

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 BN22-1 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 SGLDRAPe system. Infill lines were flown from the northwest-southeast section of the survey area at 10 m spacing. In-flight positional 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 ⁴⁰K, uranium and thorium must be measured indirectly from gamma-ray photons emitted by daughter products (²¹⁴Pb for uranium and ²¹⁴Pb 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 Exploration GR20 gamma-ray spectrometer using fourteen 102 x 102 x 406 mm NaI(Tl) crystals. The main detector array consisted of twelve crystals (4 x 3 lines), shielded from the ground by the main array. The other two crystals (2 x 2 lines) were used to detect variations caused by atmospheric radon. The GR20 constantly monitored the natural potassium peak for each crystal, using a Gaussian least-squares algorithm to adjust the gain of the spectrometer. Gamma-ray spectra were recorded at one-second intervals. Noise Adjusted Singular Value Decomposition (NADSD) analysis was carried out on full spectrum raw data to reduce statistical noise in the windows. During processing, the spectra were energy calibrated, and counts were accumulated into energy windows. Counts from the radon detectors were recorded in a 1600 - 1800 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 - 1860 keV for uranium, 2410 - 2810 keV for thorium and 400 - 2810 keV for total activity. 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). Two crystals (total volume 8.4 litres), shielded from the ground by the main array, were used to detect variations caused by atmospheric radon. The GR20 constantly monitored the natural potassium peak for each crystal, using a Gaussian least-squares algorithm to adjust the gain of the spectrometer. 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 and surface water. As a result the measured concentrations are usually lower than the actual bedrock concentrations. The aircraft was equipped with a Geometrics G-222A cesium vapour magnetic sensor mounted in a stinger to the rear of the aircraft, connected to an RMS/AADCI 27 term magnetic compensator installed in a microcomputer. The magnetometer data were recorded every 0.1 seconds with a noise level of less than 0.1 nT. Diurnal variations were removed from the unfiltered aeromagnetic data. After editing the aeromagnetic data, the International Geomagnetic Reference Field was calculated and removed using the date and altitude for each data point. The International Geomagnetic Reference Field was calculated and removed using the date and altitude for each data point. The differences between the measured values and the International Geomagnetic Reference 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 24.0 kHz. The orth station was tuned to the 24.8 kHz station NLK at Seattle, WA. VLF data were recorded 4 times per second. VLF data will only be made available with the data. 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.

LEGEND / LÉGENDE

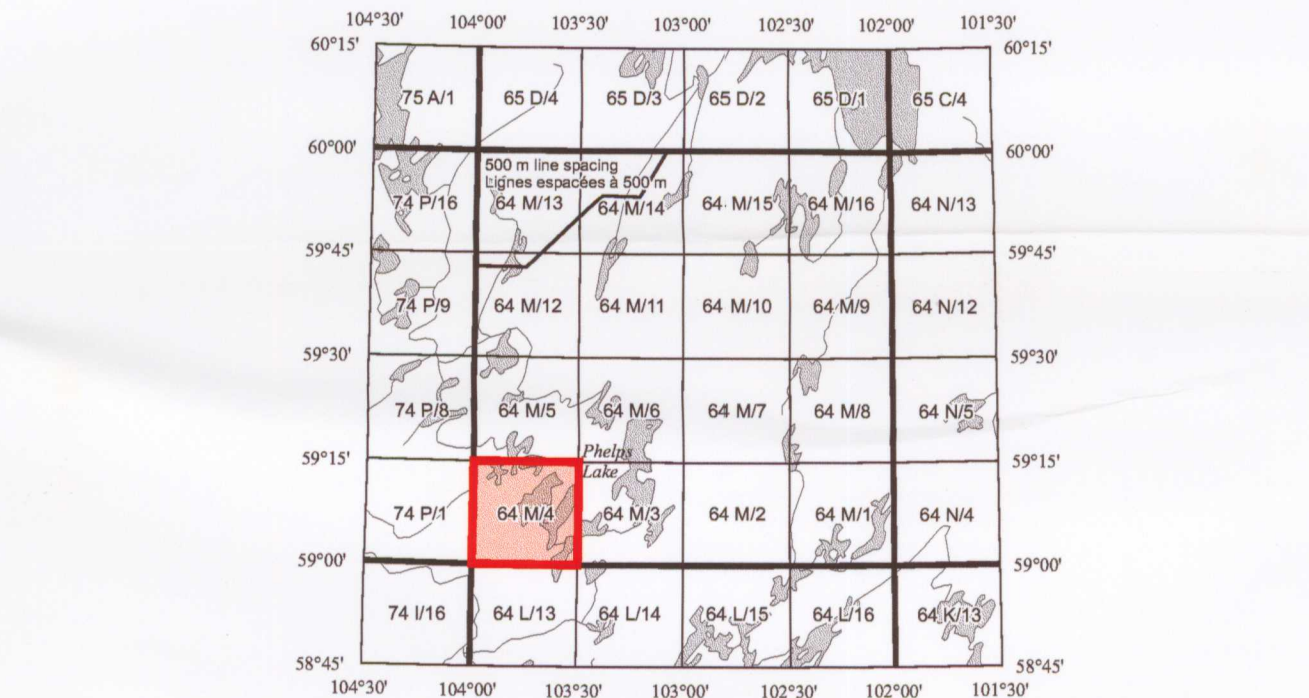
- Wetland / Marais
- Lake / Lac; Intermittent
- Watercourse / Cours d'eau
- Flooded area / Région inondée
- Esker / Esker
- Elevation contour / Courbes d'élévation
- Depression contour / Courbes de dépression
- Flight Line / Ligne de vol

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Elevation contour interval: 10 metres.

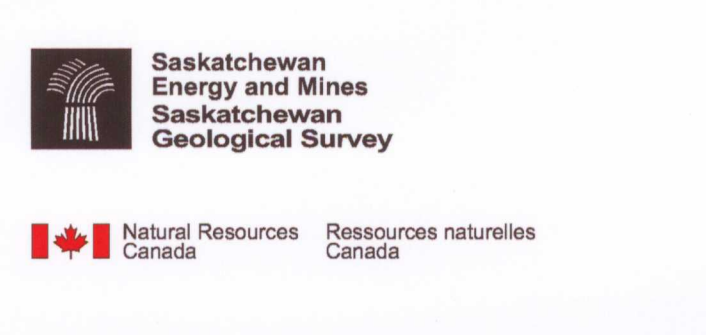
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Équidistance des courbes d'élévation: 10 mètres.

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THORIUM MAP (eTh)
CARTE DU THORIUM (éTh)

MISEKUMAW LAKE
SASKATCHEWAN

NTS / SNRC 64M/4

Scale 1 : 50 000 - Échelle 1 / 50 000

Open File
Dossier Public
3951_34
Geological Survey of Canada
Commission géologique du Canada
Ottawa
2001

SEM Open File 2001-2
Map 34 of 160

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THORIUM MAP (eTh)
CARTE DU THORIUM (éTh)

MISEKUMAW LAKE
SASKATCHEWAN

NTS / SNRC 64M/4