

Technical Information

The map was compiled from data acquired during an airborne electromagnetic survey carried out by Geotech Canada Inc. utilizing Geotech's VTEM Max. Time-Domain Electromagnetic (TDEM) system. The system was mounted on a Eurocopter AS330 helicopter (registration C-GLHX) and the survey was carried out between December 1, 2022 and March 13, 2023. The helicopter flight altitude was maintained at 100 m above ground clearance of 94 m, with an average speed of 90 km/h. Aircraft navigation used a 14-channel Novatel dual frequency GPS system. Post-flight differential corrections were applied to the flight path position. A vertically mounted video camera was used to record imagery of the ground. The data was recorded at 10 times per second using a TR3000000 transmitter. The magnetic data were recorded 10 times per second using a Geometrics G823A cesium magnetometer installed in a bird 10 below the helicopter.

Electromagnetics

The TDEM system operated at a base frequency of 30 Hz and transmits a 7 m half square wave from a four turn, 340 m horizontal loop mounted approximately 48 m below and 8 m behind the helicopter. This configuration generates a peak dipole moment of 733 200 Am². The responses of conductors in the subsurface was recorded at 100 kHz over the entire waveform using a three axis (X, Y and Z) electromagnetic receiver coincident with the transmitter. The receiver was mounted on a 1.5 m pole. The receiver measures the change in the magnetic field with respect to time (dB/dt) of the secondary magnetic field (B_s) numerically integrated. High-altitude background sections from all the start and end of each flight allowed for accurate removal of system drift.

Apparent Conductivity

The apparent conductivity values (mS/m) were derived from the electromagnetic decays using selected early channels 4 to 14 (0.021 - 0.096 ms), middle channels 15 to 30 (0.110 - 0.880 ms) and late channels 31 to 46 (1.010 - 8.083 ms) of the off-line signal. The nomogram indicates the correspondence between the value of dB/dt (nT/s) and half-space conductivity. Forward thin plate modeling is used to estimate the depth to the top of target (m) for the VTEM MAX TDEM system.

Electromagnetic Decay Constant

Decay constant (Tau) values were obtained by fitting the data from selected early Z channels 4 to 14 (0.021 - 0.096 ms), middle channels 15 to 30 (0.110 - 0.880 ms) and late channels 31 to 46 (1.010 - 8.083 ms) of the off-line signal to a single exponential. In semi-log space, the slope of the function will reflect the exponential decay rate of the transient field and, therefore, the strength of the conductivity. A slow rate of decay, reflecting a high conductivity, will be represented by a high decay constant.

Magnetics

The magnetic field was sampled 10 times per second using a cesium vapour magnetometer (leveling $\pm 0.001 \text{ nT}$). Differences in magnetic values at the elevations of control and traverse lines were analyzed to obtain a mutually leveled set of flight-line magnetic data. The leveled data were then integrated to 40 m for magnetic contacts at high magnetic latitudes (Hood, 1965). The first vertical derivative of the magnetic field reduced to the pole was calculated using the fast Fourier transform with a grid cell size of 50 m.

Availability

This map is available for free download through GEOCAN (<https://geocan.nrc.ca/geocan>). Corresponding digital profile and grid data as well as similar data for adjacent areas and geophysical surveys can be downloaded, at no charge, from Natural Resources Canada's Geophysical Data Library (<https://geophysicaldata.library.gc.ca/>). For more information, please contact the Geophysical Data Centre, Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario K1A 0X8, Canada (gdcc@geophysicaldata.gc.ca).

Acknowledgments

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References

Hood, P.J., 1965. Gradient measurements in aeromagnetic surveying. *Geophysics*, v. 30, p. 591-602.

Mau, M.A., 1998. Short Note: A simple method of transient electromagnetic data analysis. *Geophysics*, v. 63, p. 405-410.

