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REPORT ON A HELICOPTER-BORNE TIME DOMAIN ELECTROMAGNETIC AND MAGNETIC SURVEY AT MACDIARMID AND JAMIESON TOWNSHIP

- Property Name -

MacDiarmid, Ontario

NTS Areas 042 A12

- Location -

48° 38’ 19” Latitude, -81° 32’ 42” Longitude

459,836.6 mE, 5,387,420.3 mN GPS

NAD-83, UTM Zone 17N

- Prepared for -

Noble Mineral Exploration Inc
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- Written by -

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- Completion Date -

Survey: November 3rd, 2018

Report: January 10th, 2020

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SUMMARY

Balch Exploration Consulting Inc. (BECI) was contracted by Noble Mineral Exploration (NME) to perform an electromagnetic survey over NME's MacDairmid property, within the MacDiarmid and Jamieson townships, to define conductive and/or magnetic trends related to Cu-Zn mineralisation.

The system used is known as AirTEM and has been developed by Triumph Instruments of Georgetown, Ontario.

The survey was flown between October 25th and November 3rd, 2018. A total of 442.2 l-km was flown with 410.5 l-km being over NME's mining claims. Early, early-mid, mid, mid-late, and late off-time EM grids as well as total magnetic intensity and its first vertical derivative grids were produced.

Recommendations include: (1) a review of historical exploration data; (2) compilation of historical drilling collars, drillhole orientation, and depths; (3) review of geophysics and drilling in 1999 from Falconbridge work in a similar area; (4) conduct a series of short drilling to intersect targets; and (5) pursue other conductive targets.

1.0 INTRODUCTION

1.1 CONTRACTOR

Balch Exploration Consulting Inc. ("BECI", the "Contractor") having its head office at 11500 Fifth Line, Rockwood, Ontario, Canada, N0B 2K0, has performed a helicopter time domain electromagnetic (HTEM) and magnetic survey (MAG) using the AirTEM^{TM} system developed by Triumph Instruments.

1.2 CLIENT

Noble Mineral Exploration ("NME", or the "Client") having its head office at 120 Adelaide St. W, Suite 2500, Toronto, Ontario, Canada, M5H 1T1

1.3 SURVEY OBJECTIVES

At MacDiarmid a large magnetic feature was identified from the OGS regional magnetic data. This area has never been flown with modern EM. The hope is to detect conductive Ni-Cu sulphide mineralization within the magnetic anomaly and possibly Cu-Zn mineralization elsewhere within the property.

2.0 SURVEY AREA

2.1 LOCATION

The MacDiarmid property is located in Ontario, Canada. Figure 1 shows a regional location map for the survey area. The closest major center is Timmins located 24 km to the south-east. The approximate center of the MacDiarmid block has a latitude and longitude of 48° 38’ 19” and -81° 32’ 42”, respectively. The MacDiarmid block is located on NTS sheets 042 A12.

2.2 ACCESS

There is logging-road access off Highway 655 about 44.5 km from Timmins, Ontario. Fuel was brought in by truck and trailer directly to the helicopter behind the Cedar Meadows Spa and Resort within a gated field.

2.3 INFRASTRUCTURE

While there is no real infrastructure within the survey block there is infrastructure nearby. Highway 655 and a north-northwest powerline are located 16.5 km east of the block. Timmins Airport is located 16 km to the southeast and the town of Timmins is 24 km southwest of the block. The MacDiarmid Block is located 13.5 km west of the historic Kidd-Creek mine.

2.4 CLIMATE

The average daily temperature varies from a high of +17.5º C during July to a low of -17.5º C during January. During the survey daytime temperatures ranged from -8ºC to +3ºC. It snowed and rained frequently, along with a few days of morning fog.

2.5 TOPOGRAPHY

The topography is quite flat, with a total variation of less than 50m over the survey areas. Of particular importance were two radio towers identified by the pilot and operator at the start of the survey, as well as very large poplar trees along the shores of the river.

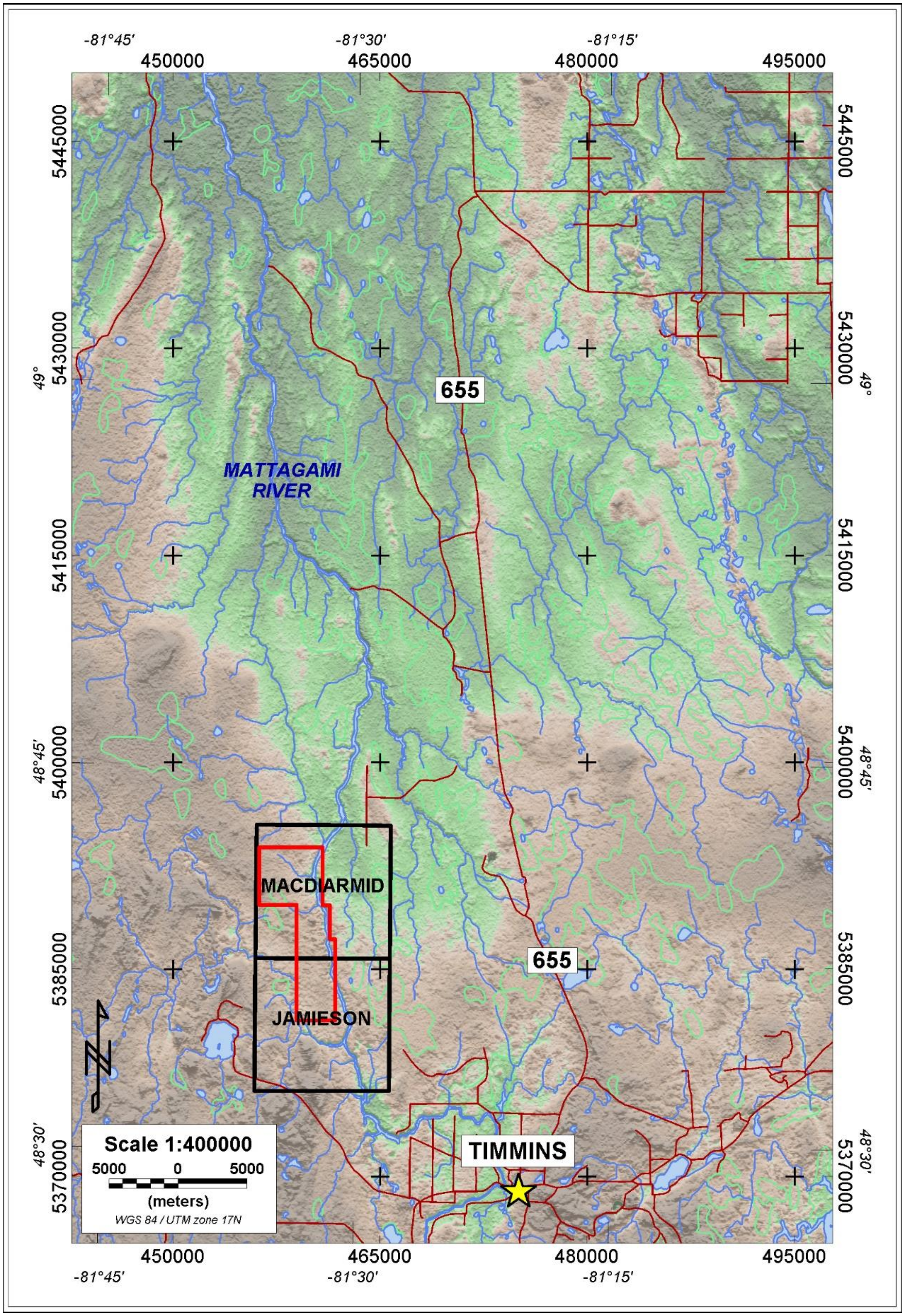

Figure 1 – Location map of the survey block.

2.6 GEOLOGIC SETTING

The project area forms part of the Abitibi greenstone belt of the Superior Province. Volcanic rhyolites and andesites are common as are sediments. Exploration targets exist within the rhyolite units, especially for volcanogenic massive sulphide (VMS) deposits. In fact, the Kidd Creek deposit, the largest VMS deposit in North America is located within 30 km of the project area. There is a strong structural control to the Kidd Creek rhyolite dome and mineralization. The same volcanic structures that were responsible for the extrusion of the rhyolite also focused the hydrothermal fluids that ascended through the rhyolite and concentrated the minerals.

The dominant structural trend is west-northeast to east-southeast. A number of mineralized structures have been mapped previously and typically show a strike length of several hundred meters to a few kilometers. These mineralized trends can contain graphite and/or pyrrhotite and pyrite and are therefore conductive. Within these conductive trends, economic concentrations of sulphide (similar to the Kidd Creek Mine) could have concentrated and would have a lateral foot print of several hundred meters. These deposits may or may not be magnetic but they should be strongly conductive and would have an anomalous gravity high (positive Bouguer anomaly).

In addition to VMS mineralization, a number of prominent ultramafic sills offer the potential for nickel, copper and platinum group element (PGE) deposits.

Also, within the property are a number of historic gold showings, typically within tuffs that form part of a larger sequence of volcanic rocks. In some cases, the tuffs are a few hundred meters thick. Within Lucas Township, for example, the gold mineralization appears to have a structural control and sulphide association. Induced polarization and high-resolution magnetics should help to outline the mineralized zones.

2.7 PROPERTY HISTORY

NME’s Timmins-Cochrane of Northern Ontario area project consists of approximately 78,527 hectares. From 2011 to 2018 NME has acquired mineral claims, through purchasing or staking, 100% title and interest. As a hole the project has had historical gold exploration from the 1960s through the 1980s. This included diamond drilling. No exploration work occurred between the 1980s and 2011.

2.8 MINERAL AND MINING CLAIMS

The mineral claims are shown in Figure 2. The Client mineral claims are shown in magenta. Table 1 presents a list of mining claim numbers within the survey area. All claims are owned by NME and Canada Nickel Company.

