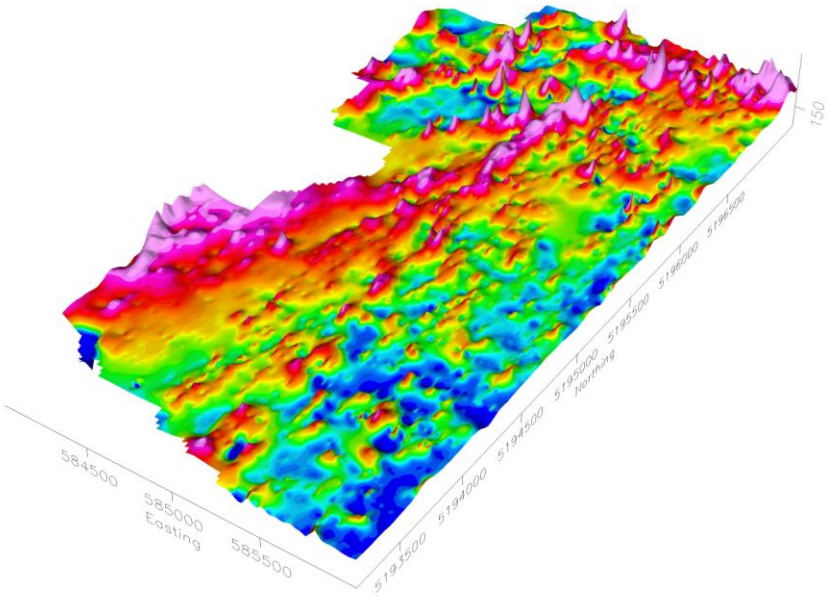
MAGNETOMETER SURVEY REPORT

HERITAGE GOLD PROJECT

BURIN PENINSULA, NEWFOUNDLAND



Prepared for

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May 08, 2016

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SUMMARY

*This report summarizes the logistics and other information along with an interpretation of data related to a total field magnetometer geophysical survey performed on the Heritage Gold Project located approximately near the town of Point May on the Burin Peninsula of Newfoundland. Puddle Pond Resources Inc. commissioned **RDF** Consulting Limited from April 22nd through to April 29th, 2016 to perform a high resolution, GPS enabled, ground magnetometer survey on the property. The Heritage Gold Project Survey consisted of 41 lines comprising a total of 74.525 line kilometers of data. A small 1.775 kilometer test survey was also undertaken over the Lord's Cove Property. The surveys were performed in an attempt to gain a better understanding of the local geology in the area.*

The magnetometer survey was performed using a high resolution GEM GSMP-35 potassium field magnetometers and a GEM GSM-19 Overhauser base station magnetometer. The base station unit was used to correct for variations in the earth's magnetic field.

The data obtained from the magnetometer survey was considered to be high quality and no problems were encountered with either the field or base units during the survey. The dataset was edited for all readings that were considered suspect or where "unlocking" of the signal occurred. The data collected over a portion of the Lord's Cove Survey was subject to significant cultural effects as Lines 1 through 4 are located over a buried dump site. Metal objects were noted throughout the survey area.

An interpretation of the Heritage Grid magnetic data was performed for the purpose of this report and a discussion of the results are contained within. The survey over the Heritage Grid proved very effective in identifying a significant number of structures and contacts along with identifying areas interpreted to be directly related to epithermal alteration known to exist on the Property. All maps and data files produced for this report have been appended to the accompanying data CD.

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I. INTRODUCTION

a) Scope

This report summarizes the logistics and other information related to a total field magnetometer geophysical survey performed on the Heritage Gold Project located near the small coastal town of Point May, Newfoundland (Figure 1). A small test grid was also performed over an area near Lord's Cove also referred to as the "Dump Grid". Basic results from the Lord's Cove survey area will be presented at the end of this report. Puddle Pond Resources Inc. commissioned ***RDF*** Consulting Limited (RDF) of Paradise, Newfoundland from April 22nd through to April 29th, 2016 to perform high resolution, GPS enabled, ground magnetometer surveys over these properties.

An experienced geophysicist, utilizing one potassium field magnetometer was used for the data collection. ***RDF*** collected a total of 74.525 line kilometers of total field magnetometer data over 41 grid lines on the Heritage Project accounting for 85,255 data points. An additional 1.775 line kilometers of data was collected on the Lord's Cove Grid. The survey was performed in an attempt to delineate and gain a better understanding of known mineralization and geology in the area.

b) Disclaimer

The type of work performed and presented in this report is by nature strictly interpretive. There are always ambiguities in qualitative and quantitative geophysical interpretations. All decisions made by the client related to the data presented in this report are considered solely the clients responsibility.

c) Grid Location and Access

The survey was based out of the small town of Point May, located near the very southern tip of the Burin Peninsula of Newfoundland. Point May is a town of approximately 150-250 people and provides an excellent staging area for work on the Project. Point May is accessible via the Burin Highway (Route 210).

Access to the Hertitage grid area can be easily gained from Point May via a well maintained ATV trail just outside the Community. The grid terminates along the main highway on its southern extents and extends approximately 5 kilometers to the north.

The Heritage Project area is characterized by very open gently rolling hills with abundant bogs, low thick brush and occasional tuckamore growth. Small lakes and ponds exist throughout the area. The Heritage grid map has been provided as Figure 2.

d) Personnel

Table 1 summarizes all RDF personnel involved in performing and finalizing geophysical work on the Heritage Gold Project.

Name	Address	Dates Worked	Work Performed
Dean Fraser (P.Geo.)	St. John's, Newfoundland	April. 22 – Aug. 29, 2016	Geophysicist and Report

Table 1: RDF Personnel employed on the Heritage Gold Project Geophysical Survey

Figure 1: Heritage Gold Project Location Map (Taken from Goggle Earth)

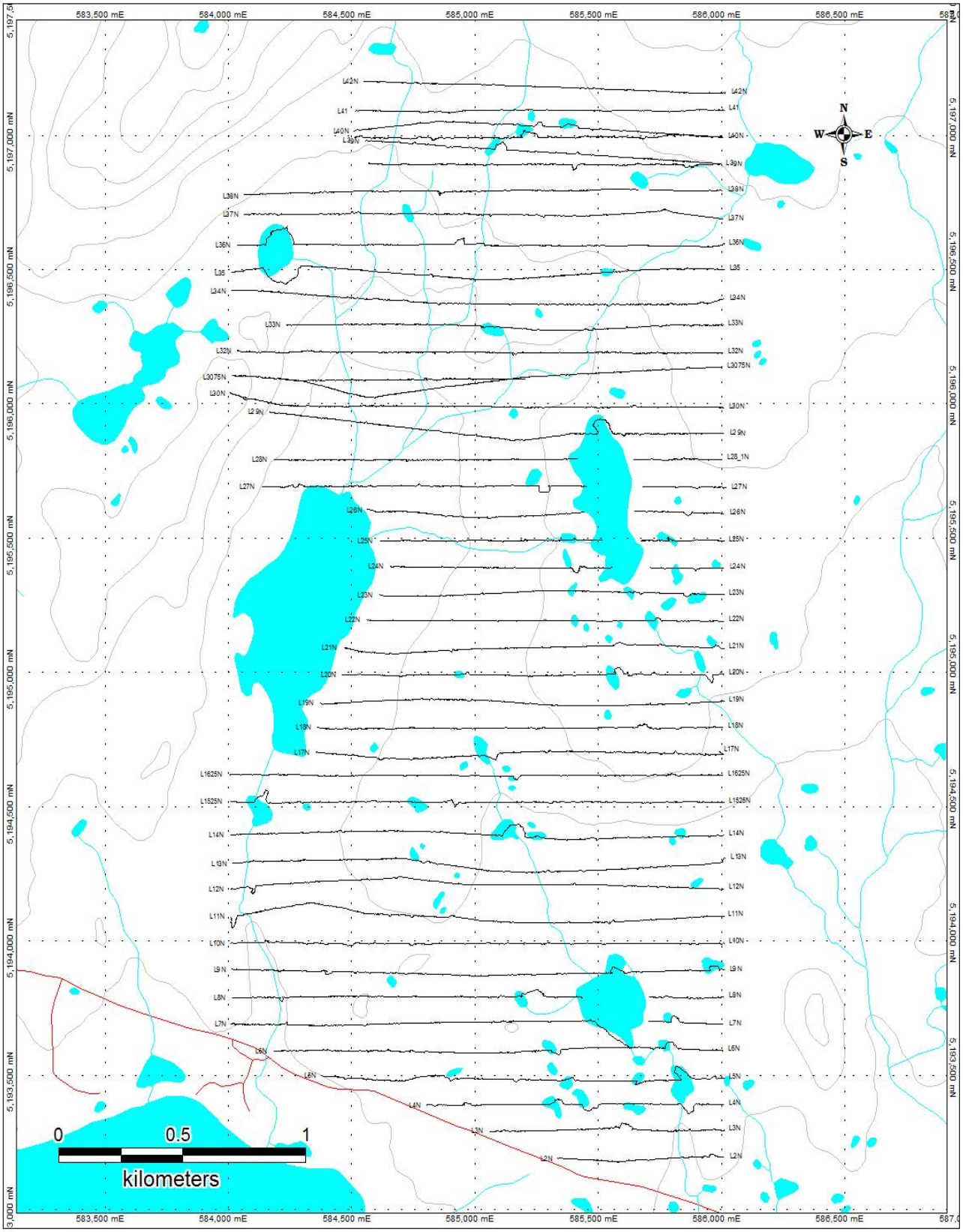


Figure 2: Heritage Gold Project Grid Map (Based on Magnetometer GPS Survey)

II. MAGNETOMETER SURVEY SPECIFICATIONS

Table 2 summarizes survey equipment and related survey parameters for the magnetometer survey performed on the Heritage Gold Project. Appendix A provides the detailed specifications of the State-of-the-Art GEM equipment used on the survey.

