data that is well suited for intended purposes. As we progress it is important to note that many procedures described herein continue to change and improve as we learn more about the performance of the instrument in dynamic airborne environments. Air-FTG® data can consistently detect shallow bodies spanning 300 meters or less, with amplitudes repeatedly and accurately measured less than 10 Eötvös. Third party analyses have recently put resolution at 4.7 to 7 Eötvös. As we further refine processing and acquisition methods, even higher resolution will be achieved

FINAL MAPS AND DIGITAL DATA

The final step in the data processing is the application of gridding and contouring to the flight line data. Typically a minimum curvature grid with an increment on the order of 1/3 to 1/2 the closest line spacing is used, or a spacing that reflects the along line sampling rate. Air-FTG® gradient component maps are contoured at an appropriate interval and displayed using a colour filled shaded relief grid. Measured free air and terrain corrected maps for each of the six-tensor components are provided. Measured component Tzz is best compared to ground gravity if available i.e., a computed 1st vertical derivative upward continued (to flying height) Tzz as derived from ground gravity. Computed gravity, the result of vertical integration of the measured free air Tzz component, can be produced and made available for comparison and reference purposes. Page sized free air maps (jpeg format) of the final data are provided separately on a CD-ROM.

The final digital flight line data are provided on CD-ROM in a Geosoft Oasis database and also in Geosoft grid format. Measured Free air and terrain corrected tensors components are included along with the terrain correction at 1.00 gm/cc to facilitate re-computation at various densities.

Prepared by:



Dean Selman
Bell Geospace Inc.
2 Northpoint Drive, Suite 250
Houston, TX 77060
USA
Ph. 281-591-6900 ext. 226
Fax 281-591-1985
Email: dselman@bellgeo.com

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This data is covered by the United States Munitions list (USML) 22.CFR121.1 and the export of the data must be licensed by the office of Defense Trade Controls (ODTC) U.S. Department of State, prior to export from the United States or to a foreign person within the United States. It is the responsibility of the exporter to assure that the export is properly licensed and documented.

Appendix 1: Background Information on Tensors

Gradiometer data differs in many aspects from conventional high-resolution gravity data. One important difference is in bandwidth which is 500m or less for gradient data versus 3,000m for conventional gravity. The greatly increased bandwidth allows the retention of the short wavelength signal generated by shallow to intermediate geologic features which are not retained in gravity data. The increased sensitivity allows for much greater resolution and is the reason gradiometer data can be successfully incorporated into the subsequent interpretation at a prospect level.

Just as the gradient of a scalar field such as gravitational potential, is a 3 x 1 matrix of numbers commonly called a vector, the gradient of a vector field is a 3 x 3 matrix of numbers commonly called a tensor. Each element of the tensor is the rate of change of one of the components of the vector in one of the coordinate directions. Thus, when T is a scalar field,

$$\text{grad T} = \quad [\partial T/\partial x \quad \partial T/\partial y \quad \partial T/\partial z] \text{ or } [T_x \ T_y \ T_z]$$

$$\text{Then, grad(grad T)} = \begin{bmatrix} T_{xx} & T_{yx} & T_{zx} \\ T_{xy} & T_{yy} & T_{zy} \\ T_{xz} & T_{yz} & T_{zz} \end{bmatrix}$$

In the expressions above, T_x , T_y , and T_z represent the familiar acceleration of gravity in the three coordinate directions. T_{xx} , T_{yx} , ... represent the rate of change of each component of gravity as one's position changes in the three coordinate directions.

For a potential field, the sum of the diagonal components is zero, i.e., $T_{xx}+T_{yy}+T_{zz} = 0$. This is the definition of a potential field and is the famous Laplace's Equation. Perhaps as importantly, one can show that the matrix is symmetry about this diagonal, so $T_{yx} = T_{xy}$, $T_{yz} = T_{zy}$, and $T_{zx} = T_{xz}$. As a consequence, of these two facts, only five components of the gradient tensor are independent. For example, if one knows T_{xx} , T_{yy} , T_{xz} , T_{yz} , and T_{zz} , the remaining four components are uniquely determined by the relationships give above.

Each of the gravity gradient tensor components responds uniquely to the size, shape and thickness of density anomalies, providing extensive constraint during the interpretation process. All 5 independent tensors are used in the interpretation process to determine the center of mass (T_{xz} and T_{yz}), edges (T_{yy} and T_{xx}) and corners (T_{xy}) of the anomaly. The expression of T_{zz} (the vertical component) more closely resembles the conventional gravity in that the anomaly is shown in the correct position spatially and is thus more easily related to sub-surface geology.

For more information, please see Potential Theory in Gravity & Magnetic Applications by Richard J. Blakely (Cambridge University Press, 1996).

3D FTG Field: **Vectors** and **Tensors**

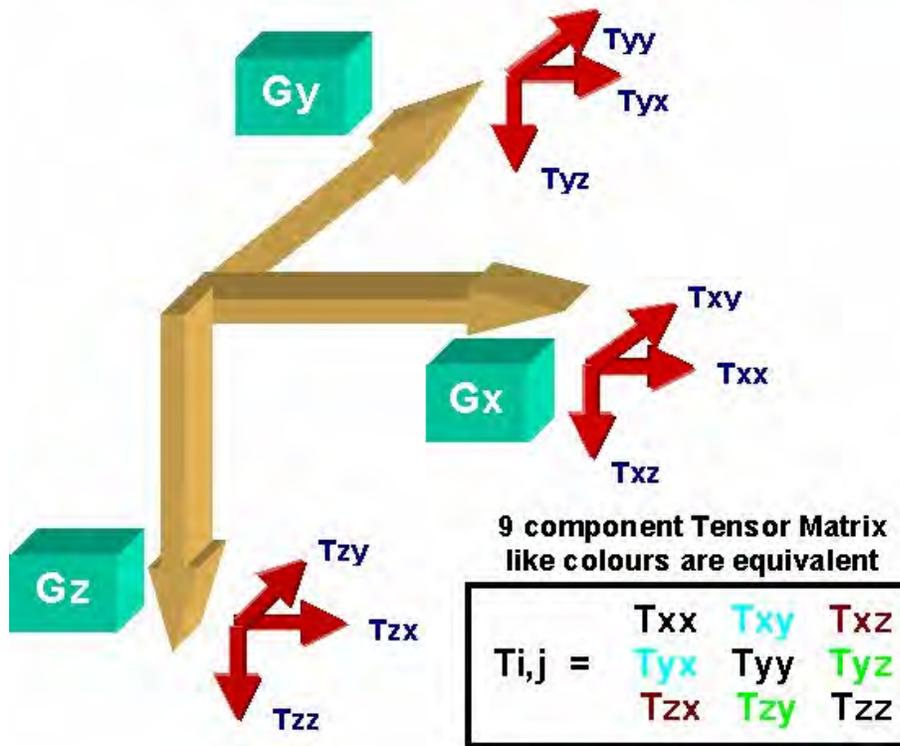


Figure 1.1: Vector and Tensor relationships of the measured gradient data

Appendix 2: FTG Data Processing

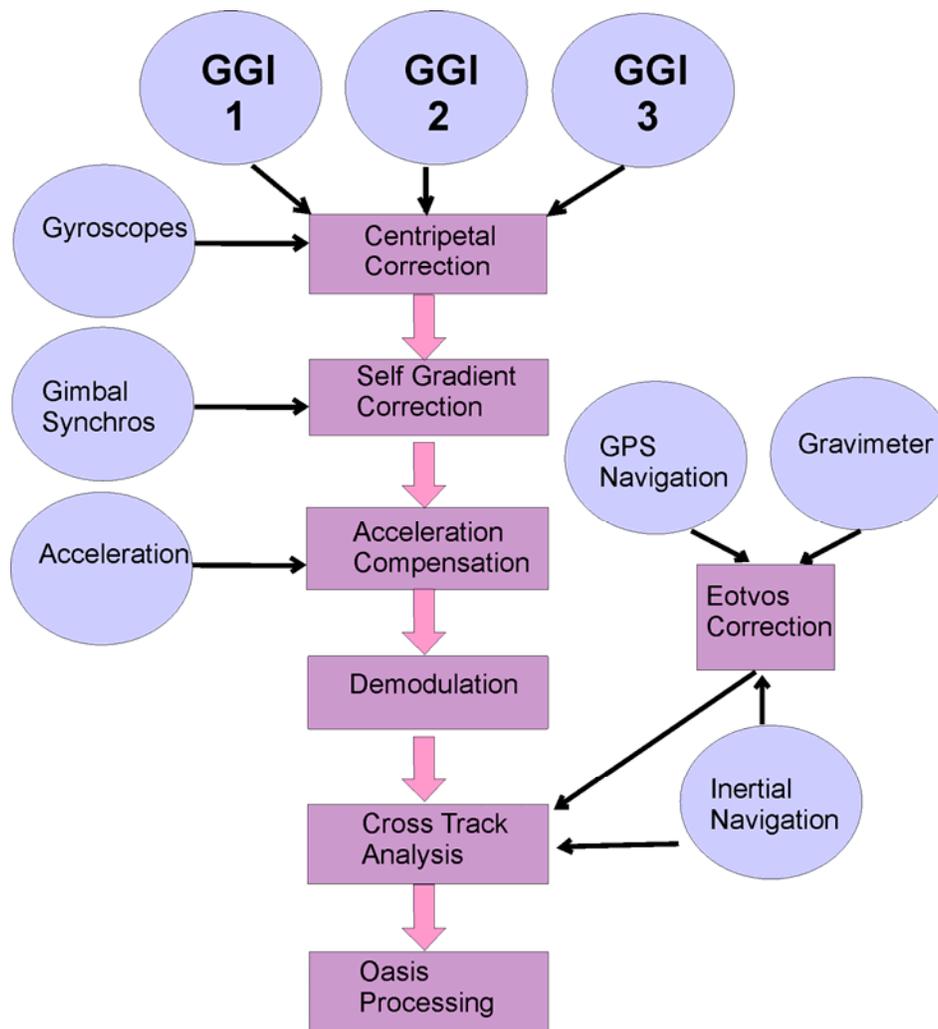


Figure 2.1: A schematic diagram showing different stages of FTG Data Processing

The box “Oasis processing” consists of several steps that may be summarized as

- Basic Low Rate compensation,
- Removal of high amplitude variation flight line data/poor S/N data;
- Line levelling or network adjustment within Oasis, and
- Terrain correction with density = 2.67 g/cc

Appendix 3. Contents of the Distribution CD

The digital data produced by the surveys is distributed in the form of a Geosoft Oasis database and several maps of the pertinent channels in that database.

Products for each survey reside in separate directories on the CD. The flight line data resides in an Oasis database. Each database channel is described in Appendix 4. Maps of the flight lines, the terrain, and each of the free air and terrain corrected channels are included here. Final products for the Magnetics are also included. All final data is provided in Geosoft Grid format and also as geo-referenced image files (GeoTif).

As an example, the data for the Odie survey resides in various directories on the CD and contains the following files. All other data files are named similarly to these examples.

<u>Description</u>	<u>File Name</u>
Flight Line Tensor Data	Swift_Air_FTG.gdb
Flight Line Magnetic Data	Swift_Air_Mag.gdb
Flight Lines Map	Flight_Lines.tif
Terrain Map	Terrain.tif
Free Air Tzz Map	Tzz_fa.tif
Terrain Corrected Tzz Map	Tzz_TC_260.tif
Terrain Corrected Tzz Grid	Tzz_TC_260.grd
Total Magnetic Intensity Map	TMI.tif
Total Magnetic Intensity, Reduced to the Pole Map	TMI_RTP.tif

Notes: All final FTG data was de-noised with Multi-Channel Processing (MCP).

Terrain Corrected Data is provided at density 2.60 gm/cc, however a suitable density correction appropriate for the survey area will be selected based on the geological knowledge of the area

Appendix 4: Oasis Database Channel Descriptions

The primary format for final digital FTG data is points at one second sample interval along the flight lines in a Geosoft Oasis database. The final database containing the magnetics is sampled at 0.1 second. The label for each of the data channels is tabulated below. While descriptive, they are somewhat abbreviated. For display purposes, both the free air and terrain corrected gradient components are gridded and displayed in Geosoft Oasis map form, as are the final magnetic products.

Following is a list of channel names and a short description of the channel contents. Not all channel names are listed, but the contents of those not listed here can be inferred from the examples given.

FTG Data – Swift_Air_FTG.gdb

<u>Channel Name</u>	<u>Description</u>
YYMMDD	Date of acquisition
HHMMSS	Time of acquisition
Lat	Latitude in WGS84
Lon	Longitude in WGS84
X	Easting in Meters, UTM Zone 8 North
Y	Northing in Meters, UTM Zone 8 North
Altitude	GPS Altitude
RA_Alt	Altitude measured by the radar altimeter
SRTMTerrain	Terrain elevation sampled from SRTM terrain model
CDEDTerrain	Terrain Model from Canadian Digital Elevation Data

De-noised (MCP), Leveled Free Air components

Txx_FA_MCP

Tyx_FA_MCP

Txz_FA_MCP

Tyy_FA_MCP

Tyz_FA_MCP

Tzz_FA_MCP

Terrain correction factors at a density of 1.00 gm/cc

TC _Txx_100

TC _Tyx_100

TC _Txz_100

TC _Tyy_100

TC _Tyz_100

TC _Tzz_100

De-noised, Leveled components with terrain correction at a density of 2.67 gm/cc

Txx_TC_267_MCP

Tyx_TC_267_MCP

Txz_TC_267_MCP

Tyy_TC_267_MCP

Tyz_TC_267_MCP

Tzz_TC_267_MCP

Magnetic Data – Swift_Air_Mag.gdb

<u>Channel Name</u>	<u>Description</u>
YYMMDD	Date of acquisition
HHMMSS	Time of acquisition
Time	GPS Seconds
Lat	Latitude in WGS84
Lon	Longitude in WGS84
X	Easting in Meters, UTM Zone 8 North
Y	Northing in Meters, UTM Zone 8 North
RA_Alt	Radar Altimeter Altitude
EarthsField	Earth's Magnetic Field
Diff4	Fourth Difference
Inc	Inclination
Dec	Declination

TFc	Total Field
TMI	Final Corrected and levelled Total Field
TMI_RTP	Final Corrected and levelled Total Field reduced to the magnetic pole
TMI_RTP_FVD	First Vertical Derivative of the above

The information contained in this report is for the use of Bell Geospace and Yukon Zinc Corporation or their authorized personnel only and in accordance with ITAR restrictions as stated in the main body of this report.

All information contained herein is by all intent a true and accurate representation of the facts and results as they pertain to this Air-FTG® survey.

Addendum A: Swift Prospect

The Swift prospect is located about 120 km west of Watson Lake city south east of Yukon figure A1. The survey area lies between latitudes 60° 06'N and 60° 14'N and longitudes -131° 20'W and -131° 00'W. An Air-FTG® survey was flown over this prospect from November 24, 2006, through December 10, 2006, covering a total of 608 linear km, encompassing an area of approximately 126 km².

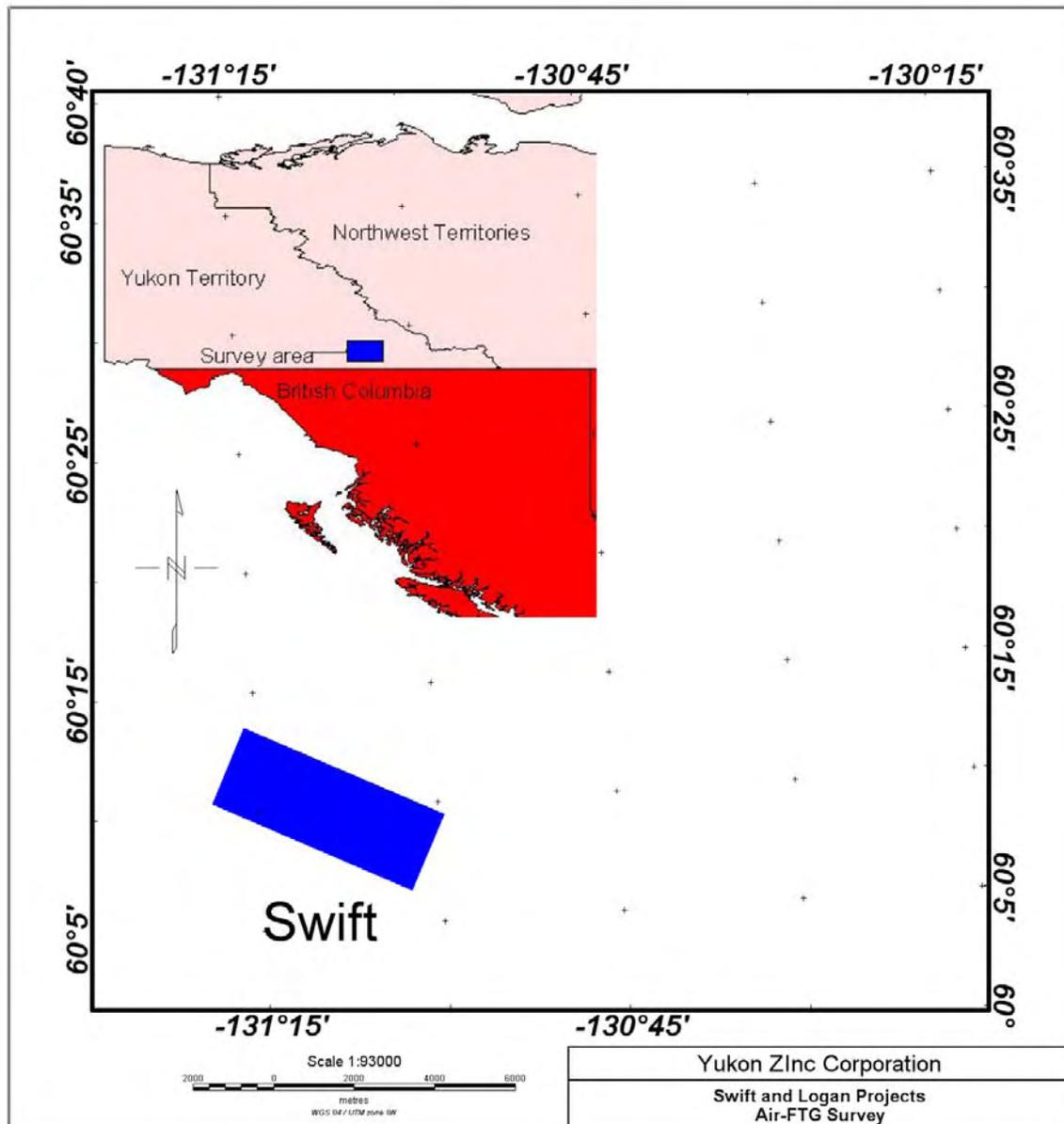


Figure A 1. Swift prospect survey location shown in a blue box.

