

An airborne geophysical survey of the Phelps Lake area, Saskatchewan, was flown by Sander Geophysics Limited (SGL) for the Geological Survey of Canada and Saskatchewan Energy and Mines. The purpose of the survey was to obtain gamma-ray spectrometry, aeromagnetic and VLF-EM data. The survey was flown between August 14 and September 7, 2000 using a Britten-Norman Islander BN2-2 aircraft flying 120 m above the terrain at a mean speed of 220 km/h.

The 1000 m spaced, north-south oriented survey lines and orthogonal 10 000 m spaced control lines were planned using the SDCrape system. In-flight differential GPS data were collected during the survey to produce 500 m grid spacing. In-flight differential data were recorded using an Omnistar real-time differential GPS system. GPS ground station data were combined with airborne GPS data to produce differentially corrected positional data with an accuracy of 1 to 2 m.

Potassium is measured directly from the 1460 keV gamma-ray photons emitted by <sup>40</sup>K. Uranium and thorium must be measured indirectly from gamma-ray photons emitted by daughter products (<sup>214</sup>Pb for uranium and <sup>214</sup>Pb 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 spectrometry measurements of uranium and thorium are referred to as equivalent uranium (eU) and equivalent thorium (eTh).

The airborne gamma-ray measurements were made with an Explorer GR200 gamma-ray spectrometer using fourteen 102 x 102 x 406 mm NaI(Tl) crystals. The main detector array consisted of twelve crystals (two in the forward and two in the aft) and four crystals (two in the forward and two in the aft) used to detect variations caused by atmospheric radon. The GR200 constantly monitors the natural potassium peak for each crystal, using a Gaussian least-squares algorithm to adjust the gain for individual crystals.

Gamma-ray spectra were recorded at one-second intervals. Noise Adjusted Singular Value Decomposition (NASVD) analysis was carried out on full spectrum 256 channel data to reduce statistical noise in the windowed data. The corrected data were then used to calculate U/Th ratios. The data were then processed using a 3-D filter to remove any terrain-related variations. The filter was designed to remove any terrain-related variations that are not due to the geology. The standard windows were recorded in a 1660 - 1860 keV window and radiation at energies greater than 3000 keV was recorded in the cosmic window. The standard windows used are 1370 - 1570 keV for potassium, 1660 - 1870 keV for uranium, 2410 - 2810 keV for thorium and 400 - 2810 keV for total activity data.

All wind counts were corrected for dead time. The standard windows were corrected for background activity from cosmic radiation, the radioactivity of the aircraft and atmospheric radon. The standard windows were also corrected for spectral scattering in the ground, air and detectors. The four standard windows were corrected for deviations of altitude from the planned terrain clearance and for variation of temperature and pressure prior to conversion. The conversion factors used were 102.3 cps/eU for potassium, 9.75 cps/eU for uranium, 6.37 cps/eTh for thorium and 33.26 cps/eUTh for total activity data.

Corrected data were filtered and interpolated to a 200 m grid for the 1:250 000 and 1:50 000 scale maps using a minimum curvature algorithm technique. The results of an airborne gamma-ray spectrometry survey represent the average surface concentrations that are influenced by varying amounts of outcrop, overburden, vegetation cover and surface water. As a result measured concentrations are usually lower than the actual bedrock concentration.

The aircraft was equipped with a Geometrics G-822A cesium vapour magnetic sensor mounted in a slinger to the rear of the aircraft, connected to an RMS AADC17 term magnetic compensator installed in a microcomputer. The magnetometer data were recorded every 0.1 seconds with a noise level of less than 0.1 nT. Diurnal drift values were subtracted from the unfiltered aeromagnetic data. After editing the aeromagnetic data, the International Geomagnetic Reference Field was subtracted from the unfiltered aeromagnetic data. The International Geomagnetic Reference Field was calculated and removed using the data and the differences in the magnetic values and the differences in the magnetic values and the differences in the magnetic values and the differences in the magnetic values and the differences in the magnetic values.