2.9 FLIGHT AND TIE LINES

The flight lines are shown in Figure 3 and summarized in Table 2.

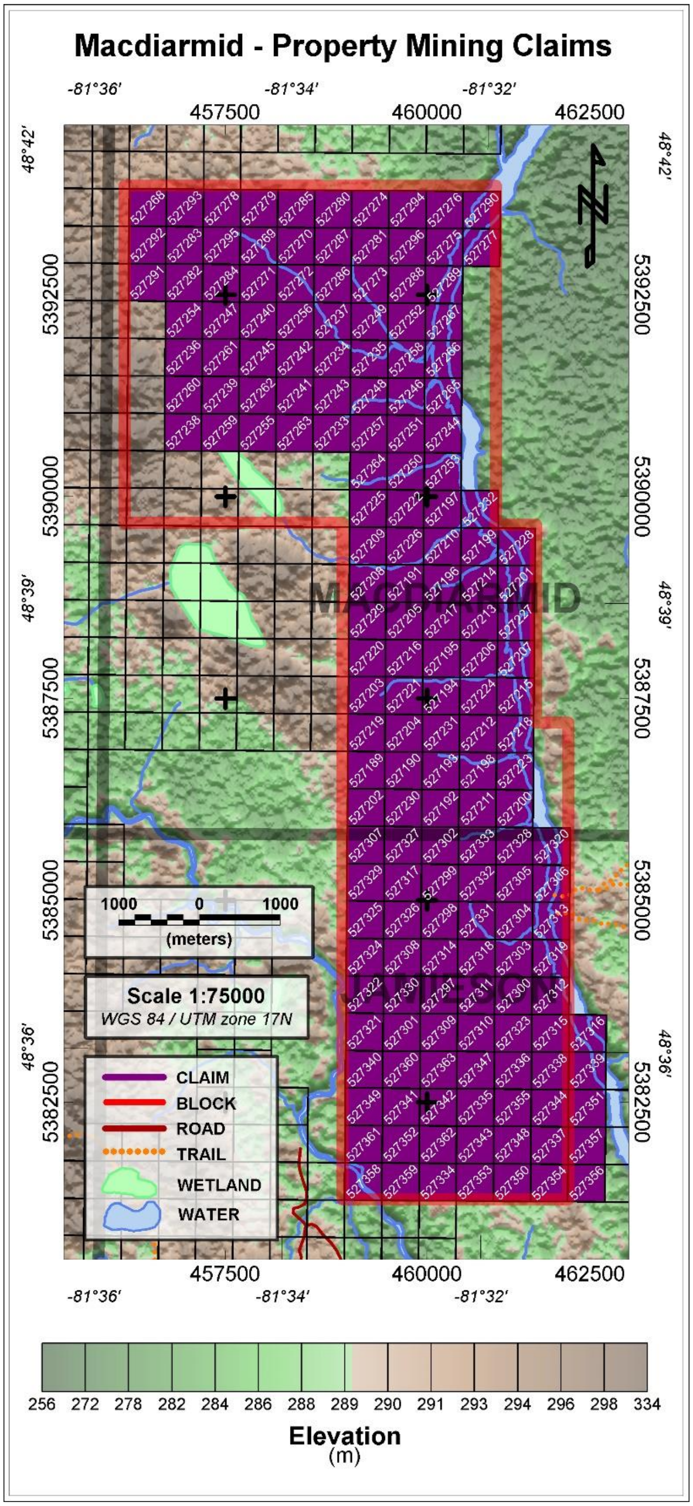

Figure 2 – The mineral claims and claim number within the survey block.

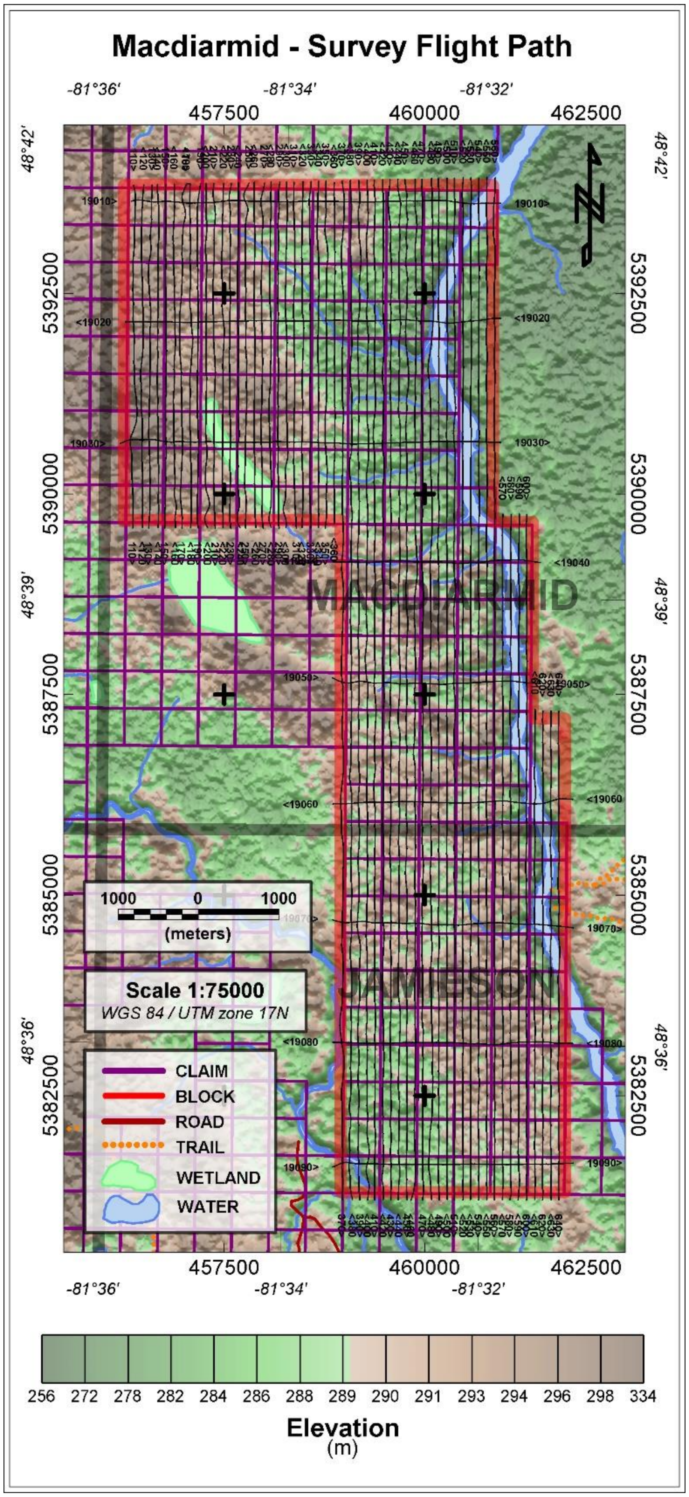

Figure 3 – Flight lines for the survey block. Next to flight line numbers are angle brackets indicating flight direction.

527309	527337	527215	527238	527275
527310	527338	527216	527239	527276
527311	527339	527217	527240	527277
527312	527340	527218	527241	527278
527313	527341	527219	527242	527279
527314	527342	527220	527243	527280
527315	527343	527221	527244	527281
527316	527344	527222	527245	527282
527317	527347	527223	527246	527283
527318	527348	527224	527247	527284
527319	527349	527225	527248	527285
527320	527189	527226	527249	527286
527321	527190	527227	527250	527287
527322	527191	527228	527251	527288
527323	527192	527229	527252	527289
527324	527193	527230	527253	527290
527325	527194	527231	527254	527291
527326	527195	527232	527255	527292
527327	527196	527350	527256	527293
527328	527197	527351	527257	527294
527329	527198	527352	527258	527295
527330	527199	527353	527259	527296
527331	527200	527354	527260	527297
527332	527201	527355	527261	527298
527333	527202	527356	527262	527299
527334	527203	527357	527263	527300
527335	527204	527358	527264	527301
527336	527205	527359	527265	527302
	527206	527360	527266	527303
	527207	527361	527267	527304
	527208	527362	527268	527305
	527209	527363	527269	527306
	527210	527233	527270	527307
	527211	527234	527271	527308
	527212	527235	527272	
	527213	527236	527273	
	527214	527237	527274	

Table 1 – Mining claim numbers for the survey block.

Survey Block	Area (km^2)	Line Type	Planned No. of Lines	Line Spacing (m)	Line Orientation	Nominal Survey Height (m)	Total Planned (km)	Total Actual (km)	Total Over Claims (km)
MacDiarmid	41.7	Survey	54	100	0°/180°	45	412.4	429.3	
		Tie	9	1500	90°/270°	45	29.8	31.7	
		Total					**442.2**	**460.0**	**446.9**

Table 2 – Summary of flight and tie line specifications.

2.10 DATUM AND PROJECTION

The survey was flown using the WGS-84 Datum and UTM Projection, Zone 17N. The survey data was collected and processed in WGS-84 using proprietary software. The processed data was then imported into Oasis Montaj and further processed. All Geosoft databases, grids and maps were generated in WGS-84, Zone 17N (as easting “x” and northing “y”).

3.0 SURVEY SYSTEM

The survey system is comprised of an electromagnetic airframe and magnetic sensor housing connected to the helicopter via a tow cable and related and ancillary electronics and sensors inside the helicopter to control navigation, power and survey height. Combined, this system measures the response from sub-surface conductors containing minerals such as pyrrhotite and pyrite and the magnetic response from features containing minerals such as magnetite. The positions of these responses are measured using a differential GPS antenna and receiver. Flight height is measured by radar altimeter.

3.1 ELECTROMAGNETIC SYSTEM

The electromagnetic system (Figure 4) was developed by Triumph Instruments (Triumph) and is known as AirTEM™, a helicopter time domain electromagnetic (HTEM) system that is designed for mineral exploration, oil & gas exploration and geologic mapping. AirTEM™ is based on the concept of a concentric transmitter and receiver geometry originally developed by Wally Boyko.

