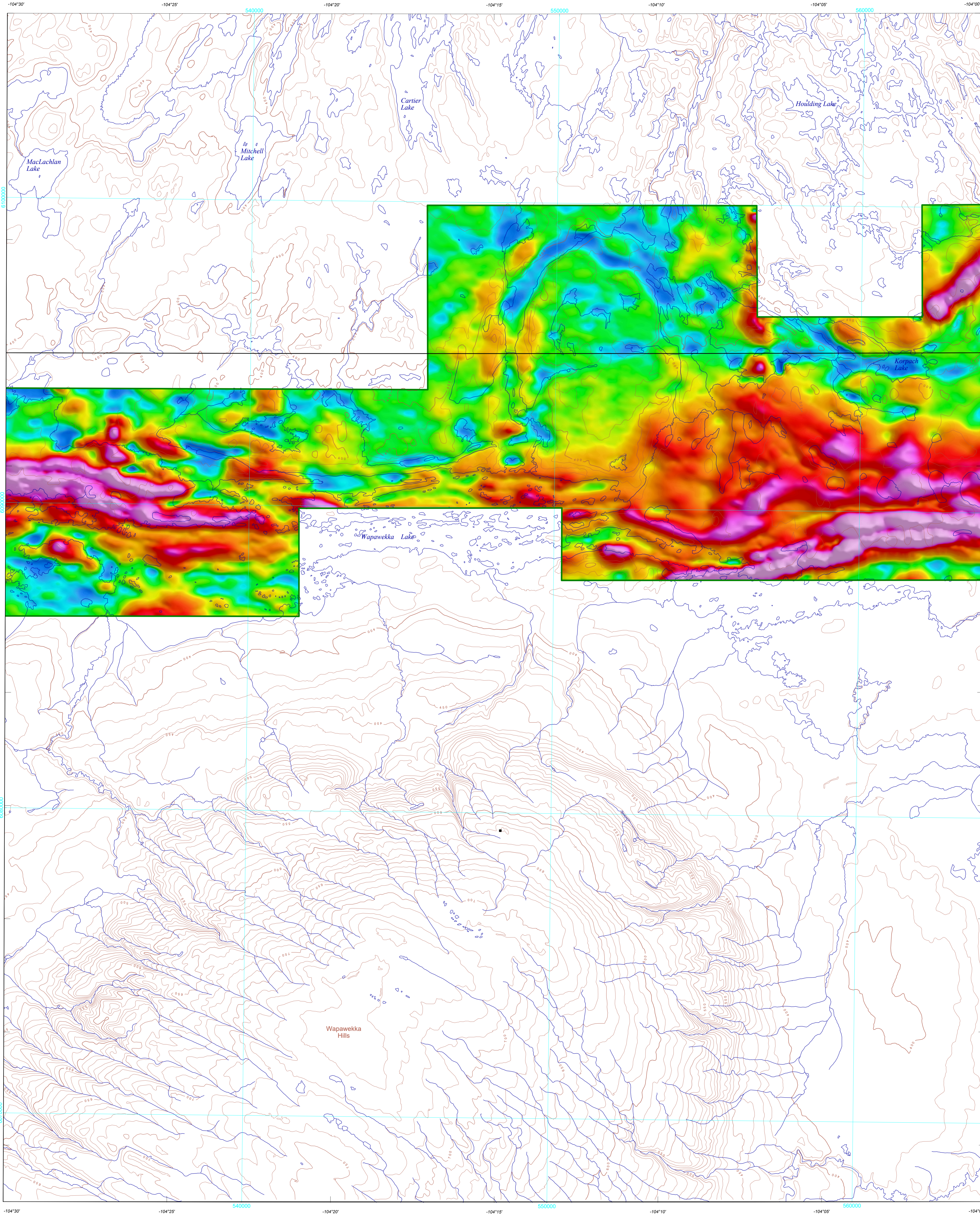




TIME DECAY CONSTANT (TAU Z) - EARLY CHANNELS 4 to 14 (0.021 - 0.096 ms)