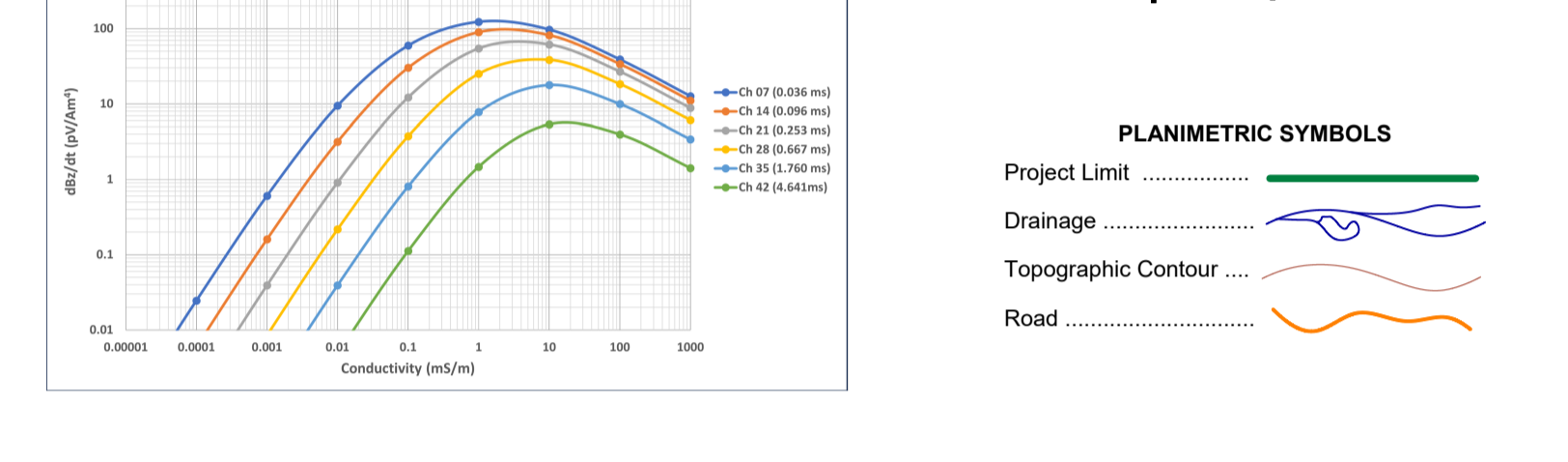
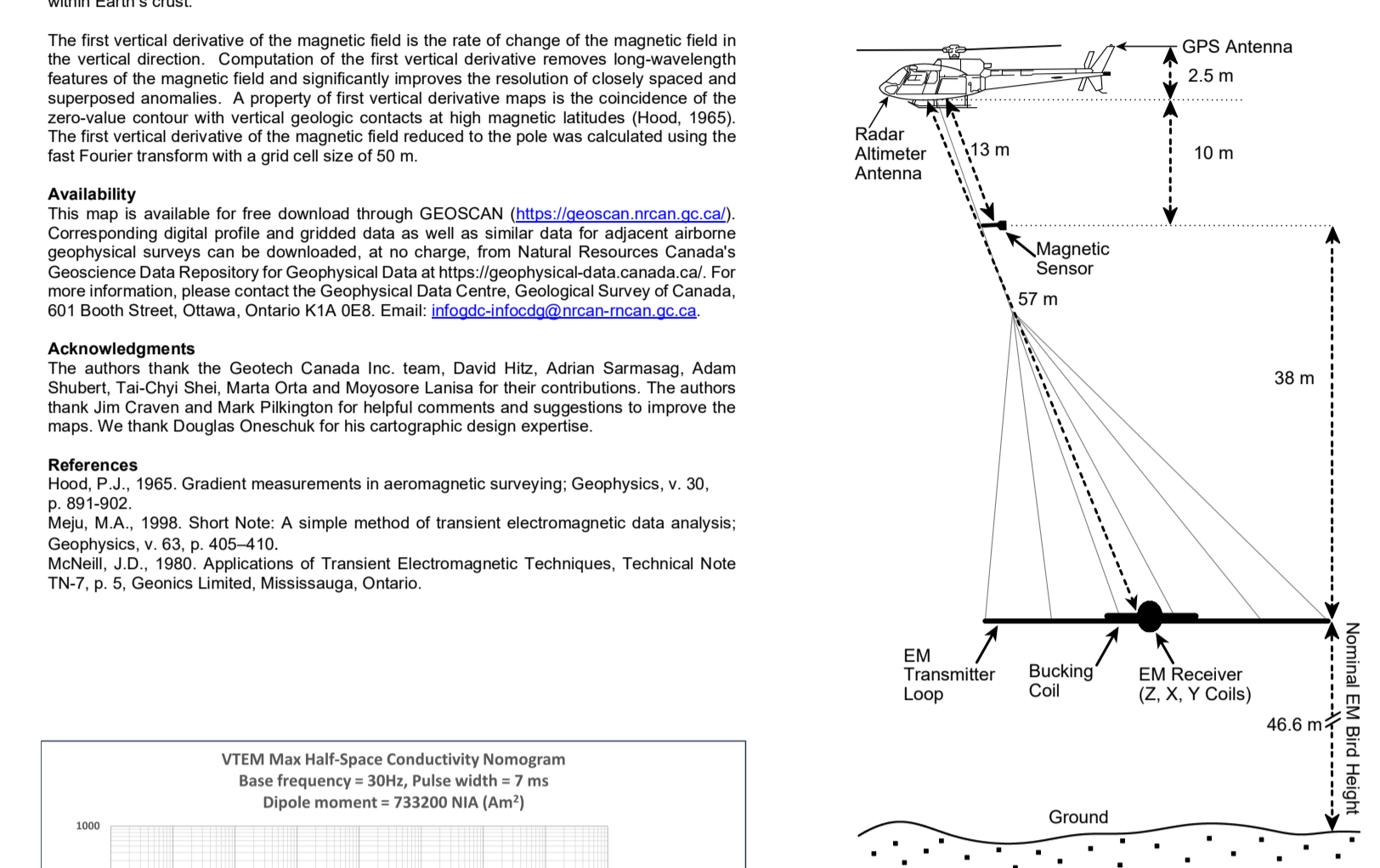
McNeill, J.D., 1980. Applications of Transient Electromagnetic Techniques. Technical Note TN-7, p. 5. Geonics Limited, Mississauga, Ontario.