OPERATIONS SUMMARY

The crew arrived in Watson Lake city on November 20, 2006. Actual flight operations on this survey commenced November 24, 2006, through December 10, 2006. The 3D Full Tensor Gradient data was collected with Bell Geospace’s FTG-002 onboard a Cessna Grand Caravan C-GSKT (Figure 3), operated by Aries Aviation. The final data was projected into Universal Transverse Mercator (UTM) Zone 8N using the Hayford, Lambert Conic Conformal (2SP) datum.

SURVEY DESIGN AND DATA ACQUISITION

Figure A2 shows the survey area with the actual flight lines. The survey was flown in a northwest - southeast direction at a lines spacing of 200 m and tie lines of 2000 m. The survey was designed as a 80 m altitude standard tie - drape. A total of 33 survey lines and 608 line km were acquired.

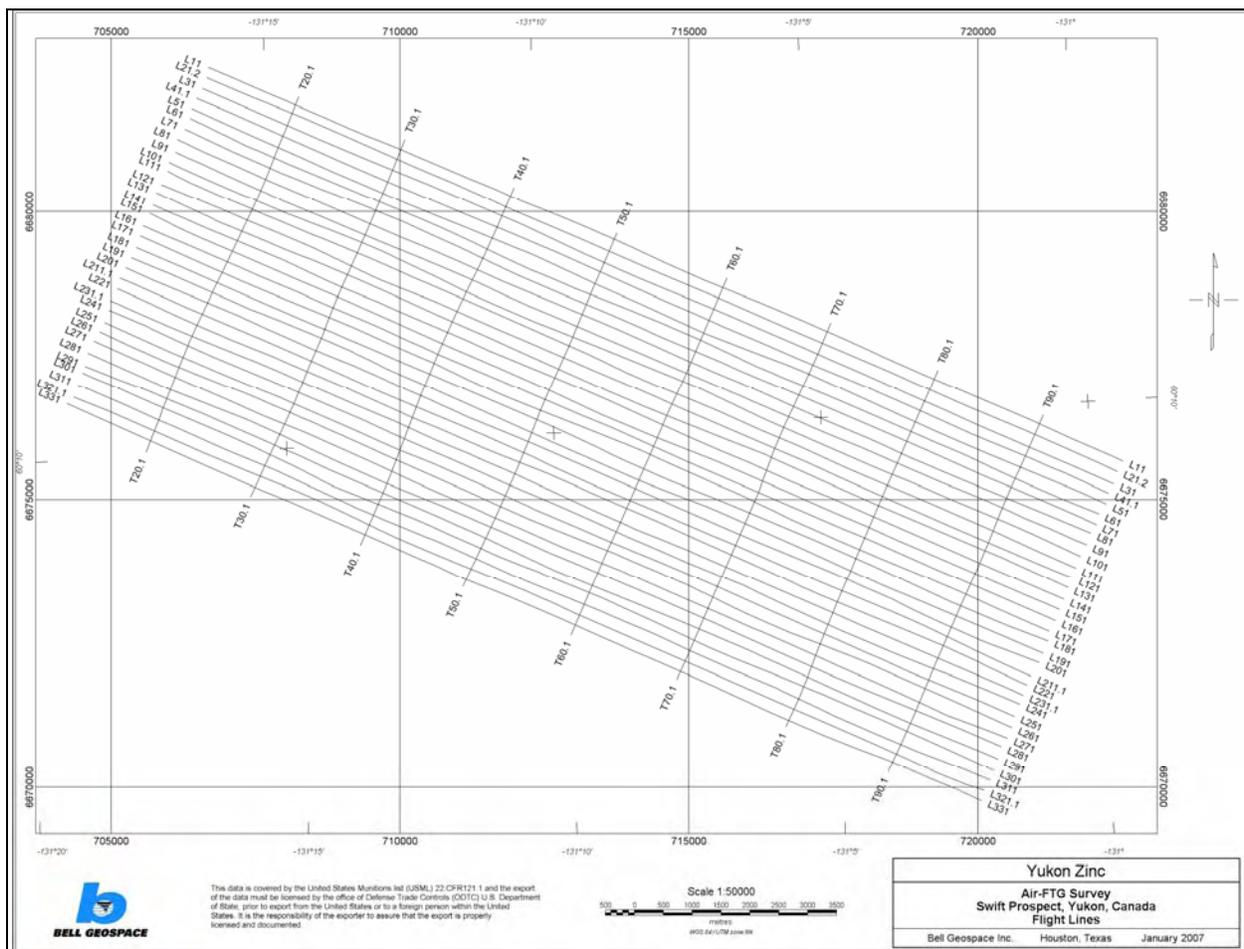


Figure A 2. Survey actual flight lines.

The survey plan included draping the flight path to maintain a constant distance from the ground for the entire length of each survey line. However, it is not always possible to maintain the constant clearance as the terrain relief increases or decreases rapidly, so in depression areas ground clearance will exceed 80m altitude.

Table A.1 includes information about the terrain, flight altitude, and clearance.

The terrain data used is a 50 m cell size Canadian Digital Elevation Data (CDED) from the Canadian Government (Figure A3).

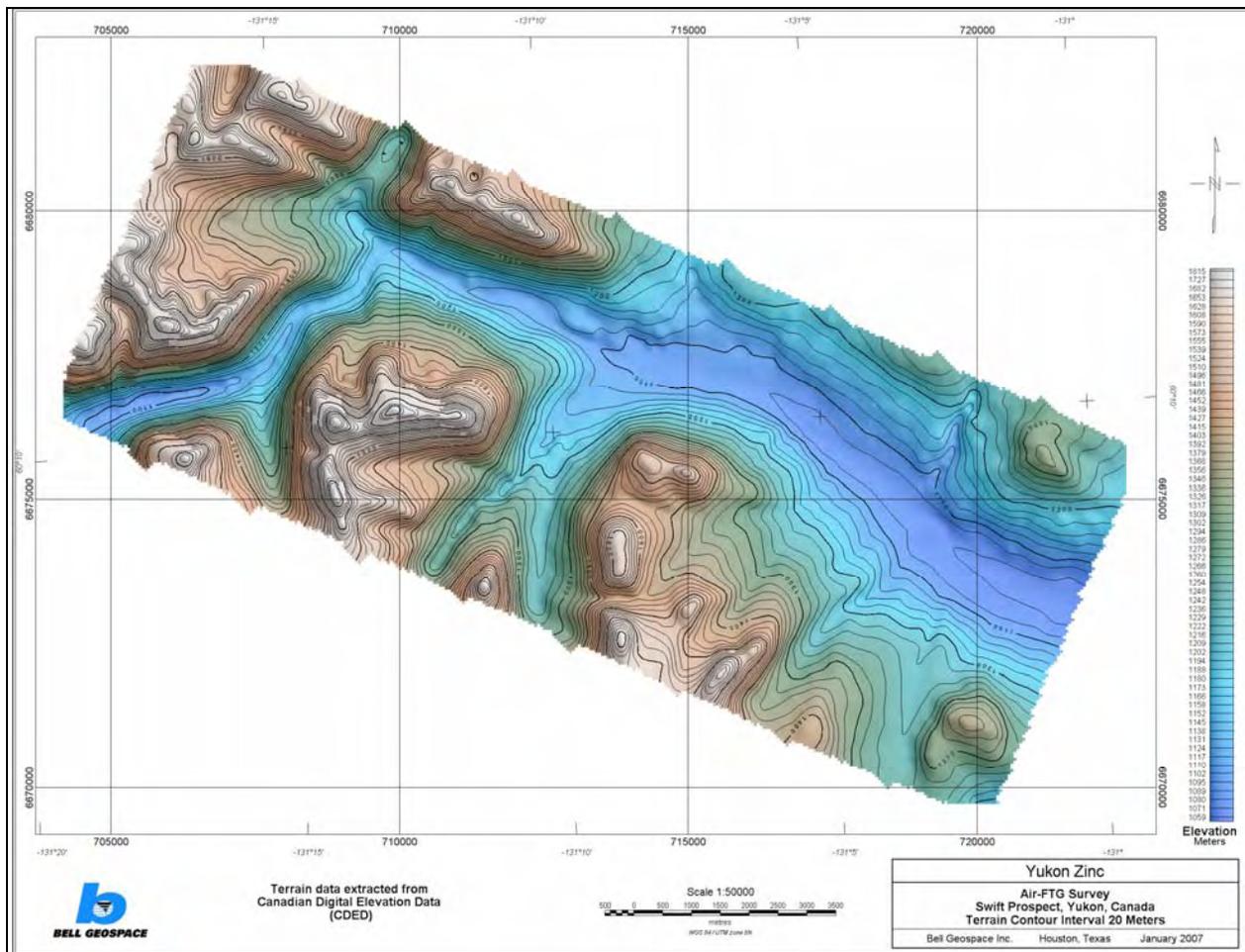


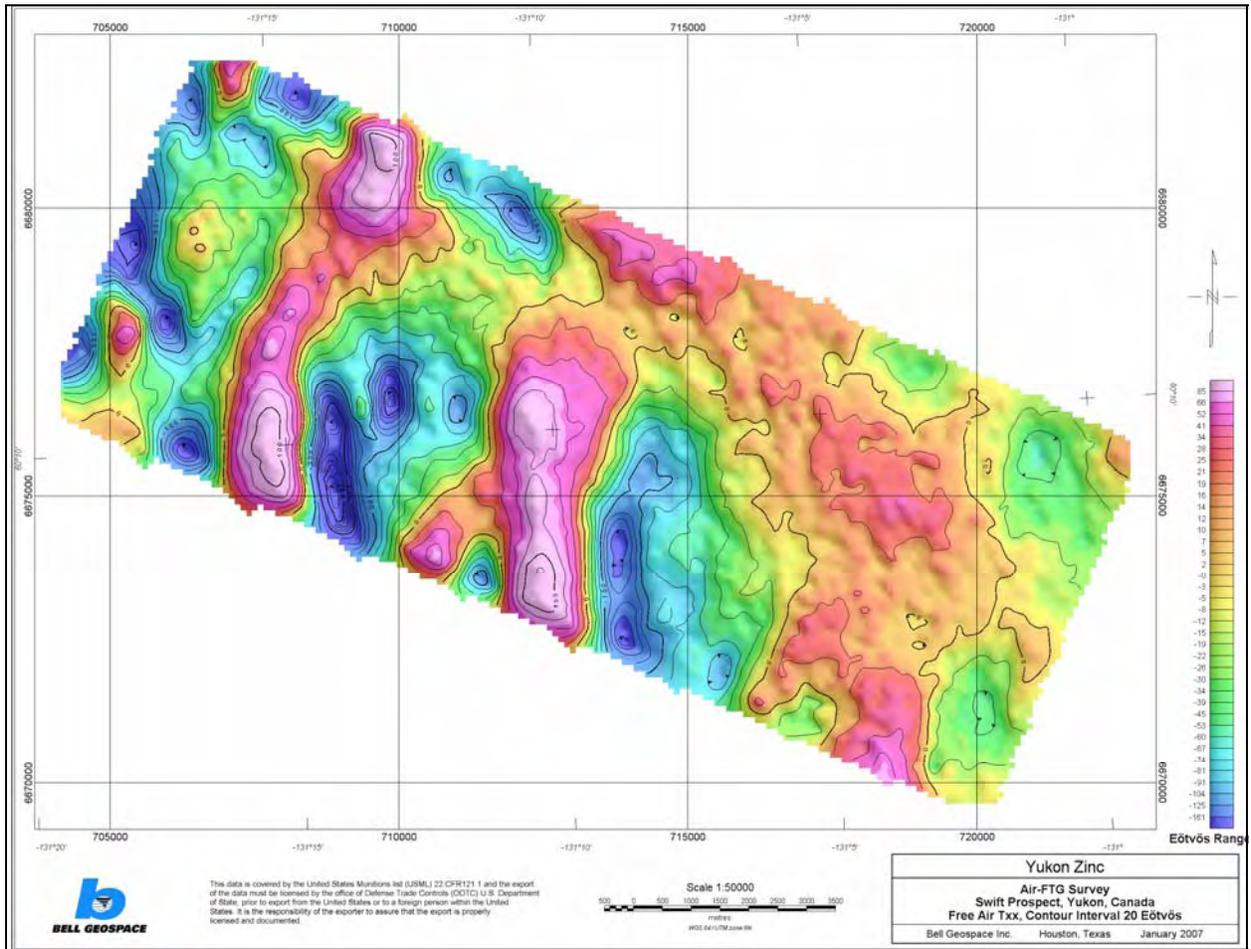
Figure A 3. Digital terrain model compiled from CDED Terrain data.

Table A 1. Flight Altitude Statistics (meters)

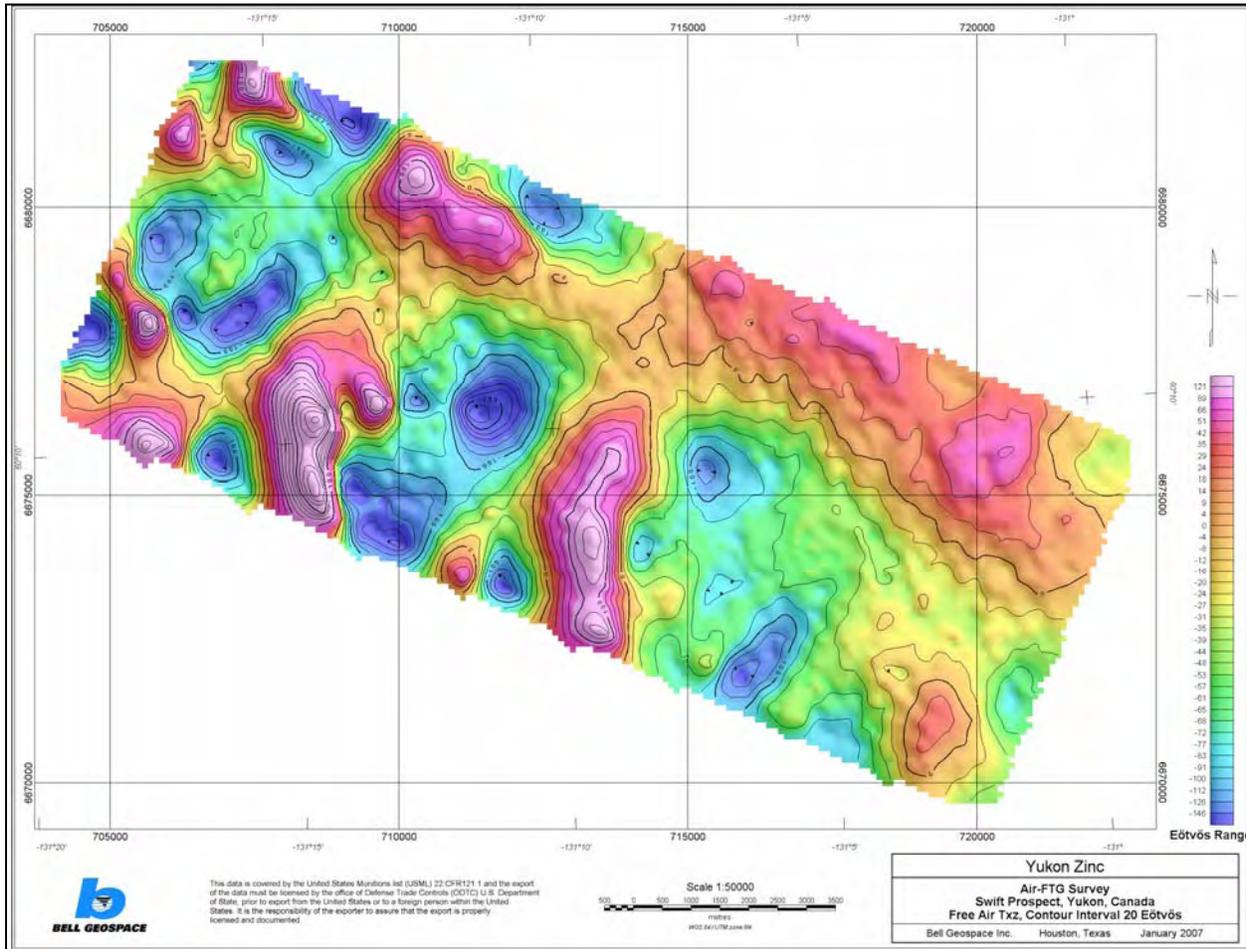
	<u>Min</u>	<u>Max</u>	<u>Std Dev</u>	<u>Mean</u>
Terrain	1047	1939	175	1312
Altitude	1656	2031	71	1884
Ground Clearance	72	844	147	571