VLF total field and quadrature components for two frequencies were recorded using a Herz Totem 2A system. The line station was tuned to station NAA at Cutler, MA, transmitting at 24.0 kHz. The ortho station was tuned to the 24.8 kHz station NIK at Seattle, WA. VLF data were recorded in 10 second periods. VLF data will only be made available with the digital contour maps.

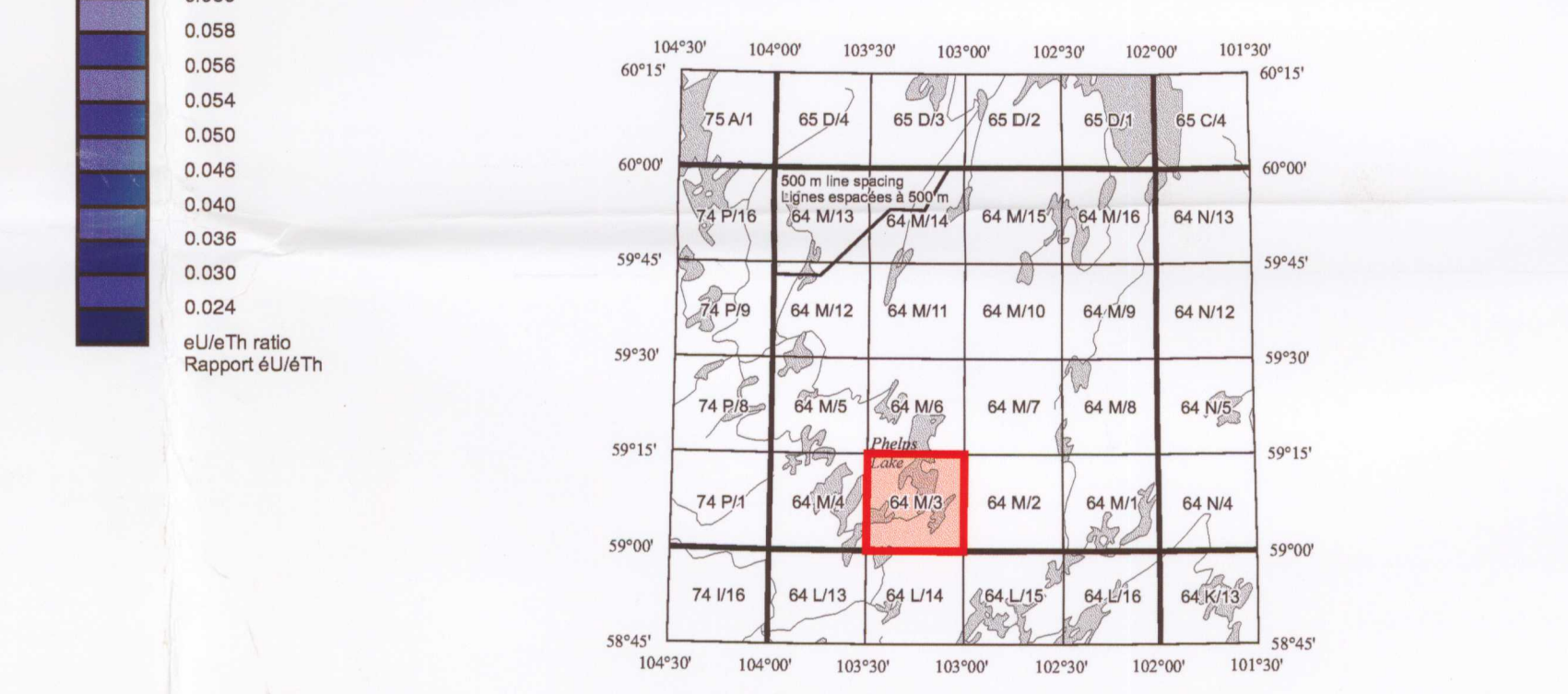
Colour levels were calculated for each grid and combined with map information to create an RTI plot file, which was plotted using an HP DesignJet 2000CP colour plotter.

