

An airborne geophysical survey of the Phelps Lake area, Saskatchewan, was flown by Sander Geophysical Limited (SGL) for the Geological Survey of Canada and Saskatchewan Energy and Mines. The purpose of the survey was to obtain gamma-ray spectrometric, aeromagnetic and VLF-EM data. The survey was flown between August 14 and September 7, 2000 using a Britten-Norman Islander EN2B-21 aircraft flying 120 m above the terrain at a mean speed of 220 km/h.

The 1000 m spaced, northwest-southeast oriented survey lines and orthogonal 1000 m spaced control lines were planned using the SIDERAPS system. Infill lines were flown in the northwest-southeast direction to produce 500 m spacing. In-flight positional data were recorded using a Trimble 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 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 (eU) and equivalent thorium (eTh).

The airborne gamma-ray measurements were made with an Exploranium GR200 gamma-ray spectrometer using fourteen 102 x 102 x 406 mm NaI(Tl) crystals. The main detector array consisted of twelve crystals (total volume 50.4 litres). Two crystal total volume 8.4 litres, shielded from the ground by the main array, were used to detect variations caused by atmospheric radon. The GR200 constantly monitored the natural potassium peak for each crystal, using a Gaussian least-squares algorithm to adjust for radon.

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. During processing, the spectra were energy calibrated, and counts were accumulated into six energy windows. Counts from the radon detectors were recorded in a 1860 - 1950 keV window and radon at energies greater than 3000 keV was recorded in the cosmic window. The standard windows used are 1370 - 1570 keV for potassium, 1660 - 1860 keV for uranium, 2410 - 2810 keV for thorium and 400 - 2910 keV for total activity data.

All window 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 potassium, uranium and thorium window data were then corrected for spectral scattering in the ground, and the results of an airborne gamma-ray spectrometric 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 aircraft was equipped with a Geometrics G-422A cesium vapour magnetic sensor mounted in a stinger to the rear of the aircraft, connected to an RMS ADCI 27 arm magnetic computer installed in a microcontroller. The magnetic data were recorded every 0.1 seconds with a noise level of less than 0.1 nT. Diurnal values were monitored at 0.2 second intervals using a Geometrics cesium vane. After editing the survey data, low pass filtered diurnal values were subtracted from the unfiltered aeromagnetic data. The International Geomagnetic Reference Field was calculated and removed using the date and latitude of each data point. The intersections of contour lines were determined and the values were computerized and manually verified to obtain the leveled network. The corrected magnetic data were interpolated to a 200 m grid for the 1:250,000 and 1:50,000 scale maps using a minimum curvature algorithm. The vertical gradient of the magnetic field was calculated from the total magnetic intensity grid using a FFT based algorithm.

VLF total field and quadrature components for two frequencies were recorded using a Hez Telen 2A system. The line station was tuned to station NAA at Cutler, MA, transmitting at 24.8 kHz. The ortho station was tuned to the 24.8 kHz station NUK at Seattle, WA. VLF data were recorded 4 times per second. VLF data will only be made available with the digital data.

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

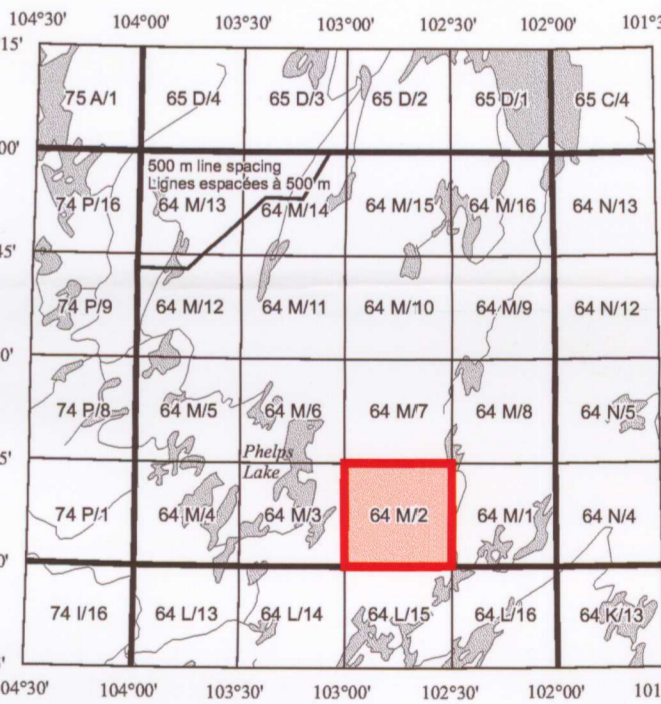
- LEGEND / LÉGENDE**
- Wetland / Marais
  - Lake / Lac; Intermittent
  - Watercourse / Cours d'eau
  - Flooded area / Région inondée
  - Esker / Esker
  - Elevation contour / Courbes d'élévation
  - Depression contour / Courbes de dépression
  - Flight Line / Ligne de vol - L1410-1

Digital cartographic base information supplied by Information Services Corporation of Saskatchewan. Elevation contour interval 10 metres.

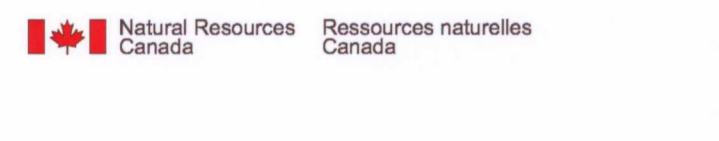
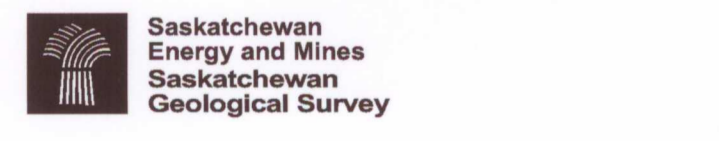
L'information cartographique numérique a été fournie par Information Services Corporation of Saskatchewan. Équidistance des courbes d'élévation 10 mètres.

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**URANIUM / POTASSIUM MAP  
CARTE DE L'URANIUM / POTASSIUM**

**EYINEW LAKE  
SASKATCHEWAN**  
NTS / SNRC 64M/2

Scale 1 : 50 000 - Échelle 1 / 50 000

Transverse Mercator Projection  
North American Datum 1983  
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Open File  
Dossier Public  
**3951\_16**  
Geological Survey of Canada  
Commission géologique du Canada  
Ottawa  
2001

SEM Open File 2001-2  
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URANIUM / POTASSIUM MAP  
CARTE DE L'URANIUM / POTASSIUM  
EYINEW LAKE  
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