TENSOR COMPONENT MAPS

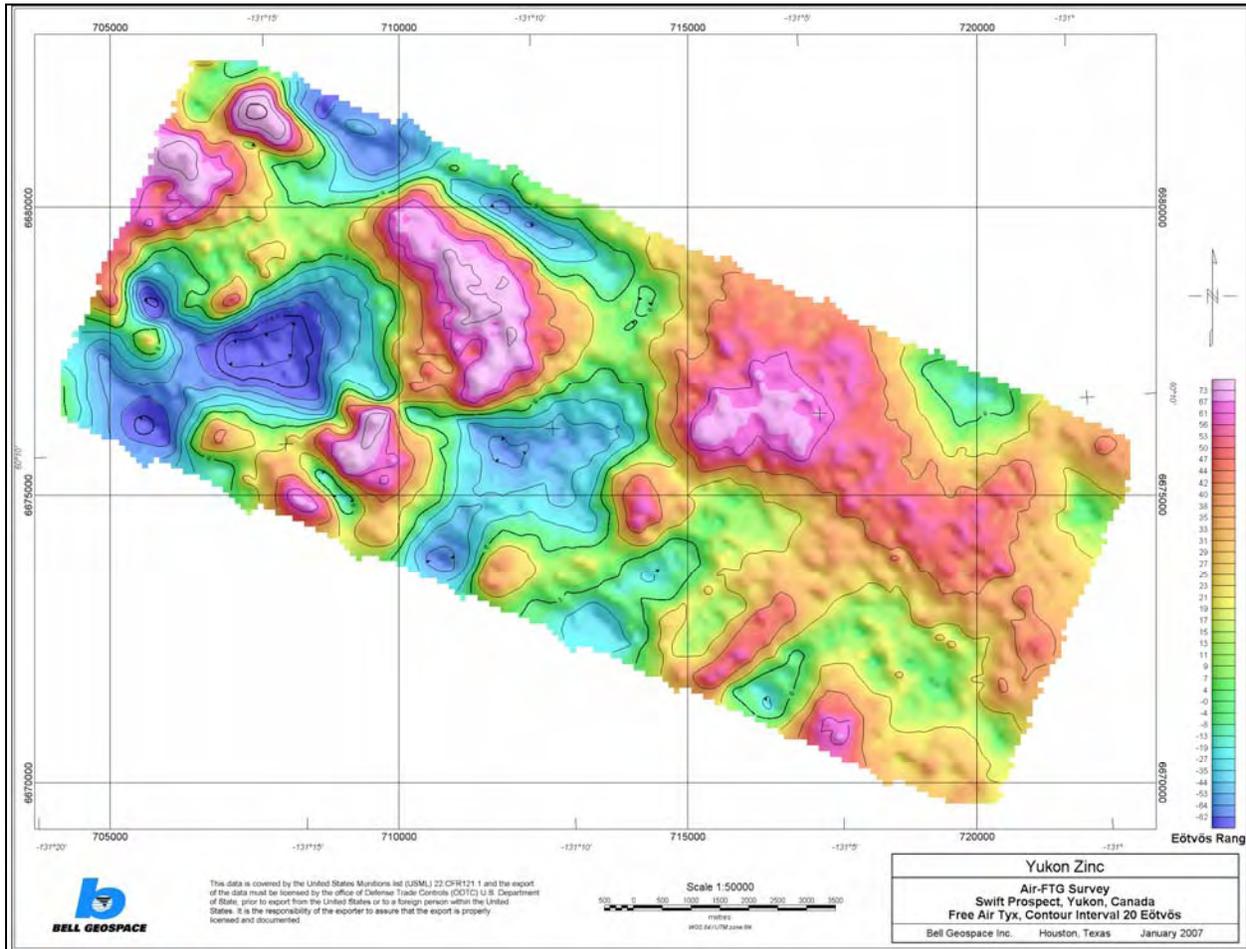
Free Air Txx



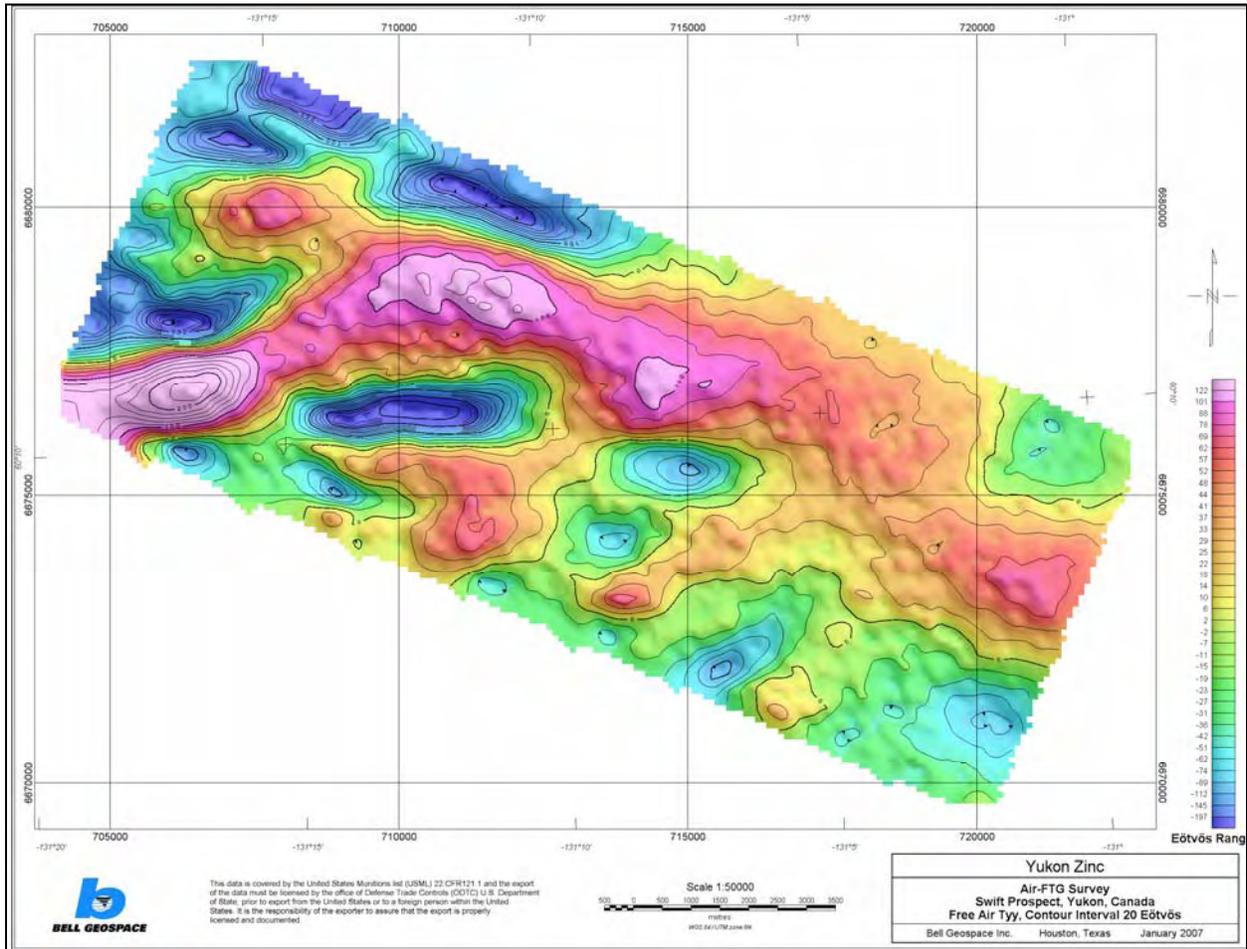
Free Air Tsz



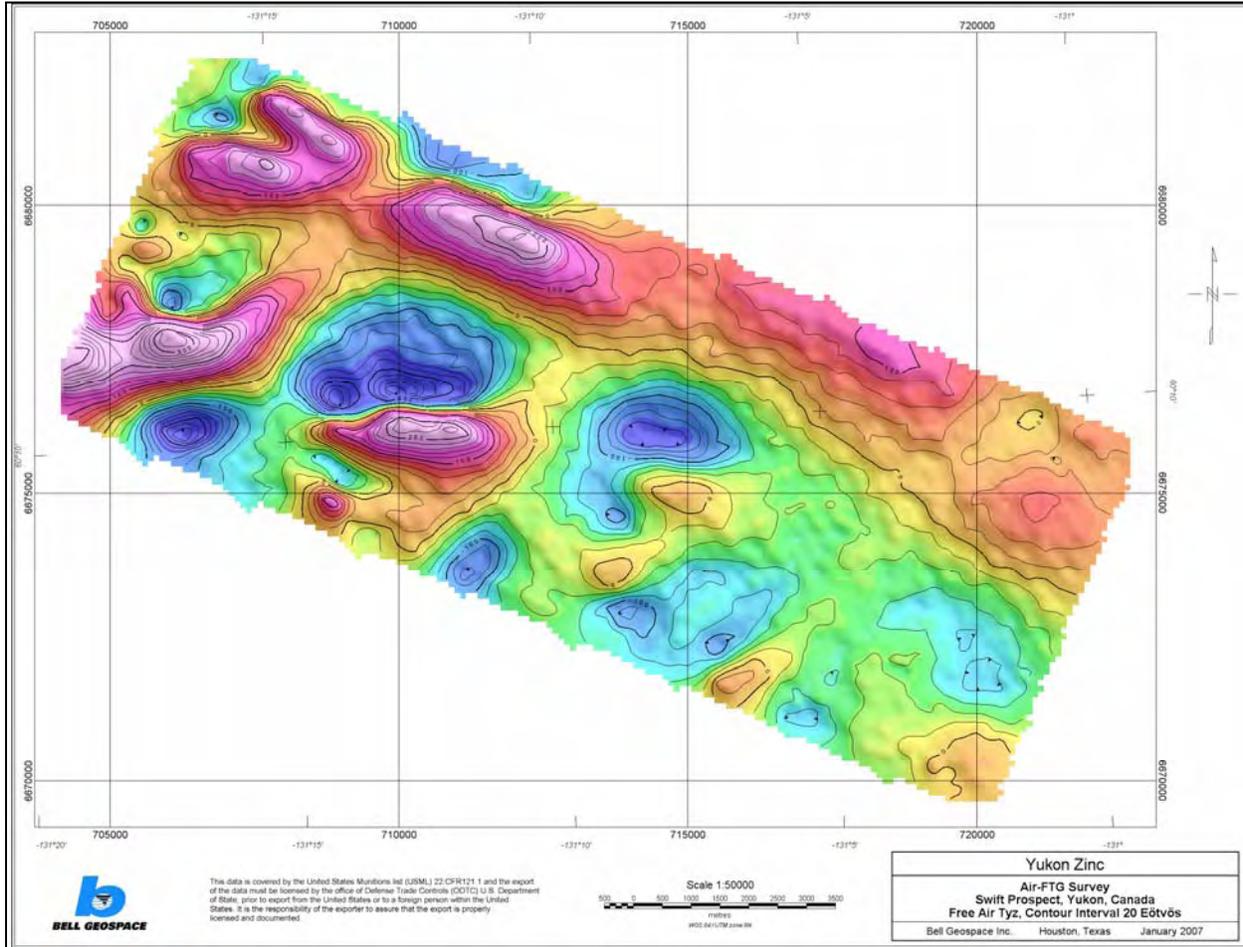
Free Air Tyx



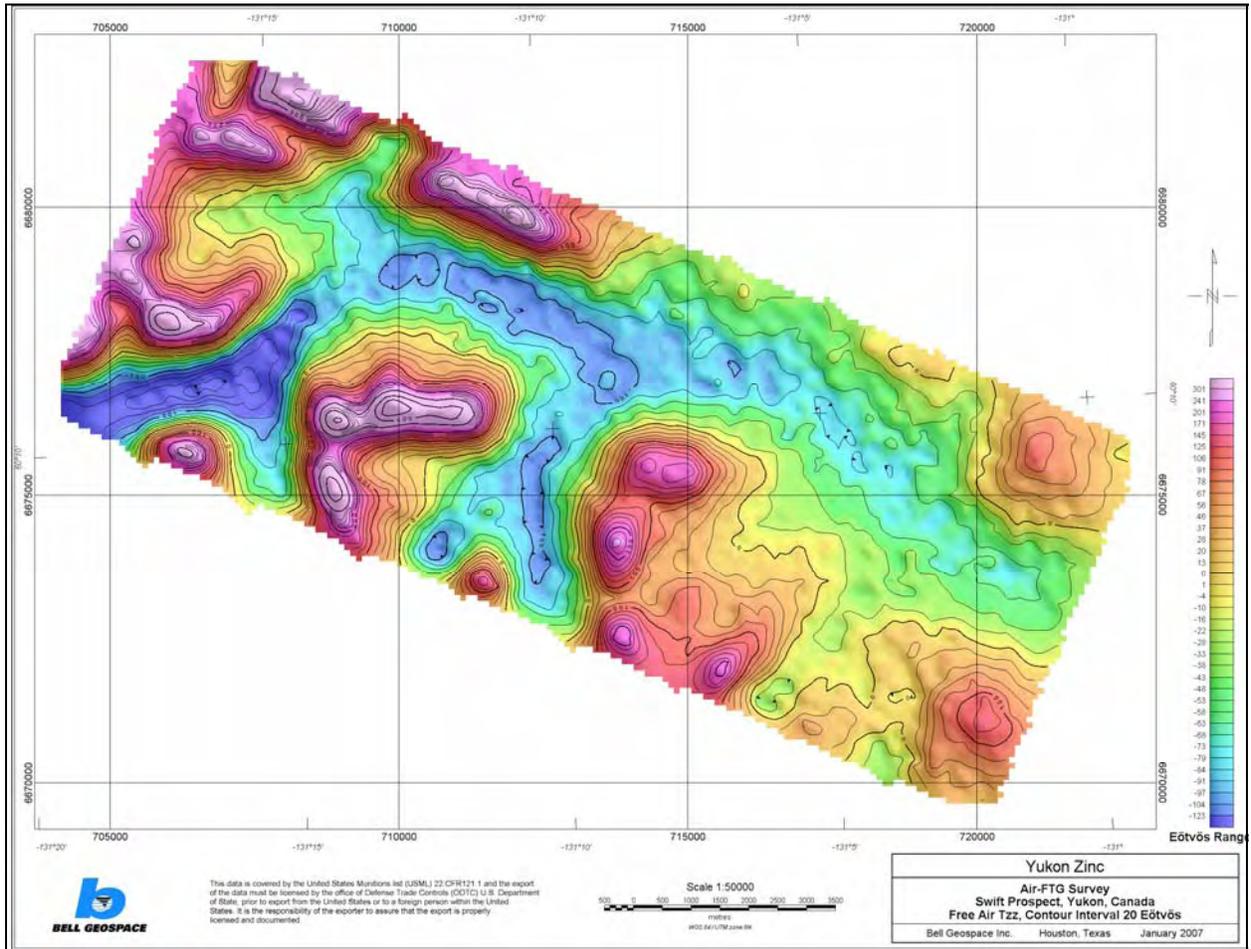
Free Air Tyy



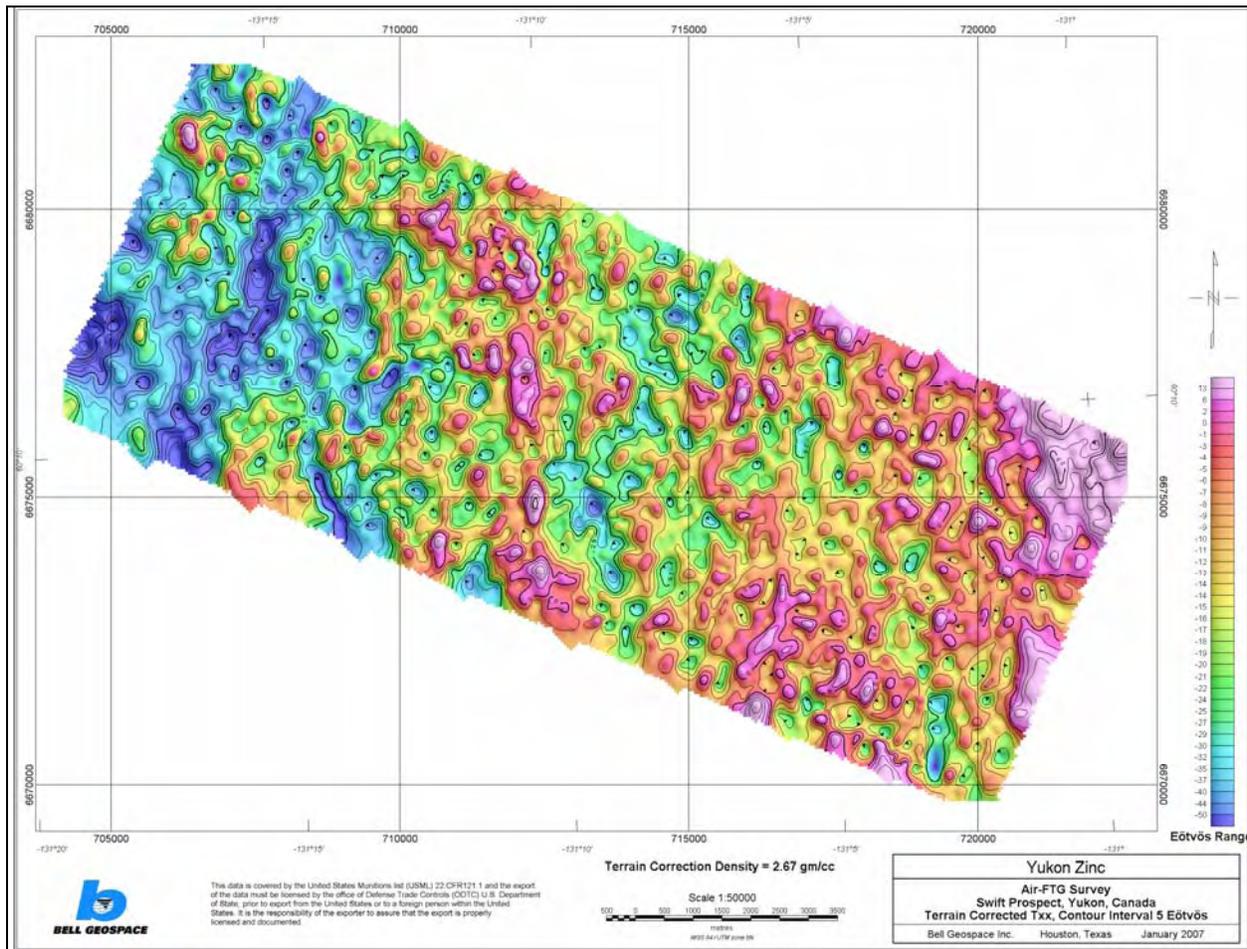
Free Air Tyz



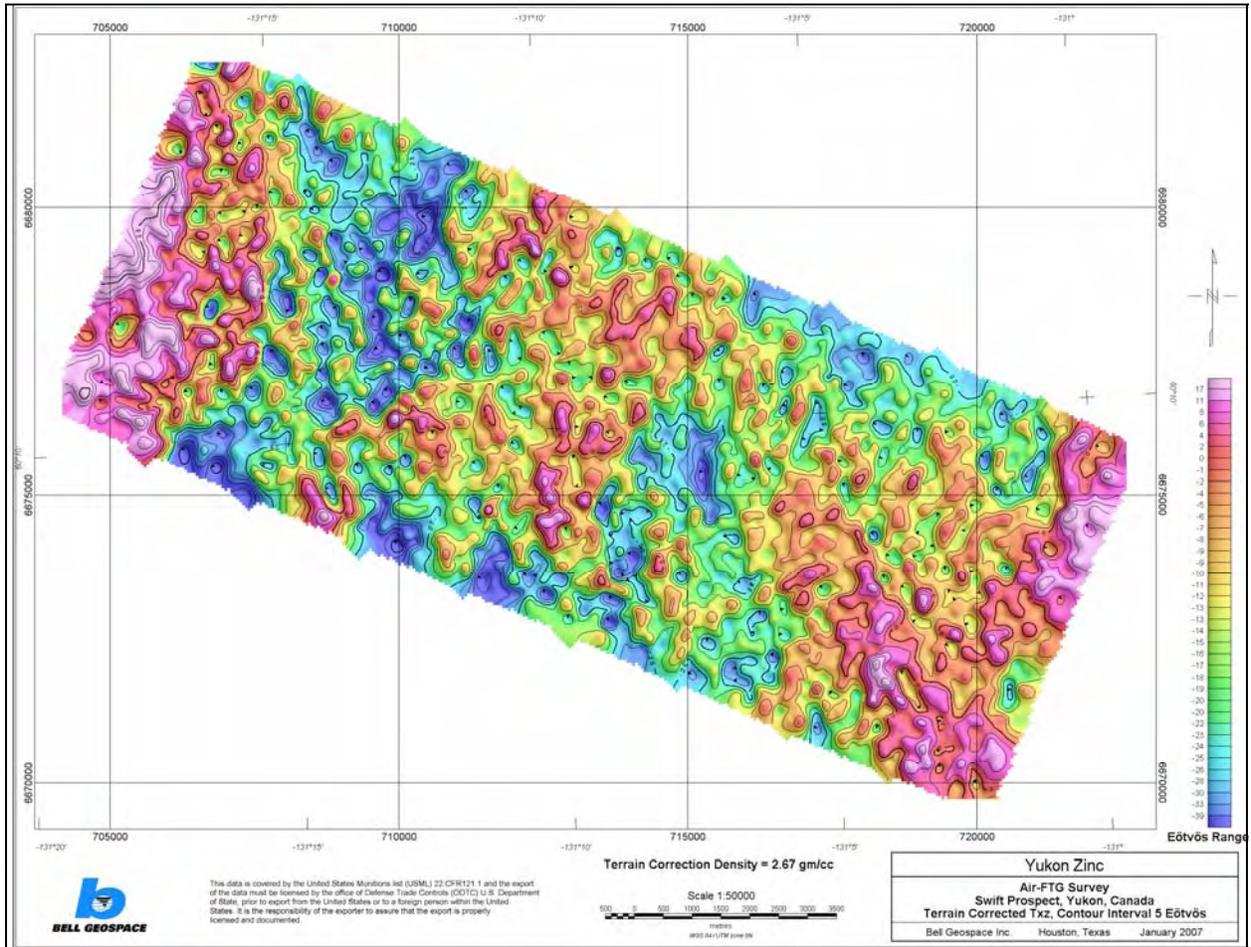
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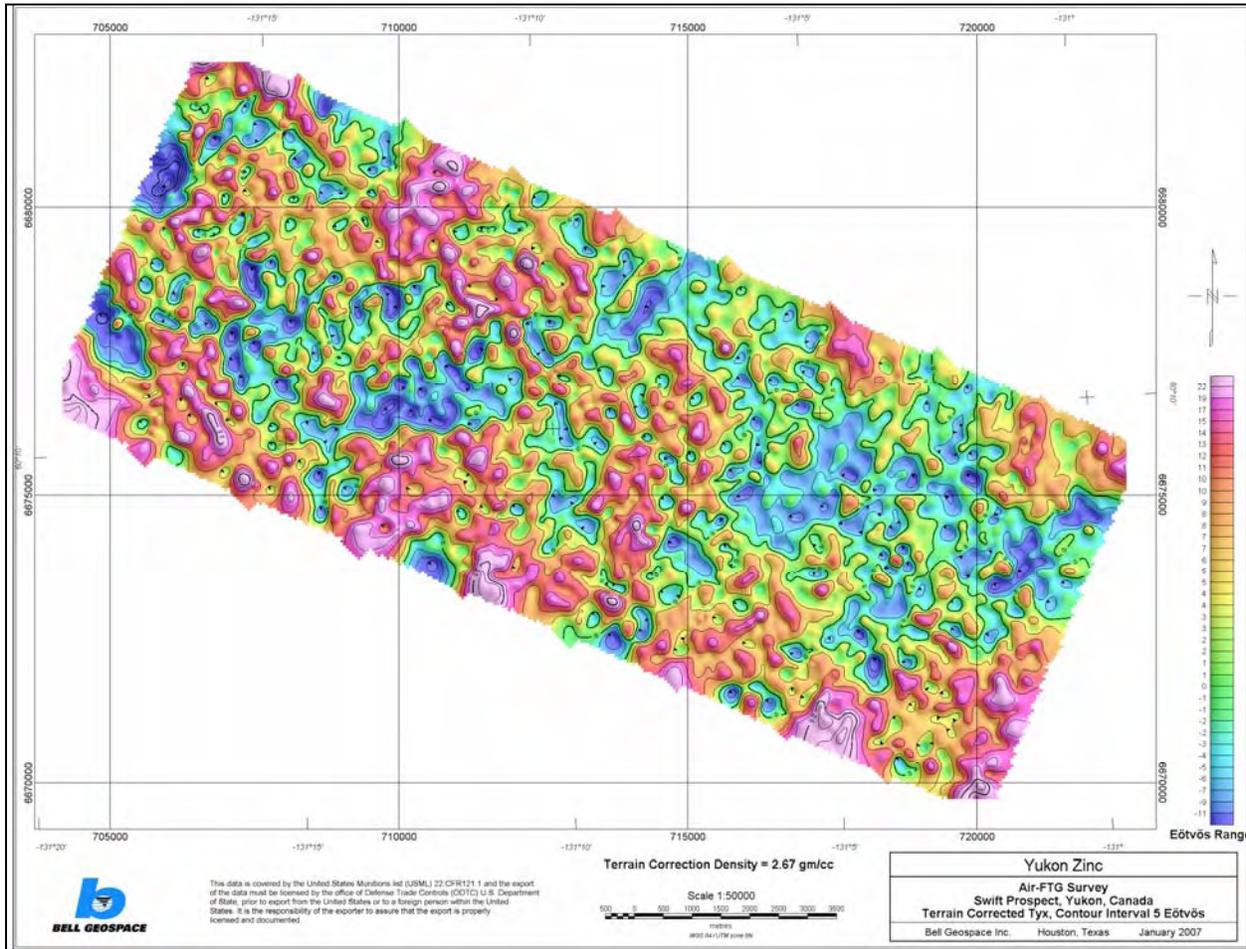
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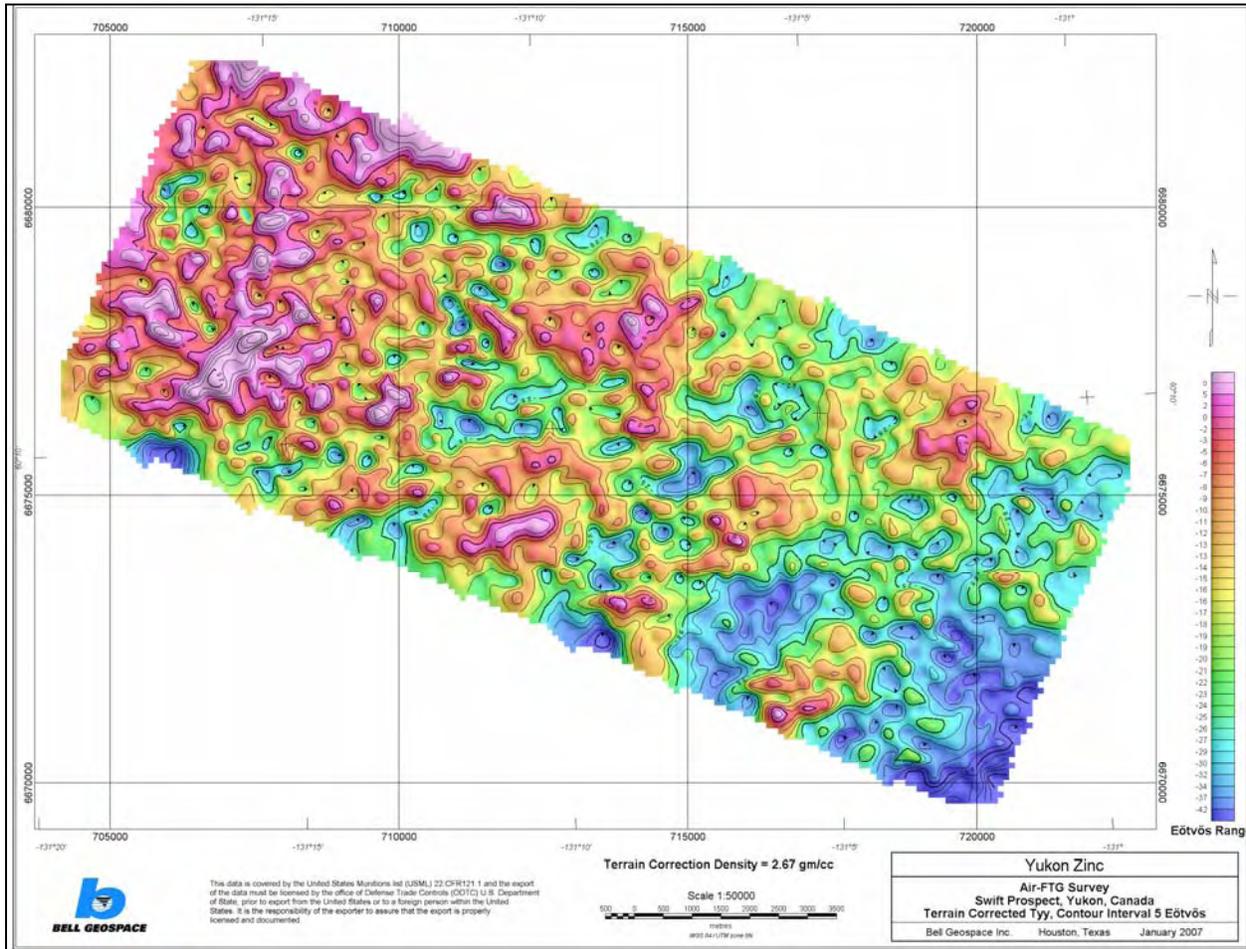