Survey Area Parameters:

Traverse line azimuth	N147°E
Traverse line spacing	200 m
Tie line azimuth	N57°E
Tie line spacing	1200 m
Aircraft average clearance	94.6 m
EM transmitter nominal clearance	46.6 m
Magnetic sensor nominal clearance	84.6 m
EM receiver nominal clearance	46.6 m

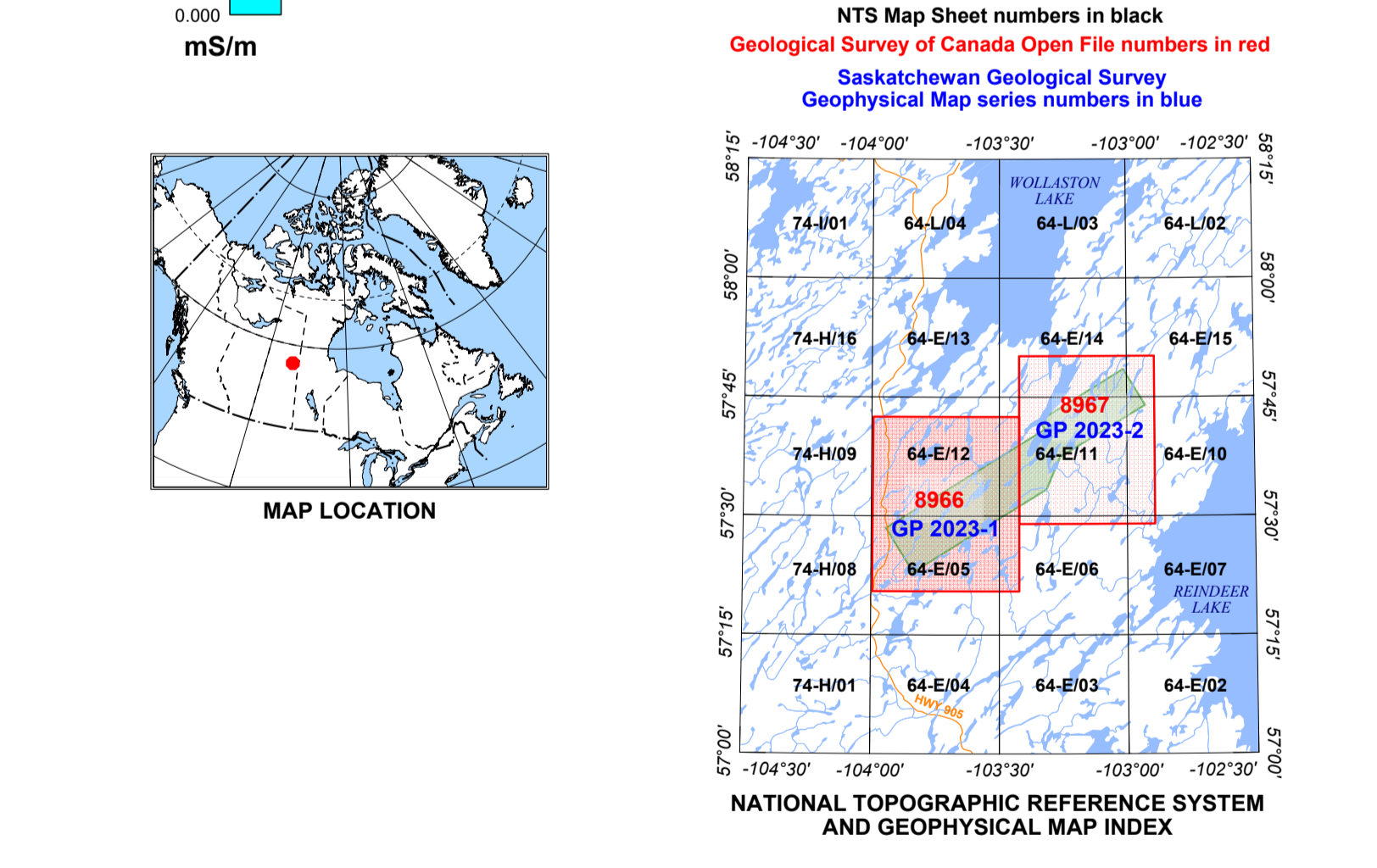
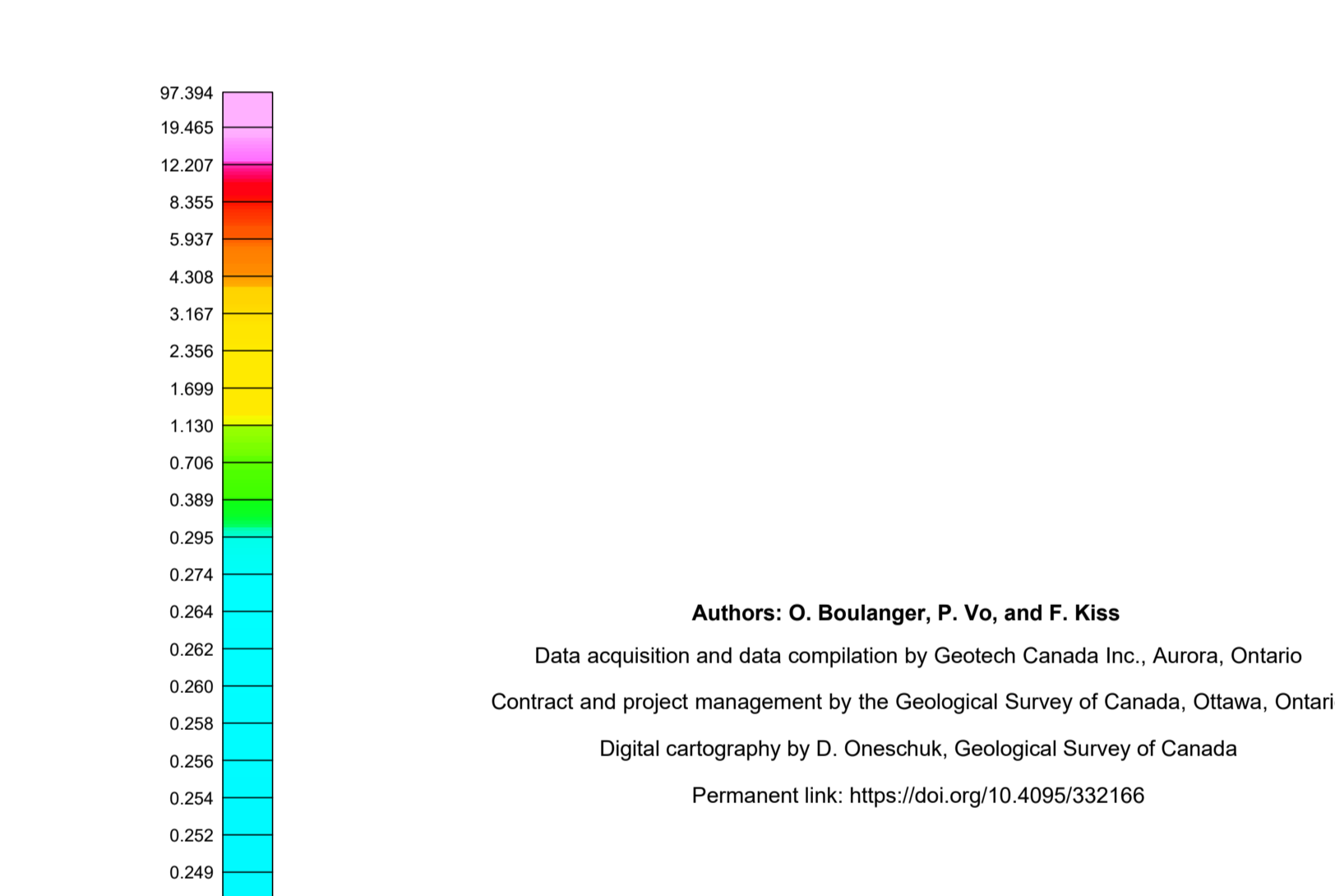
Electromagnetic System Specifications:

Base frequency	30 Hz
Waveform	Polygonal
Transmitter pulse width	7 ms
Transmitter area	940 m ²
Transmitter off-time	8.7 ms
Transmitter loop diameter	34.8 m
Transmitter peak current	195 A
Dipole moment (peak)	733 200 Am ² (4 turns)
Windmoted data sampling rate	10 Hz
Receiver	3-component induction coils (Z, X, Y)
Measured response	Voltage (dB/dt)
Digital recording	Z: 4-46 channels X, Y: 20-46 channels
1 st off-time Z channel	Channel 4 at ~0.021 ms after pulse turn off
Tx-Rx configuration	In-loop concentric



MAP SHEET SUMMARY

- Sheet 1: Time Decay Constant (Tau-Z) - Early Channels 4 to 14 (0.021 - 0.096 ms)
- Sheet 2: Time Decay Constant (Tau-Z) - Mid Channels 15 to 30 (0.110 - 0.880 ms)
- Sheet 3: Time Decay Constant (Tau-Z) - Late Channels 31 to 46 (1.010 - 8.083 ms)
- Sheet 4: Apparent Conductivity - Early Channels 4 to 14 (0.021 - 0.096 ms)
- Sheet 5: Apparent Conductivity - Mid Channels 15 to 30 (0.110 - 0.880 ms)
- Sheet 6: Apparent Conductivity - Late Channels 31 to 46 (1.010 - 8.083 ms)
- Sheet 7: Residual Total Magnetic Field
- Sheet 8: First Vertical Derivative of the Magnetic Field
- Sheet 9: Interpretation



GEOLOGICAL SURVEY OF CANADA OPEN FILE 8966
SASKATCHEWAN GEOLOGICAL SURVEY GEOPHYSICAL MAP GP 2023-1
ELECTROMAGNETIC SURVEY OF THE EASTERN WOLLASTON AREA
SASKATCHEWAN
Parts of NTS 64-E/5, 6, 11 and 12
APPARENT CONDUCTIVITY - MID CHANNELS 15 to 30 (0.110 - 0.880 ms)
Scale 1:50 000

© His Majesty the King in Right of Canada, as represented by the Minister of Natural Resources, 2023
Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications
Contour interval 20 metres. Elevations in metres above mean sea level

OPEN FILE / DOSSIER PUBLIC 8966 GEOLOGICAL SURVEY OF CANADA COMMISSION GEOLOGIQUE DU CANADA 2023 Sheet 5 of 9 / Feuille 5 de 9	Publications in this series have not been edited; they are released as submitted by the author. Les publications de cette série ne sont pas révisées; elles sont publiées telles que soumises par l'auteur.	GEOLOGICAL SURVEY OF CANADA SASKATCHEWAN GEOLOGICAL SURVEY COMMISSION GEOLOGIQUE DE LA SASKATCHEWAN 2023 Sheet 5 of 9 / Feuille 5 de 9
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