Field Magnetometer	GEM GSMP-35 Potassium Magnetometers
Base Magnetometer	GEM GSM-19 Overhauser Magnetometer
Magnetic Survey Type:	Total Field
Sampling Rate (Base Station)	5 Seconds
Sampling rate (Field Unit)	1 second
Base Datum Used	51,300 nT

Table 2: Magnetometer Survey Specifications

III. MAGNETOMETER SURVEY PRODUCTION SUMMARY

Tables 3 and 4 below summarize survey coverage for the magnetometer geophysical method over the Heritage Grid and Dump Grid. The line distances were calculated from the start and end locations provided by Puddle Pond. A total of 76.30 line kilometers of data was collected on the two grids.

Grid 1: Heritage Gold Project			
Line #	Station From	Station to	Distance (m)
L2N	0W	675W	675
L3N	0W	950W	950
L4N	0W	1175W	1175
L5N	0W	1625W	1625
L6N	0W	1825W	1825
L7N	0W	2000W	2000
L8N	0W	2000W	2000
L9N	0W	2000W	2000
L10N	0W	2000W	2000
L11N	0W	2000W	2000
L12N	0W	2000W	2000
L13N	0W	2000W	2000
L14N	0W	2000W	2000
L15N	0W	2000W	2000
L16N	0W	2000W	2000
L17N	0W	1650W	1650
L18N	0W	1650W	1650
L19N	0W	1625W	1625
L20N	0W	1550W	1550
L21N	0W	1525W	1525
L22N	0W	1500W	1500

L23N	0W	1400W	1400
L24N	0W	1350W	1350
L25N	0W	1400W	1400
L26N	0W	1400W	1400
L27N	0W	1875W	1875
L28N	0W	1825W	1825
L29N	0W	2000W	2000
L30N	0W	2000W	2000
L31N	0W	2000W	2000
L32N	0W	2000W	2000
L33N	0W	1750W	1750
L34N	0W	2000W	2000
L35N	0W	2000W	2000
L36N	0W	1975W	1975
L37N	0W	1950W	1950
L38N	0W	1950W	1950
L39N	0W	1450W	1450
L40N	0W	1500W	1500
L41N	0W	1500W	1500
L42N	0W	1500W	1500
L3075N (repeat)			1000
L39N (repeat)	0W	1450	1450
L40N (repeat)	0W	1500	1500
		Total:	74525 **(74.525km)**

Table 3: Heritage Grid Magnetometer Survey Production Summary

Grid 2: Lord's Cove Grid			
Line #	Station From	Station to	Distance (m)
L1	75W	225E	300
L2	100W	250E	350
L3	100W	100E	200
L4	150W	75E	225
L5	0W	225E	225
L6	0W	375E	375
BL0	0N	75N	75
BL1	300W	275W	25
		Total:	1775 **(1.775km)**

Table 4: Lord's Cove Grid Magnetometer Survey Production Summary

IV. LOGISTICS DISCUSSION

a) Magnetometer Method

The total field magnetometer survey was performed over the Heritage Gold Project using a high resolution GEM-GSMP35, GPS enabled potassium magnetometer. A GEM-GSM19 Overhauser base station was employed to correct for diurnal variations in the earth's magnetic field during surveying. The datum used for the base station corrections was 51,300 nanoteslas. The use of a high resolution base station ensures high quality data is the end result once corrections are made at the end of each field day. The base station was best located in a magnetically "quiet" area near the survey grid. In the case of the Heritage survey, the base station remained in a set location throughout the duration of the survey. This location was also used for the reconnaissance survey over the Lord's Cove Grid. Coordinates for the base station location have been provided in Table 5. These coordinates are provided in NAD83/Zone 21.

All readings were collected on grid lines using a 1 second sampling rate. The one second sampling rate equated to an approximate 0.5 - 1.0 meter station spacing. A minimal amount of cultural noise was experienced on the Heritage Grid. A few drill collars with remaining casing did affect the data locally. Heavy cultural features were encountered on the Dump Grid on Lines 1 through 4. Field notes related to the survey can be found in Appendix B of this report.

Grid Name	UTM Coordinate (GPS Derived) – NAD83/Zone 21	
	Easting	Northing
Heritage and Lord's Cove Grid	583471	5195487

Table 5: Magnetometer base station location

While performing the magnetometer survey, the geophysical operator, where possible, tried to maintain readings directly on the grid line. This was not always possible due to impassable areas, inadequately cut grid lines and obstacles such as bogs, stream and ponds. The operator also attempted to tag picketed stations on the grid lines. These tagged data points can be found in the main GeoSoft database. Many pickets in the field have lost their line and station numbers and frequent chaining errors were noted. For this reason, the tagged station numbers in the database should be used with extreme caution and not trusted as a guide to anomalies.

The dataset was edited for any readings that were considered suspect or where the "unlocking" of the signal occurred. Unlocking of the signal can occur in conditions where the operator cannot maintain a constant sensor orientation due to the scaling of steep areas, attempting to bush crash through trees, slips and falls, loss of satellite or areas where extremely high gradients occur.

At the end of each survey day, data was downloaded to a Laptop computer and processed using the GeoSoft Oasis Montaj data processing software. Data was processed and plotted on a nightly basis. All data was backed up to an external hard drive.

b) Final Presentation

Schematic maps showing the results of the total field magnetic survey for the Heritage Grid have been provided below as Figures 4 – 8. These maps have been appended to the report as hardcopies and also in digital format on the accompanying CD.

All processed digital data, maps and reports related to the Heritage magnetometer survey can be found on the Appended CD (Appendix C). All data, images and maps related to this report utilize the Universal Transverse Mercator (UTM), North American Datum (NAD) 27, Zone 21coordinate system. Figure 3 below provides the specifications for the projection.

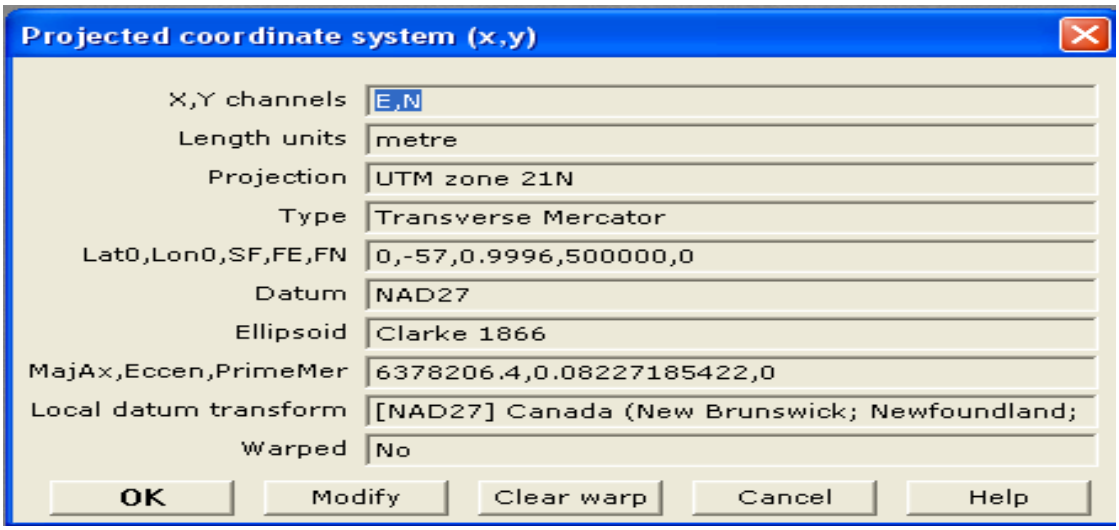


Figure 3: NAD 27, Zone 21 Projection Specifications

All data plotted reflects the corrected total field measurements obtained from the ground survey. No filters or smoothing algorithms have been applied to the TMI dataset.

The following scaled geophysical maps have been produced as hard copies and are appended to the CD which accompanies this report.