The AirTEM™ (TS-150) system features an 8.54 m diameter transmitter weighing approximately 500 Kg and producing up to 150,000 Am^2 in transmitted power. The system records the full waveform and “X”, “Y” and “Z” coil measurements for improved interpretation of complex conductor responses. Measurements of the total magnetic field are also provided.

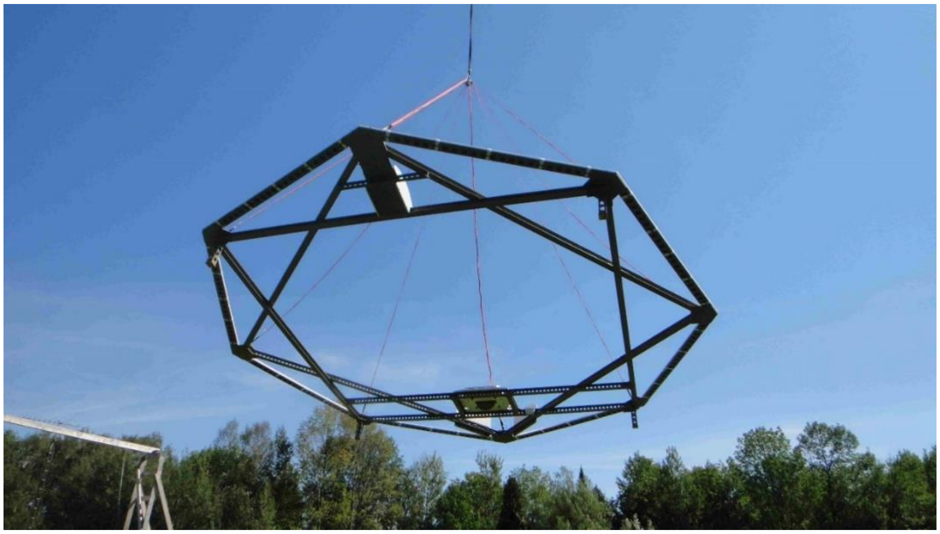

Figure 4 – The Triumph AirTEM™ TS-150 HTEM System.

Features

- Rigid concentric geometry
- Full waveform recording
- Software selectable base frequency
- Software selectable on-time period
- dB/dt off-time and on-time profiles
- Total magnetic field

Advantages

- Excellent early off-time response
- On-time conductance discrimination
- Excellent performance in rugged terrain
- Direct drilling of targets
- Improved nomogram correlation
- Interpretation software readily available

3.2 SYSTEM WAVEFORM

The AirTEM™ system uses a bipolar linear triangular pulse as shown in Figure 5. The on-time pulse is 33% of the half-cycle. The up-going and down-going portions of the pulse are 95% symmetric with the down-going pulse being slightly shorter in time duration.

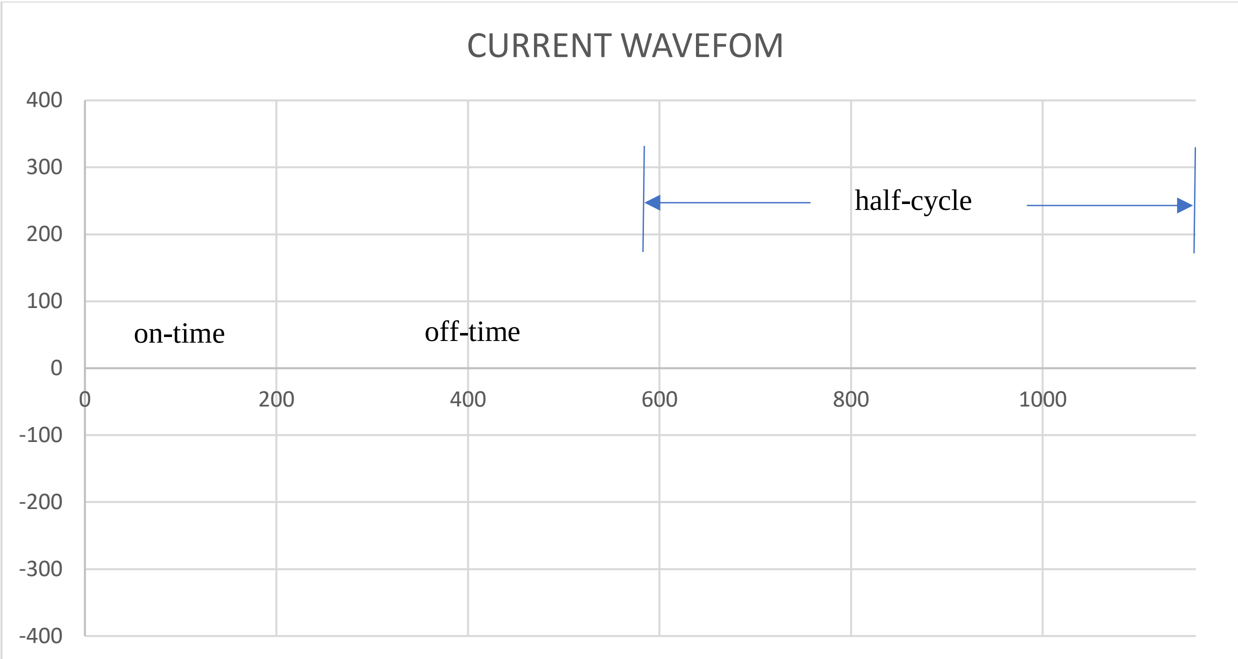

Figure 5 – The transmitter full cycle waveform is bi-polar and triangular with 95% on-time linearity.

3.3 BASE FREQUENCY

This survey was flown using a 90 Hz base frequency. At this frequency the bi-polar waveform produces half-cycles 180 times per second. The total half cycle period is the inverse of 180 Hz or 5,556 µs. For a one third duty cycle the on-time pulse is 1,850 µs in duration and the off-time pulse is 3,704 µs.

The data is stacked to a 10 Hz output sample rate. Each stack is the average of 18 half-cycles, 9 positive and 9 negative. The negative half-cycles are rectified before being added to the positive cycles. The rectified and stacked half-cycles are stored at the 10 Hz sample rate.

The half-cycle is sampled at 105 kHz or one sample every 9.48 µs producing 580 half-cycle samples, 193 during the transmitter on-time and 387 during the off-time. During the on-time there are 99 up-going samples and 94 down-going samples.

3.4 TIME CHANNELS

The time channels are defined on a logarithmic scale starting at channel 10. Channels 1 through 9 are linearly spaced, have a 5 µs width and start 10 µs after the end of the on-time pulse. For a 90 Hz base frequency there are 41 off-time channels. The time channels used are listed in Table 3.

Channel	Start time (ms)	Channel	Start time (ms)
1	0.0100	26	0.4199
2	0.0150	27	0.4810
3	0.0200	28	0.5512
4	0.0250	29	0.6320
5	0.0300	30	0.7249
6	0.0350	31	0.8317
7	0.0400	32	0.9545
8	0.0450	33	1.0957
9	0.0500	34	1.2581
10	0.0557	35	1.4448
11	0.0622	36	1.6595
12	0.0698	37	1.9063
13	0.0784	38	2.1901
14	0.0884	39	2.5164
15	0.0998	40	2.8916
16	0.1130	41	3.3230
17	0.1281	42	3.8190
18	0.1455	43	4.3893
19	0.1655	44	5.0451
20	0.1885	45	5.7992
21	0.2150	46	6.6662
22	0.2454	47	7.6631
23	0.2803	48	8.8093
24	0.3205	49	10.1273
25	0.3667	50	11.6427

Table 3 – Time channels for the TS-150.

3.5 MAGNETIC SYSTEM

The airborne magnetometer system consists of the housing, the sensor and control module and Larrmour frequency counter. The counter output rate is 10 Hz in digital RS 232 format. Power is provided to the sensor electronics via a 28 VDC power cable on the tow cable which is terminated to a 5-pin connector at the magnetometer housing. This cable also contains conductors that carry the RS 232 signal.

3.6 MAGNETOMETER SENSOR

The magnetometer sensor is a model CS-3 made by Scintrex Limited. It is an optical split-beam cesium magnetometer and consists of a sensor head with a 3-m cable connected to a sensor driver. The output of the sensor driver is a larmour frequency which is linearly proportional to the earth’s magnetic field. The CS-3 is shown in Figure 6 and the sensor specifications are given in Table 4.

Figure 6 – Scintrex CS-3 magnetometer sensor, cable and electronics.

3.7 LARMOUR COUNTER

The larmour frequency is input into a frequency counter made by Triumph Instruments. The counter can convert the magnetic field to a theoretical accuracy of 0.2 pT. The output of the frequency counter is a digital value of the magnetic field with +/- 0.001 nT resolution. This value is transmitted to the EM console at a 10 Hz output rate.

The larmour counter is not synchronized to the EM transmitter but is synchronized instead to the EM data system. This allows the frequency counter to average down the magnetic field caused by the on-time pulse from the EM transmitter. The noise resulting from lack of synchronization to the EM transmitter is removed using a high-cut frequency filter during processing which also removes the effects of drop-outs when the magnetometer sensor loses lock with the magnetic field (common during turn-arounds).

3.8 SENSOR HOUSING

The magnetometer sensor housing is made from a thin-wall fiberglass tube (see Figure 7). The manufacturer is AeroComp of London, Ontario. Within the housing a two-axis gimbal holds the sensor and can be rotated in both the horizontal and vertical plane. The sensor was set to the point 45º degrees forward with a 25º azimuth for this survey. The housing contains the sensor driver electronics and the larmour frequency counter.

