

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 spectrometric, aeromagnetic and VLF-EM data. The survey was flown between August 14 and September 7, 2000 using a Britten-Norman Islander BN2B-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 SCDrape system. Infill lines were flown in the northwest-southeast direction at 200 m spacing. Right positional data were acquired 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 down their respective decay chains, they are assumed to be in equilibrium with their parents; thus gamma-ray 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 Eglogram GR820 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 crystals (total volume 4.4 litres), shielded from the ground by the main array, were used to detect variations caused by atmospheric radon. The GR820 constantly monitored the natural potassium peak for each crystal, using a Gaussian least squares algorithm to adjust the gain of individual crystals.  
Gamma-ray spectra were recorded at one-second intervals. Noise Adjusted Singular Value Decomposition (NAJDV) 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 at 1150, 1650 keV window and radon at energies greater than 3000 keV was recorded in the control window. The standard windows used are 1370-1570 keV for potassium, 1650-1860 keV for uranium, 2410-2810 keV for thorium and 400-480 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 decay products. The potassium, uranium and thorium window data were then 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 to standard units. The conversion factors used were 102.3 cps/g for potassium, 169.1 cps/g for uranium, 241.0 cps/g for thorium and 33.26 cps/g 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 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 aircraft was equipped with a Geometrics G-222A cesium vapour magnetic sensor mounted in a strafe to the rear of the aircraft, connected to an RMS ADC11 27 term magnetic compensator installed in a microcomputer. The magnetometer data were recorded every 0.1 seconds with a noise level of less than 0.01 nT. Diurnal variations were monitored at 0.2 second intervals using a Geometrics cesium vapour magnetic sensor. 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 altitude for each data point. The intersections of true and corrected lines were determined and differences in the magnetic field were computer analyzed 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 an FFT based algorithm.  
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 24.8 kHz. The earth station was tuned to the 24.8 kHz station NLA 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 plotted using an HP DesignJet 2000CP colour plotter.

**LEGEND / LÉGENDE**

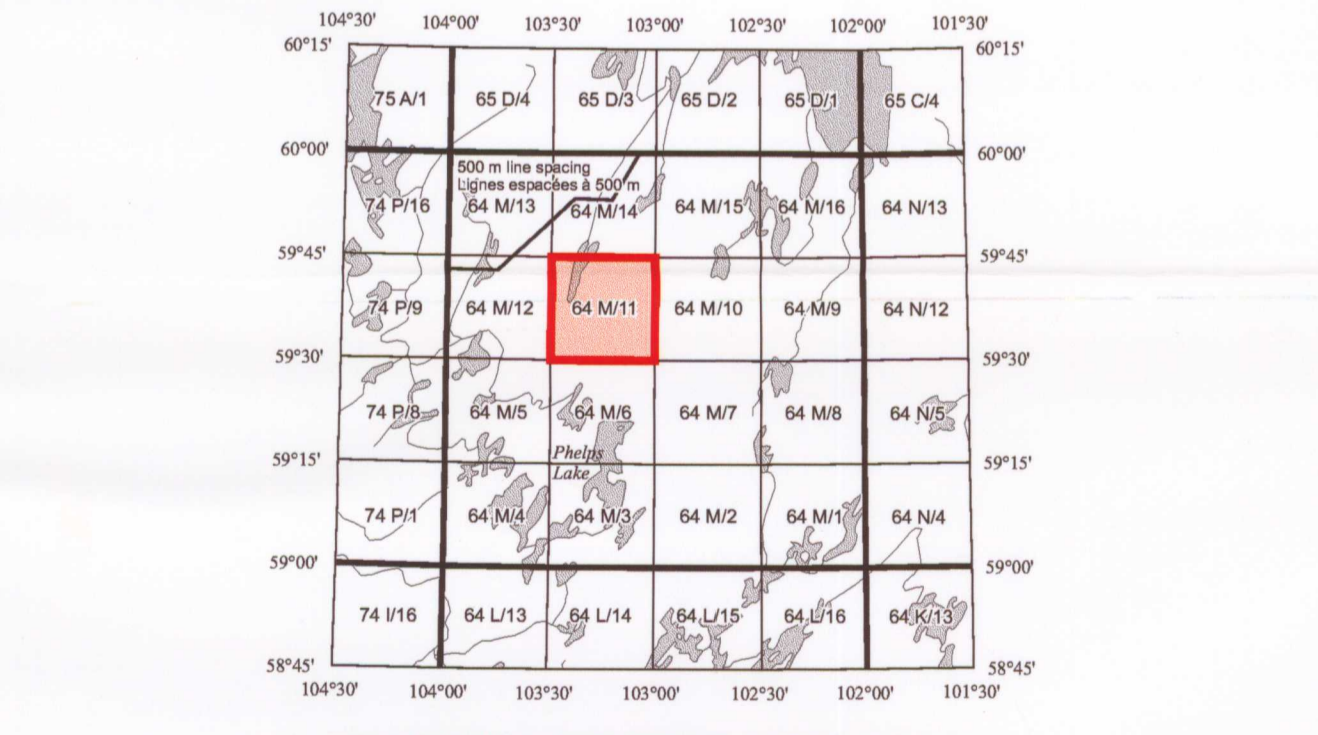
- Wetland / Marais
- Lake / Lac; Intermittent
- Watercourse / Cours d'eau
- Flooded area / Région inondée
- Esker / Esker
- Elevation contour / Courbes d'élévation
- Depression contour / Courbes de dépression
- Flight Line / Ligne de vol

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Élévation contour interval 10 mètres.

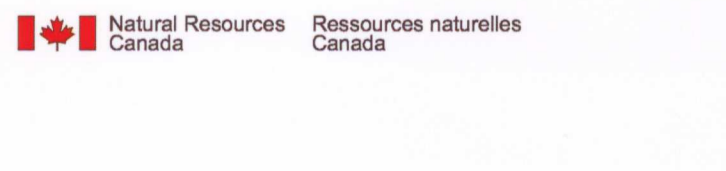
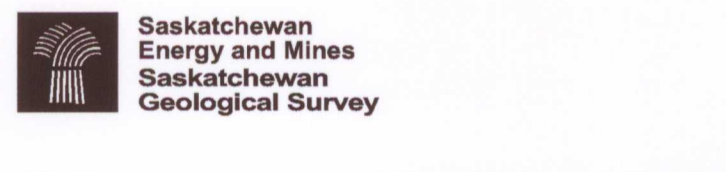
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Équidistance des courbes d'élévation 10 mètres.

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**URANIUM MAP (eU)  
CARTE DE L'URANIUM (éU)**

**BATTLEFORD LAKE  
SASKATCHEWAN**  
NTS / SNRC 64M/11

Scale 1 : 50 000 - Échelle 1 / 50 000

Transverse Mercator Projection  
North American Datum 1983  
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Open File  
Dossier Public  
**3951\_103**  
Geological Survey of Canada  
Commission géologique du Canada  
Ottawa  
2001

SEM Open File 2001-2  
Map 103 of 160

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**URANIUM MAP (eU)  
CARTE DE L'URANIUM (éU)**  
BATTLEFORD LAKE  
SASKATCHEWAN  
NTS / SNRC 64M/11