- 0.522
- 0.464
- 0.436
- 0.416
- 0.402
- 0.390
- 0.380
- 0.366
- 0.354
- 0.342
- 0.332
- 0.324
- 0.294
- 0.278
- 0.266
- 0.256
- 0.246
- 0.238
- 0.230
- 0.222
- 0.216
- 0.212
- 0.206
- 0.202
- 0.198
- 0.192
- 0.188
- 0.184
- 0.180
- 0.178
- 0.174
- 0.170
- 0.166
- 0.160
- 0.158
- 0.154
- 0.148
- 0.146
- 0.144
- 0.142
- 0.138
- 0.136
- 0.134
- 0.132
- 0.130
- 0.126
- 0.124
- 0.122
- 0.120
- 0.118
- 0.116
- 0.114
- 0.112
- 0.110
- 0.108
- 0.106
- 0.104
- 0.102
- 0.100
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- 0.088
- 0.086
- 0.084
- 0.082
- 0.080
- 0.078
- 0.076
- 0.074
- 0.072
- 0.070
- 0.068
- 0.066
- 0.064
- 0.062
- 0.060
- 0.058
- 0.056
- 0.054
- 0.052
- 0.046
- 0.040
- 0.036
- 0.032
- 0.028
- 0.024

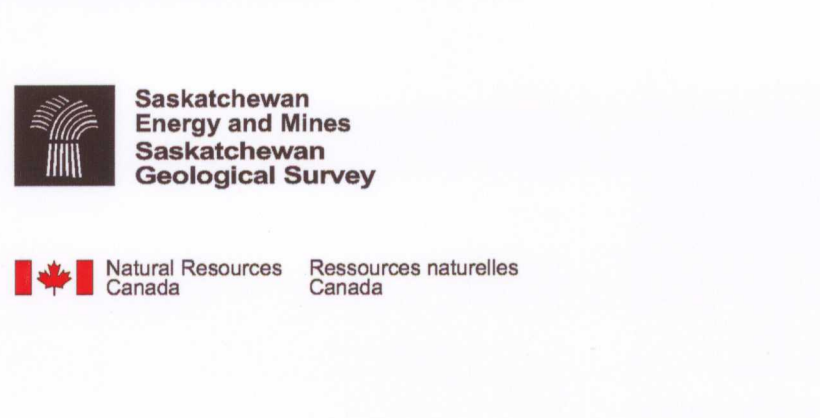
- LEGEND / LÉGENDE**
- Wetland / Marais .....
  - Lake / Lac, Intermittent .....
  - Watercourse / Cours d'eau .....
  - Flooded area / Région inondée .....
  - Esker / Esker .....
  - Elevation contour / Courbes d'élévation .....
  - Depression contour / Courbes de dépression .....
  - Flight Line / Ligne de vol .....
- Digital cartographic base information supplied by Information Services Corporation of Saskatchewan. Elevation contour interval 10 metres. L'information cartographique numérique a été fournie par Information Services Corporation of Saskatchewan. Équidistance des courbes d'élévation 10 mètres.

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Carson J.M., Holman P.B., Shives R.B.K., Ford K.L., Harper C.T., Slimon W., 2001. Uranium / Thorium Map, Bickerton Lake, Saskatchewan: NTS 64M/3. Geological Survey of Canada, Open File 3951\_25, Scale 1:50 000

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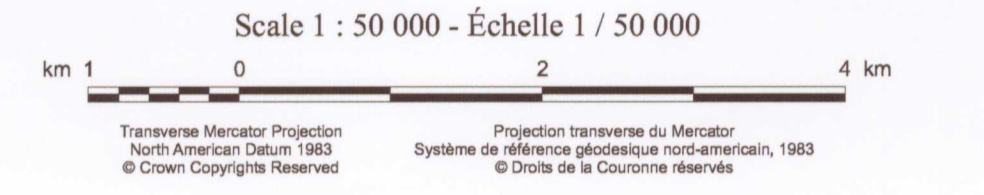


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URANIUM / THORIUM MAP  
CARTE DE L'URANIUM / THORIUM

BICKERTON LAKE  
SASKATCHEWAN  
NTS / SNRC 64M/3



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Open File  
Dossier Public  
**3951\_25**  
Geological Survey of Canada  
Commission géologique du Canada  
2001

SEM Open File 2001-2  
Map 25 of 160

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