Operating Principal	Self-oscillation split-beam Cesium Vapor (non-radioactive Cs-133)
Operating Range	15,000 to 105,000 nT
Gradient Tolerance	40,000 nT/meter
Operating Zones	10° to 85° and 95° to 170°
Hemisphere Switching	a) Automatic b) Control voltage c) Manual
Sensitivity	0.0006 nT √Hz rms
Noise Envelope	Typically, 0.002 nT P-P, 0.1 to 1 Hz bandwidth
Heading Error	+/- 0.25 nT (inside the optical axis to the field direction angle range 15° to 75° and 105° to 165°)
Absolute Accuracy	<2.5 nT throughout range
Output	a) Continuous Larmor frequency proportional to the magnetic field (3.49857 Hz/nT) sine wave signal amplitude modulated on the power supply voltage b) Square wave signal at the I/O connector, TTL/CMOS compatible
Information Bandwidth	Only limited by the magnetometer processor used
Sensor Head	Diameter: 63 mm (2.5”) Length: 160 mm (6.3”) Weight: 1.15 kg (2.6 lb)
Sensor Electronics	Diameter: 63 mm (2.5”) Length: 350 mm (13.8”) Weight: 1.5 kg (3.3 lb)
Cable, Sensor to Sensor Electronics	3 m (9’ 8”), lengths up to 5 m (16’ 4”) available
Operating Temperature	-40°C to +50°C
Humidity	Up to 100%, splash proof
Supply Power	24 to 35 Volts DC
Supply Current	Approx. 1.5 A at start up, decreasing to 0.5 A at 20°C
Power Up Time	Less than 15 minutes at -30°C

Table 4 – Scintrex CS-3 specifications.

Figure 7 – Airborne magnetometer housing with tow cable.

3.9 BASE STATION MAGNETOMETER

A GSM-19 base station magnetometer (manufactured by Gem Systems) was used to record variations in the earth's magnetic field and referenced into the master database using a GPS UTC time stamp. This system is based on the Overhauser principle and records the total magnetic field to within +/- 0.02 nT at a one (1) second time interval.

The base station unit was erected about 400m west of the edge of Highway 655 just past the turn off to the Kidd Creek Mine. The unit was assembled each morning and disassembled in the evening so that the batteries could be recharged back at the hotel.

Figure 8 – Base station magnetometer used for diurnal corrections.

3.3 NAVIGATION

Navigation was provided by the AgNav Incorporated (AgNav-2 version) GPS navigation system (Figure 9 - left) for real-time locating while surveying, guidance along survey lines, and ground speed monitoring. The AgNav unit was connected to a Tee-Jet GPS receiver (Figure 9 – right).

Also used was a Garmin 19x antenna and receiver located on the HTEM airframe. The Garmin 19x, which is capable of sub five-meter accuracy, was sampled at 10 Hz.

Figure 9 – AgNav main console (left) and Tee-Jet GPS receiver (right).

3.4 RADAR ALTIMETER

The radar altimeter transmitter and receiver antenna were fixed to the rear skids of the helicopter (one antenna on each skid) approximately 36” apart. The coaxial cables were fed through the floor of the helicopter and routed along the floor. Both coaxial cables connected to the controller which was located near the TDEM-2400 control unit. On the output side of the controller (Figure 10 - left) a proprietary 16-bit A/D convertor was connected proving digital input to the TDEM-2400 via RS 232 format. The altimeter signal was also fed into a digital read-out unit (Figure 10 - right) mounted on the dash board of the helicopter in clear vision of the pilot to provide height above ground navigation.

Figure 10 – Freeflight radar altimeter controller and digital readout.

3.5 HELICOPTER

The helicopter used (Figure 11) was an AS350 D2 with registration C-FXBP, owned and operated by Expedition Helicopters and based in Cochrane, Ontario.

Figure 11 – The survey used an AS350 D2 as shown above.

3.6 PERSONNEL

The following personnel were involved in the survey (Table 5).

Individual	**Position**	**Description**
Nick Greenfield and Devin Landis	Pilot	Helicopter pilot
Dan LeBlanc	Operator	Operated and maintained the equipment
Steve Balch	Field Processing	On-site data processing
Steve Balch	Final Processing	Line-leveling, drift correction, diurnal corrections, tie-line leveling
Mike Cunningham	Reporting	Report write-up and interpretation
Steve Balch	Interpretation	Final review of data, interpretation write-up and recommendations
Steve Balch	Supervision	Liaison with Client. Responsible for the crew
Chris Balch	Mapping	Plotting maps, printing report, folding and binding
Randy Singh	Client	Client representative

Table 5 – Summary of Personnel.

4.0 DATA ACQUISITION

4.1 HARDWARE

Data was collected through the main console (the TDS-2400, see Figure 12) which contained both the acquisition system and dc-dc power control module (booster circuit) for the transmitter coil. The TDS-2400 has a hardware controller that sets the timing for the four (4) 24-bit A/D converters that sample at 9.48 µs. The controller also generates and transmits the timing control signals to the transmitter driver located on the airframe.

The main controller also performs synchronization between the transmitter and receiver and all ancillary information (GPS, MAG, EM, RAD ALT). The ancillary information is digitized and stored at a rate of 10 Hz. The resulting data string is transmitted to a laptop computer and stored on an internal hard-drive.

Figure 12 – Triumph TDS-2400 EM console and acquisition system.

4.2 SOFTWARE

A rugged laptop computer running the Windows 10 operating system controls the incoming data stream from the TDS-2400. The software on the laptop (AirDAS) is capable of real-time acquisition with no data loss from 25 Hz to 300 Hz for a duty cycle that can vary from 10% to 50% (nominally set at 30-35%).

During the survey the Operator can monitor the incoming differential GPS data, radar altimeter, magnetometer and all EM profiles.

After each flight data is copied from the laptop internal hard-drive onto a memory stick. While there is no limit on the maximum file size during acquisition, the processing software can only process up to five (5) continuous hours of recorded data. For longer flights the data can be broken into two files.

4.3 CALENDAR

Data was acquired over a 9-day period (Table 5). Mobilization to Timmins occurred on October 25th from Cochrane, Ontario. Assembly and testing of the system previously took place on October 22nd and 23rd. Production com

menced on October 26th and was completed on November 2nd. The equipment was removed from the helicopter on November 2nd and the crew de-mobed back to Rockwood, Ontario November 3rd.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Oct. 21	Oct. 22	Oct. 23	Oct. 24	Oct. 25	Oct. 26	Oct. 27
				Mob to Timmins	FL-04, FL-06	FL-07 FL-08
Oct. 28	Oct. 29	Oct. 30	Oct. 31	Nov. 1	Nov. 2	Nov. 3
Standby	Standby	FL-09	Standby	FL-10, FL-11	FL-12, FL-13	Demob

Table 6 – Time schedule of the survey.

5.0 DATA PROCESSING

Preliminary data processing is performed using BECI proprietary methods. This includes compensation, filtering and line leveling of the HTEM data. This also includes calculation of the vertical magnetic gradient, analytic signal, digital terrain model, bird height, and merging of the base station magnetic data (sampled at 1.0 sec) with the survey data (sampled at 0.1 sec).

5.1 NAVIGATION

The helicopter pilot uses “ideal” flight lines as guidance during surveying as displayed on the real-time AgNav system with the aid of a helicopter mounted GPS. A separate GPS mounted to the bird is used to record actual position. The sample rate of the GPS is 10 Hz, the same as the EM, MAG and ancillary data collected in flight.

The GPS unit outputs both latitude, longitude and easting, northing values, all in the WGS-84 Datum, using a UTM Projection. The positional data is not filtered but occasional bad data points are interpolated using a linear algorithm.

5.2 TERRAIN CLEARANCE

The radar altimeter is located under the base of the helicopter. The helicopter mounted radar altimeter is used to maintain terrain clearance by the pilot. A digital indicator is mounted on the dashboard of the helicopter. This installation is approved by a licensed helicopter engineer provided by the helicopter operator.

5.3 EM DATA PROCESSING

The EM data is processed using BECI proprietary software designed to compensate, filter and level both the off-time and on-time data.

The first step in processing is to determine the transmitter shut-off time and align the time gates to this position. The length of time that the transmitter is on is known as the on-time. The time gates are logarithmically spaced in the off-time and linearly spaced in the on-time.

The second processing step is the calculation of the system background transient. This is done at a suitable flight height, nominally 1,000 feet or higher. During this time EM data is collected for a period of 50 seconds and averaged into a single background transient. This is subtracted from the transients recorded on line.

The third step is to assign the flight line numbers to each data point so that the flight can be separated into flight lines within Geosoft.

Line-leveling and drift-correction are achieved on a flight by flight basis using the background transients, recorded at the start and end of each flight.

Filtering the data involves a two-step process. Spikes are removed using an algorithm based on the Naudy non-linear filtering algorithm. This is followed by a 61-point Hanning filter that has the effect of smoothing the profiles over an equivalent distance of approximating twice the nominal flight height.

Micro-leveling of the late time channels is also performed before the data file is written to disk. Conductor picks and Tau time constants are determined at this point as well.

B-field processing of the time channels uses a fully integrated on-time in addition to the integrated off-time (i.e. full waveform). The early off-time channels are evaluated for possible primary field leakage (this involves a compensation filter based on linearly derived correlation between the late on-time and early off-time samples). The exact methodology is considered proprietary.

5.4 MAGNETIC DATA PROCESSING

The magnetic data (i.e. MAG from the airborne sensor and BMAG from the ground sensor) is collected without a lag time (i.e. synchronous with the HTEM data and UTC time), therefore a lag time correction is not applied. In areas where the MAG sensor has become unlocked (e.g. most often during turn-arounds), the total magnetic field values are replaced with a dummy value ("*") and the data is later interpolated in Geosoft.

The raw ASCII survey data files and BMAG ASCII data files are imported into BECI software and merged using UTC time, common to both files. A quality control check of the BMAG data is made on a day to day basis.

Diurnal magnetic corrections are applied to the MAG data using the BMAG data. The base station data (i.e. BMAG) is linearly interpolated from a 1.0 sec sample rate to 0.1 sec to correspond to the flight data after the BMAG has been filtered with a 60 second filter.

Once the diurnal field is subtracted from the MAG data, a heading correction is applied and the resulting total magnetic intensity (TMI) is micro-leveled.