- DTM Elevation Plot (1:10,000)
- Total Field Magnetics Contour Map : (1:10,000)
- First Vertical Derivative of TMI Map (1:10,000)
- Analytical Signal Contour Map (1:10,000)
- Reduction to the Magnetic Pole Map (1:10,000)

Data processing and final presentations were produced using the GeoSoft Oasis Montaj geophysical software.

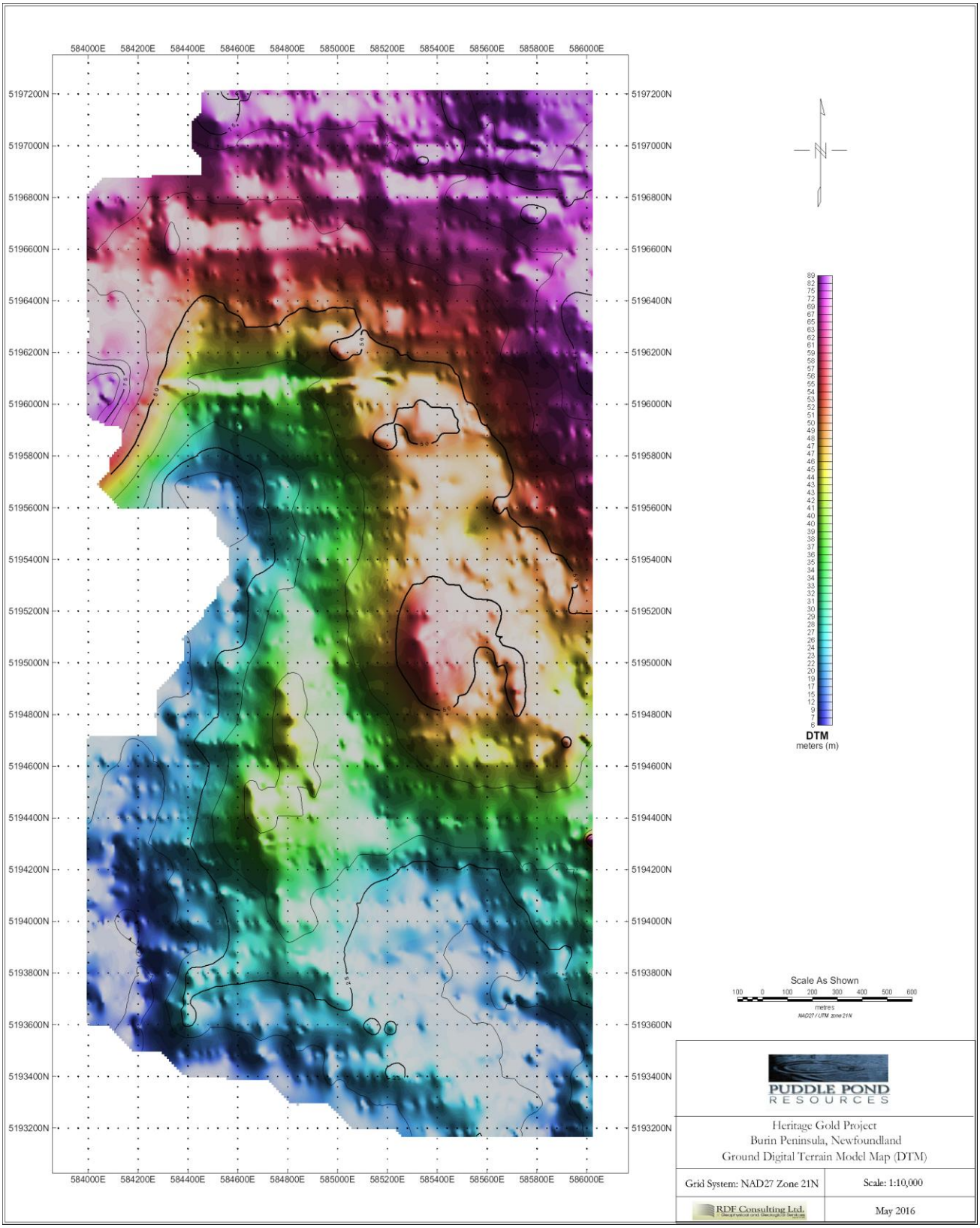


Figure 4: Heritage Grid Digital Elevation Model

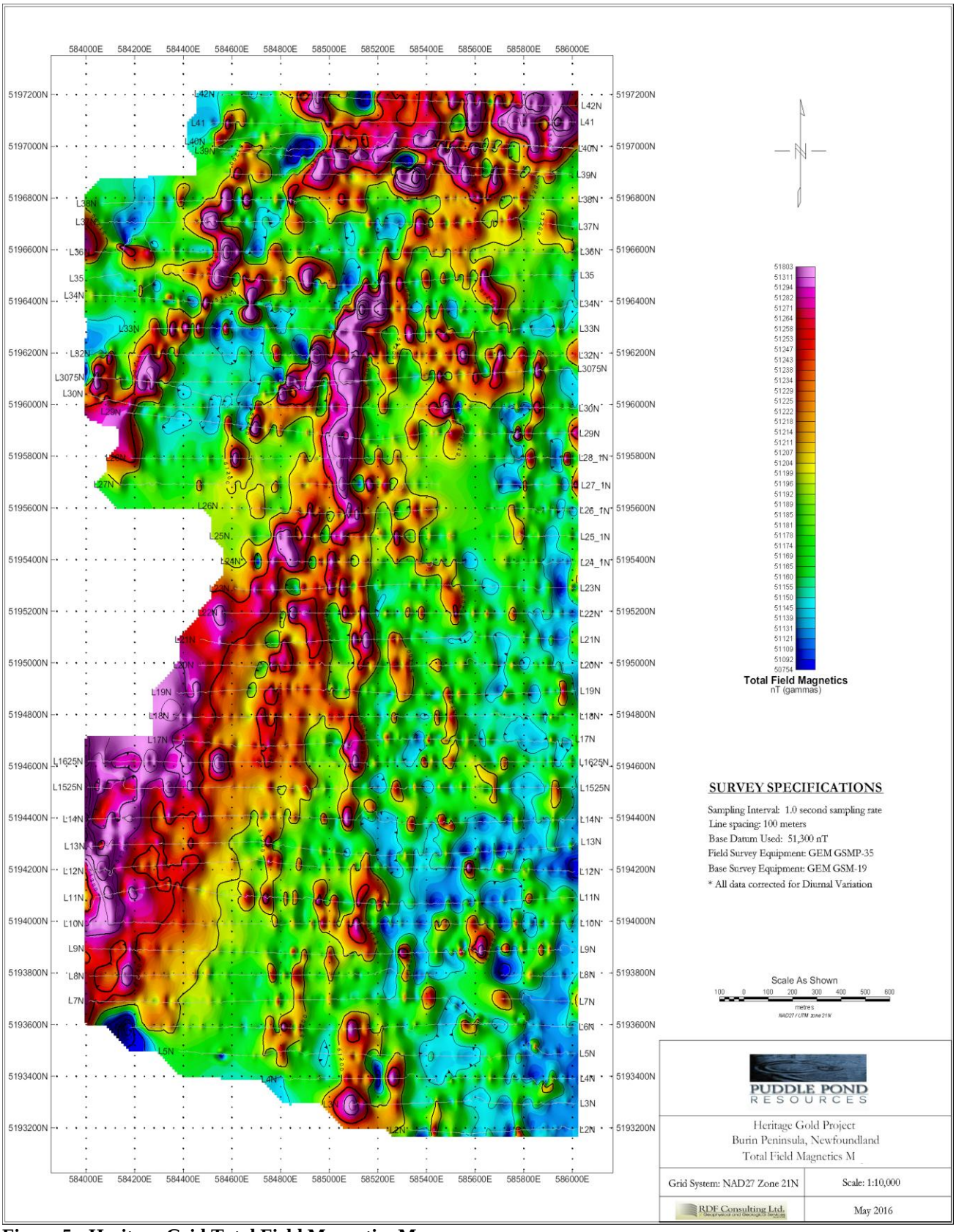


Figure 5: Heritage Grid Total Field Magnetics Map

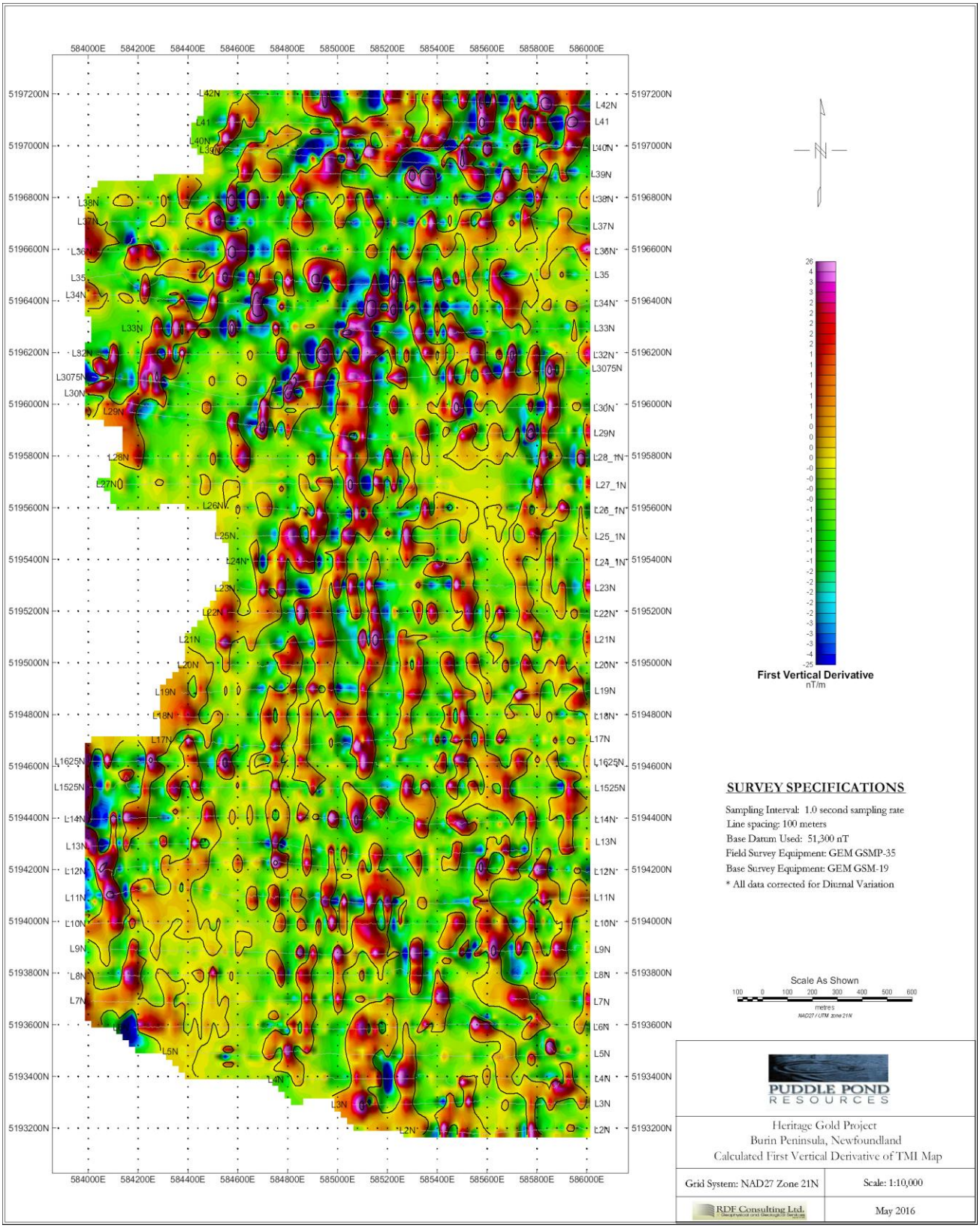


Figure 6: Heritage Grid First Vertical Derivative of TMI Map

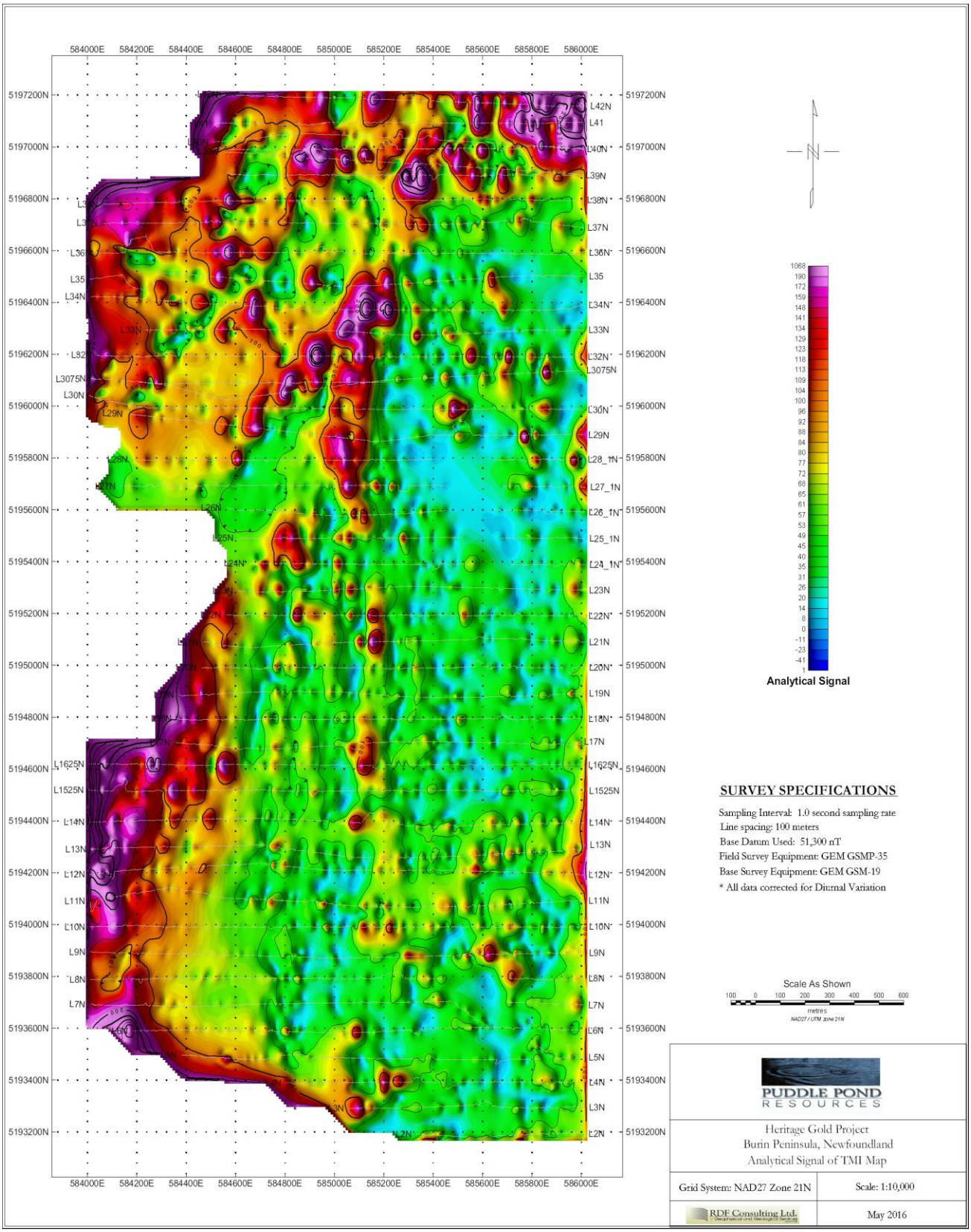


Figure 7: Heritage Grid Analytical Signal of TMI Map

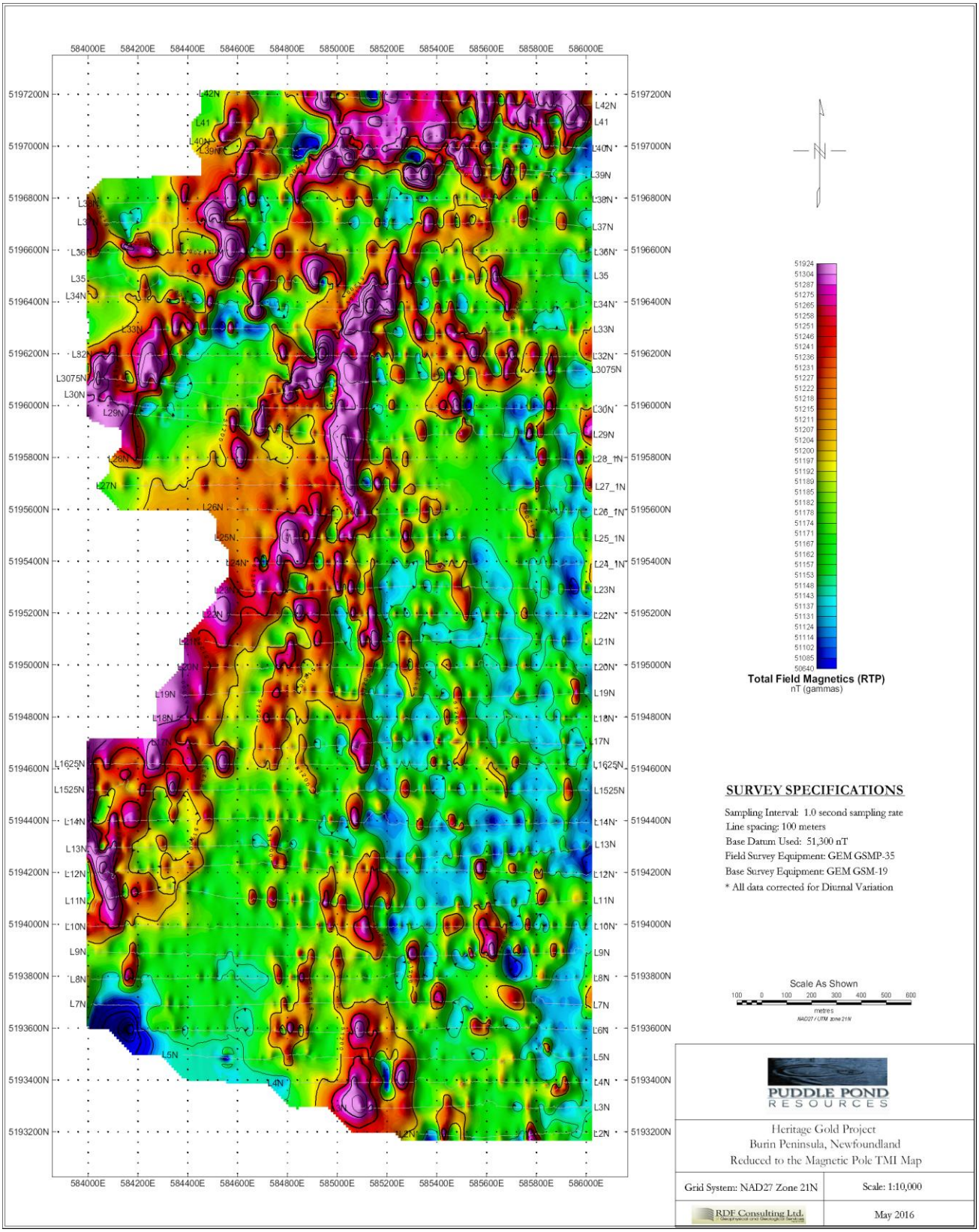


Figure 8: Heritage Grid Reduction to the Magnetic Pole Map

V. INTERPRETATION

a) Introduction

The high resolution ground magnetometer survey performed on the Heritage Gold Project proved to be very effective in delineating numerous structures, lithologies and potential zones of epithermal alteration within the grid area. Overall, the magnetic gradient for the survey area is on the order of 2149 gammas providing a good contrast between various lithologies. The magnetic high responses are believed to be associated with mafic/intermediate volcanics in the area. Narrow magnetic dykes in the area may contribute to some of the short wavelength magnetic features. Based on field observations made by the operator, zones of epithermal alteration noted from trenching and drilling correspond directly to areas of low or depressed magnetic responses.

