# Airborne Geophysical Survey Lizar Property (Claim 1246624) <br> Lizar Township <br> Sault Ste Marie Mining Division <br> Hornepayne Area, Ontario 

# 2. 25102 

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March 01, 2003
Thunder Bay, Ontario


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# Airborne Geophysical Survey Lizar Property (Claim 1246624) Sault Ste Marie Mining Division <br> Hornepayne Area, Ontario 

## Introduction

At the request of Teck Cominco Limited, Fugro Airborne Systems conducted an airborne electromagnetic and magnetic survey over the Lizar property. The total survey consisted of 1,503 line kilometres with 40.7 line kilometres covering claim SSM 1246624 which is presented in this report.

Claim 1246624 is part of the Lizar property which is located some 100 kilometres east of the Hemlo mines, approximately 40 kilometres south of the town of Hornepayne (Fig. 1). Access to the property is via a network of logging roads south of Hornepayne, east from Highway 631.

Freewest Resources Canada Inc. is the recorded holder of claim 1246624 which Teck Cominco Limited has an option agreement. The claim consists of 15 units located in the central part of Lizar Township near Kabinakagami Lake (Fig. 2). The centre of the claim is at approximately UTM $685,300 \mathrm{mE}$ and $5,419,200 \mathrm{mN}$ (NAD 83, Zone 16).


Figure 1: Location Map


## Geophysical Survey

From October 12 to October 23, 2002, an airborne electromagnetic and magnetic survey was completed on the Lizar Property. The survey was conducted by Fugro Airborne Surveys, 2060 Walkley Road, Ottawa, Ontario. The survey was designed to cover the entire property including claim 1246624 located to the northeast of the main block of claims. The Lizar property is underlain by mainly upper greenschist facies mafic volcanics and lesser sedimentary rocks, felsic lithologies and local gabbroic to ultramafic intrusions. Outcrop exposure is relatively poor comprising less than 1-2\% in many parts of the property.

The aircraft used for this survey was a specially modified Casa-212 aircraft equipped with a magnetometer and a new GEOTEM 1000 Receiver capable of deeper ground penetration. The complete aircraft and survey specifications are appended (Appendix I). Fight lines were oriented north-south spaced 100 metres apart. Each flight line was 8 kilometres in length which is the minimum required for this specific survey for proper coupling. West-east oriented flight tie lines were positioned at approximately 2 kilometre spacings as control lines.

Results of the survey covering claim 1246624 are presented in Figures 3 and 4. Figure 3 shows flight lines with posted magnetic readings (in nT , nanotesla) along with contours of these values at a scale of 1:5000. In Figure 4, also at a scale of $1: 5000$, electromagnetic data is presented as posted values, profiles and anomaly picks.

Results of the survey over claim 1246624 indicate the presence of a larger magnetic high anomaly in the south central portion of the claim (see Fig. 4) This anomaly corresponds to an area where a gabbroic to ultramafic intrusion has been mapped. No significant electromagnetic anomalies are outlined.

## Cost Statement

Airborne Magnetics and Electromagnetics Survey ..... $\$ 3,582$
Plotting/Processing Data ..... \$ 200
Aircraft Mobilization/Demobilization (pro rata) ..... $\$ 1,246$
Aircraft Stand-By Due To Poor Weather (pro rata) ..... \$ 278
TOTAL ..... $\$ 5,306$

## Statement of Qualifications

I, Jari Paakki, do certify that:
I am a registered Geoscientist (No. 0230) with the Association of Geoscientists of Ontario.

I graduated from Laurentian University in 1990 with a Bachelor of Science Degree and in 1992 with a Master of Science Degree, both in Geology.

I have been employed as a geologist continuously for the last 10 years.
The data contained in this report and conclusions drawn from it are true and accurate to the best of my knowledge.


$$
\frac{\text { Mareh or, } 2003}{\text { Date }}
$$

Jari Paakki
Senior Project Geologist
Teck Cominco Limited
Thunder Bay, Ontario

Appendix I
Airborne System and Survey Specifications

## SURVEY OPERATIONS

## Survey Coverage and Location

The survey area (Figure 2) was flown from Hornepayne, Ontario used as the base of operations.