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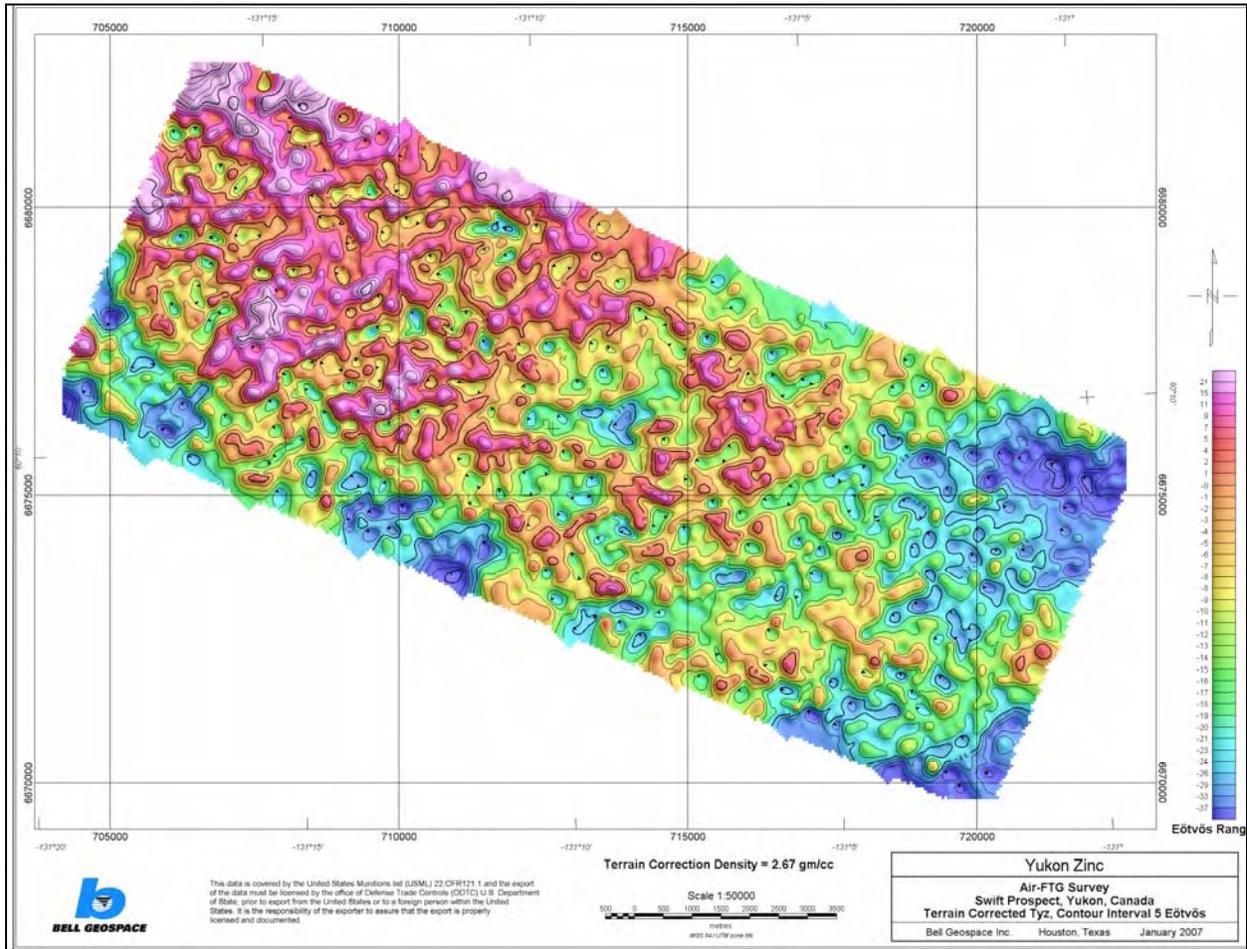
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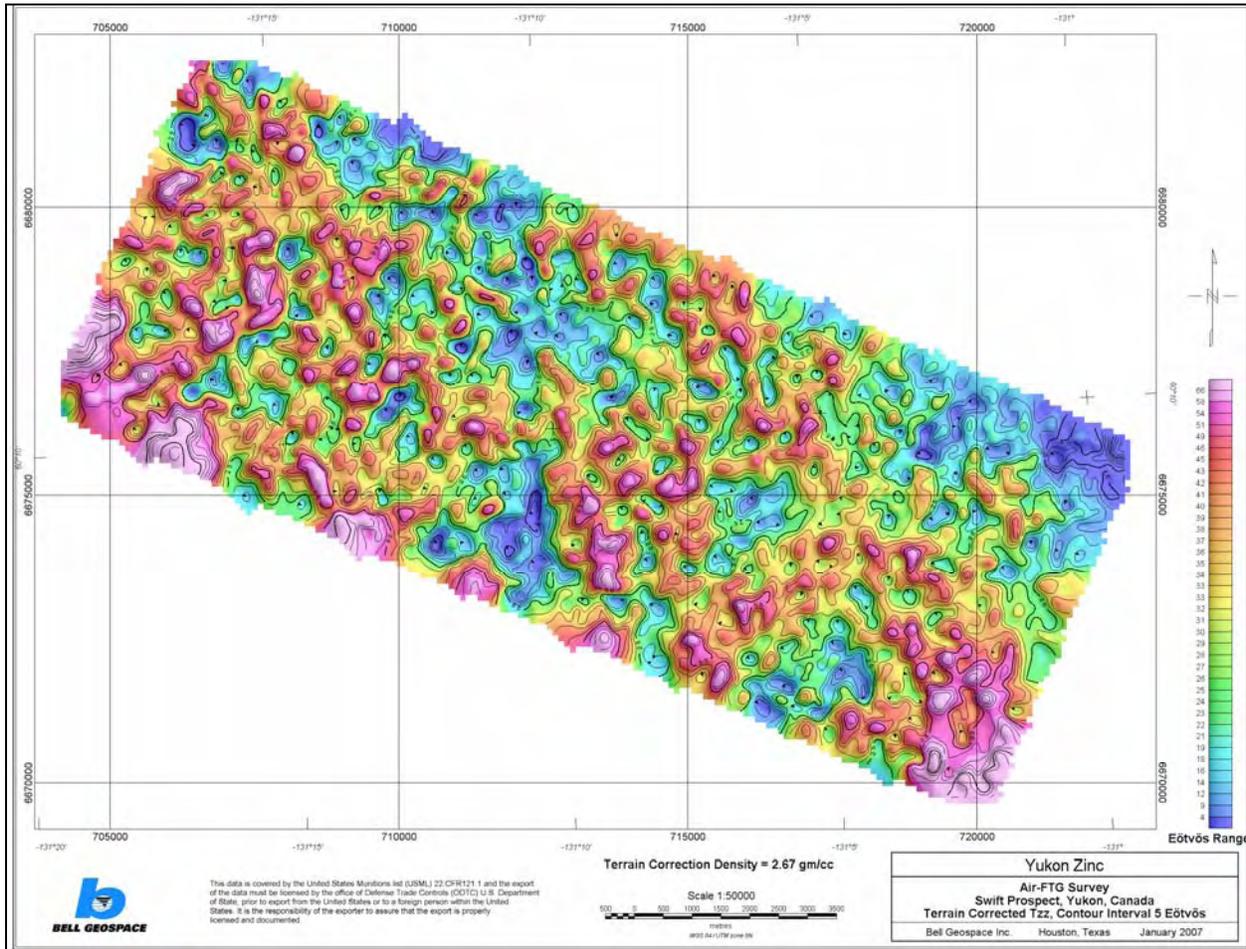
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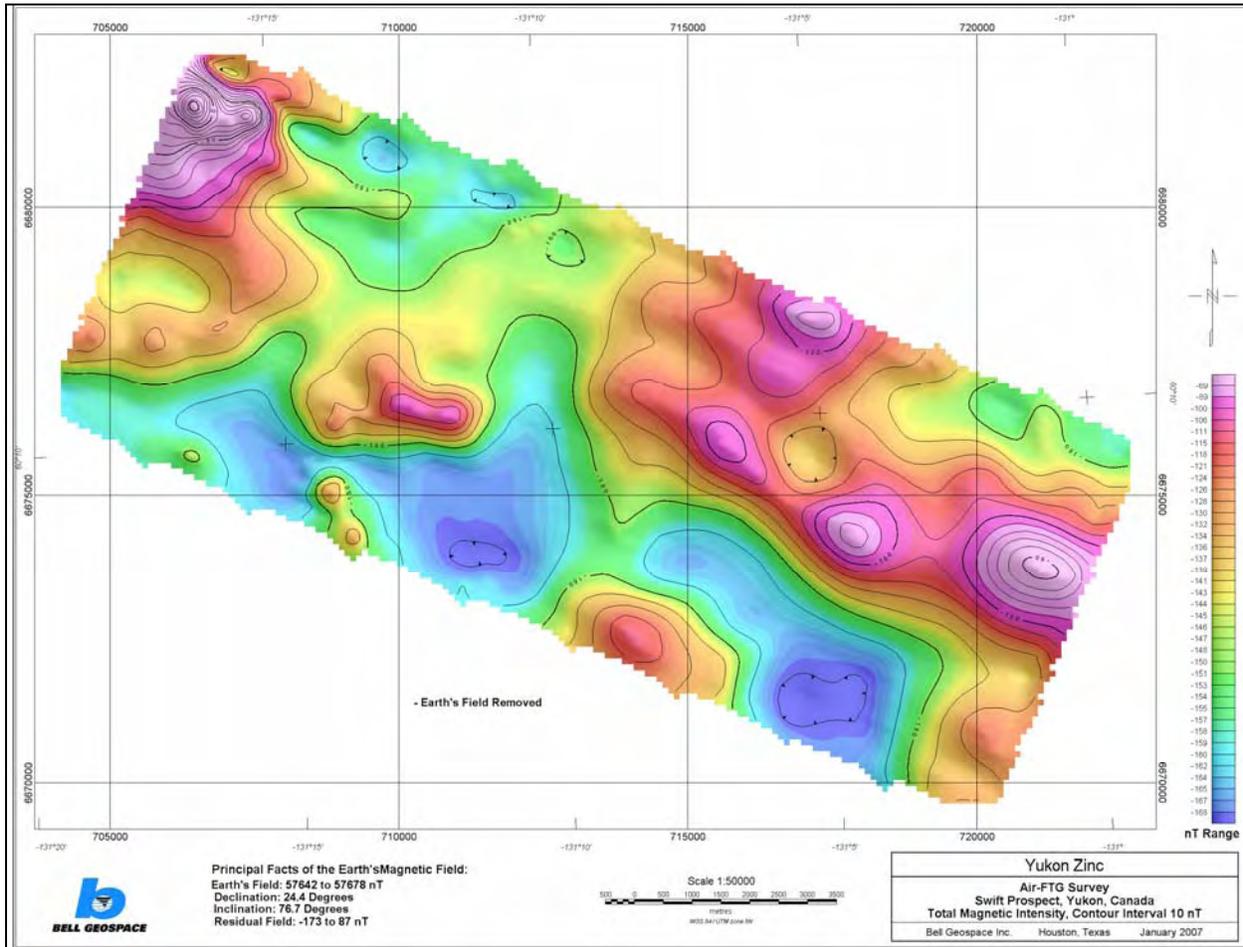
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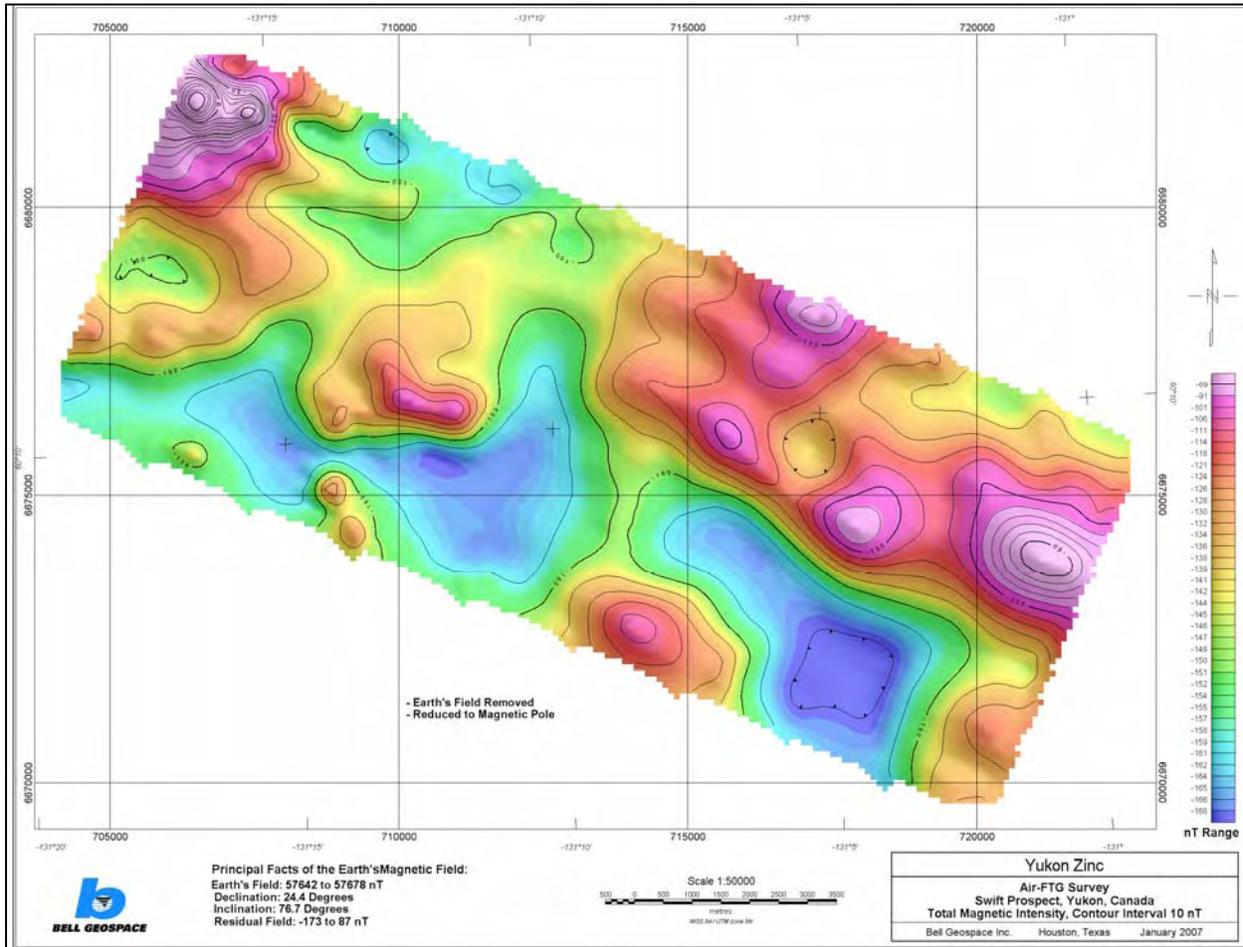
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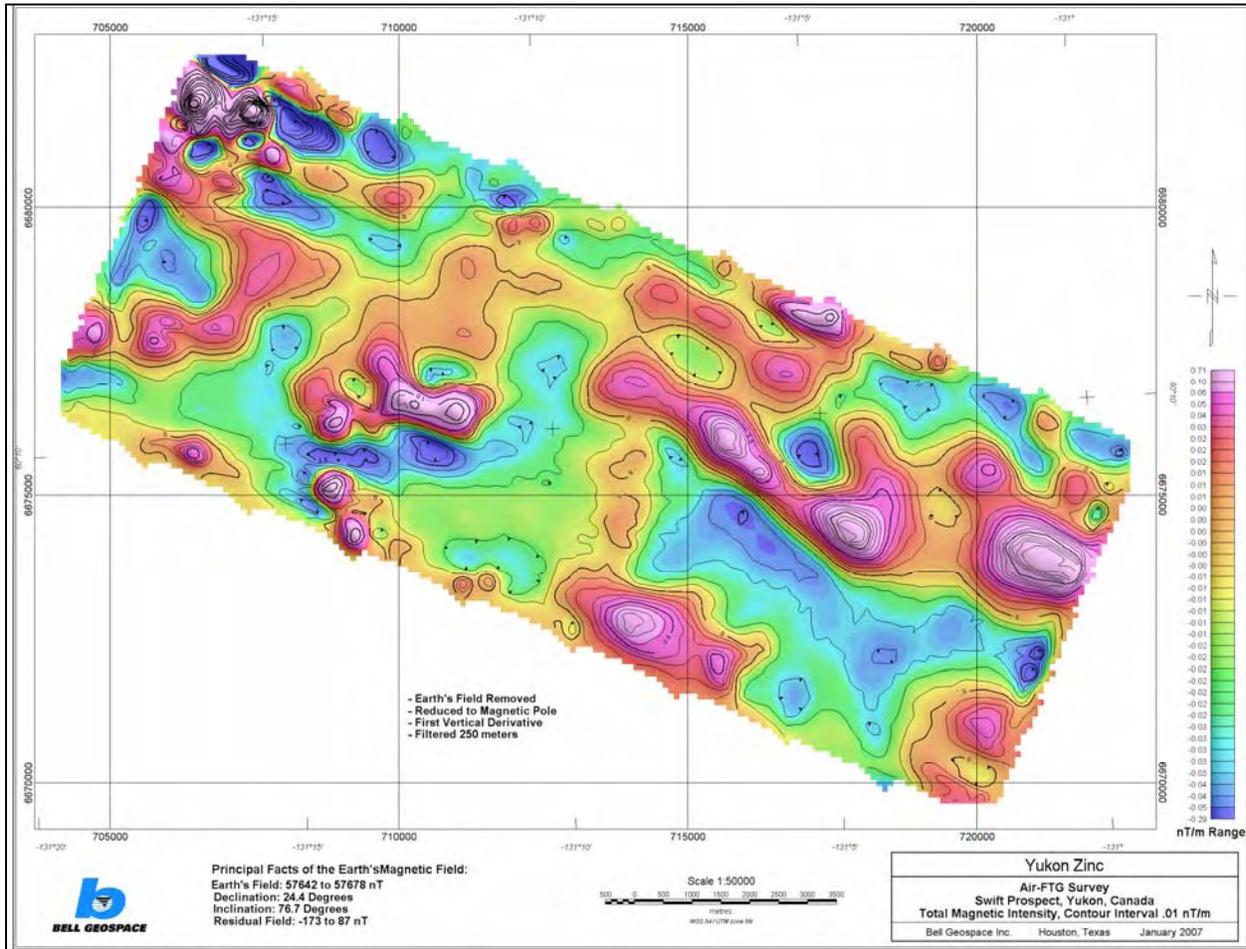
Total Magnetic Intensity