For the purpose of this report, an attempt has been made to interpret structures, contacts and areas of interest based on the magnetic data for Puddle Pond Resources. These interpretations are presented below as a series of figures. A compilation map of the information available has been appended to this report as Appendix D. As the author has only minimal knowledge of the project area, some of these conclusions may be deemed invalid. Prior to the completion of this report, information was received regarding historic induced polarization surveys over a portion of the project area. A cursory look at the contour maps and how they relate to the magnetic data has been provided below. Field investigation of all conclusions made in this section should be performed by Puddle Pond crews to confirm or disprove their validity.

b) Discussion of Results

A geological map of the known geology and showings for the Heritage Grid area was provided by Puddle Pond (Figure 9). The map represents a combination of historical Government mapping along with modifications made by Puddle Pond personnel. The area is dominantly comprised and mapped as Marystown Group non-marine volcanic rocks. Figure 10 illustrates the results of the recently performed ground magnetometer survey over the area. Based on the comparison of the known mapping in the area and results of the ground magnetic survey, it is evident that the grid scale geology is significantly more complex than the mapping suggests. Newly identified and significant epithermal style mineralization known to exist in the area further complicates the magnetic signature of the rocks as the alteration associated with such systems can be broad scale, localized and erratic. Magnetic low or depressed features are generally associated with this style of mineralization. It is evident that many, but not all of the known mineralized showings in the area are located in the lows. Quartz veining cutting through the host rocks outside of the epithermal center may account for some of the showings but this is not known to the author.

As a first pass interpretation, an attempt was made to identify structural and linear features that can be noted from the dataset. Many interpreted structures/linears were identified by the survey and are presented as Figure 11. Three predominant structural orientations have been identified. These include strong northeast-southwest, north-south and southeast-northwest components. It should also be noted that many of the showings are located near or on these features. Figure 12 illustrates the total field data over Google Earth topography. This figure is very useful in identifying trenches and workings on the ground as well as gaining a better feeling for topography in the area.

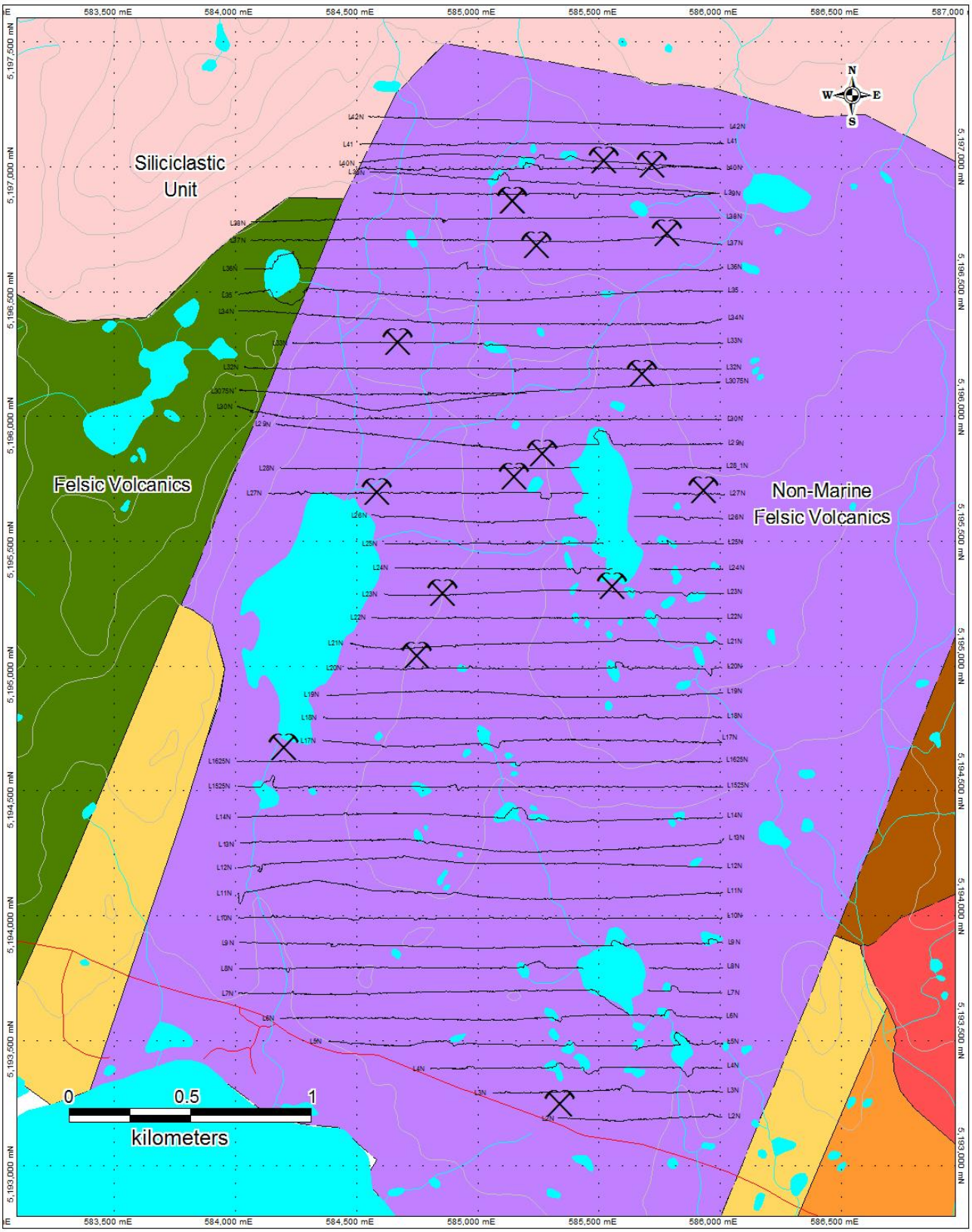


Figure 9: Heritage Grid Geological Map (Geology supplied by Puddle Pond)