Figure 2. Survey Location.
Line direction, spacing, as well as size of the flown survey are shown in Table 1. In all, 1,503 line kilometres of data were collected.

Table 1

| AREA | LINE <br> DIRECTION | LINE <br> SPACING | TIE-LINE <br> DIRECTION | TIE-LINE <br> SPACING | SIZE |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Lizar Project | N-S | 100 m | E-W | $\sim 2000 \mathrm{~m}$ | $1,503 \mathrm{lkm}$ |

## Aircraft and Geophysical On-Board Equipment

| Aircraft | Casa-212 (Twin Turbo Propeller) |
| :--- | :--- |
| Operator | FUGRO AIRBORNE SURVEYS |
| Registration | C-GDPP |



Survey speed
Magnetometer

Electromagnetic system
Transmitter:

Receiver :

Base frequency:
Pulse width: $2083 \mu \mathrm{~s}$

Pulse delay: $\quad 130 \mu \mathrm{~s}$
Off-time:
Point value:

Transmitter current:
Dipole moment:
~500 A
$-7 \times 10^{5} \mathrm{Am}^{2}$


Figure 4. Modified CASA-212 on survey.

[^0]GEOTEM ${ }^{\circledR} 90 \mathrm{~Hz}$ frequency electromagnetic data windows:
Table 2

| Channel | Start (p) | End (p) | Width $(\mathrm{p})$ | Start (ms) | End (ms) | Mid (ms) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 4 | 9 | 6 | 0.13 | 0.391 | 0.260 |
| 2 | 10 | 22 | 13 | 0.391 | 0.955 | 0.673 |
| 3 | 23 | 36 | 14 | 0.955 | 1.563 | 1.259 |
| 4 | 37 | 49 | 13 | 1.563 | 2.127 | 1.845 |
| 5 | 50 | 55 | 6 | 2.127 | 2.387 | 2.257 |
| 6 | 56 | 57 | 2 | 2.387 | 2.474 | 2.431 |
| 7 | 58 | 59 | 2 | 2.474 | 2.561 | 2.517 |
| 8 | 60 | 61 | 2 | 2.561 | 2.648 | 2.604 |
| 9 | 62 | 64 | 3 | 2.648 | 2.778 | 2.713 |
| 10 | 65 | 67 | 3 | 2.778 | 2.908 | 2.843 |
| 11 | 68 | 71 | 4 | 2.908 | 3.082 | 2.995 |
| 12 | 72 | 75 | 4 | 3.082 | 3.255 | 3.168 |
| 13 | 76 | 79 | 4 | 3.255 | 3.429 | 3.342 |
| 14 | 80 | 84 | 5 | 3.429 | 3.646 | 3.537 |
| 15 | 85 | 90 | 6 | 3.646 | 3.906 | 3.776 |
| 16 | 91 | 97 | 7 | 3.906 | 4.210 | 4.058 |
| 17 | 98 | 104 | 7 | 4.210 | 4.514 | 4.362 |
| 18 | 105 | 112 | 8 | 4.514 | 4.861 | 4.688 |
| 19 | 113 | 120 | 8 | 4.861 | 5.208 | 5.035 |
| 20 | 121 | 128 | 8 | 5.208 | 5.556 | 5.382 |

Digital Acquisition:
Analogue Recorder:

Barometric Altimeter:
Radar Altimeter:

Camera:
Electronic Navigation:

FUGRO AIRBORNE SURVEYS GEODAS SYSTEM.
RMS GR-33, showing the total magnetic field at 2 vertical scales, the radar and barometric altimeters, the time-constant filtered traces of dB/dt X-coil off-time channels 9-20 data and the on-time channel 1, the raw traces of both dB/dt and B-field $X, Y$ and $Z$-coil channel 20 , the EM $X$ and $Y$-coils primary fields, the power line monitor, the 4th difference of the magnetics, the $X$ coil earth's field monitor and the fiducials.

Rosemount 1241 M , sensitivity $1 \mathrm{ft}, 1 \mathrm{~s}$ recording interval.
King, accuracy $2 \%$, sensitivity 1 ft , range 0 to $2500 \mathrm{ft}, 1 \mathrm{sec}$ recording interval.