Total Magnetic Intensity-Reduced to the Pole



Total Magnetic Intensity-Reduced to the Pole, 1st Vertical Derivative



Addendum B: Logan Prospect

The Logan prospect is located about 110 km west of Watson Lake city southeastern of Yukon Fig. B1. The survey area lies between latitudes 60° 28'N and 60° 34'N and longitudes -130° 34'W and -130° 21'W. An Air-FTG® survey was flown over this prospect from November 24, 2006, through December 10, 2006, covering a total of 360 linear km, encompassing an area of approximately 112 km².

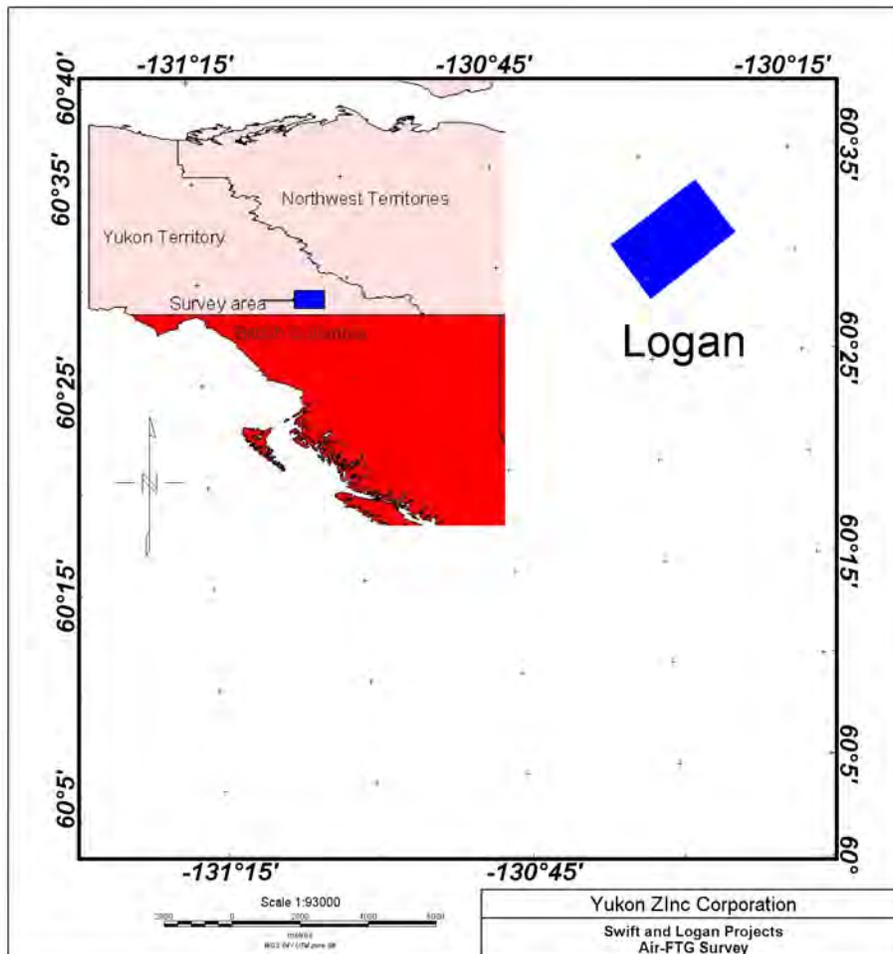


Figure B 3. Logan prospect survey location shown in a blue box.

OPERATIONS SUMMARY

The crew arrived in Watson Lake city on November 20, 2006. Actual flight operations on this survey commenced November 24, 2006, through December 10, 2006. The 3D Full Tensor Gradient data was collected with Bell Geospace's FTG-002 onboard a Cessna Grand Caravan C-GSKT (Figure 3), operated by Aries Aviation. The final data was projected into Universal

Transverse Mercator (UTM) Zone 8N using the Hayford, Lambert Conic Conformal (2SP) datum.

SURVEY DESIGN AND DATA ACQUISITION

Figure B2 shows the survey area with the actual flight lines. The survey was flown in a northeast - southwest direction at a lines spacing of 200 m and tie lines of 1000 m. The survey was designed as a 80 m altitude standard tie -drape. A total of 30 survey lines and 360 line km were acquired.

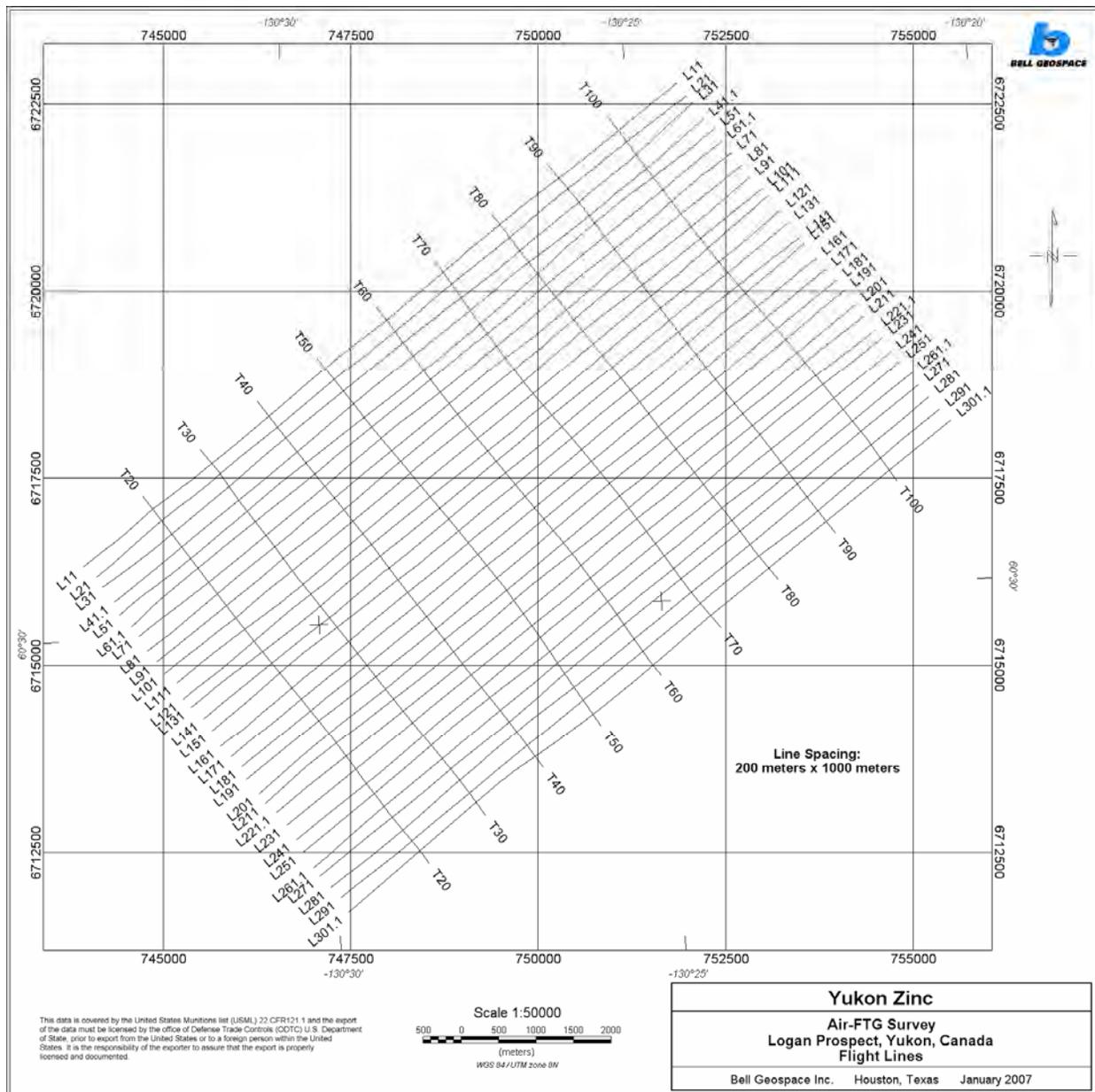


Figure B 4. Survey actual flight lines.

The survey plan included draping the flight path to maintain a constant distance from the ground for the entire length of each survey line. However, it is not always possible to maintain the constant clearance as the terrain relief increases or decreases rapidly, so in depression areas ground clearance will exceed 80m altitude.

Table B.1 includes information about the terrain, flight altitude, and clearance.

The terrain data used is a 50 m cell size Canadian Digital Elevation Data (CDED) from the Canadian Government (Figure A3).

