

Introduction
A gamma-ray spectrometric and aeromagnetic airborne geophysical survey of the northeast Thelon Basin area, Nunavut, was completed by Geobase Airborne Surveys. The survey was flown from August 2nd to September 2nd, 2009 using three Piper PA-31 Navajo (C-GJBA, C-GJBB, C-GJBG). The control traverse and control line spacing were, respectively, 400 m and 200 m, and the aircraft flew at a nominal terrain clearance of 125 m at an average between 200 and 270 km/h. Traverses were spaced at 135° with respect to control lines. The flight path and differential corrections to raw data recorded on a Global Positioning System. The survey was flown on a pre-determined flight surface to minimize differences in magnetic values at the intersections of control and traverse lines.

Gamma-ray spectrometry
The airborne gamma-ray measurements were made with a Radiation Solutions RS-500 gamma-ray spectrometer using NaI(Tl) crystals. The main detector array consisted of twelve crystals (total volume 50.4 litres). Two crystals (total volume 4.4 litres), shielded by the main array, were used to detect scatter peaks in background radiation caused by atmospheric radon. The system assembled 1524 channel spectra from the individual NaI(Tl) detectors with no loss of Poisson statistics. Spectrum stabilization is accomplished by matching the recorded spectra with several natural gamma-ray peaks.

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 (214Pb for uranium and 214Pb for thorium). Although these daughter are far from 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, respectively, 1370-1570 keV, 1660-1860 keV, and 241-2620 keV.

Gamma-ray spectra were recorded on one-second intervals. Data processing followed standard procedures as described in IAEA, 1991 and IAEA, 2003. 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 were energy calibrated, and counts were accumulated into the counts window. The window counts were corrected for dead time, background activity from cosmic radiation, radioactivity of the aircraft and atmospheric radon decay products. The window data were then corrected for spectral scattering in the ground, air and atmosphere. Corrections for variations from the planned terrain elevations due to variation of temperature and pressure were made prior to conversion to ground concentrations of potassium, uranium and thorium, using factors determined from flights over the Dartmouth, Saskatchewan test site. The factors for potassium, uranium and thorium are listed in Table 1.

Controlled data were interpolated to a 100 m grid interval. The results of an airborne gamma-ray spectrometer survey represent the average surface concentrations of the 3 natural radionuclides, and are influenced by nature or overburden, presence of outcrop, vegetation cover, soil moisture and surface water. As a result the measured concentrations are usually lower than the actual bedrock concentrations.

Magnetic Data
The magnetic field was sampled 10 times per second using a split-beam cesium vapor magnetometer (sensitivity = 0.005 nT) rigidly mounted to the aircraft. Differences in magnetic values at the intersections of control and traverse lines were analyzed to obtain a mutually leveled set of flight-line magnetic data. The leveled values were then interpolated to a 100 m grid. The International Geomagnetic Reference Field (IGRF) defined at the average GPS altitude of 237 m for the 2009 data was then removed. Removal of the IGRF, representing the magnetic field of the Earth's core, produces a residual component related essentially to magnetizations within the Earth's crust.

The first vertical derivative of the magnetic field is the rate of change of the magnetic field in the vertical direction. Computation of the first vertical derivative removes long wavelength features of the magnetic field and significantly improves the resolution of short wavelength anomalies. A primary of first vertical derivative maps is the coincidence of the zero-value contour with vertical contacts of magnetic units at high magnetic latitudes (Hood, 1965).

Tableau 1. Sensibilités des spectromètres de chacun des éléments.
Potassium (cps/k) 82.22 C-GJBA 61.61 C-GJBB 79.37
Uranium (cps/ppm) 11.55 12.11 12.39
Thorium (cps/ppm) 5.15 5.03 4.96

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GSC OPEN FILE 6511 / DOSSIER PUBLIC 6511 DE LA CGC
GEOPHYSICAL SERIES / SÉRIE DES CARTES GÉOPHYSIQUES
AERBORNE GEOPHYSICAL SURVEY OF THE NORTHEAST THELON BASIN, NUNAVUT
LEVÉ GÉOPHYSIQUE AÉROPORTÉ DE LA PARTIE NORD-EST DU BASSIN DE THELON, NUNAVUT

TERNARY RADIOELEMENT MAP
DIAGRAMME TERNAIRE DES RADIOÉLEMENTS

MAP LOCATION - LOCALISATION DE LA CARTE
Authors: Harvey, B.J.A., Coyle, M., Buckle, J.L., Carson, J.M. and Hefford, S.W.