Panasonic colour video, super VHS, model WV-CL302.
NOVATEL Propak 4E-315R 12 channel GPS receiver, 1 sec recoding interval, with a resolution of 0.00001 degree and an accuracy of $\pm 5 \mathrm{~m}$.

Analogue recorder display setup:
Table 3

| Name | Descirption | Scale | Unit |
| :---: | :---: | :---: | :---: |
| XF09 | $\mathrm{dB} / \mathrm{dt} \mathrm{X}$ coil Time Filtered Channel 09 | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| XF10 | $\mathrm{dB} / \mathrm{dt} X$ coil Time Filtered Channel 10 | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| XF11 | $\mathrm{dB} / \mathrm{dt} \mathrm{X}$ coil Time Filtered Channel 11 | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| XF12 | $\mathrm{dB} / \mathrm{dt} \mathrm{X}$ coil Time Filtered Channel 12 | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| XF13 | $\mathrm{dB} / \mathrm{dt} \mathrm{X}$ coil Time Filtered Channel 13 | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| XF14 | $\mathrm{dB} / \mathrm{dt} X$ coil Time Filtered Channel 14 | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| XF15 | $\mathrm{dB} / \mathrm{dt} \mathrm{X} \mathrm{coil} \mathrm{Time} \mathrm{Filtered} \mathrm{Channel} 15$ | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| XF16 | $\mathrm{dB} / \mathrm{dt} \mathrm{X}$ coil Time Filtered Channel 16 | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| XF17 | $\mathrm{dB} / \mathrm{dt} X$ coil Time Filtered Channel 17 | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| XF18 | $\mathrm{dB} / \mathrm{dt} X$ coil Time Filtered Channel 18 | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| XF19 | $\mathrm{dB} / \mathrm{dt} \mathrm{X}$ coil Time Filtered Channel 19 | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| XF20 | $\mathrm{dB} / \mathrm{dt} \mathrm{X}$ coil Time Filtered Channel 20 | 10000 | $\mathrm{pV} / \mathrm{cm}$ |
| BZ20 | B-Field $Z$ coil Raw channel 20 | 80000 | $\mathrm{fT} / \mathrm{cm}$ |
| BX20 | B-Field X coil Raw channel 20 | 80000 | $\mathrm{T} / \mathrm{cm}$ |
| $\times 20$ | dB/dt X coil Raw channel 20 | 20000 | $\mathrm{pV} / \mathrm{cm}$ |
| 220 | dB/dt $X$ coil Raw channel 20 | 20000 | $\mathrm{pV} / \mathrm{cm}$ |
| X01 | dB/dt X coil Raw channel 01 | 50000 | $\mathrm{pV} / \mathrm{cm}$ |
| XPL | Powerline Monitor | 0.2 | $\mathrm{V} / \mathrm{cm}$ |
| XEFM | Earth Field Monitor | 1 | $\mathrm{V} / \mathrm{cm}$ |
| XPRM | X Primary Field | 0.4 | $\mathrm{V} / \mathrm{cm}$ |
| YPRM | Y Primary Field | 13.3 | $\mathrm{V} / \mathrm{cm}$ |
| Y20 | $\mathrm{dB} / \mathrm{dt} \mathrm{Y}$ coil Raw channel 20 | 20000 | $\mathrm{pV} / \mathrm{cm}$ |
| CMAG | Coarse Total Field Magnetics | 300 | $\mathrm{nT} / \mathrm{cm}$ |
| FMAG | Fine Total Field Magnetics | 100 | $\mathrm{nT} / \mathrm{cm}$ |
| RADR | Radar Altimieter | 50 | $\mathrm{ft} / \mathrm{cm}$ |
| 4DIF | Magnetic 4th Difference Filtered | 1 | $\mathrm{nT} / \mathrm{cm}$ |
| BARO | Barometric Altimeter | 100 | $\mathrm{ft} / \mathrm{cm}$ |

## Base Station Equipment

Magnetometer:

GPS Receiver:

Computer:
Converter:

Scintrex CS-2 single cell cesium vapour, mounted in a magnetically quiet area, measuring the total intensity of the earth's magnetic field in units of 0.01 nT at intervals of 1 s , within a noise envelope of 0.20 nT .