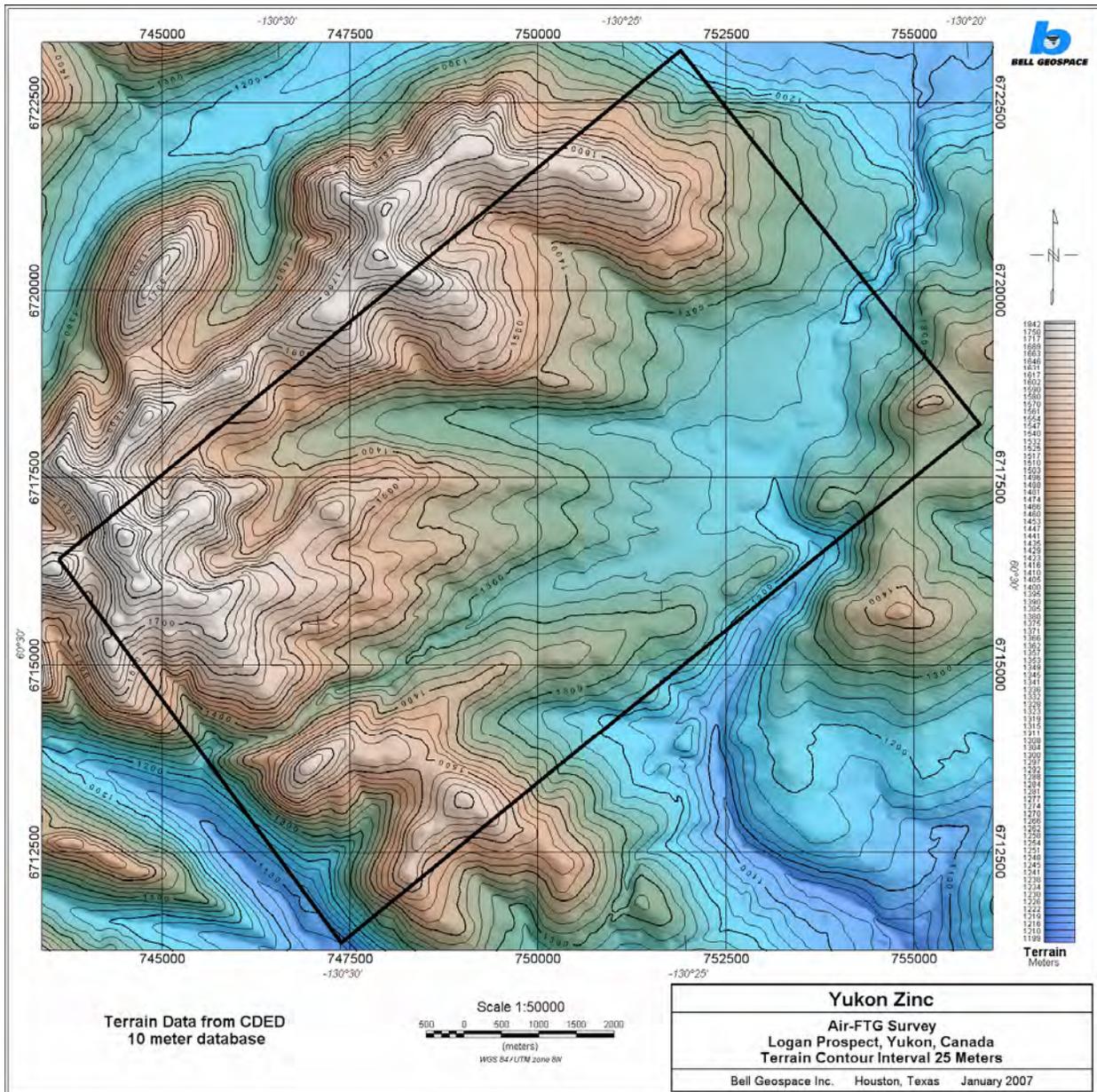


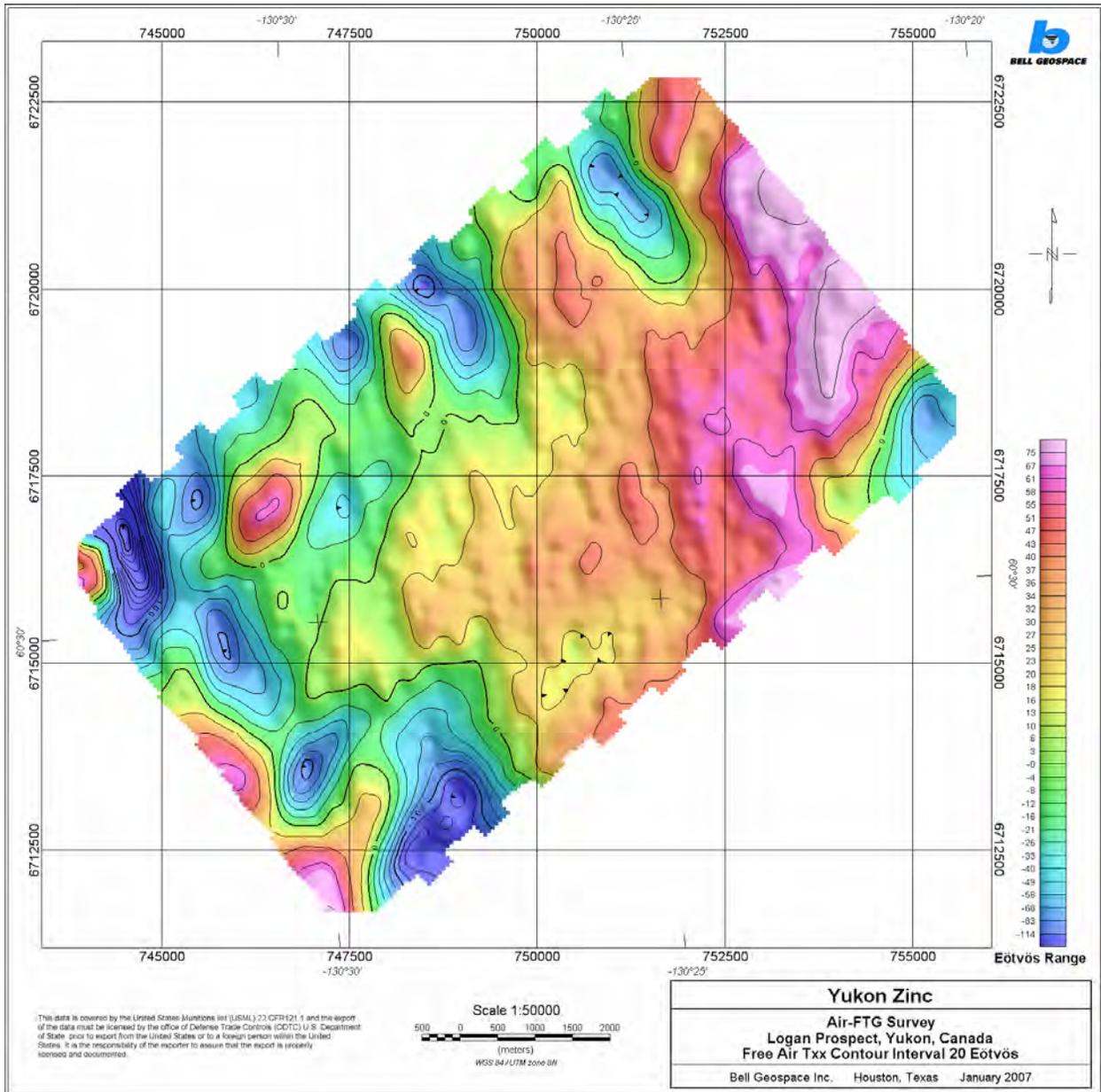
Figure B 3. Digital terrain model compiled from CDED Terrain data. The black box inside the DEM marks the survey area boundary

Table B 2. Flight Altitude Statistics (meters)

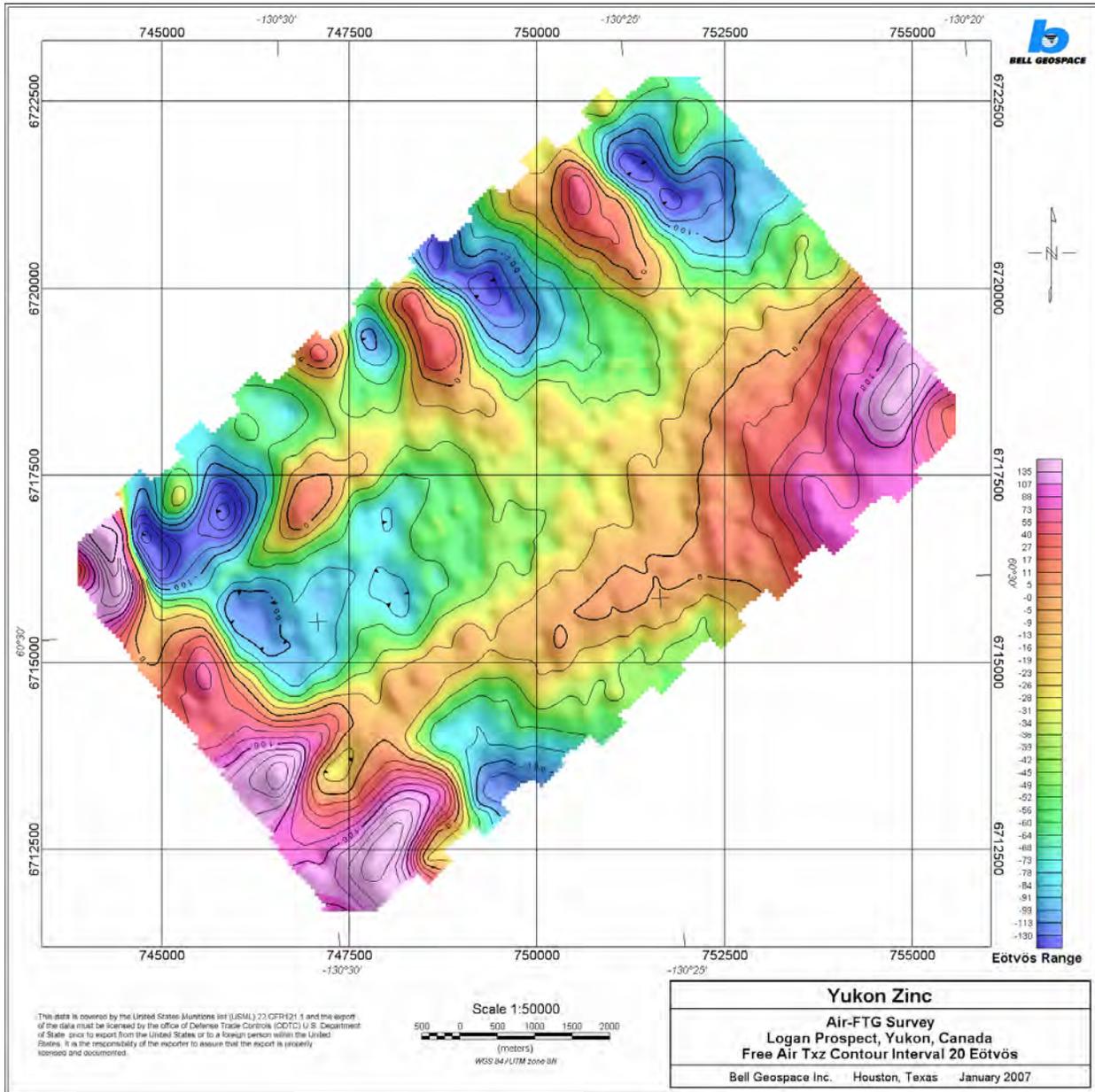
	<u>Min</u>	<u>Max</u>	<u>Std Dev</u>	<u>Mean</u>
Terrain	1169	1935	138	1397
Altitude	1560	2022	95	1792
Ground Clearance	75	630	94	395