**Technical Information**

This map was compiled from data acquired during an airborne electromagnetic/magnetic survey carried out by Geotech Canada Inc. utilizing Geoscan's VTEM Max Time-Domain Electromagnetic (TDEM) system. The systems were mounted on two Eurocopter AS350 B3 helicopters (registration C-TED and C-FRZ) and the survey was completed between December 19, 2019 and March 10, 2020. The helicopter flight altitude was maintained at an average ground clearance of 80 m, with an average spacing of 100 metres. Aircraft navigation used a 14-channel NovAtel dual frequency GPS system. Post-flight differential corrections were applied to finalize the flight path position. A vertically mounted voice camera was used to record images of the ground. The scale height was recorded ten times per second using a 176x300 altimeter. The magnetic data were recorded 10 times per second using a Geometrics G-822A cesium magnetometer installed in a basket 10 m below the helicopter.

**Electromagnetics**

The TDEM system operated at a base frequency of 30 Hz transmits a 7.0 ms half square signal from a four-turn 940 m<sup>2</sup> nominal loop mounted approximately 48 m below and 8 m behind the helicopter. This configuration generates a peak dipole moment of 721 920 Am<sup>2</sup>. The response of the system in the subsurface was recorded at 150 channels over the entire system using a three axis (X, Y and Z) electromagnetic receiver coincident with the transmitter loop (in-loop Transmitter Receiver). The EM system recorded data in a continuous stream for each of the three components. The EM receiver directly measures the change in the magnetic field with respect to time (dB/dt) from which the secondary magnetic field (B<sub>s</sub>) is numerically integrated. High-altitude background sections flown at the start and end of each flight allowed a first-order 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-time signal. The nomogram indicates the correspondence between the value of dB/dt (mT/s) and halfspace conductivity. Forward slip plate modeling is used to estimate the depth to the top of target (m) for the VTEM<sup>TM</sup> 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-time signal to a single exponential. In semi-log space, the slope of this 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 value.

**Magnetics**

The magnetic field was sampled 10 times per second using a cesium vapour magnetometer (precision ± 0.001 nT) mounted on the EM transmitter loop. Differences in magnetic values at the intersections of control and traverse lines were analysed to obtain a mutually leveled set of flight-line magnetic data. The leveled values were then interpolated to a 50 m grid. The International Geomagnetic Reference Field (IGRF) (defined at a mean GPS altitude of 72 m) for a constant mid-survey date (January 15, 2020) was then removed. Removal of the IGRF, representing the magnetic field of Earth's core, produces a residual component related essentially to magnetizations within Earth's crust.

The first vertical derivative of the magnetic field is the rate of change of the magnetic field in the vertical direction. Computation of the first vertical derivative removes long-wavelength features of the magnetic field and significantly improves the resolution of closely spaced and superposed anomalies. A property of first vertical derivative maps is the coincidence of the zero-value contour with vertical geologic contacts at high magnetic latitudes (Hood, 1965). The first vertical derivative of the magnetic field was calculated using the fast Fourier transform on the gridded total magnetic field with a grid cell size of 50 m.

