

An airborne geophysical survey of the Phelip 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, 2001 using a Britton-Norman Blenheim BN2B-21 aircraft flying 120 m above the terrain at a mean speed of 220 km/h.

The 1000 m spaced, north-west-south-east oriented survey lines and orthogonal 1000 m spaced control lines were recorded using the SCODAS system. In-flight data were flown in the northwest section of the survey area to produce 500 m line 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 as secondary products from gamma-ray photons emitted by daughter products (²¹⁴Pb for uranium and ²¹⁴Pb for thorium). Two crystals (total volume 8.4 litres), shielded from the ground by the main array, were used to detect variations from the parent to the daughter products. 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 GR20 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 8.4 litres), shielded from the ground by the main array, were used to detect variations from the parent to the daughter products. The GR20 constantly monitored 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 windows. During processing, the spectra were energy calibrated, and counts were accumulated into six energy windows. Counts from the radon detectors were recorded in a 1600 - 1800 keV window and radon and thorium energies greater than 3000 keV were recorded in the cosmic window. The standard windows used were 1370 - 1570 keV for potassium, 1660 - 1860 keV for uranium, 2410 - 2810 keV for thorium and 400 - 2810 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 terrain clearance and pressure prior to conversion to standard units. The conversion factors used were 102.3 cps/eU for potassium, 9.75 cps/eU for uranium, 6.37 cps/eU for thorium and 33.26 cps/eU for total air absorbed dose rate.

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 soil, overburden, vegetation cover, soil moisture 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-822A cesium vapour magnetic sensor mounted in a slipstream to the rear of the aircraft, connected to an RMS AADC1 27 term magnetic compensator installed in a microcomputer. The magnetometer data were recorded every 0.1 seconds with a noise level of less than 1 nT. Diurnal variations were monitored at 0.2 second intervals using a Geometrics cesium vapour base station magnetometer. After editing the survey data, low pass filtered diurnal values were used to correct the magnetometer data. The reference field was determined using the data and altitude for each data point. The intersections of traverse and control lines were determined and the differences in the magnetic values were computed and manually verified by the pilot. The corrected magnetic field was 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 field and quadrature components for two frequencies were recorded using a Herz Telen 2A system. The line station was tuned to station NAA at Cutler, MA, transmitting at 24.0 kHz. The control station was tuned to the 24.4 kHz station at Seattle, WA. VLF data were recorded 4 times per second. VLF data will only be 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

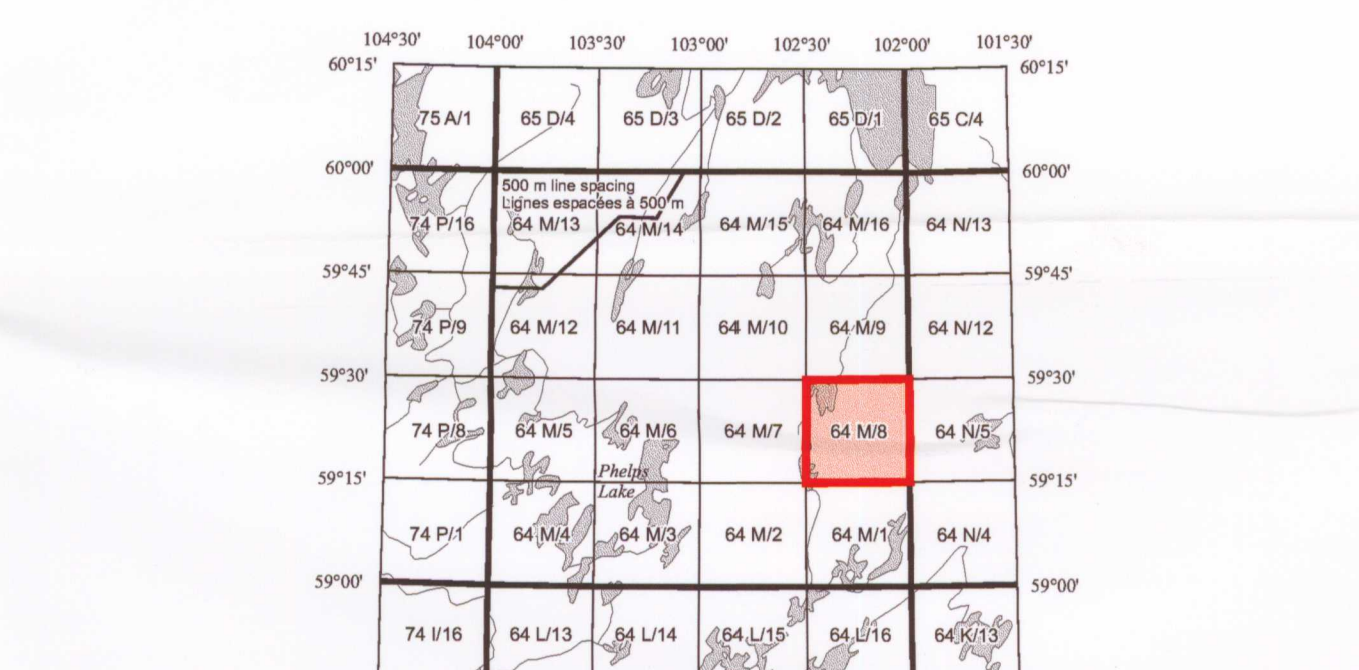
- Wetland / Marais
- Lake / Lac; Intermittent
- Watercourse / Cours d'eau
- Flooded area / Région inondée
- Esker / Esker
- Elevation contour / Courbes d'élévation
- Depression contour / Courbes de dépression
- Flight Line / Ligne de vol

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

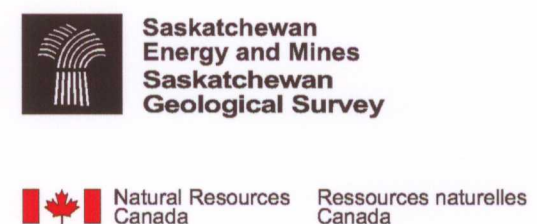
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 Carson J.M., Holman P.B., Shives R.B.K., Ford K.L., Harper C.T., Silimon W., 2001. Potassium Map, Nunim Lake, Saskatchewan, NTS 64M/8. Geological Survey of Canada, Open File 3951_72. Scale 1:50 000.

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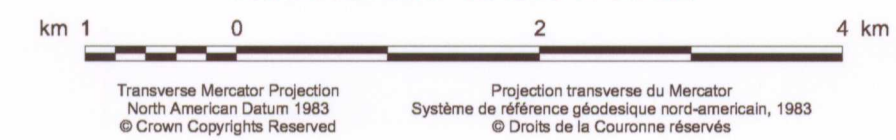
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**POTASSIUM MAP
CARTE DU POTASSIUM**

**NUNIM LAKE
SASKATCHEWAN**
NTS / SNRC 64M/8

Scale 1 : 50 000 - Échelle 1 / 50 000



Open File
Dossier Public
3951_72
Geological Survey of Canada
Commission géologique du Canada
Ottawa
2001

SEM Open File 2001-2
Map 72 of 160

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CARTE DU POTASSIUM**

**NUNIM LAKE
SASKATCHEWAN**
NTS / SNRC 64M/8