TENSOR COMPONENT MAPS

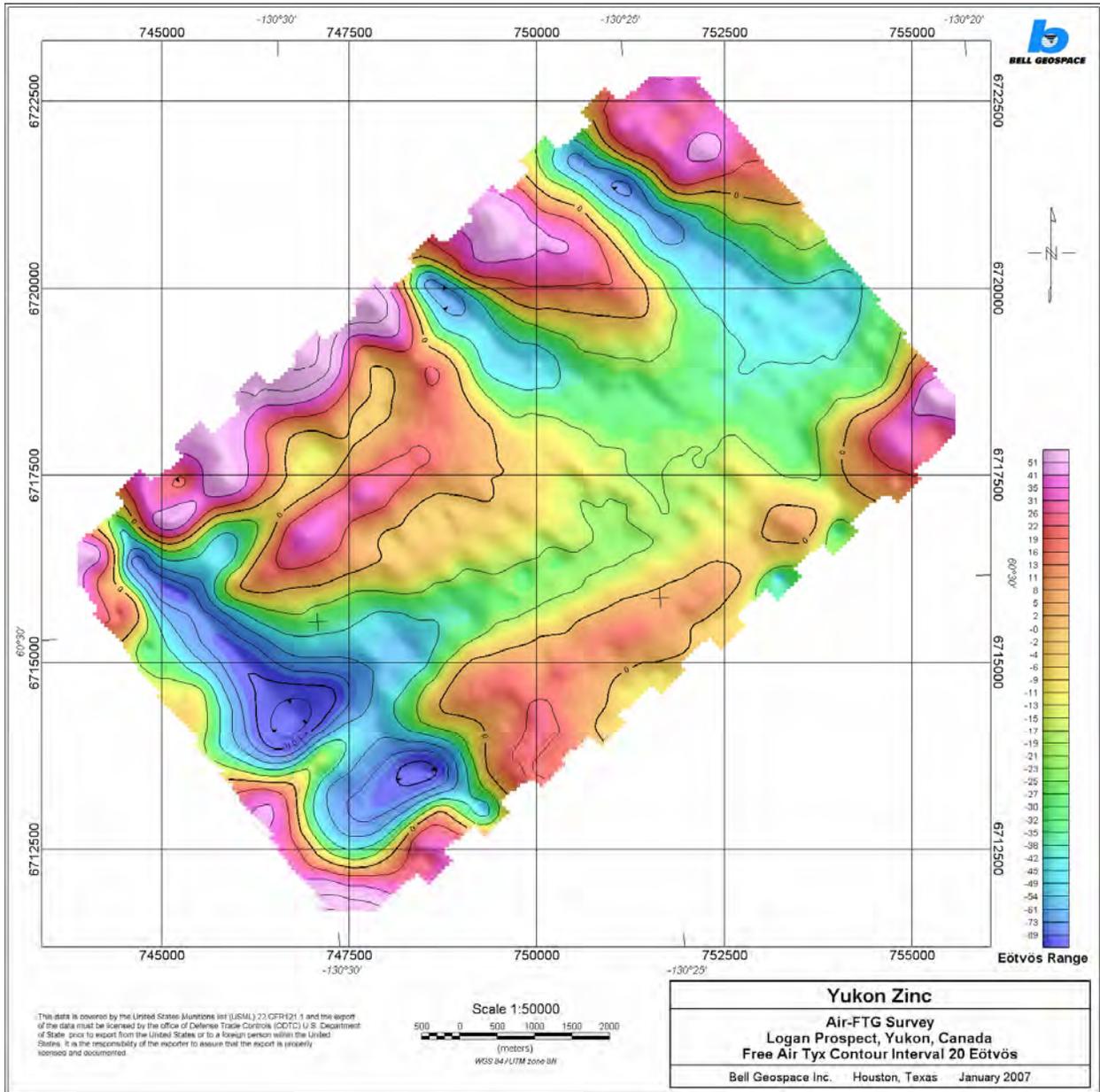
Free Air Txx



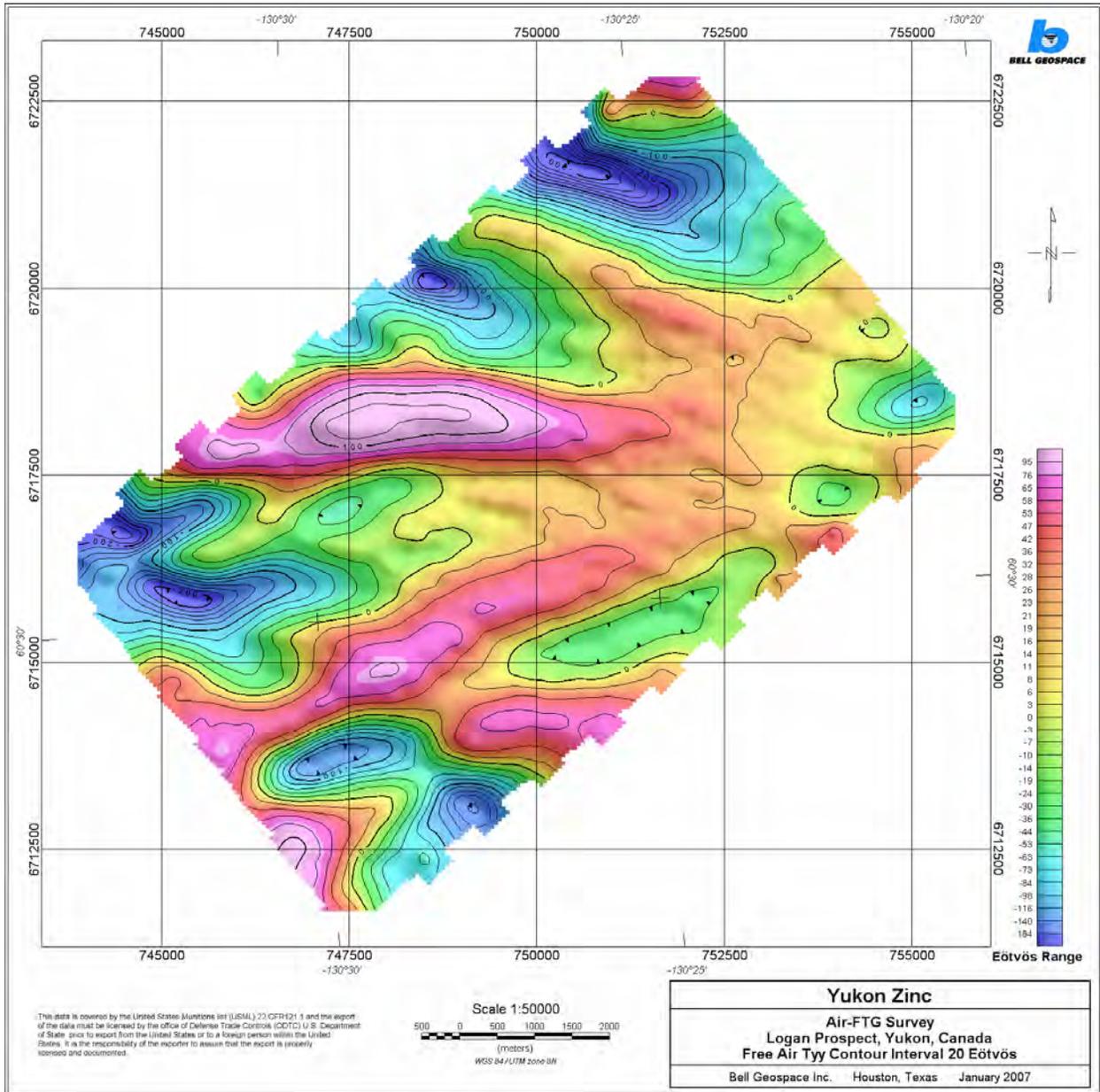
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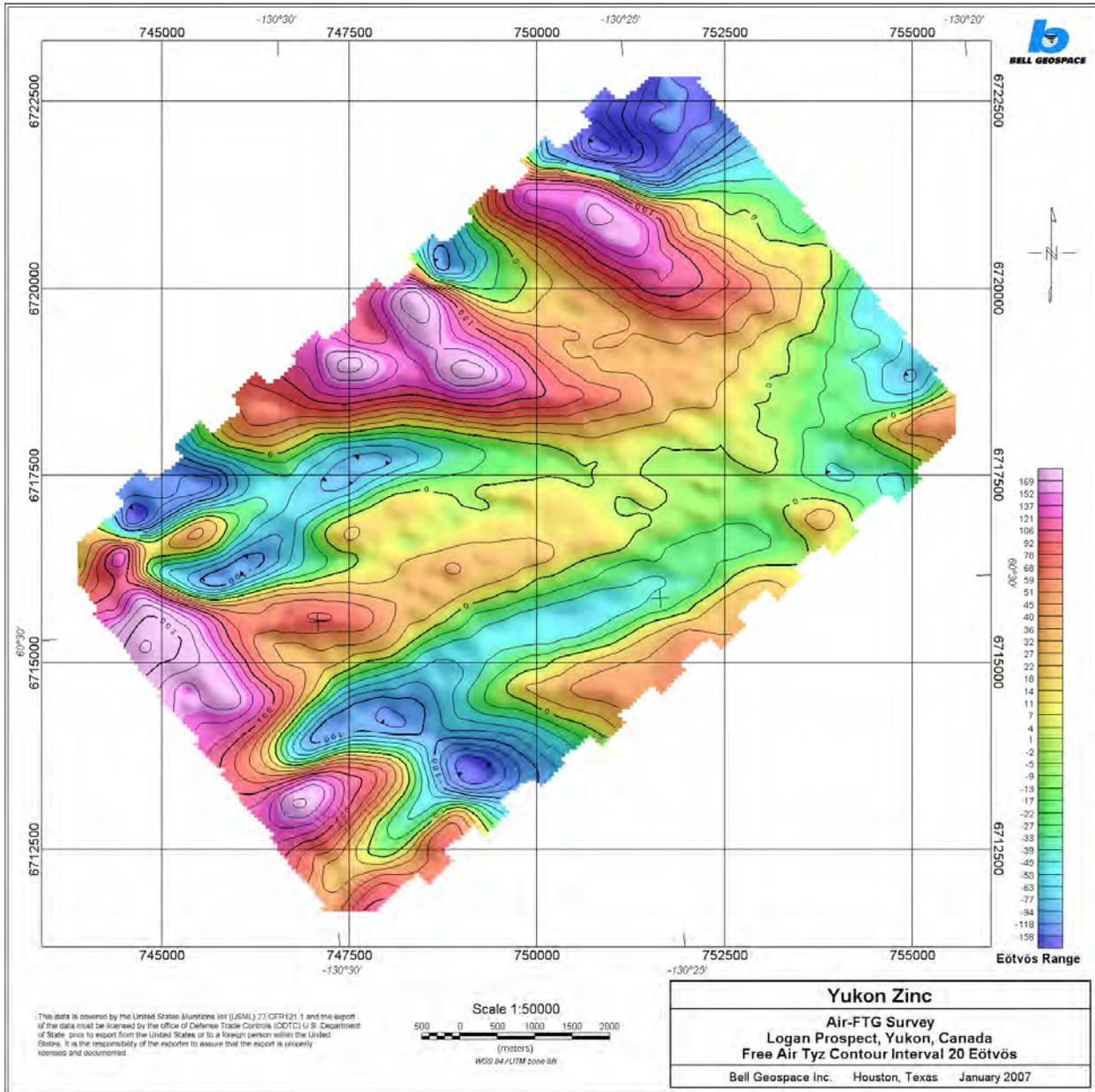
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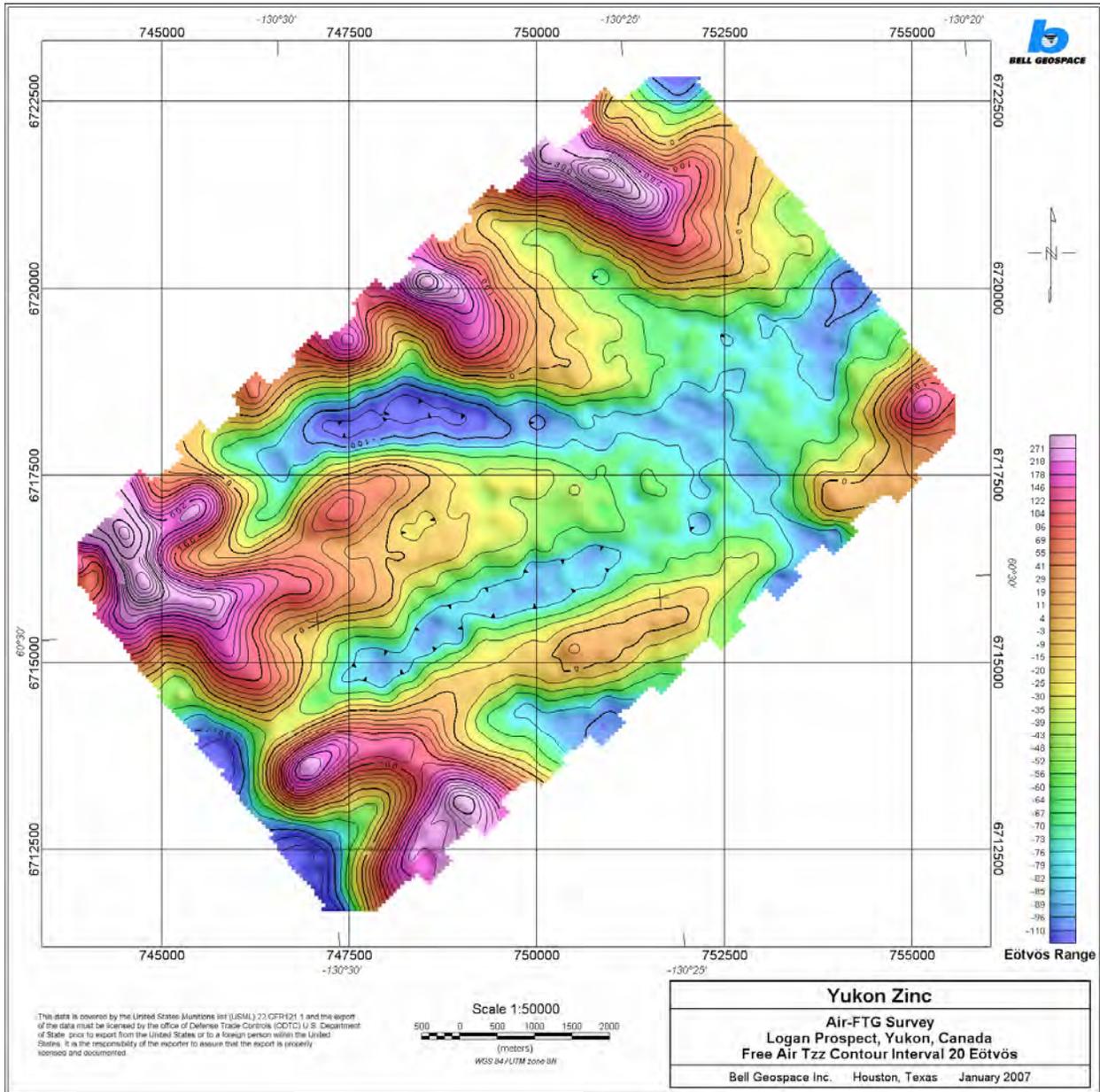
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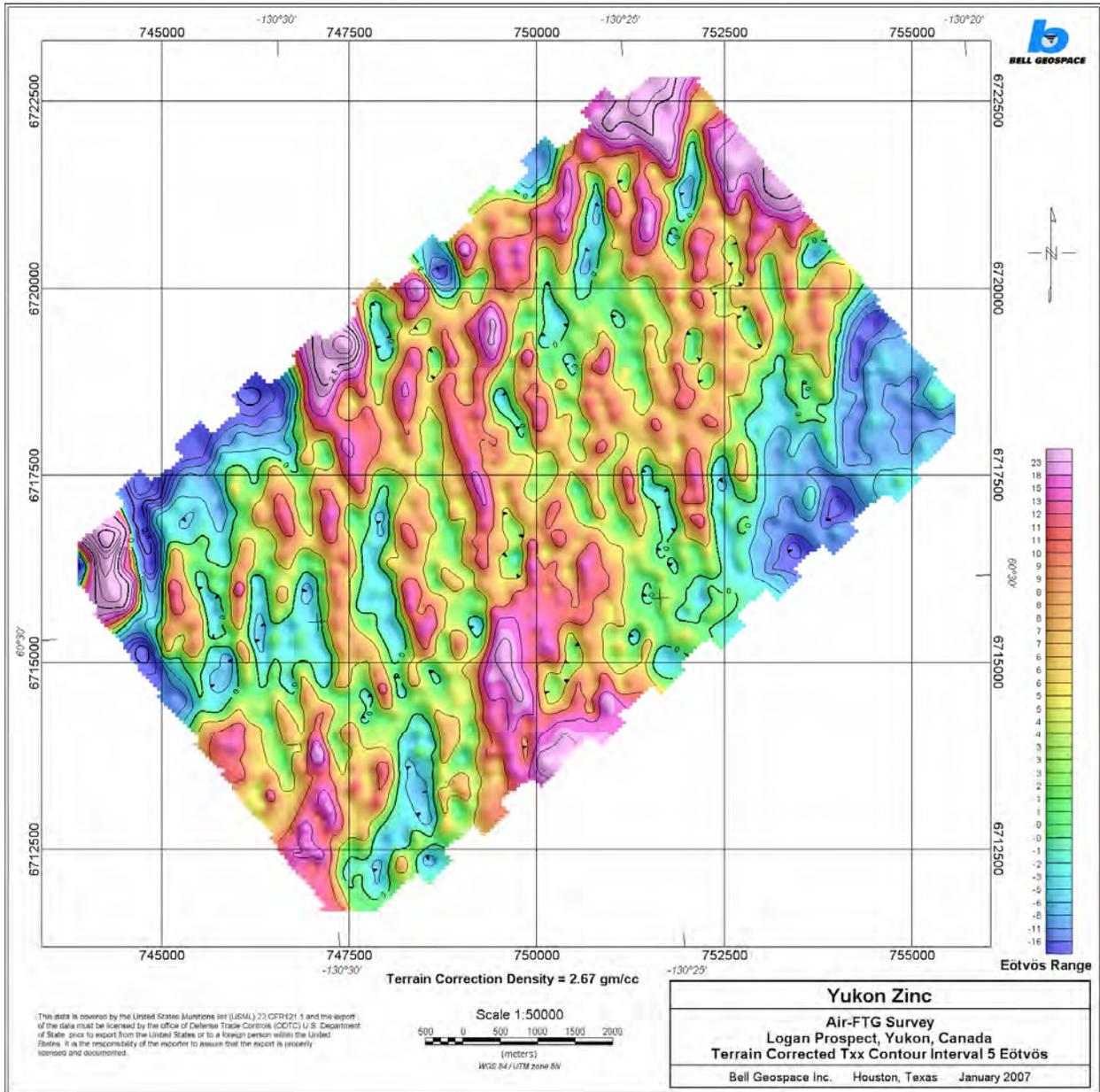
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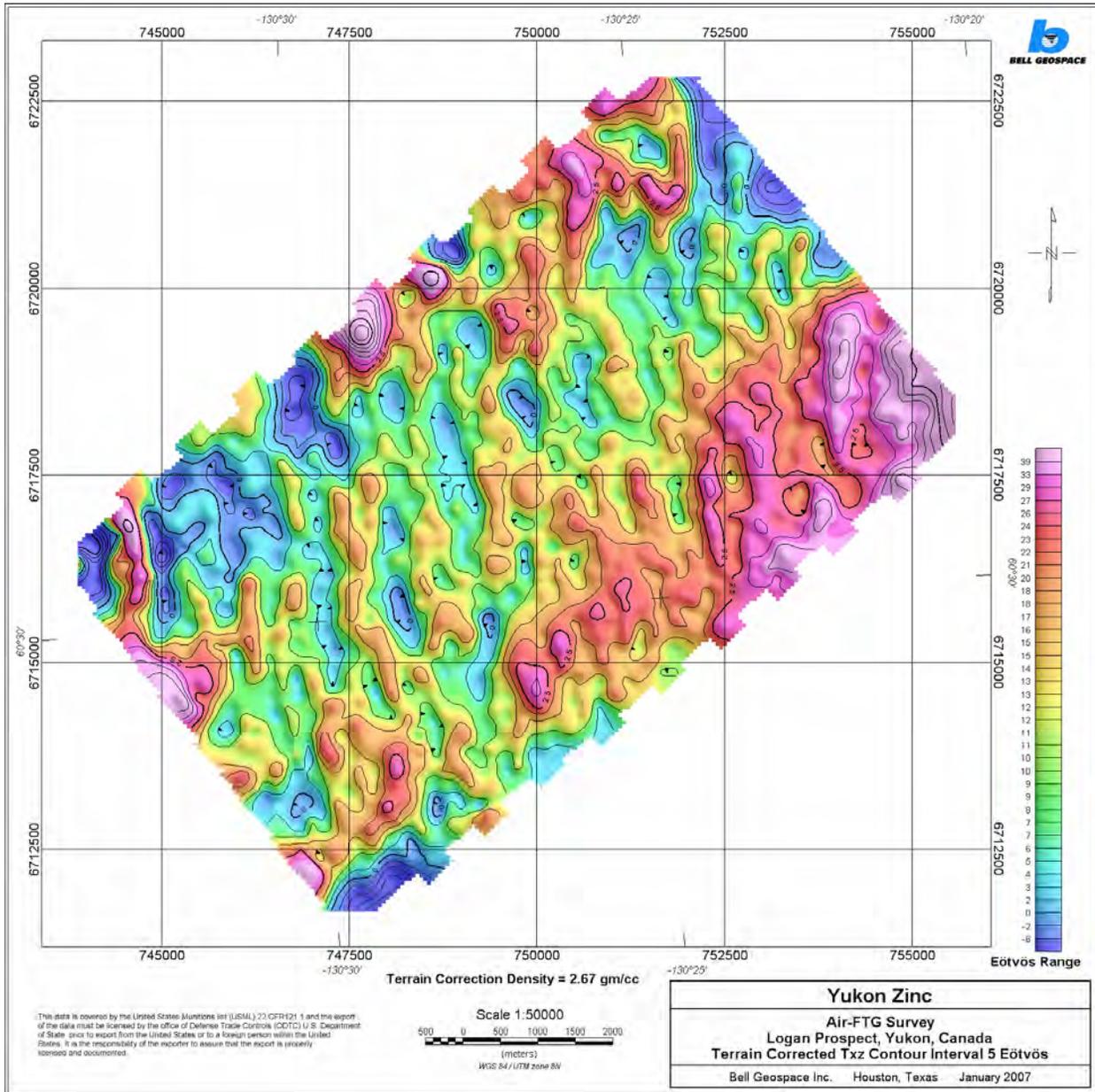
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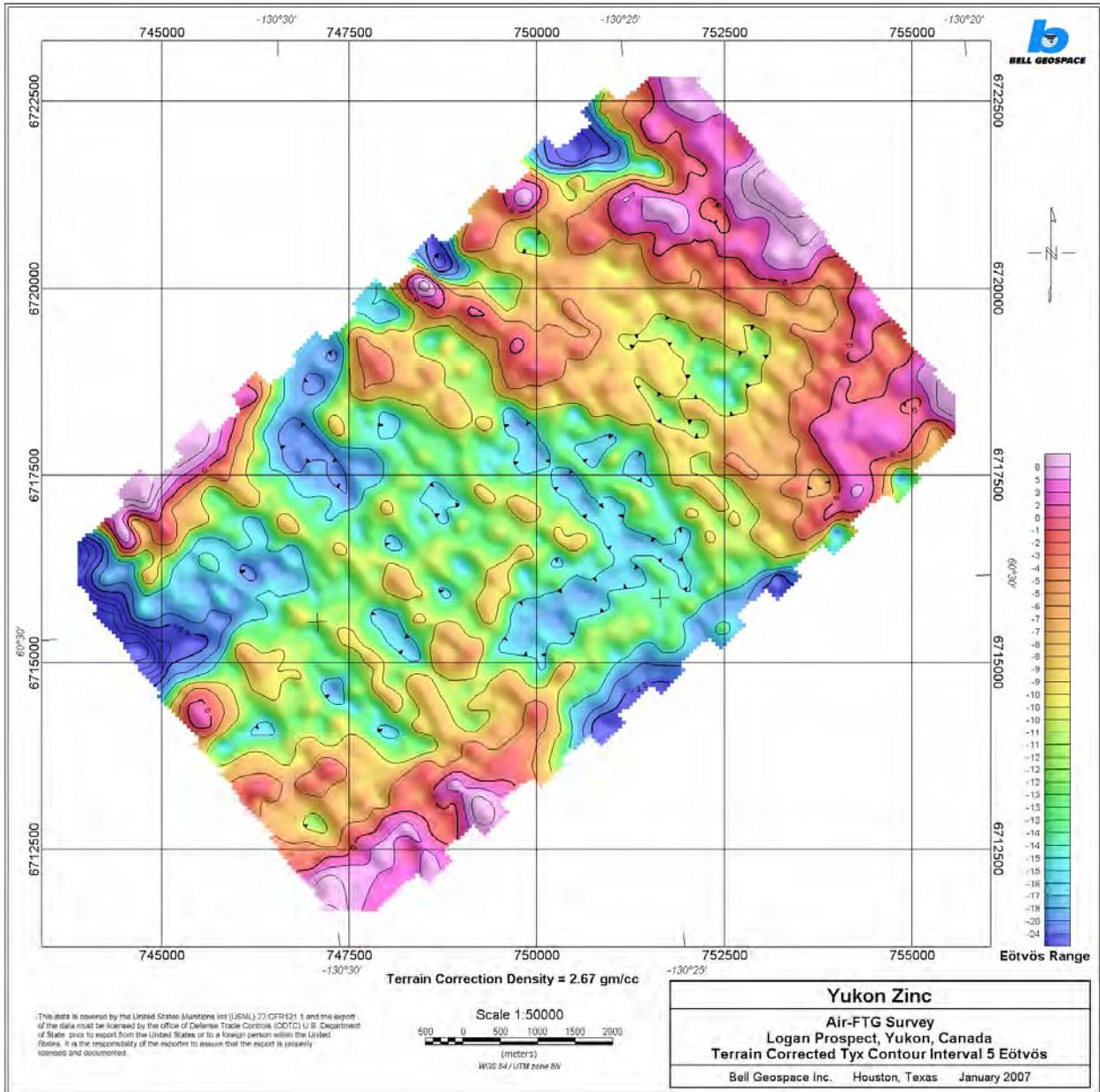
Terrain corrected Txx