6.0 RESULTS

The total magnetic intensity (TMI) is shown in Figure 13 and the vertical derivative is shown in Figure 14.

The anomalous EM response is shown in Figure 15 (Early Off-Time) to Figure 19 (late off-time).

Figure 20 shows the digital terrain model for the survey area.

6.1 PREVIOUS EXPLORATION

Much of the summary on previous exploration has been taken from "Report on Geophysical Work MacDiarmid 33/42, MacDiarmid Township" by D Londry (2000) which contains an excellent summary of the historical work performed there as well as the most recent work of Falconbridge performed in 1999.

Exploration within MacDiarmid Township is documented back to the 1940s when Inco Limited explored for nickel in the region. Inco drilled 8 holes in 1946 and intersected an "ultrabasic complex". Inco drilled 2 more holes into the ultrabasic complex in 1960 and then dropped the property.

Texas Gulf Sulphur drilled 2 holes in 1961 and intersected graphitic zones within felsic volcanics.

In 1964 and 1965 Silver-Miller and Silvertown Mines Limited drilled a total of 8 shallow holes within MacDiarmid intersecting gabbro and felsic volcanics.

Also, in 1964 North Rankin Nickel Mines and Bruce-Presto Mines Limited drilled several holes encountering ultrabasic rocks, felsic volcanics and graphite often containing pyrite and pyrrhotite.

In 1969 Noranda conducted a ground geophysical program consisting of magnetics and VLEM. Noranda drilled only one hole and intersected felsic volcanics but no conductor.

It is noted that virtually most of the exploration programs within MacDiarmid consisted of ground magnetics and HLEM (or VLEM) to map conductive and magnetic trends, followed by drilling. Overburden in the area is typically 50 m thick and can be conductive.

In 1972 Canadian Johns-Manville drilled 6 holes and encountered peridotite and gabbro along a contact.

In 1977 Geophysical Engineering Limited drilled 2 holes and intersected graphitic slate at the contact between gabbro and felsic volcanics.

In 1989 Falconbridge drilled 5 holes to test geophysical conductors. The drilling results were not described.

In 1999 Falconbridge drilled 4 holes to test a series of HLEM conductors. Minor amounts of Cu and Zn were intersected in graphitic felsic volcanics. During the HLEM surveys it was noted that the quadrature response was inverted – a sign of highly conductive overburden. At least one HLEM response was interpreted to be sub-horizontal due to the asymmetry of the HLEM profiles. The conductive overburden likely played a greater role in the HLEM responses than was realized during this exploration program and is thought to have been the reason for the interpretation of sub-horizontal conductor responses.

6.2 CURRENT EXPLORATION

The image of total magnetic intensity or TMI (Figure 13) shows a strongly magnetic feature with a strike length of 4 km which is the ultrabasic complex originally intersected by Inco in 1964. Of greatest interest is the fact that peridotite, dunite and gabbro are noted in many of the historic drill logs but there are almost no assays taken within this ultrabasic complex, even though it is described as highly serpentinized in certain areas. Most of the assays were taken from the felsic volcanic units suggesting that the ultrabasic complex itself was not of exploration interest but the surrounding volcanics (and their contact with the ultrabasic complex) were the main targets.

Figure 14 shows the first vertical derivative of the total magnetic intensity. The ultrabasic complex appears to be a layered ultramafic complex.

Figure 15 shows the early off-time response from the “z”-coil which is maximum coupled to the ground. There is a close correlation between the TMI and EM responses suggesting the ultrabasic complex is both magnetic (i.e. magnetite-rich) and conductive (i.e. serpentinized and therefore clay-rich). Farther to the south there are other EM trends that are unrelated to the ultrabasic complex but that could also be of exploration interest.

Figure 18 shows the mid-to-late off-time response from the “z”-coil. Even in near-late time the EM response over the layered ultramafic complex remains suggesting the response is caused by the bulk conductance of the complex, a likely result of clay alteration due to serpentinization of the rocks. But the conductance of the complex is not high as the response is diminished by late time (Figure 19).

Within MacDiarmid there have been intersections of anomalous economic metals. A short summary is given below:

1. DD-65-7 intersected 0.22% Ni starting at 102 m downhole (1965).
2. M3-1-73 intersected up to 0.17% Ni over several narrow intervals (1973).
3. MAC-2 intersected up to 0.3% Ni over narrow intervals at shallow depth (1979).
4. MCD42-04 intersected up to 0.175% Ni and 0.79% Zn at 159 m downhole (1997).
5. MCD41-02 intersected up to 0.13% Ni within intervals up to 4.5 m thick (1999).
6. MCD32-03 intersected serpentinized dunite. Ni was reported but no assays were given (1999).

The most important points of the above intersections are that Ni was reported within a dunite and the dunite itself was not seen as an exploration target (suggesting its mineral concentrations remain unknown).

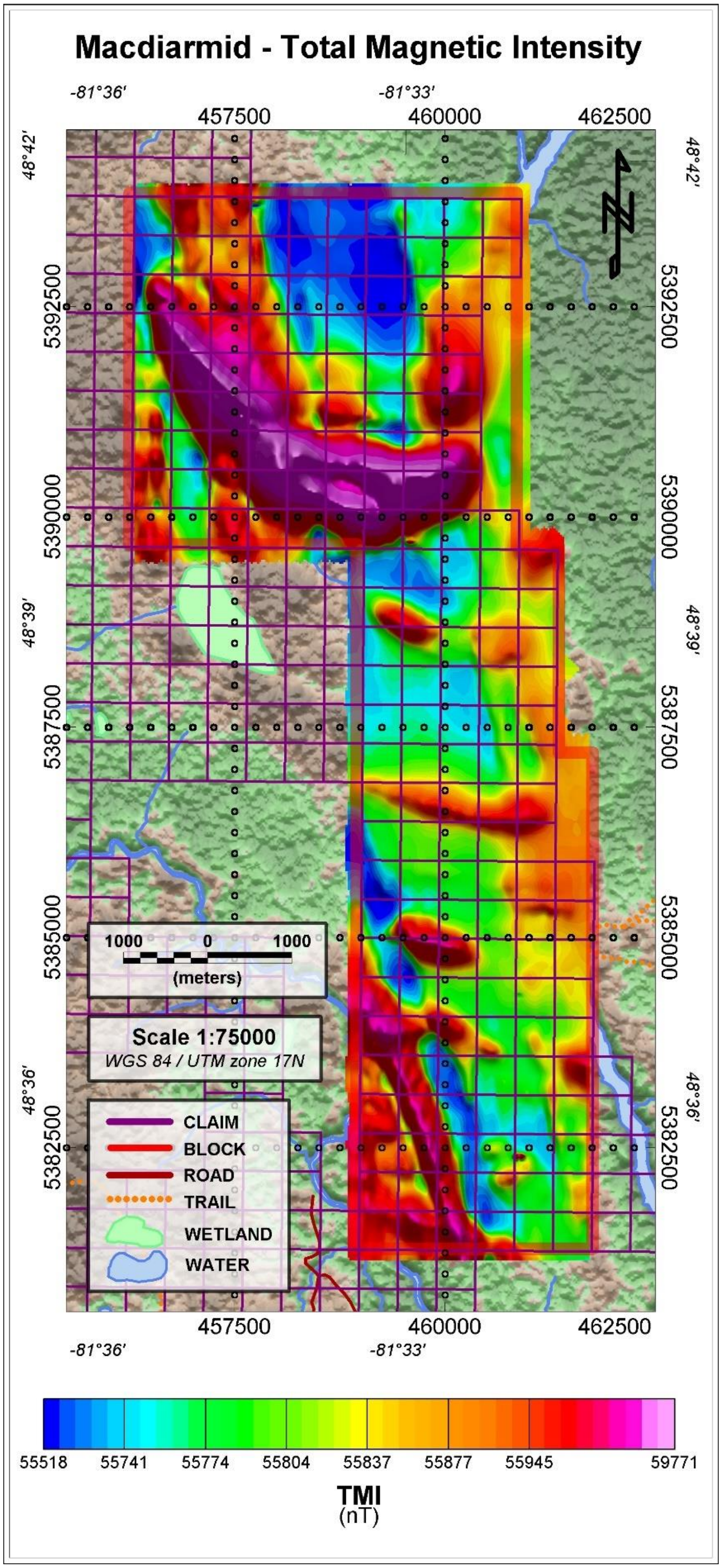

Figure 13 – Shaded image of the Total Magnetic Intensity (TMI) over the MacDiarmid block.

