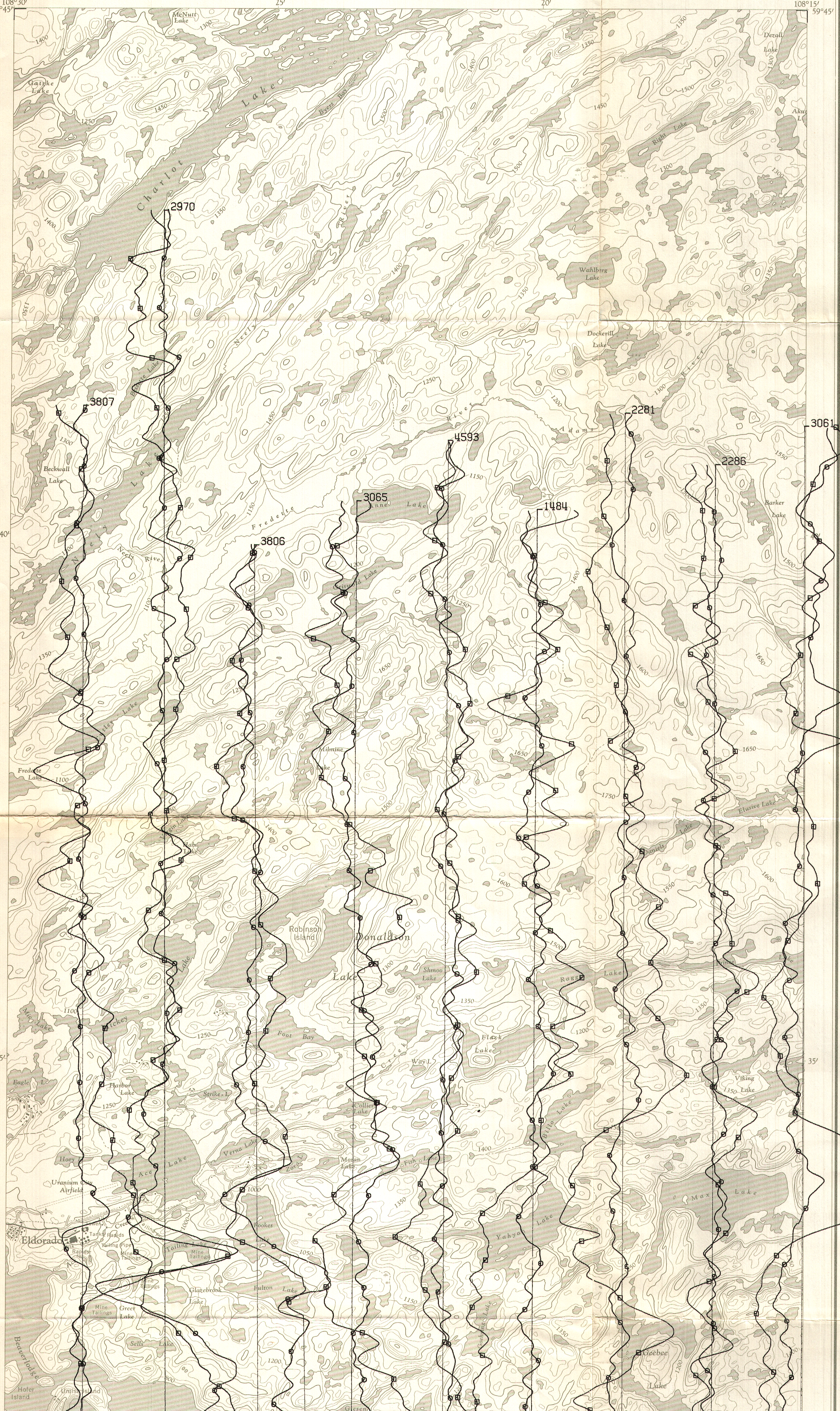
GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

GEOPHYSICAL SERIES (Electromagnetic)

SHEET 74 N/9 W



Published, 1970

MAP 25,034G
FORGET LAKE
SASKATCHEWAN

Scale 1:50,000

Miles 1 0 1 2 Miles

Metres 1000 0 1000 2000 3000 Metres

EXPLANATORY NOTES

AFMAG is a synonym for Audio Frequency MAGnetics. The AFMAG method is an electromagnetic technique that does not require a transmitter. The source of energy in the sub-audio and audio frequency range is mainly due to lightning discharges generated by thunderstorm activity in tropical regions. The electromagnetic (EM) energy is propagated over several thousand miles between the surface of the earth and the ionized layers acting as a waveguide. The magnetic component of this EM wave is mainly horizontal. When this magnetic field meets a conductor such as a fault zone (not all are conductive) or an ultramafic dyke, the energy induces eddy currents in the conductor. A secondary magnetic field is reradiated. This secondary magnetic field is detected by the AFMAG cross-coil sensor and is recorded as a dip angle. Because of the nature of the EM wave and the low frequencies of interest, 140 and 510 Hz, the depth of detection is greater than with conventional EM systems. For this reason, the AFMAG method is being evaluated as an aid for detecting large geological structures such as faults, shear zones and ultramafic dykes.