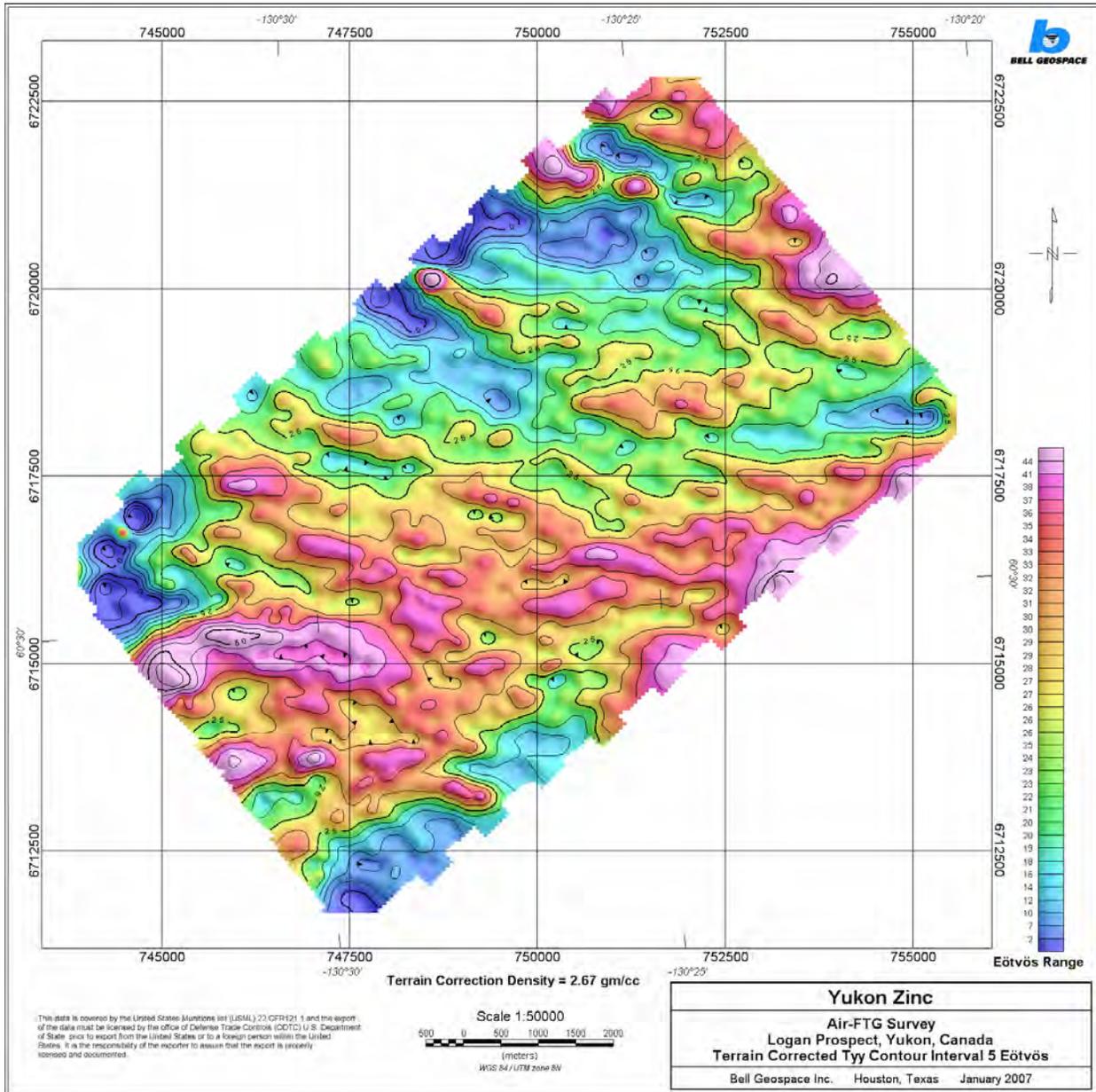
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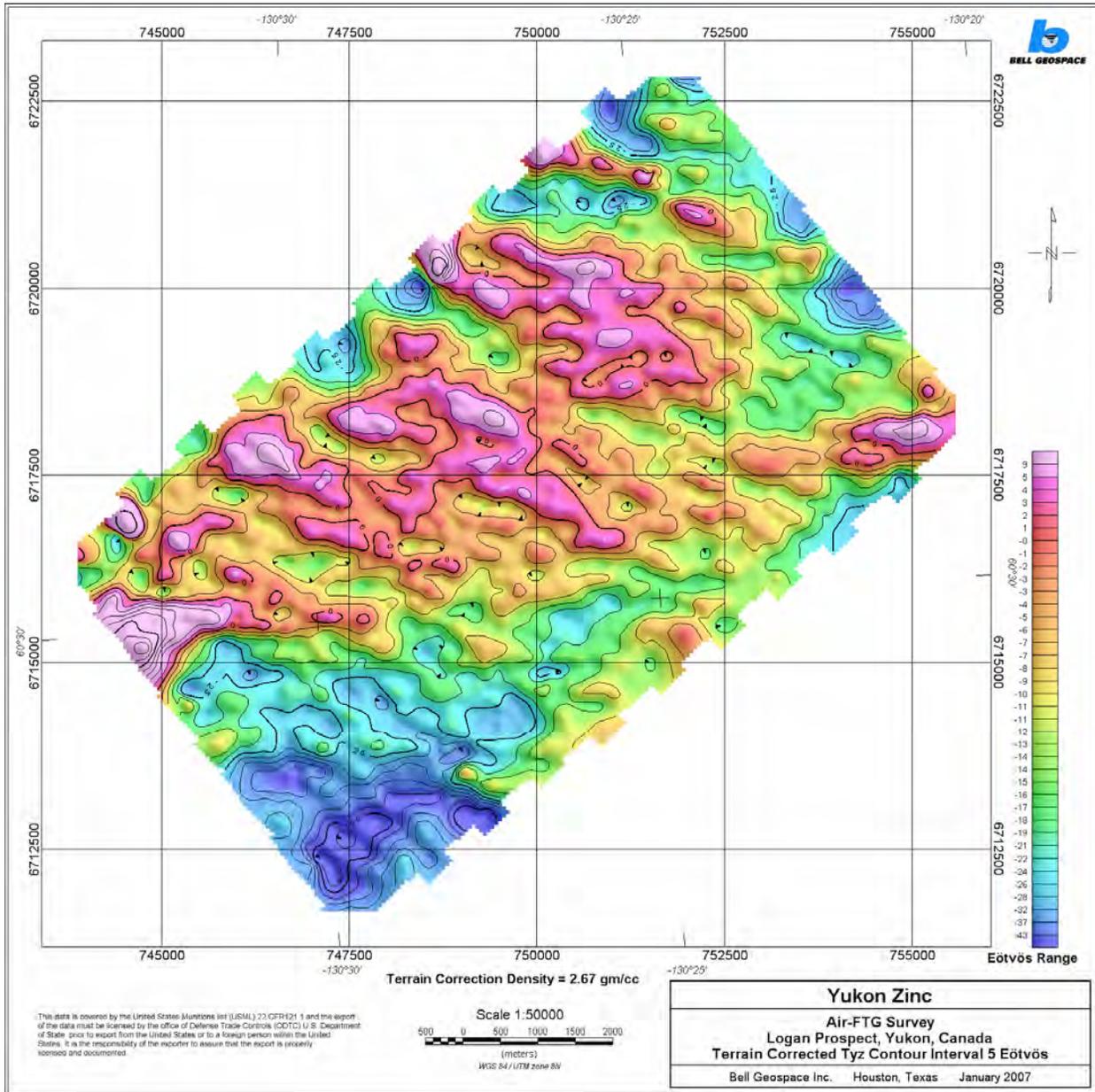
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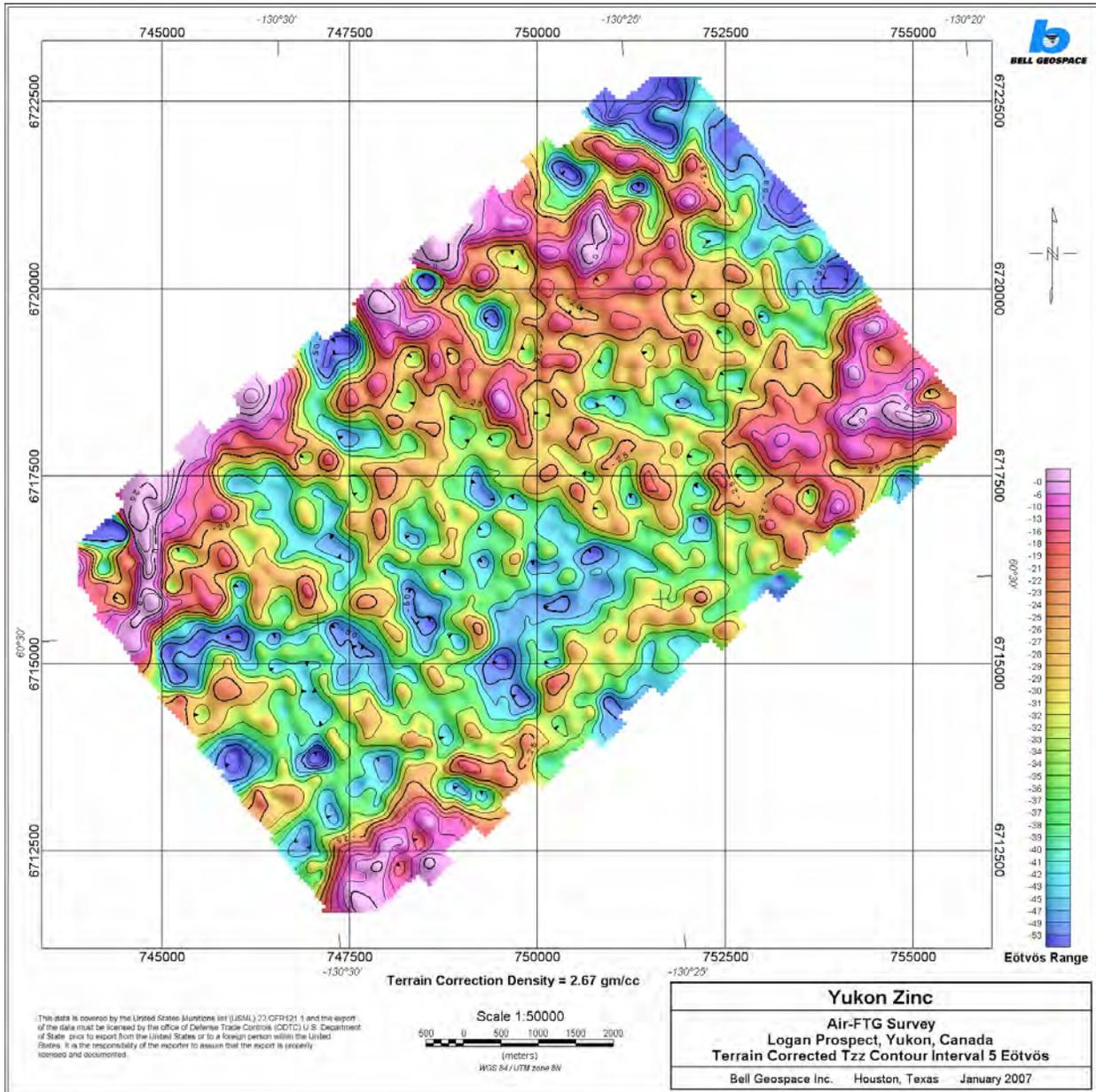
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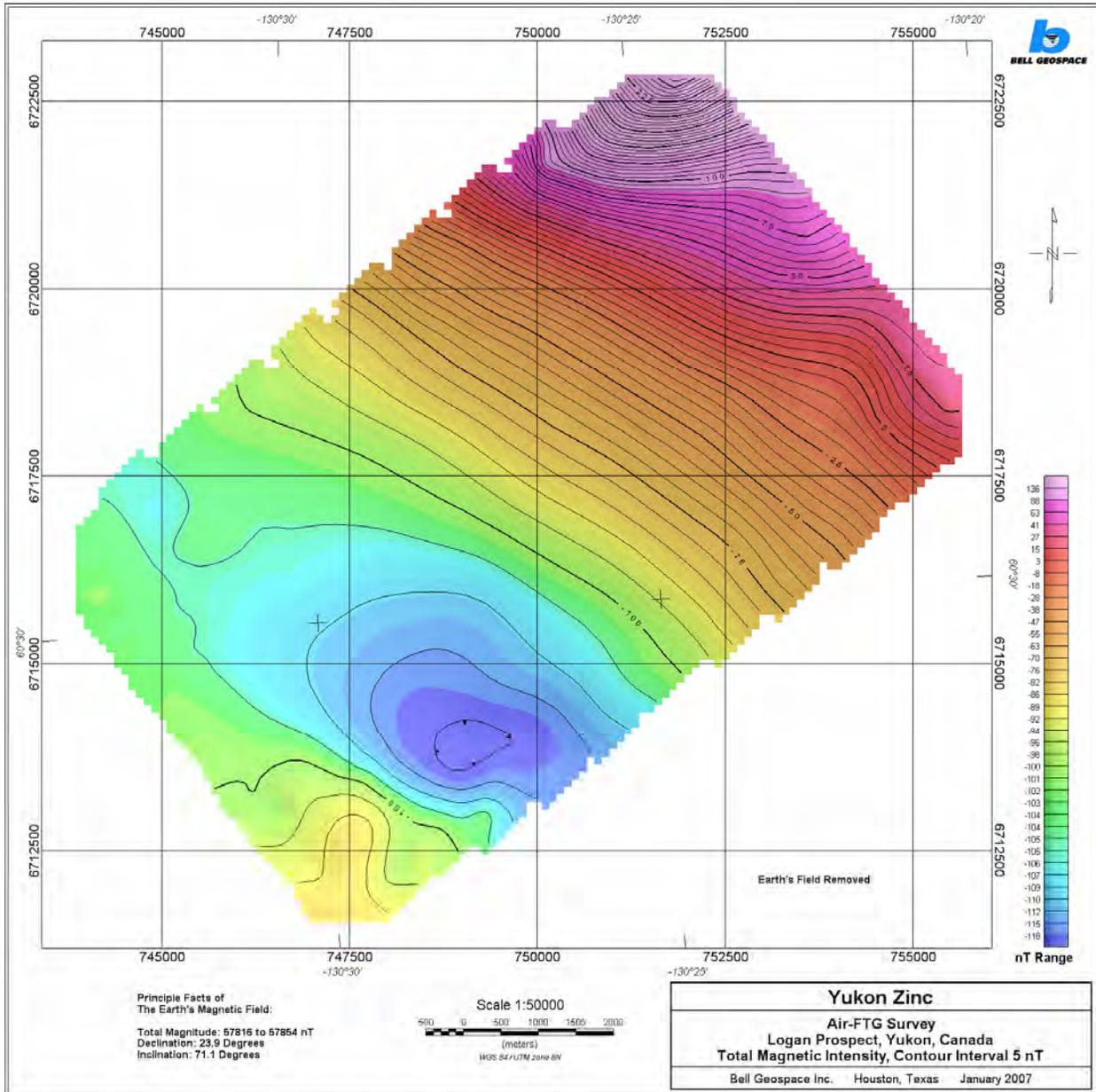
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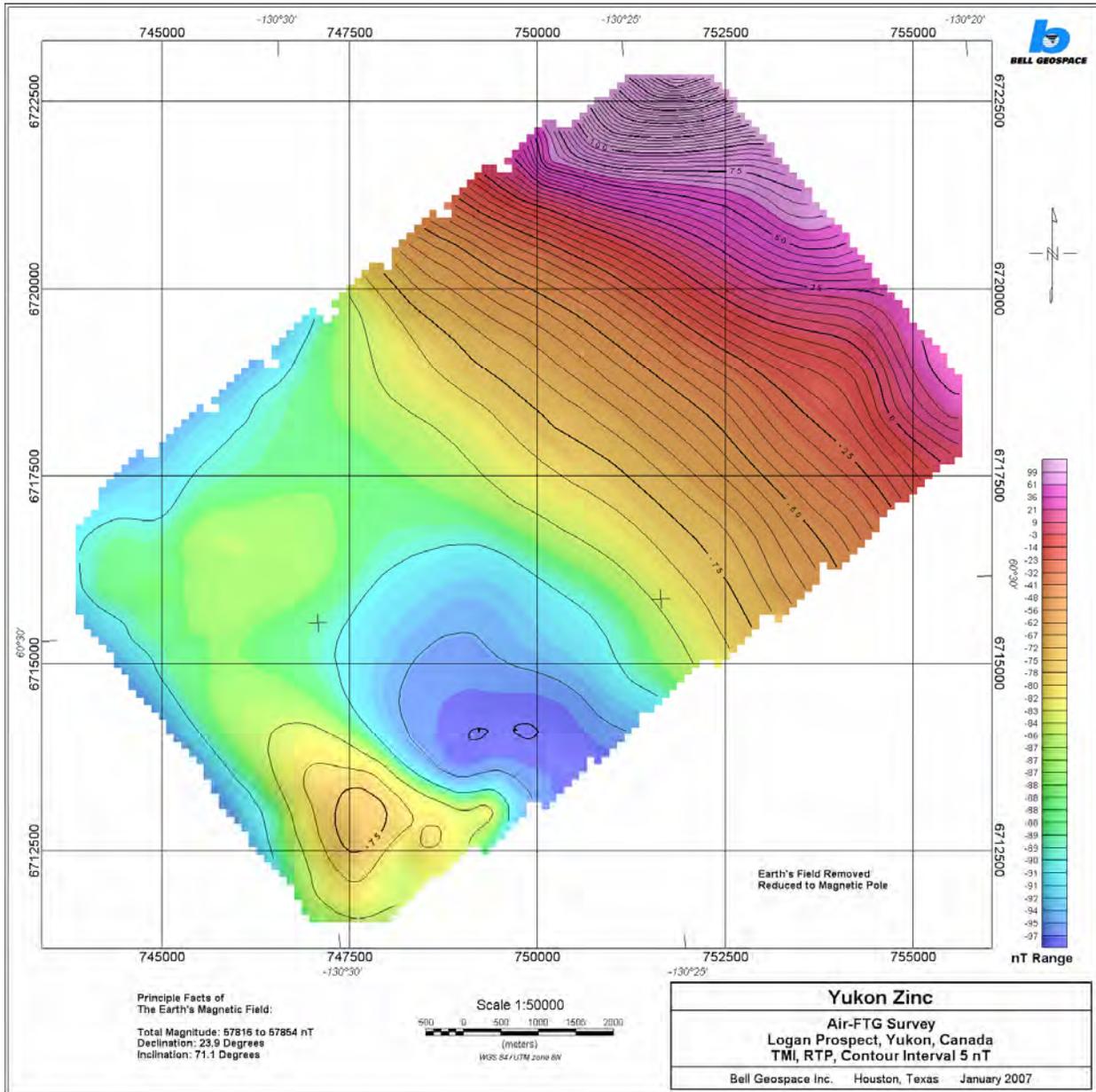
Terrain corrected Tzz



Total Magnetic Intensity



Total Magnetic Intensity-Reduced to the Pole



Total Magnetic Intensity-Reduced to the Pole, 1st Vertical Derivative