NOVATEL Propak 4E-315R 12 channel GPS receiver, 1 sec recoding interval, with a resolution of 0.00001 degree and an accuracy of $\pm 5 \mathrm{~m}$.

Laptop, Pentium II model, 220 Mhz.
Picodas, model MEP710 3/10901 GTS 780008.

## Field Office Equipment

Computer:
Printer:
DAT Tape Drive:
Hard Drive:

## Survey Specifications

Traverse Line Direction:
Traverse Line Spacing:
Tie Line Direction:
Tie Line Spacing:

Navigation:

Altitude:

Magnetic Noise Levels:

EM Noise Levels:

Diurnal Variations:

## Survey Calibrations

EM System Calibration:

Dell Inspiron 8000 Pentium III laptop with 30 GB hard drive.
Hewlett Packard Deskjet 690C.
DDS-90 4 mm.
8 GB Removable hard drive.

See Table 1.
See Table 1.
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See Table 1.

Differential GPS. Traverse and tie line deviation was not to exceed the theoretical flight path by 50 m over a distance $>3 \mathrm{~km}$.

The survey was flown at a mean terrain clearance of 120 m . Altitude was not to exceed 20 m from the nominal over 3 km .

The noise envelope on the magnetic data was not to exceed $\pm 0.25 \mathrm{nT}$ over 3 km .

The noise envelope on the raw electromagnetic $\mathrm{dB} / \mathrm{dt} X$ - and $Z$ coil channel 20 was not to exceed $\pm 3500 \mathrm{pT} / \mathrm{s}$ over a distance greater than 3 km as displayed on the raw analogue traces.

Deviations were not to exceed 10 nT over a chord of 30 sec .

## Field Crew

Project Manager:
E. Aparicio
Geophysicist:
Data Processor:
T. Carmichael
Pilots:
M. Carriere
M. Williston, K. Wilson, L. Maike
Electronics Operator:
E. Aparicio
Engineer:
S. Erickson

## Production Statistics

Flying dates:
Total production:
Number of production flights:
Hours of production flying:
Number of km/hour of production flying:
Number of km/average production flight:
Number of hours/average production flight:
Days lost due to weather:

October $14^{\text {th }}-$ October $21^{\text {st }}, 2002$
1,503 line kilometres 7
22.8 hrs
65.9 km/hour
214.7 km/flight
3.3 hour/flight

1

## III

## QUALITY CONTROL AND COMPILATION PROCEDURES

In the field after each flight, all analogue records were examined as a preliminary assessment of the noise level of the recorded data. Altimeter deviations from the prescribed flying altitudes were also closely examined as well as the diurnal activity, as recorded on the base station.

All digital data were verified for validity and continuity. The data from the aircraft and base station was transferred to the PC's hard disk. Basic statistics were generated for each parameter recorded, these included: the minimum, maximum, and mean values; the standard deviation; and any null values located. All recorded parameters were edited for spikes or datum shifts, followed by final data verification via an interactive graphics screen with on-screen editing and interpolation routines.

The quality of the GPS navigation was controlled on a daily basis by recovering the flight path of the aircraft. The $\mathrm{C}^{3} \mathrm{NAVG}^{2 \mathrm{TM}}$ (Combined Code and Carrier for NAVigation with GPS and GLONASS) correction programme employs the raw ranges from the base station to create improved models of clock error, atmospheric error, satellite orbit, and selective availability. These models are used to improve the conversion of aircraft raw ranges to aircraft position.

Checking all data for adherence to specifications was carried out in the field by the FUGRO AIRBORNE SURVEYS field geophysicist. IV

## DATA PROCESSING

## Flight Path Recovery

GPS Recovery: GPS positions recalculated from the recorded raw range data, and differentially corrected.