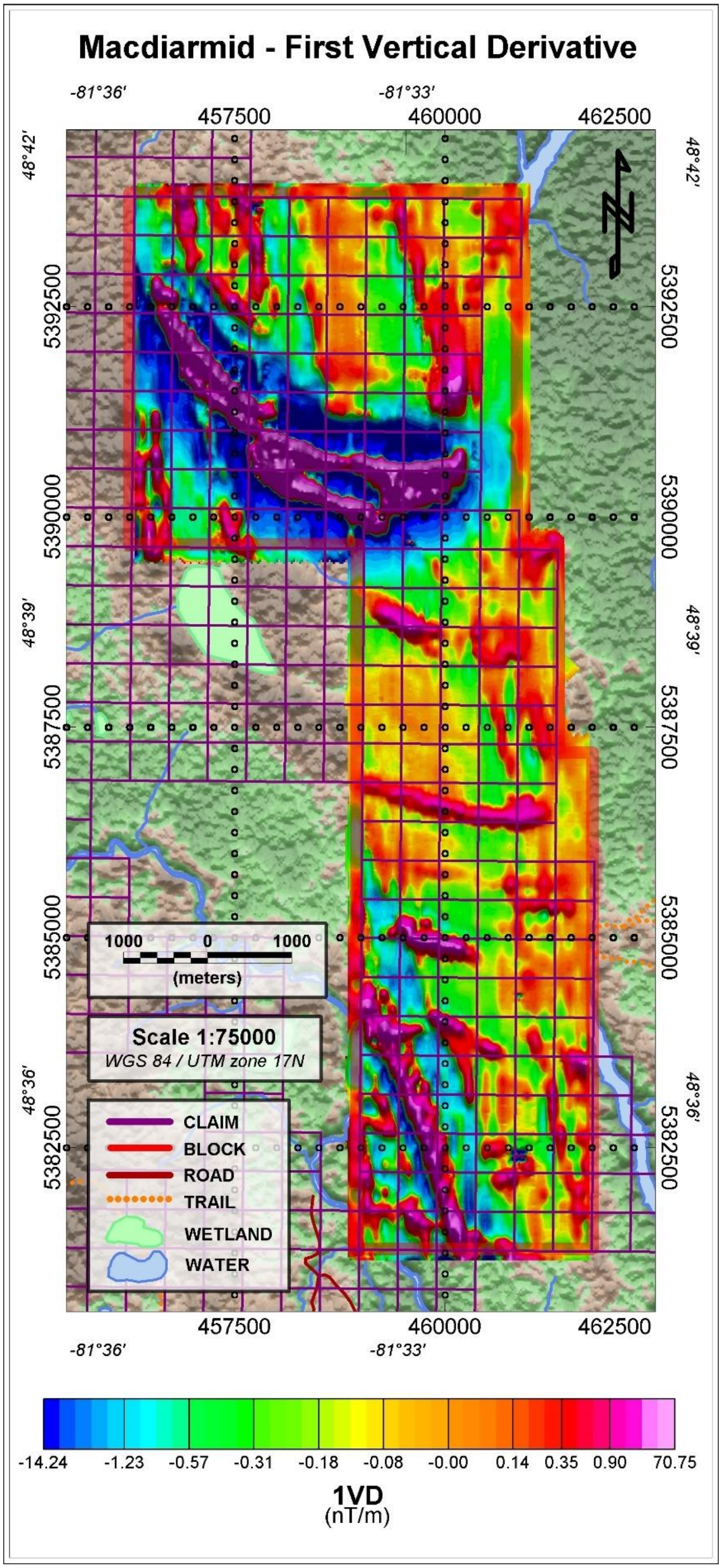

Figure 14 – Shaded image of First Vertical Derivative (1VD) over the MacDiarmid block

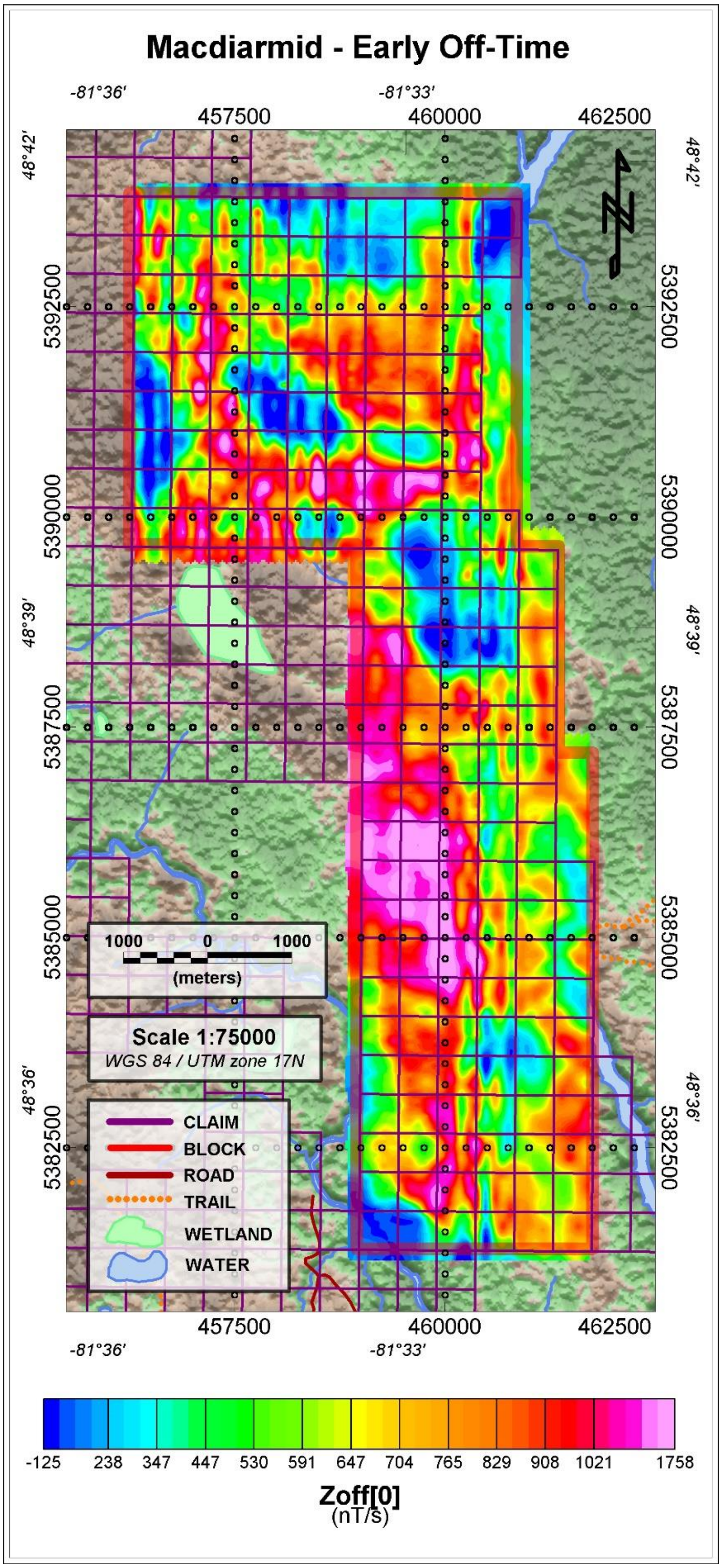

Figure 15 – Image of the Early Off-Time (Zoff[0]) over the MacDiarmid block.

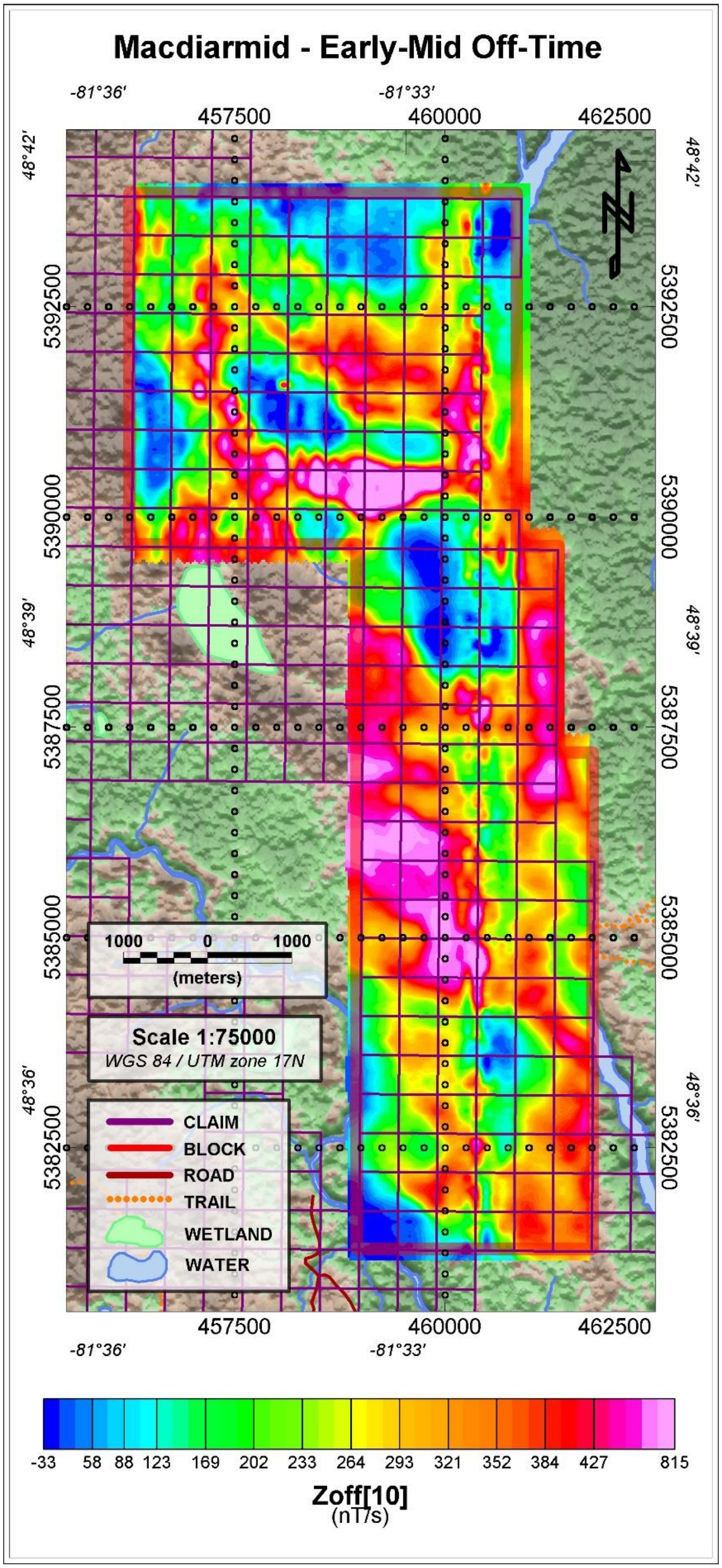

Figure 16 – Image of the Early-Mid Off-Time (Zoff[10]) over the MacDiarmid block.