**Availability**

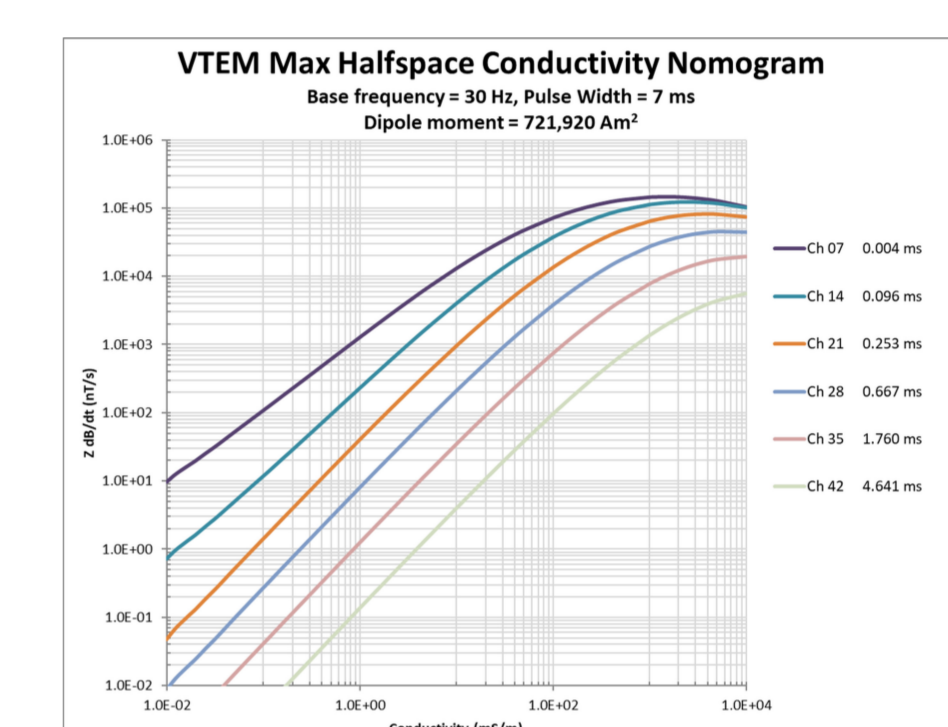
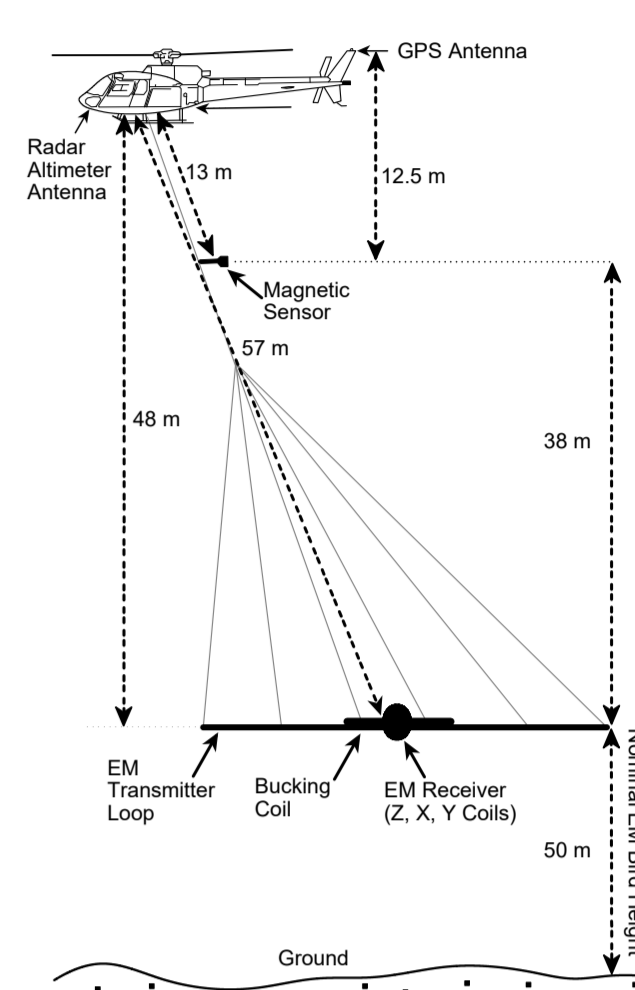
This map is available for free download through GEOSCAN (<http://geoscan.mrcan.gc.ca/>). Corresponding digital profile and gridded data as well as similar data for adjacent airborne geophysical surveys can be downloaded, at no charge, from Natural Resources Canada's Geophysical Data Repository for Geophysical Data at <http://grd.agr.mrcan.gc.ca/index.cfm>. The same products are also available, for a fee, from the Geophysical Data Centre, Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario K1A 0E8. Telephone: 613-995-5325; email: [info@geoscan.gc.ca](mailto:info@geoscan.gc.ca).

**Acknowledgments**

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**Reference**

Hood, P.J., 1965. Gradient measurements in aeromagnetic surveying. *Geophysics*, v. 30, p. 891-902.



