

First Vertical Derivative of the Magnetic Field

This map of the first vertical derivative of the magnetic field was derived primarily from data acquired during an aeromagnetic survey carried out by Geo Data Solutions (GDS) Inc. from March 1, 2017 to April 2, 2017. The survey area consists of three adjoining survey blocks, A, B and C. Published data (Buckle et al., 2009) originating from a survey flown by Fugro Airborne Survey Corp. supplements the new survey data in block C. Data from all survey blocks were recorded using split-beam column vapour magnetometers (sensitivities $\pm 0.005\text{ nT}$) mounted in each of the tail booms of two GDS T-7E1 Navajo and a Cessna Titan 404 aircraft operated by Fugro Airborne Survey Corp.

Survey project specifications

	Block A	Block B	Block C	Block C (in-fill)
Survey year	2017	2017	2009	2017
Aircraft registration	C-FYUW	C-FYUW	C-FYAU	C-FYUW
Flight height	Draps: 100 m	Draps: 100 m	Draps: 125 m	Draps: 100 m
Line spacing	250 m	250 m	400 m	400 m
Line direction	45° / 225°	100° / 280°	100° / 280°	100° / 280°
Tie line spacing	1200 m	1200 m	2400 m	2400 m
Tie line direction	135° / 315°	10° / 190°	10° / 190°	10° / 190°

In block C, the in-fill flight lines and tie lines for the current 2017 survey were offset to provide the denser coverage of 200 m line and 1200 m tie spacing when combined with the 2009 survey. The flight path was recorded following post-flight differential corrections to the new Global Positioning System (GPS) data. The survey blocks were flown on a pre-determined flight draps surface to minimize differences in magnetic values at the intersection of tie lines and traverse lines. The draps surface for the 2009 survey in block C was lowered and the magnetic data were downward continued to the new surface level of the 2017 survey draps surface before these intersection differences were corrected. The data were then analyzed to obtain a mutually leveled set of flight line magnetic data. The leveled values were then interpolated to a 0.25 m grid. The International Geomagnetic Reference Field (IGRF) defined at the average GPS altitude of 534 m for the current mid-survey date of 20170317 was then removed. Removal of the IGRF, representing the magnetic field of the Earth's core, produces a residual component related almost entirely to magnetizations within the 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 the wavelength features of the magnetic field and significantly improves the resolution of closely spaced and suppressed anomalies. A property of first vertical derivative maps is the coincidence of the zero-value contour with vertical contacts at high magnetic latitudes (Hood, 1965).

Keating Correlation Coefficients

Possible kimberlite targets have been identified from the first vertical derivative of the magnetic field based on the identification of roughly circular anomalies. This procedure was automated by using a known pattern recognition technique (Keating, 1995) which consists of computing, over a moving window, a linear regression between the anomaly data to a vertical cylinder model (Table 1) and the gridded magnetic data. Only the results where the absolute value of the correlation coefficient is above 0.75 were retained.

The results are depicted as circular symbols to reflect the correlation value. The most favorable targets are those that exhibit a higher correlation coefficient in the vertical cylinder model (Table 1). Correlation coefficients with a negative value correspond to reversely magnetized sources. It is important to be aware that other magnetic sources may correlate with the vertical cylinder model, whereas some kimberlite pipes of irregular geometry or insufficient diameter may not.

Table 1. Parameters for vertical cylinder model anomaly.