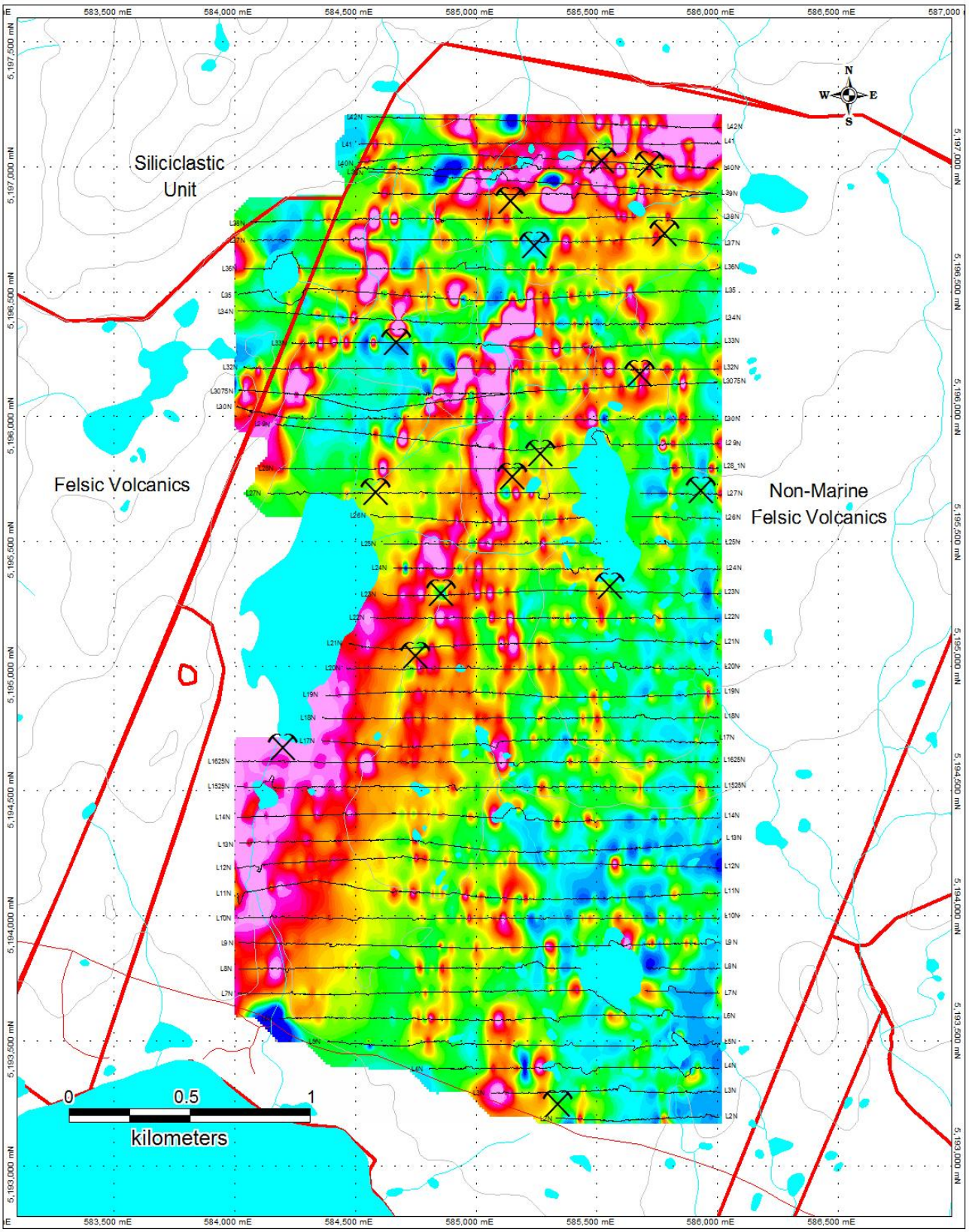


Figure 10: Heritage Grid TMI Magnetics with outline of Geology and Showings

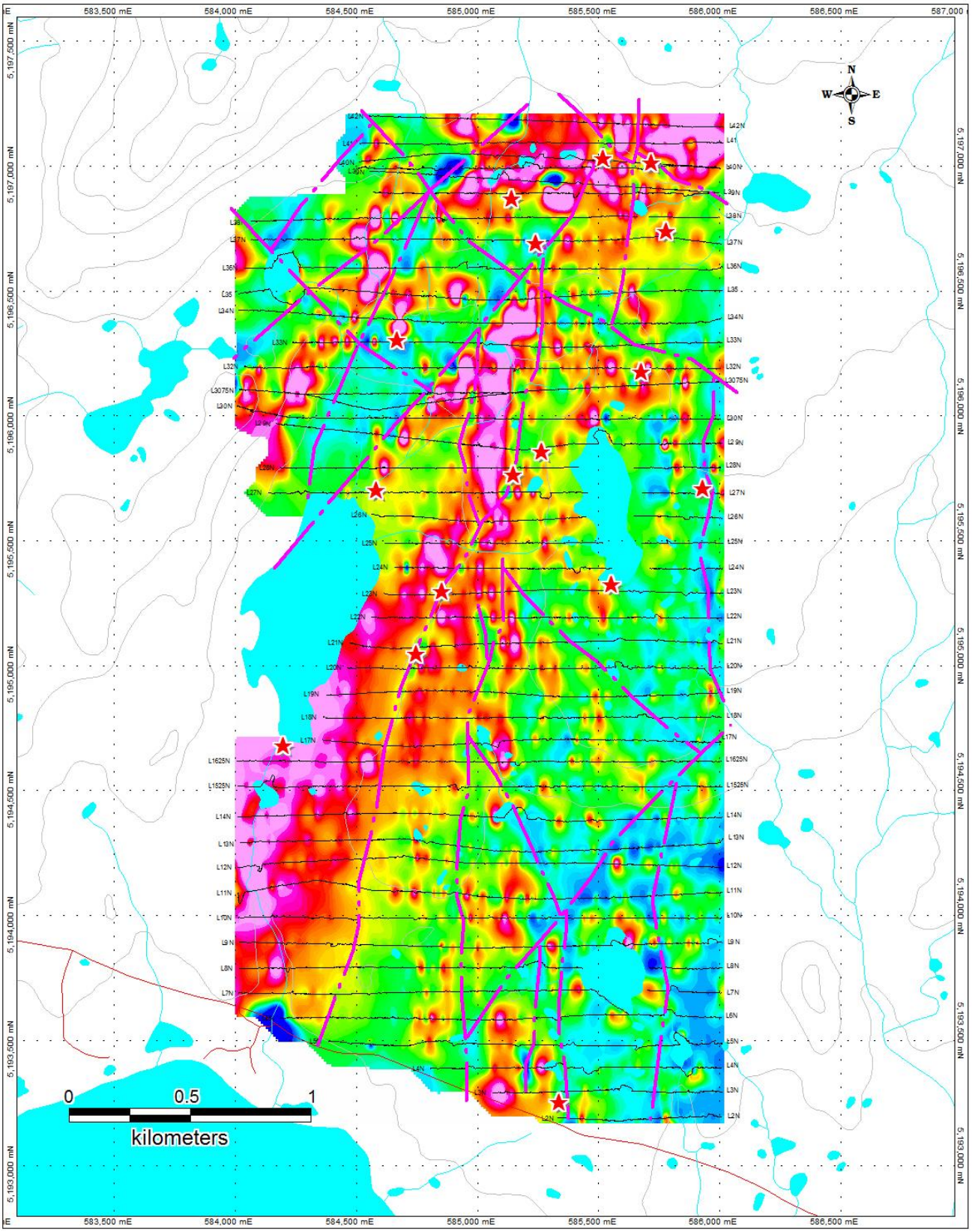


Figure 11: Heritage Grid TMI and Interpreted Structure Map

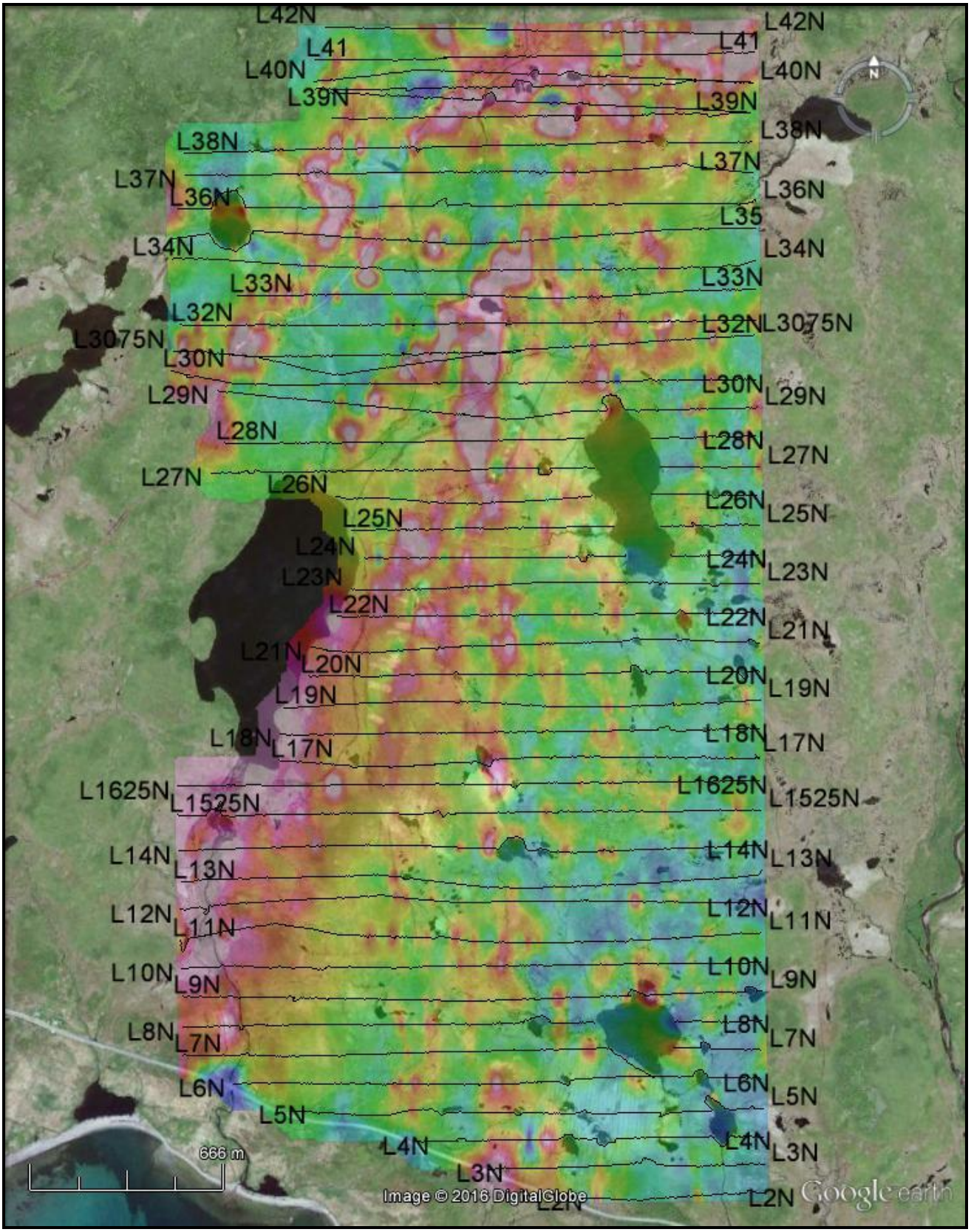


Figure 12: Heritage Grid TMI over Google Earth Topography

Geological contacts and lithologies can also be interpreted from the data. An attempt has been made to interpret the property scale geology based on the magnetic data. Figure 13 represents a rough interpretation of lithology and alteration. The magnetic high features stand out as the easiest to identify. A north-northeast trending magnetic high exists and extends from the southwest corner of the grid area and continues to approximately L35N where it becomes disrupted and more difficult to trace. It can be interpreted that the southernmost part of this lithology represents fresher mafic volcanic rocks with alteration affecting the magnetism in these units to the north. It is also in this area that the rocks appear to dip to the east. A very notable linear magnetic high feature runs north-south through the center of the grid and intersects the NNE trending magnetic high. This unit is interpreted as the same lithology albeit much narrower and is disrupted along its length in several areas. This disruption may be related to alteration where structure crosscuts these volcanics. A third area of high magnetism exists as an approximate northeast trending feature from Lines 28N-40N on the western side of the grid. Again, this feature is interpreted as the same lithology as the other magnetic highs. The low/depressed magnetic response between the two areas may be caused by alteration related to the epithermal system. The final significant area of a high magnetic response exists in the northern portion of the grid near what is referred to as the "Whalesback". Based on the mapping and magnetic response, it can be interpreted that again this is the same mafic/intermediate volcanic lithology. Further work is required to prove or disprove these interpretations.