Projection: Universal Transverse Mercator (UTM Zone 16N).
Datum:
Ellipsoid:
Central meridian: $\quad 87^{\circ}$ West.
False Easting: $\quad 500000$ metres.
False Northing: 0 metres.
Scale factor: $\quad 0.99960$.

## Altitude Data

Noise editing: $\quad$ Alfatrim median filter used to eliminate the two highest and two lowest values from the statistical distribution of a 9 point sample window for the radar altimeter. For the barometric altimeter the alfatrim median filter eliminated only the single highest and lowest points from the statistical distribution of a 5 point window.

Noise filtering: $\quad$ Triangular filter set to remove radar, baro and GPS wavelengths less than 4 seconds.

## Base Station Diurnal Magnetics

Noise editing: $\quad$ Alfatrim median filter used to eliminate the two highest and two lowest values from the statistical distribution of a 9 point sample window.

Culture editing: Polynomial interpolation via a graphic screen editor.
Noise filtering: Running average filter set to remove wavelengths less than 2 seconds.
Extraction of long wavelength component:
Low pass filter set to retain only wavelengths greater than 75 seconds.

## Airborne Magnetics

Lag correction: $\quad 3.7$ seconds.

Noise editing: $\quad 4$ th difference editing routine set to remove spikes greater than 0.5 nT , followed by an alfatrim median filter eliminating the high and the low value from its calculation over a 5 point window.

Noise filtering: $\quad$ Triangular filter set to remove noise events having a wavelength less than 0.5 seconds and an amplitude less than 0.5 nT .

Diumal substraction: The long wavelength component of the diurnal (greater than 75 seconds) was removed from the data, prior to the levelling analysis.

IGRF removal date: 2002.8.
Gridding: $\quad$ The data was gridded using an Akima routine with a grid cell size of $\mathbf{2 0} \mathbf{m}$.

## Residual Magnetic Intensity:

The residual magnetic intensity ( RMI ) is derived from the total magnetic intensity (TMI), the diufnal, and the regional magnetic field. The total magnetic intensity is measured in the aircraft, the diurnal is measured from the ground station, and the regional magnetic field is calculated from the International Geomagnetic Reference Field (IGRF). The low frequency component of the diurnal is extracted from the filtered ground station data and removed from the TMI. The average of the diurnal is then added back in to obtain the resultant total magnetic intensity. The regional magnetic field, calculated for the specific survey location and the time of the survey, is then removed from the resultant total magnetic intensity. After levelling the residual magnetic intensity is completed.
Levelling:
The first stage of levelling of the magnetic data (correcting for residual diurnal effects, altitude differences and positioning errors) was done on the line data by automatically comparing the values of the total field at the intersection of each line and tie line. The differences were analyzed and a compensation was calculated at each intersection in order to provide a pattern of smoothly varying adjustments along each line and tie-line. Erratic differences, implying an error in the intersection location, were carefully checked and corrected.

The second step consisted of applying a micro-levelling routine to the gridded data in order to remove errors that are due to diurnal variations. During the micro-levelling routine a compensation grid was created and profile data was then extracted along the survey lines and stored in the final dataset as the levelling compensation.

The final Residual Magnetic Intensity was calculated in the following manner:
Filtered airborne Total Magnetic Intensity

- Low frequency component of the Diurnal data
+ Average diurnal data value
- IGRF
+ Levelling compensation
= Final Residual Magnetic Intensity


## Electromagnetics

## dB/dt Data

Lag correction: 4.2 seconds.
Data correction: The $x, y$ and $z$-coil data were processed from the 20 raw channels recorded at 4 samples per second.

The following processing steps were applied to the $\mathrm{dB} / \mathrm{dt}$ data from all coil sets:
a) The data from channels 1 to 5 (on-time) and 6 to 20 (off-time) were corrected for drift in flight form (prior to cutting the recorded data back to the correct line limits) by passing a low order polynomial function through the baseline minima along each channel, via a graphic screen display;
b) The data were edited for residual spheric spikes by examining the decay pattern of each individual EM transient. Bad decays (i.e. not fitting a normal exponential function) were deleted and replaced by interpolation;
c) Corrections were made in the $x$ - and z-coil data for low frequency, incoherent noise elements (that do not correlate from channel to channel) in the data, by analysing the decay patterns of channels 10 to 20 (OMEGA process).
d) Noise filtering was done using an adaptive filter technique based on time domain triangular operators. Using a 2nd difference value to identify changes in gradient along each channel, minimal filtering (5 point convolution) is applied over the peaks of the anomalies, ranging in set increments up to a maximum amount of filtering in the resistive background areas ( 27 points for both the $x$-coil and the $z$-coil data).
e) This was followed by the application of a small running average filter.
f) The filtered data from the $x, y$ and $z$-coils were then re-sampled to a rate of 5 samples/s and combined into a common file for archiving.