Cylinder radius	75 m
Cylinder length	248 m
Depth of cylinder	(belowal sensor) 147 m
Magnetic inclination	79°N
Magnetic declination	131°E
Window cell size	12 x 12

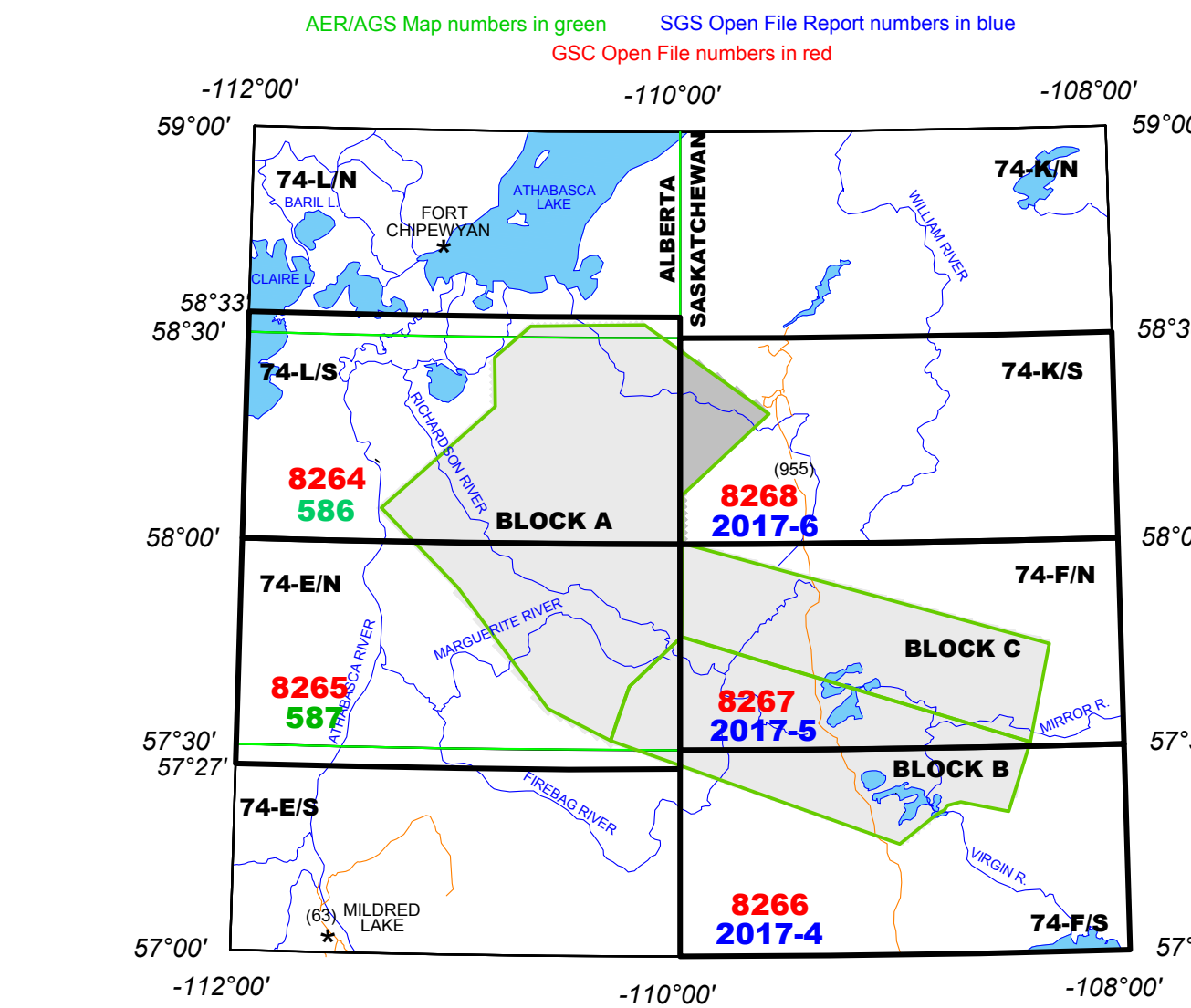
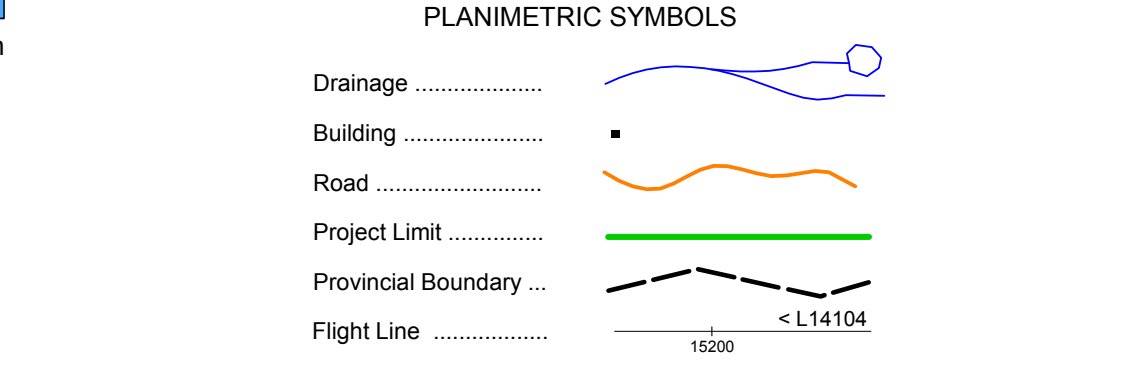
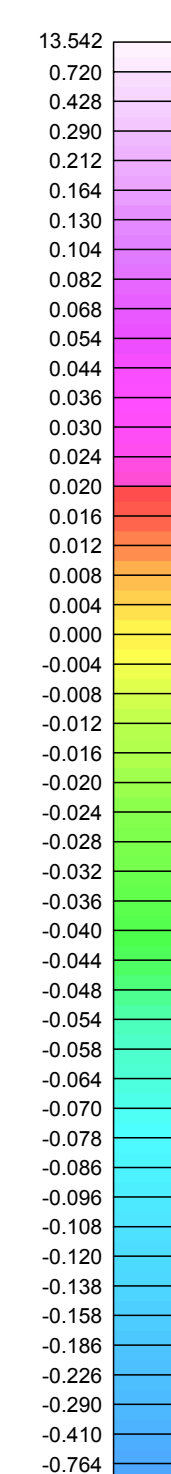
This publication is available for free download at: <http://www.nr.canada.ca>. Corresponding digital profile and gridded data as well as similar data for adjacent Canadian geographical surveys are available from Natural Resources Canada's Geoscience Data Repository at: <http://www.gdr.nrc.ca/geodata/atlantida.html>. The same products are also available, for a fee, from the International Geomagnetic Reference Field (IGRF) at: <http://www.igrf.int/>. Telephone: (613) 995-2226, email: ifp@gsd.nrc.ca