Currently, very little is known or understood about the geology on the eastern side of the mafic/intermediate volcanic unit. From a geophysical standpoint, the rocks display a significantly weaker response than the higher magnetic rocks considered to be mafic/intermediate volcanic. It is thought that this area could be underlain by sedimentary units. An alternate interpretation could reflect widescale alteration of the country rocks however the previous is most probably. Addition field work is required to determine the magnetic response associated with this area.

Numerous short wavelength, high magnetic features exist throughout the grid area. These features can be interpreted as narrow mafic dikes. Dyking is known to exist throughout the property. Several of these can be easily identified and have been outlined on Figure 13. These dikes appear to be vertical/subvertical in nature.

Of particular importance to the economics of the Heritage Property is the extent of epithermal style mineralization and associated alteration within the system. It is believed that the magnetic survey may have effectively mapped out several potential areas of interest. The low or depressed magnetic areas my represent the alteration of the surrounding mafic/intermediate volcanic. These areas have been identified on Figure 12 and require additional investigation. The narrow magnetic low that runs north-northeast through the Turpin and Pinnacle Showings may of particular interest. This zone is characterized by a distinct narrow structurally related magnetic low that could extend in excess of 2 kilometers in length.

c) Historical Heritage Geophysics

A ground induced polarization and resistivity survey was performed by a third party over the northern portion of the Property from Lines 27N to 42N in past years. RDF received colour grid maps containing selected zone for the chargeability and resistivity to aid with interpretation of the magnetic results. Figures 14 and 15 illustrate the results of these plots at the 44 meter depth level with the interpreted geology based on the magnetometer survey as an overlay.