NOTE: A fault developed with the transmitter controller board which affected the data from flights 6 to 11. This problem resulted in a slight shift in the group delay at the start of the waveform and the introduction of some spikes. This was remedied in processing by adjusting the gate positions, along the waveform, to compensate for the shift in the group delay and re-windowing the data from the halfwave files. Small irregularities in the on-time channels of the B-Field data may result.

## B-field Data

Processing steps: The processing of the B-Field data stream is essentially the same as that described above for the regular $\mathrm{dB} / \mathrm{dt}$ stream. The lag adjustment used was the same, followed by: 1) drift adjustments; 2) spike editing for spheric events; 3) correction for low frequency, incoherent and non-decaying noise events; and 4) final noise filtering with an adaptive filter. The processing step 3 was applied in the B-field processing but not in the $\mathrm{dB} / \mathrm{dt}$ processing. By nature, the B-Field data will contain a higher degree of coherency of the noise that
automatically gets eliminated (or considerably attenuated) in the regular $\mathrm{dB} / \mathrm{dt}$, since this is the time derivative of the signal.

## B-field Data Advantage:

The introduction of the B-Field data stream, as part of the GEOTEM system, provides the explorationist with a more effective tool for exploration in a broader range of geological environments and for a larger class of target priorities.
The advantage of the B-Field data compared with the normal voltage data ( $\mathrm{dB} / \mathrm{dt}$ ) are as follows:

1. A broader range of target conductance that the system is sensitive to (the B field is sensitive to bodies with conductance as great as 100,000 Siemens);
2. Enhancement of the slowly decaying response of good conductors;
3. Suppression of rapidly decaying response of less conductive overburden;
4. Reduction in the effect of spherics on the data;
5. An enhanced ability to interpret anomalies due to conductors below thick conductive overburden;
6. Reduced dynamic range of the measured response (easier data processing and display).
Figures 5 and 6 display the calculated vertical plate response for the GEOTEM signal for the $\mathrm{dB} / \mathrm{dt}$ and $B$-field respectively. For the $\mathrm{dB} / \mathrm{dt}$ response, you will note that the amplitude of the early channel peaks at about 25 Siemens, and the late channels at about 250 Siemens. As the conductance exceeds 1000 Siemens the response curves quickly roll back into the noise level. For the B-Field response, the early channel amplitude peaks at about 80 Siemens and the late channel at about 550 Siemens. The projected extension of the graph in the direction of increasing conductance, where the response would roll back into the noise level, would be close to 100,000 Siemens. Thus, a strong conductor, having a conductance of several thousand Siemens, would be difficult to interpret on the $\mathrm{dB} / \mathrm{dt}$ data, since the response would be mixed in with the background noise. However, this strong conductor would stand out clearly on the B-Field data, although it would have an unusual character, being a moderate to high amplitude response, exhibiting almost no decay.


Figure 5. $\mathrm{dB} / \mathrm{dt}$ vertical plate nomogram.


Figure 6. B-field vertical plate nomogram.

In theory, the response from a super conductor ( 50,000 to 100,000 Siemens) would be seen on the B-Field data as a low amplitude, non-decaying anomaly, not visible in the off-time channels of the $\mathrm{dB} / \mathrm{dt}$ stream. Caution must be exercised here, as this signature can also reflect a residual noise event in the B-Field data. In this situation, careful examination of the dB/dt on-time (in-pulse) data is required to resolve the ambiguity. If the feature were strictly a noise event, it would be not be present in the $\mathrm{dB} / \mathrm{dt}$ off-time data stream. This would locate the response at the resistive limit, and the mid in-pulse channel (normally identified as channel 3) would reflect little but background noise, or at best a weak negative peak. If, on the other hand, the feature does indeed reflect a superconductor, then this would locate the response at the inductive limit. In this situation, channel 3 of the $\mathrm{dB} / \mathrm{dt}$ stream will be a mirror image of the transmitted pulse, i.e. a large negative.