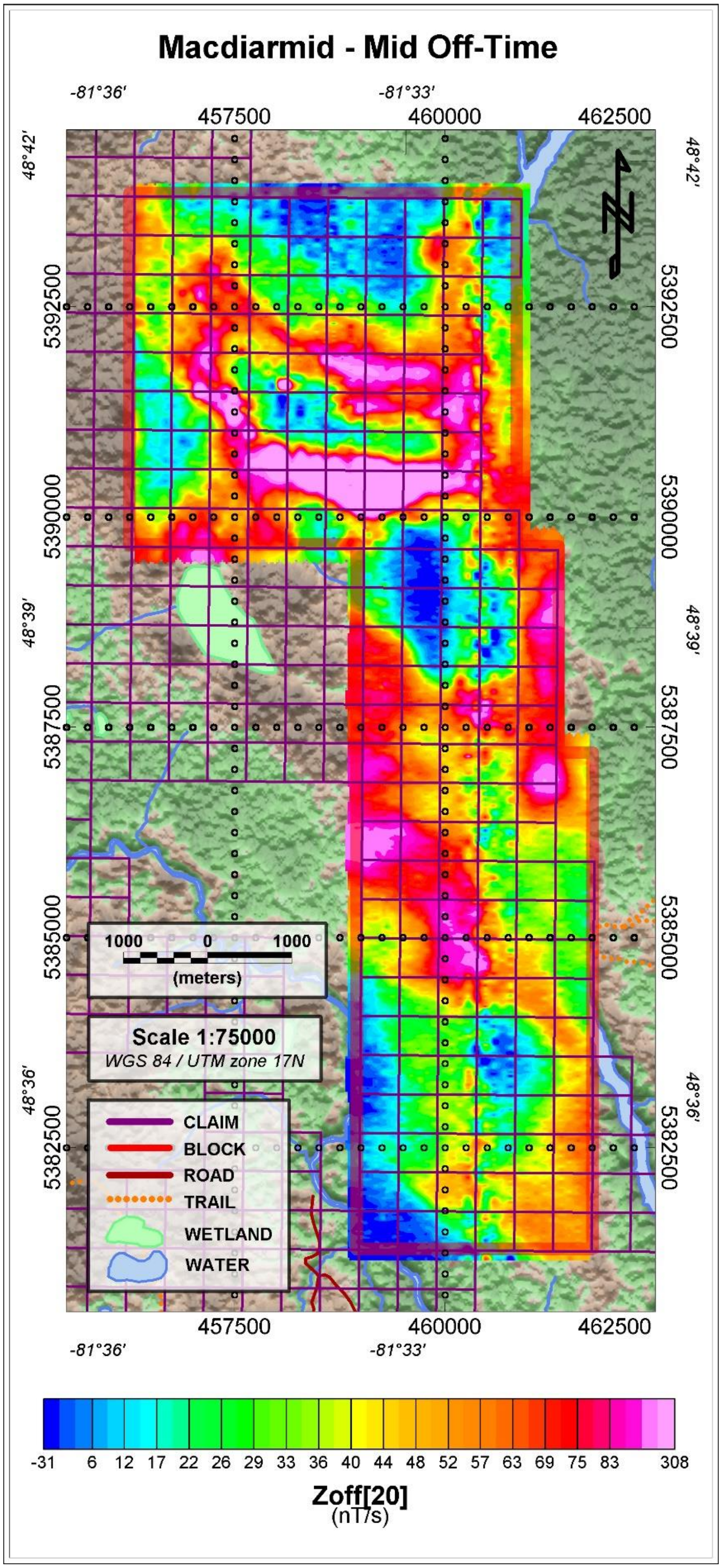

Figure 17 – Image of the Mid Off-Time (Zoff[20]) over the MacDiarmid block.

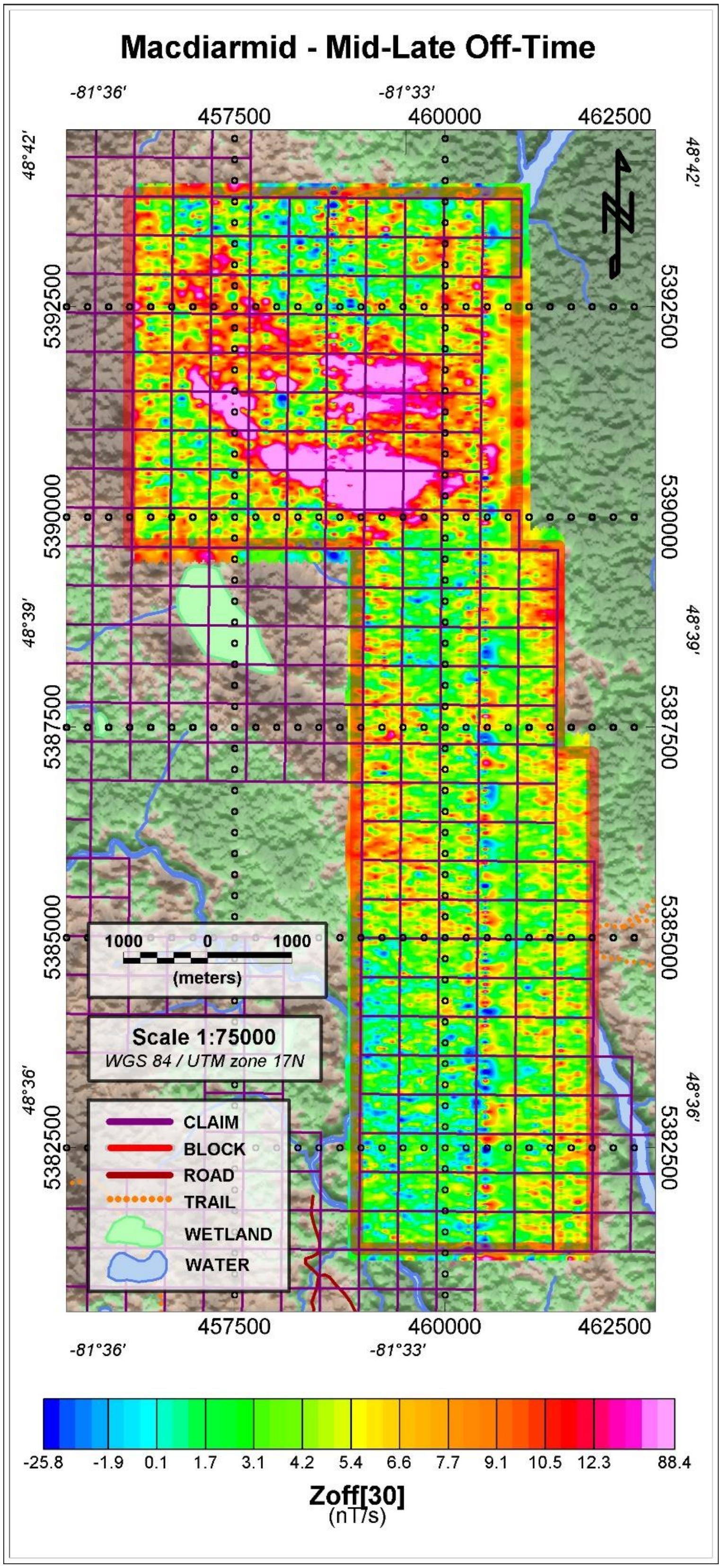

Figure 18 – Image of the Mid-Late Off-Time (Zoff[30]) over the MacDiarmid block.

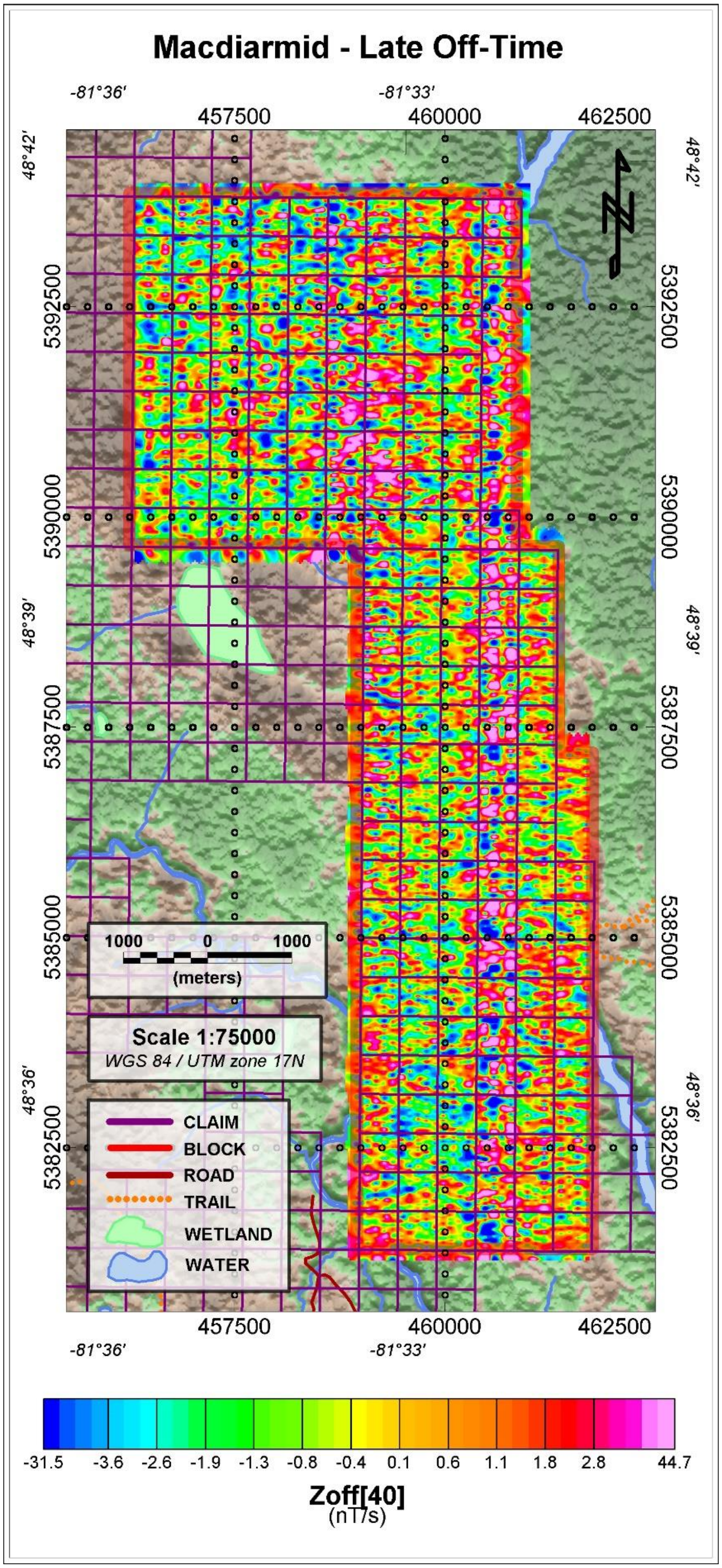

Figure 19 – Image of the Late Off-Time (Zoff[40]) over the MacDiarmid block.