A Beaver aircraft used in the AFMAG survey was flown at 650 feet mean terrain clearance. The cross-coil sensor was mounted in a bird and towed approximately 200 feet below and behind the aircraft. The axes of the two mutually perpendicular coils are located in a vertical plane which contains the flight direction and are oriented 45° to the horizontal. When the magnetic field is horizontal, the voltages in the two coils are equal. Any departure of the magnetic field from the horizontal results in a recording of a positive or negative dip angle above or below a centre line. The strip chart recorder traces out the tilt angle at 140 and 510 Hz, the relative field strengths at these two frequencies, and the altimeter height.

For presentation on this map, only the 140 and 510 Hz dip angle traces on the analogue paper were digitized at 1 mm intervals (an average of once every 60 feet) by using a D-Mac digitizer. Using a computer, a base line was fitted to the data points for each flight by using the method of least squares. Then the dip angles were plotted to the flight line at a scale of 1:50,000 using this base line. The convention for plotting the positive dip angles was to the W and negative to the E for flights flown in the N direction. For flights flown in the S direction, the positive dip angles were plotted to the E and negative to the W, i.e. the dip angles were inverted in polarity. To reduce the higher frequency components along the profile, a filtering technique was used. Smoothing is accomplished by summing the value of a point with the two previous points and the two succeeding points and then dividing by 5 according to the formula:

$$\bar{A}_x = \frac{A_{x-2} + A_{x-1} + A_x + A_{x+1} + A_{x+2}}{5}$$

where $\bar{A}_x$ = the new filtered value of the dip angle at point x.

This routine assumes that the data is evenly spaced along the flight line. By passing the dip angle data points through this smoothing filter twice, a much cleaner trace was obtained without affecting the amplitude of the peaks of the broad and larger dip angles. No interpretation has been attempted on this map sheet.

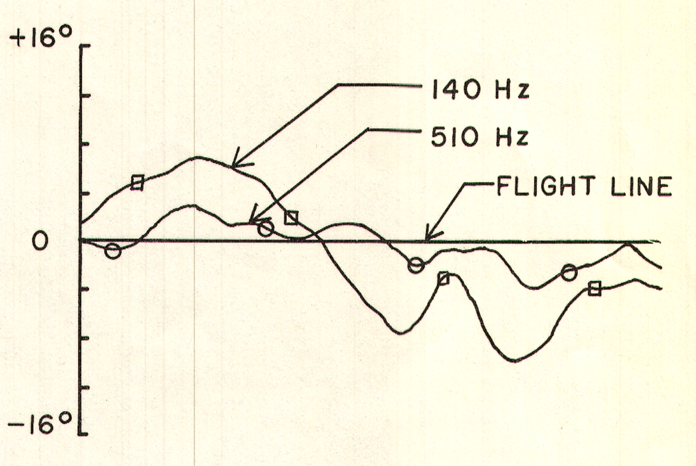
Airborne AFMAG survey, August 1968, and flight path recovery by McPhar Geophysics Ltd. Data digitizing, compilation and plotting by Dataplotting Services Ltd.

Topographic base-map at the same scale published by the Surveys and Mapping Branch, Department of Energy, Mines and Resources, Ottawa

Copies of this map may be obtained from the Geological Survey of Canada, Ottawa

Project planned, coordinated and compiled by L. S. Collett

FILTERED AFMAG PROFILES

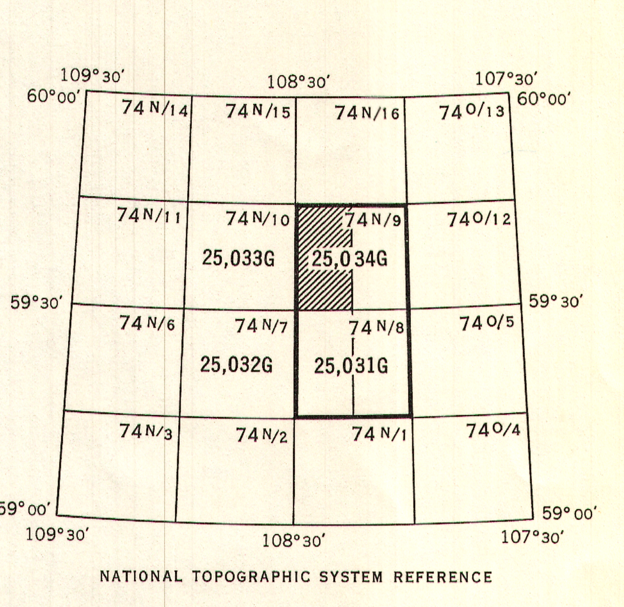


12 FLIGHT LINE No. 12N

13 FLIGHT LINE No. 13S

2645 FIDUCIAL NUMBER

FLIGHT ALTITUDE 650 FEET



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

MAP 25,034G
FORGET LAKE
SASKATCHEWAN
74 N/9 (West Half)

25,034G