Scale 1:50 000 - Échelle 1/50 000
Authors: Harvey, B.J.A., Coyle, M., Buckle, J.L., Carson, J.M. and Hefford, S.W.

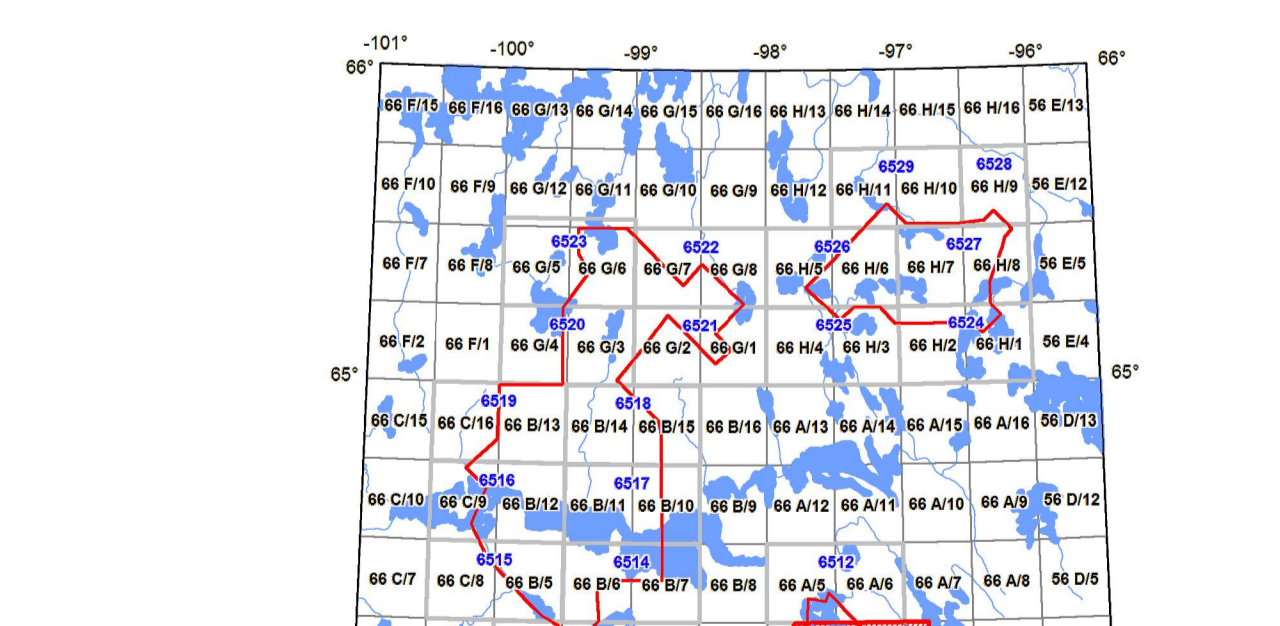
Department of Economic Development and Transportation
Ministère du Développement économique et des Transports

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Digital versions of this map, corresponding digital profile and gridded data, and similar data for adjacent aeromagnetic and gamma-ray spectrometry surveys can be downloaded, at no charge, from Natural Resources Canada's Geoscience Data Repository at: http://gdr.nrc.gc.ca. The same products are available, for a fee, from the Geophysical Data Centre, Geological Survey of Canada, 615 Booth Street, Ottawa, Ontario, K1A 0E9. Telephone: (613) 995-5326, email: gdr@gsc.nrc.gc.ca

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MAP SHEET SUMMARY / SOMMAIRE DES FEUILLETS
1. MAP / CARTE
2. National Air Absolute Data Rate
3. Potassium
4. Uranium
5. Uranium / Thorium
6. Uranium / Potassium
7. Thorium / Potassium
8. Ternary Radioelement Map
9. Residual Total Magnetic Field
10. First Vertical Derivative of the Magnetic Field
11. Detrended magnetic field



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Recommandé citation: Harvey, B.J.A., Coyle, M., Buckle, J.L., Carson, J.M., et Hefford, S.W., 2011. Série des cartes géophysiques, Levé géophysique aéroporté de la partie nord-est du bassin de Thelon, Nunavut, NTS 66 A/3 et parties de 66 A/2 et 66 A/4, échelle 1:50 000.