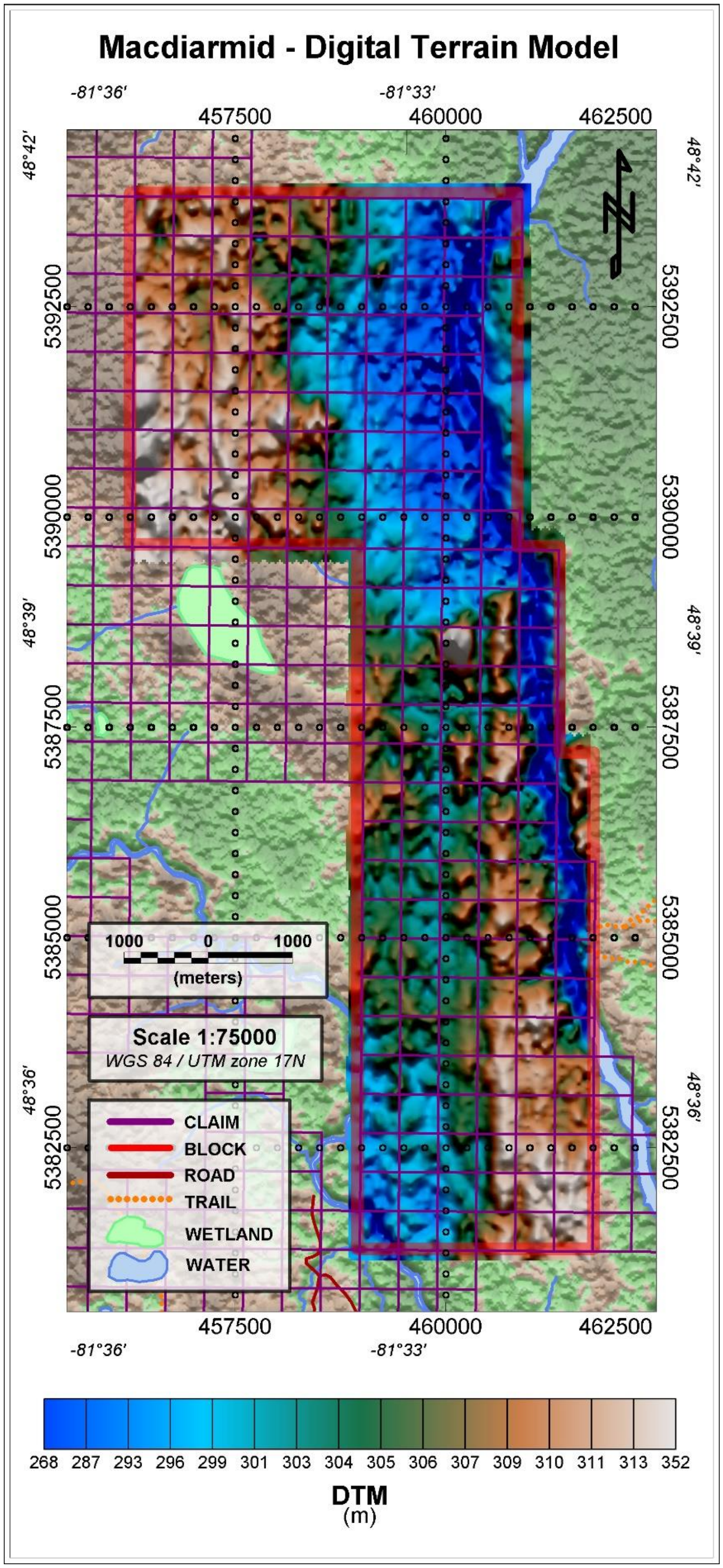

Figure 20 – Shaded image of the Digital Terrain Model (DTM) over the MacDiarmid block.

7.0 RECOMMENDATIONS

1. A review of the historic exploration data is required to determine if the ultrabasic complex, originally discovered by Inco, has been adequately drilled and assayed. Inco may not have reported the assay data.

2. A township-wide compilation of the historic drilling is required where collar locations, drillhole orientations and depths are acquired. Lithology and assays should also be compiled where available.

3. A review of the latest Falconbridge work (geophysics and drilling in 1999) should be reviewed as that company is familiar with the area and the report provides significant detail of previous work. One drillhole did not reach its intended target and remains untested.

4. A series of short drillholes could be proposed to intersect the most serpentinized sections of the ultrabasic complex (as interpreted from the magnetic data). These holes could be used for metallurgical testing to determine if any nickel present could be extracted. Such a program could be accomplished based on the data submitted with this report.

5. There are other possible conductive trends identified from this survey that warrant further work, but these targets should only be pursued with the available historic data compiled first.

6. Much of the historic exploration within MacDiarmid Township took place over 50 m of conductive overburden using shallow-penetrating EM systems. This should be considered when re-interpreting any of the historic drilling recommendations.

8.0 QUALIFICATIONS

I, Michael Cunningham, do hereby claim the following to be true:

1. I am a professional geoscientist (P.Geo.) in good standing, registered with the Association of Geoscientists of Ontario (#3007);
2. I am a graduate of Carleton University with a degree in Earth Sciences (Geophysics) (M.Sc, 2016);
3. I am a practicing exploration geophysicist with more than 4 years experience and reside at F-3070 Councillor’s Way, Ottawa, Ontario, K1T 2S6;
4. I have no direct interest in the MacDiarmid, Ontario property or in Noble Mineral Exploration Inc.;
5. I prepared this report in conjunction with Stephen Balch and we are responsible for its contents.

Dated at Ottawa, Ontario this the 10th day of January 2020.

Michael Cunningham, P.Geo.
Geophysicist
Balch Exploration Consulting Inc.

I, Stephen Balch, do hereby claim the following to be true:

1. I am a professional geoscientist (P.Geo.) in good standing, registered with the Association of Geoscientists of Ontario (#2250);

2. I am a graduate of the University of Western Ontario with a degree in Honors Geophysics (B.Sc., 1985);

3. I am a practicing exploration geophysicist with more than 30 years experience;

4. I reside at 11500 Fifth Line, Rockwood, Ontario, N0B 2K0;

5. I own 100,000 common shares of Noble Mineral Exploration Inc. which I acquired for investment purposes only and have no direct interest in the MacDiarmid Property;

6. I prepared this report in conjunction with Michael Cunningham and we are responsible for its contents.

Dated at Rockwood, Ontario this the 2nd day of February 2019.

Stephen Balch, P.Geo.
President
Balch Exploration Consulting Inc.

APPENDIX A – OUTLINE OF SURVEY POLYGONS

Table 7 shows the polygon corners in meters easting and northing, WGS-84, UTM ZONE 17N.

MacDiarmid WGS-84	
Easting (m)	**Northing (m)**
456,250	5,393,850
460,850	5,393,850
460,850	5,389,650
461,350	5,389,650
461,350	5,387,200
461,750	5,387,200
461,750	5,381,300
458,950	5,381,300
458,950	5,389,675
456,250	5,389,675
456,250	5,393,850

Table 7 – Corner coordinates for the survey block.

APPENDIX B - LIST OF DATABASE COLUMNS (.GDB FORMAT)

Channel Name	Description
X	X positional data (meters – WGS84, UTM Zone 14 North)
Y	Y positional data (meters – WGS84, UTM Zone 14 North)
EMFID	Time Fiducial from EM console (10 Hz)
TS	Time Fiducial from AirDAS software (10 Hz)
LINE	Flight line number
LAT	Latitude data (degrees – WGS84)
LON	Longitude data (degrees – WGS84)
Zgps	Altitude of helicopter (feet)
ANG	Flight direction angle (degrees)
DIR	+1 for North or East heading, -1 for South or West heading
TIME	GPS time (seconds after midnight) UTC
RADALT	Radar Altimeter (meters)
DTM	Digital Terrain Model (meters)
BHGT	Height of EM airframe above ground (meters)
MAG	Raw Total Magnetic field data (nT)
TMI	Processed, leveled Total Magnetic Intensity (nT)
BASEMAG	Base station magnetometer (nT)
VEL	Velocity of Airframe (meters per second)
ITX	Current in Transmitter Coil (Amps)
PRL	Powerline Indictor (nT/s)
PICKOFF	Off-time Anomaly Picks
PICKON	On-time Anomaly Picks
TAUOFF	Raw Off-time Time Constant (microseconds)
TAUON	Raw On-time Time Constant (microseconds)
Tau	TAUOFF edited to 30 microseconds

TauF	Tau line-leveled and filtered (microseconds)
dB_dt	Average of all off-time channels (nT/s)
B	Average of all on-time channels (nT/s)
Xoff	Off-time X coil array [0..49] (nT/s)
Xon	On-time X coil array [0..49] (nT/s)
Xbf	B-field X coil array [0..49] (nT/s)
Yoff	Off-time Y coil array [0..49] (nT/s)
Yon	On-time Y coil array [0..49] (nT/s)
Ybf	B-field Y coil array [0..49] (nT/s)
Zoff	Off-time Z coil array [0..49] (nT/s)
Zon	On-time Z coil array [0..49] (nT/s)
Zbf	B-field Z coil array [0..49] (nT/s)