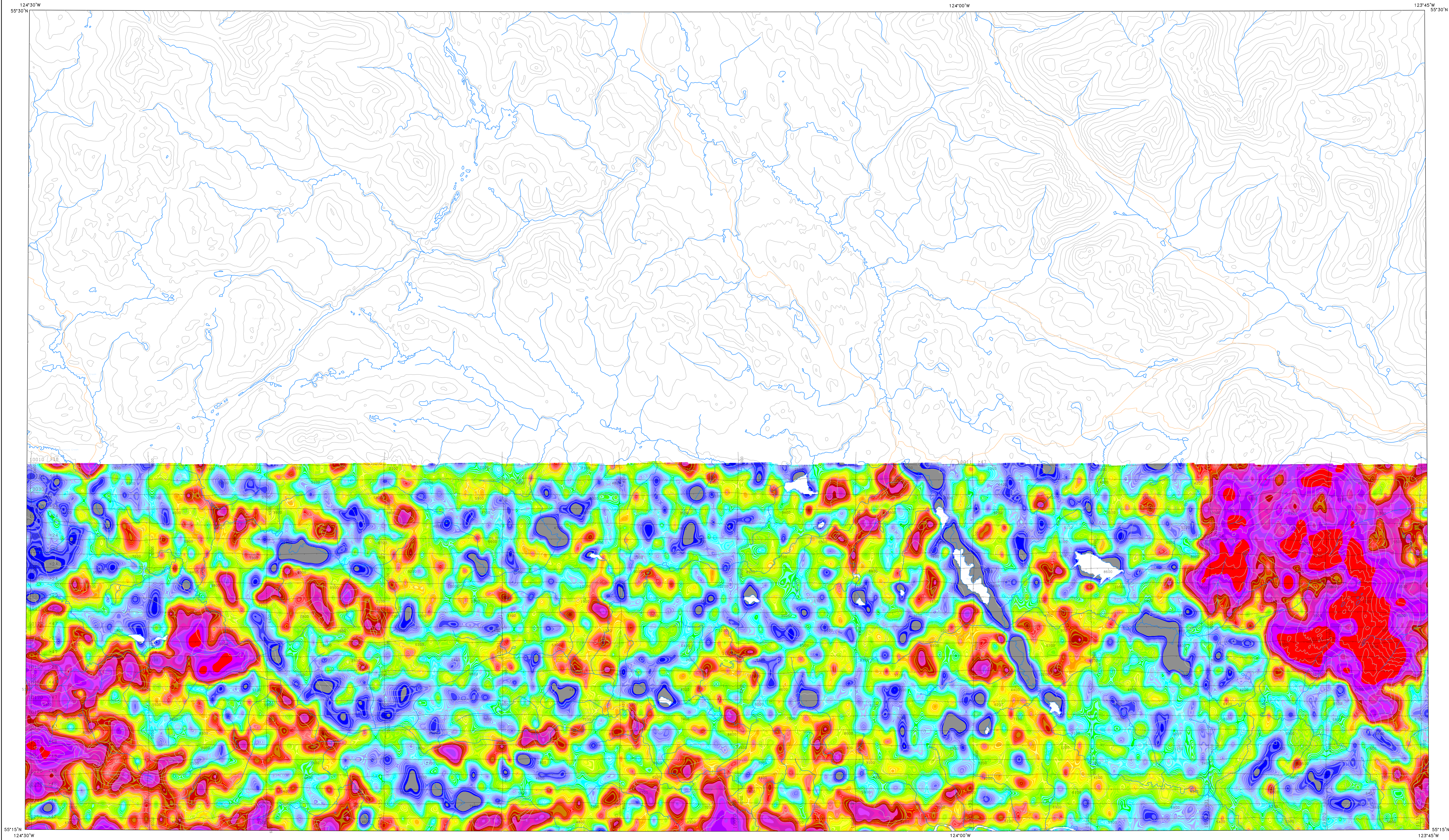

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K (pct)

GEOLOGICAL SURVEY OF CANADA — COMMISSION GÉOLOGIQUE DU CANADA

High Sensitivity Airborne Gamma-Ray Spectrometric and Aeromagnetic Surveys
Central British Columbia, 2004 - 2005

In 2004 and 2005, Fugro Airborne Surveys completed nine multi-sensor airborne geophysical surveys in the central region of British Columbia for the Geological Survey of Canada, the British Columbia and Yukon Chamber of Mines, Yekooche First Nation, and five industry partners, including Serengeti Resources Inc., Yankee Hat Minerals Ltd.,Richfield Ventures Corp.,GWR Resources Inc., and Amarc Resources Ltd. The Geological Survey of Canada provided survey supervision and quality control. The purpose of the surveys was to obtain quantitative gamma-ray spectrometric and aeromagnetic data. The surveys were flown over two seasons, from September 18 to November 17, 2004 and June 15 to August 8, 2005 using AStar 350-B2 and 350-B3 helicopters, C-GECL and C-FGSC.

Gamma-ray Spectrometric Data

The airborne gamma-ray measurements were made with an Exploranium GR820 gamma-ray spectrometer using nine 102 x 102 x 406 mm NaI (Tl) crystals. The main detector array consisted of eight crystals (total volume 33.6 litres). One crystal (total volume 4.2 litres), shielded by the main array, was used to detect variations in background radiation caused by atmospheric radon. The system constantly monitored the natural potassium peak for each crystal, and using a Gaussian least squares algorithm, adjusted the gain for each crystal.