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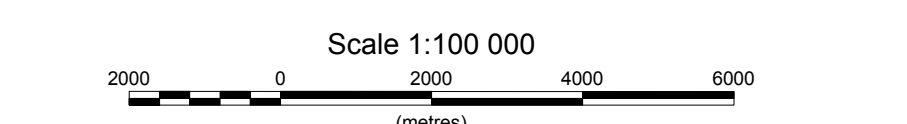


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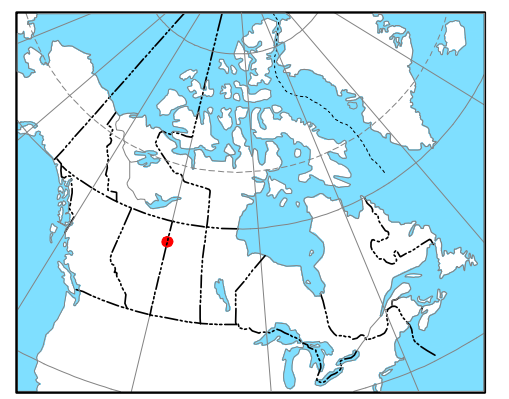
AEROMAGNETIC SURVEY OF THE MARGUERITE RIVER AREA

SASKATCHEWAN
Part of NTS 74-K South



Universal Transverse Mercator Projection
North American Datum 1983
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Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications

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