## EM Decay Constant:

The decay constant values are obtained by fitting the channel data to a single exponential function of the form:

$$
Y=A e^{-t \tau},
$$

where $\mathrm{A}=$ amplitude at time zero, $\mathrm{t}=$ time in microseconds and $\tau$ is the decay constant. A semi-log plot of this exponential function will be displayed as a straight line, the slope of which will reflect the rate of decay and therefore the strength of the conductor. A slow rate of decay, reflecting a high conductance, will be represented by a high decay constant value. As a single parameter, the decay constant provides more useful information than the amplitude data alone of any given single channel, as it indicates not only the peak position of the response but also the relative strength of the conductor.
For the present dataset, the decay constant was calculated by fitting the $\mathrm{dB} / \mathrm{dt} \mathrm{X}$-coil data from channels 8 to 20 to the exponential function.

## Anomaly Selection:

EM anomalies were selected by fitting the data from the dB/dt X-coil channels 9 to 20 to a vertical plate model, in order to extract conductance and depth information. Comparisons of the response from the $X$ and $Z$ coil data were made during the anomaly review for the final selection of the anomalies.
Refer to Appendix F for a full listing of the anomaly selections which provides the particulars of each selected anomaly, including the conductivity-thickness-product (CTP) and the depth of the conductor below surface. It is important to note that the derived values of CTP and depth associated with the anomaly selections are only valid if the geometry of the conductive source can be well approximated by a vertical plate of 300 by 600 m . A note is also included to guide the correct evaluation of the anomaly information.

## Apparent Conductance Calculation:

The apparent conductance values were computed from the full waveform (all 20 channels) of the combined $\mathrm{dB} / \mathrm{dt} X$ and Z-coils data by fitting to a thin sheet model. The results are stored in milliSiemens (mS).

## Total Energy Envelope:

To combine the benefits of the measurements from both the $X$ and $Z$ coil data and reduce the asymmetry in the shape of the anomalies, the data from channel 9 of both the $X$ and $Z$ coils were used to compute the Total Energy Envelope. This was done through an Hilbert transform and essentially reflects the square root of the sum of the squares of each component. This parameter provides a good picture of the overall near-surface conductivity.

## Gridding:

The EM data were gridded with a 20 m grid cell size, using a linear interpolation.

## Work Report Summary



Ministère du
Développement du Nord et des Mines

GEOSCIENCE ASSESSMENT OFFICE 933 RAMSEY LAKE ROAD, 6th FLOOR SUDBURY, ONTARIO P3E 6B5

RESSOURCES FREEWEST CANADA INC.,
Tel: (888) 415-9845
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800 BOUL. RENE LEVESQUE OUEST
BUREAU 1525
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Submission Number: 2.25102
Transaction Number(s): W0350.00344
Dear Sir or Madam

## Subject: Approval of Assessment Work

We have approved your Assessment Work Submission with the above noted Transaction Number(s). The attached Work Report Summary indicates the results of the approval.

At the discretion of the Ministry, the assessment work performed on the mining lands noted in this work report may be subject to inspection and/or investigation at any time.

If you have any question regarding this correspondence, please contact BRUCE GATES by email at bruce.gates@ndm.gov.on.ca or by phone at (705) 670-5856.

Yours Sincerely,


Ron Gashinski
Senior Manager, Mining Lands Section

Cc: Resident Geologist
Ressources Freewest Canada Inc., Freewest Resources Canada Inc. (Claim Holder)

Assessment File Library
Ressources Freewest Canada Inc., Freewest Resources Canada Inc. (Assessment Office)





[^0]:    ${ }^{1}$ One nanotesla ( $n T$ ) is the S.I. equivalent of one gamma.