Potassium is measured directly from the 1460 keV gamma-ray photons emitted by 40K, whereas uranium and thorium are measured indirectly from gamma-ray photons emitted by daughter products (214Bi for uranium and 208Tl for thorium). Although these daughters are far down their respective decay chains, they are assumed to be in equilibrium with their parents; thus gamma-ray spectrometric measurements of uranium and thorium are referred to as equivalent uranium and equivalent thorium, i.e. eU and eTh. The energy windows used to measure potassium, uranium and thorium are:

Potassium (^{40}K) 1360 - 1560 keV
Uranium (^{214}Bi) 1660 - 1860 keV
Thorium (^{208}Tl) 2410 - 2810 keV

Gamma-ray spectra were recorded at one-second intervals at a planned terrain clearance of 120m or 90m depending on the survey area and an air speed of 125km/h. The total, potassium, uranium and thorium window counts were derived from the recorded 256 channel spectra. During processing, the spectra were energy calibrated, and counts were accumulated into the windows described above. Counts from the radon detectors were recorded in a 1660 - 1860 keV window and radiation at energies greater than 3000 keV was recorded in the cosmic window. The window counts were corrected for dead time, and for background activity from cosmic radiation, the radioactivity of the aircraft and atmospheric radon decay products. The window data were then corrected for spectral scattering in the ground, air and detectors. Corrections for deviations of altitude from the planned terrain clearance and for variation of temperature and pressure were made prior to conversion to ground concentrations of potassium, uranium and thorium, using factors determined from flights over a calibration range near Ottawa.

Potassium 57.3 cps/% (2004) 56.9 cps/% (2005)
Uranium 6.7 cps/ppm (2004) 8.4 cps/ppm (2005)
Thorium 3.6 cps/ppm (2004) 3.7 cps/ppm (2005)

Corrected data were filtered and interpolated to a 100m grid for the 1:250 000 scale maps and to a 50m grid for the 1:20 000 and 1:50 000 scale maps. The results of an airborne gamma-ray spectrometer survey represent the average surface concentrations that are influenced by varying amounts of outcrop, overburden, vegetation cover, soil moisture and surface water. As a result the measured concentrations are usually lower than the actual bedrock concentration. The total air absorbed dose rate in nanograys per hour was produced from measured counts between 410 and 2810 keV.

Magnetic Data

The helicopter was equipped with a Scintrex CS-2 cesium vapour magnetic sensor mounted in a HM1 high-resolution single sensor stinger mounted system. The system recorded readings every 0.1 seconds with a noise level of less than 0.01 nT. Magnetic interferences caused by aircraft maneuvers were compensated using an RMS AADCII Magnetic compensator. Diurnal variations and GPS fluctuations were recorded using a Fugro CF1 base station.

After editing the survey data, the intersections of traverse and control lines were determined and the differences in the magnetic values were computed, analyzed and manually verified to obtain the leveling network. The International Geomagnetic Reference Field was calculated and removed using a fixed date of October 3, 2004 and an altitude of the differentially corrected GPS height for each data point. The corrected magnetic data was interpolated to a 50m grid using a minimum curvature algorithm. The first vertical derivative grid was calculated from the corrected total magnetic intensity grid using a FFT based frequency domain filtering algorithm.

Positional Data

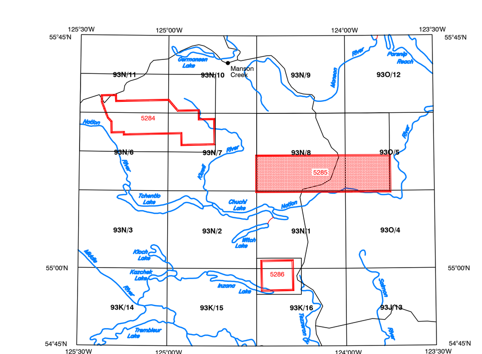
Line spacing and direction for survey and control lines were selected for each block to ensure the best intersection of local geological features. Terrain clearance was monitored by radar altimeter. Positional data were recorded using a dual frequency Novatel Millenium system. GPS groundstation data were combined with airborne GPS data to produce differentially corrected positional data with an accuracy of 2 to 5 m.

Data Presentation

Colour levels and contours were calculated for each grid and combined with map surround information to create postscript plot files, which were plotted using HP DesignJet colour plotters.

Planimetric Symbols

Topographic Contour
Drainage
Roads
Culture
Railway
Flight lines, fiducial — 10100 < — 42500



NATIONAL TOPOGRAPHICAL SYSTEM REFERENCE AND GEOPHYSICAL MAP INDEX
SYSTÈME NATIONAL DE RÉFÉRENCE CARTOGRAPHIQUE ET INDEX DES CARTES GÉOPHYSIQUES

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Geological Survey of Canada, Open File 5285,
scale 1:50 000.

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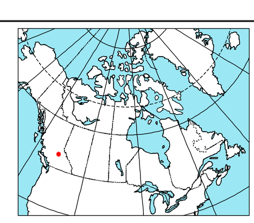
ROCKS TO RICHES

Natural Resources Canada — Ressources naturelles Canada

Canada



LOCATION MAP

GEOPHYSICAL SERIES - NTS 93N/8, 93O/5 - SYLVESTER CREEK
BRITISH COLUMBIA

POTASSIUM

Scale 1:50 000 - Échelle 1/50 000

Kilometres 1 0 1 2 3 4 Kilomètres

NAD 83 / UTM Zone 10N

Universal Transverse Mercator Projection
North American Datum 1983
© Her Majesty the Queen in Right of Canada 2006

Projection universelle transverse de Mercator
Système de référence géodésique nord-américain, 1983
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GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
2006

SHEET 2 OF 10
FEUILLET 2 DE 10

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POTASSIUM

SYLVESTER CREEK
BRITISH COLUMBIA

93N/8, 93O/5