**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

**PLANNIMETRIC SYMBOLS**

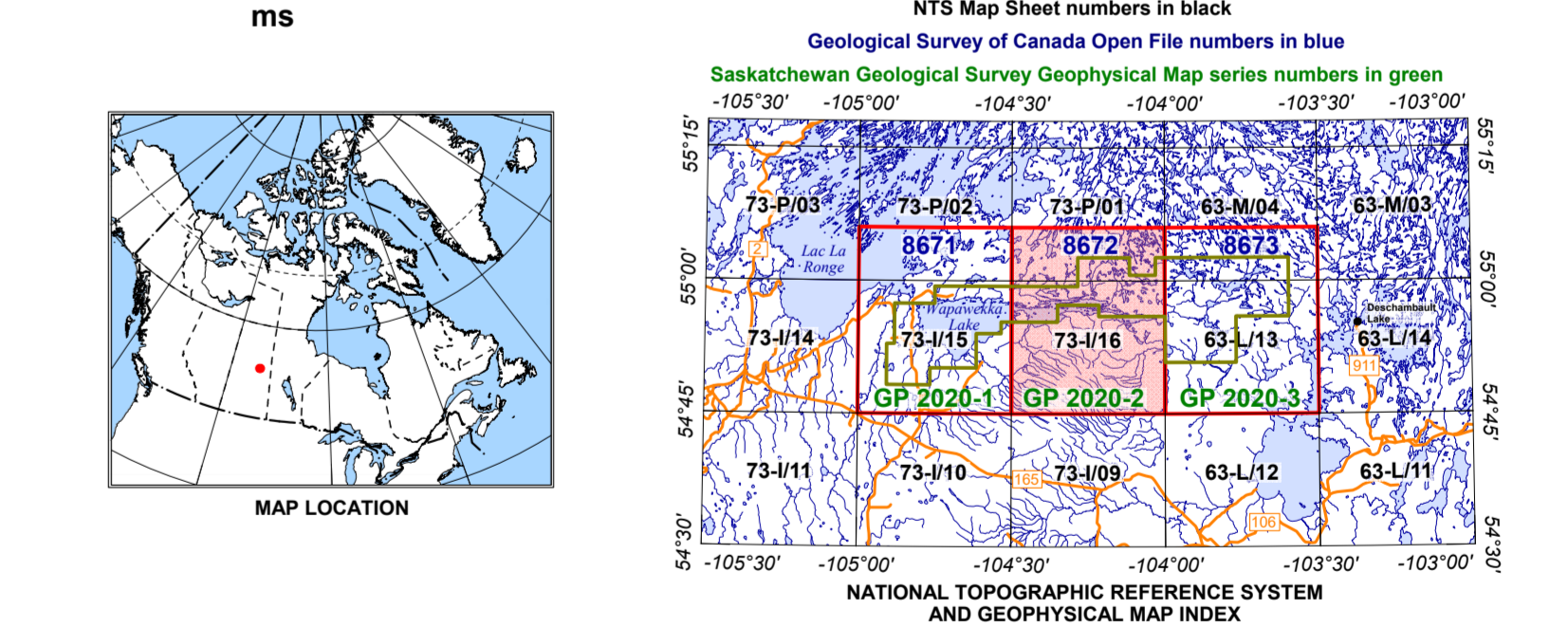
- Project Limit
- Drainage
- Topographic Contour
- Building
- Road

**NTS**

0.088  
0.087  
0.086  
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0.084  
0.083  
0.082  
0.081  
0.080  
0.079  
0.078  
0.077  
0.076  
0.075  
0.074  
0.073

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GEOLOGICAL SURVEY OF CANADA OPEN FILE 8672  
 SASKATCHEWAN GEOLOGICAL SURVEY GEOPHYSICAL MAP GP 2020-2  
**ELECTROMAGNETIC SURVEY OF THE SOUTHERN GLENNIE AREA**  
 SASKATCHEWAN  
 Parts of NTS 73-I/16 and NTS 73-P/01

**TIME DECAY CONSTANT (TAU Z) - EARLY CHANNELS 4 to 14 (0.021 - 0.096 ms)**

Scale 1:50 000

1 0 1 2 3  
 (kilometres)  
 WGS 84 / UTM Zone 13N  
 Universal Transverse Mercator Projection  
 World Geodetic System 1984

© Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources, 2020  
 Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications  
 Elevations in metres above sea level

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 GEOLOGICAL SURVEY OF CANADA  
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 2020

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Sheet 1 of 9 / Feuille 1 de 9

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