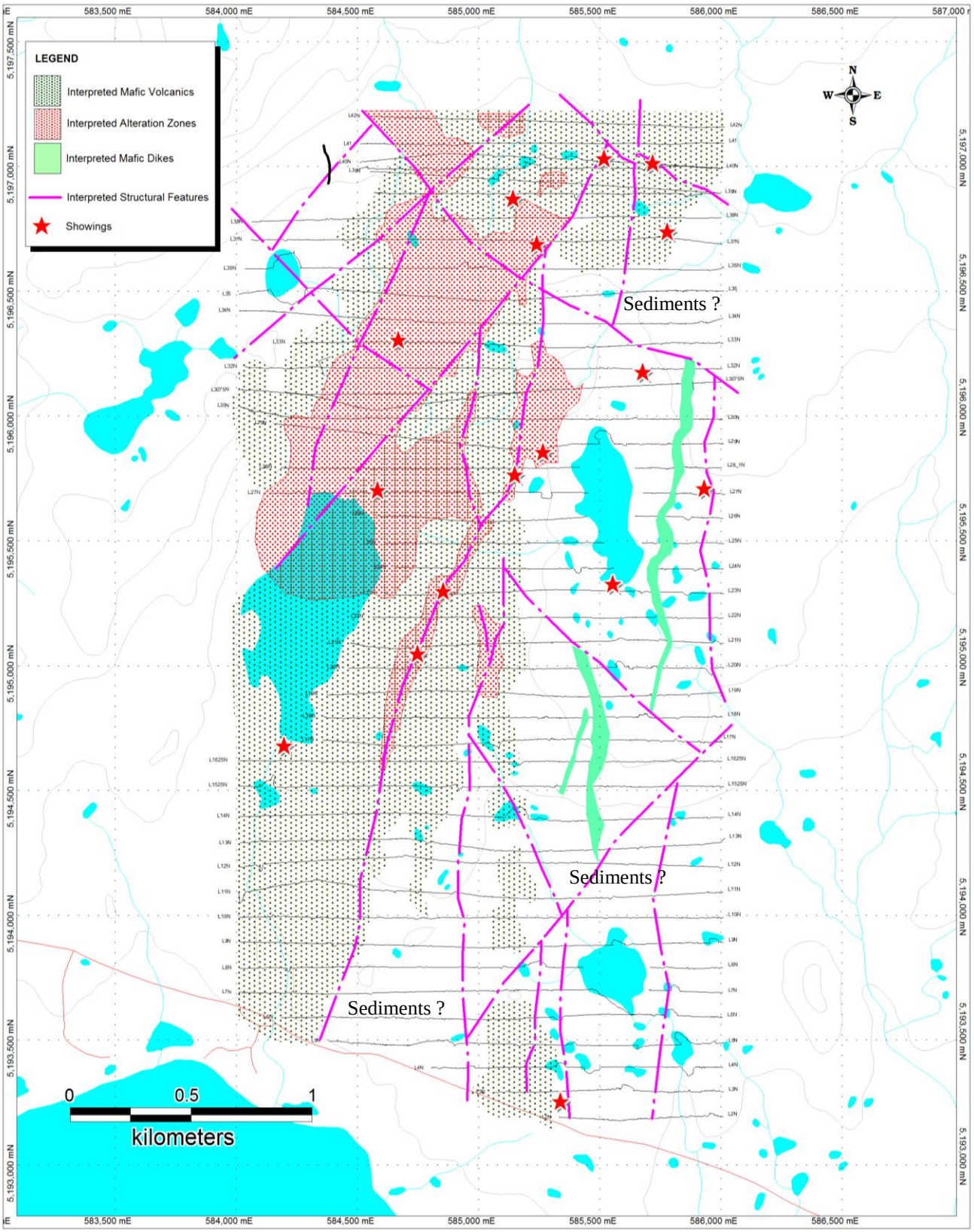


Figure 13: Heritage Grid Interpreted Geology Map

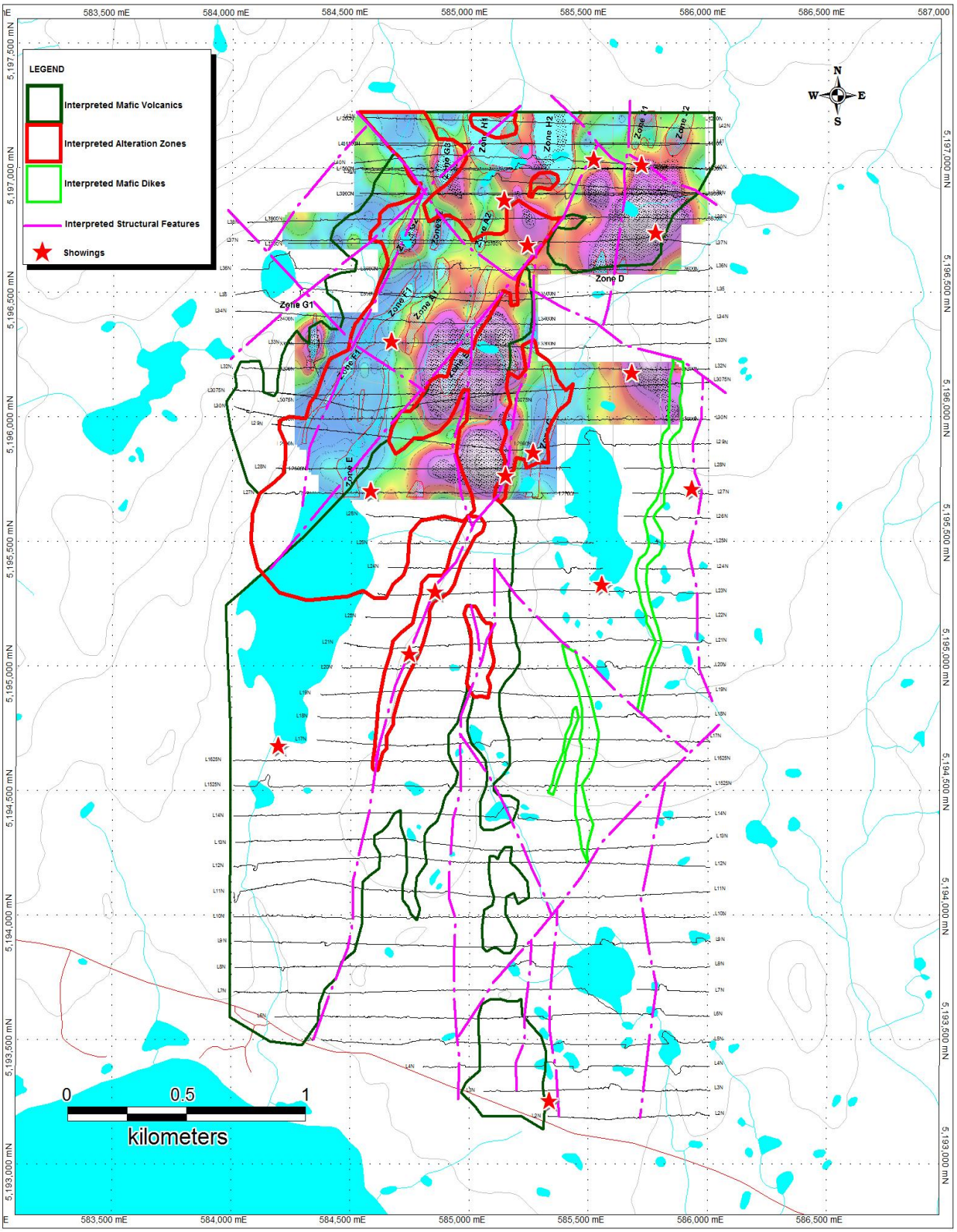


Figure 14: Heritage Grid Interpreted Geology and IP Resistivity Map

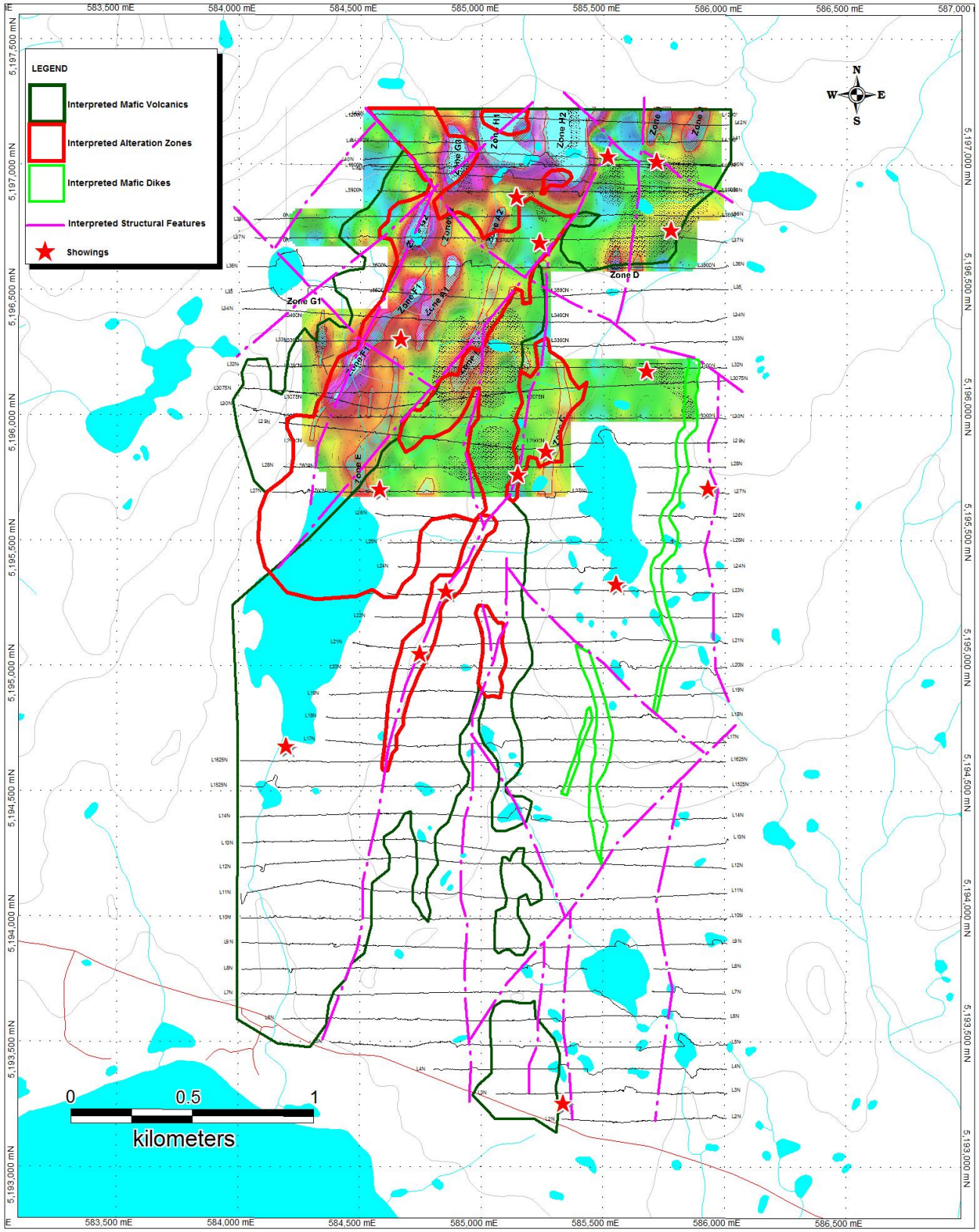


Figure 15: Heritage Grid Interpreted Geology and Chargeability Map

No additional raw or processed pseudosection data was analyzed for the purpose of this report but should be closely looked at in conjunction with the magnetic data.

The results of the historical IP/Resistivity survey provide additional useful information. Based on the resistivity results, it appears that most of the elevated resistivity features are associated with the volcanic sequence associated with the magnetic highs. The lower resistivity areas occur within the interpreted alteration zones. It is presently unclear why this is the case unless clay alteration and acid leaching associated with the epithermal system exists in these areas.

The higher chargeability zones are generally associated with the depressed areas of magnetism and most probably directly associated with the epithermal alteration system. A more in-depth examination of the IP is required to better assess this data.

VI. LORD'S COVE MAGNETIC TEST SURVEY

a) Overview

A small test survey, consisting of 1.775 line kilometers of reading was performed over two small areas near Lord's Cove. The grid area is located approximately 18 kilometers east southeast from Point May and is easily accessible from the paved Burin Highway. The Lord's Cove survey consisted of six grid lines on two separate areas. The first four lines were read directly over the now closed and reclaimed dump for the town. Significant cultural effects were associated with the data in this area. Buried drums, automobiles and metal of various types were encountered during the surveying and significantly affect the data quality.

Figure 16 below illustrates the grid area and TMI results located in Google Earth. Figure 17 shows the results of the total field magnetic response over the two areas. As the area was performed as a test only and the fact that the survey area was an old dump site no interpretation was performed on the results.

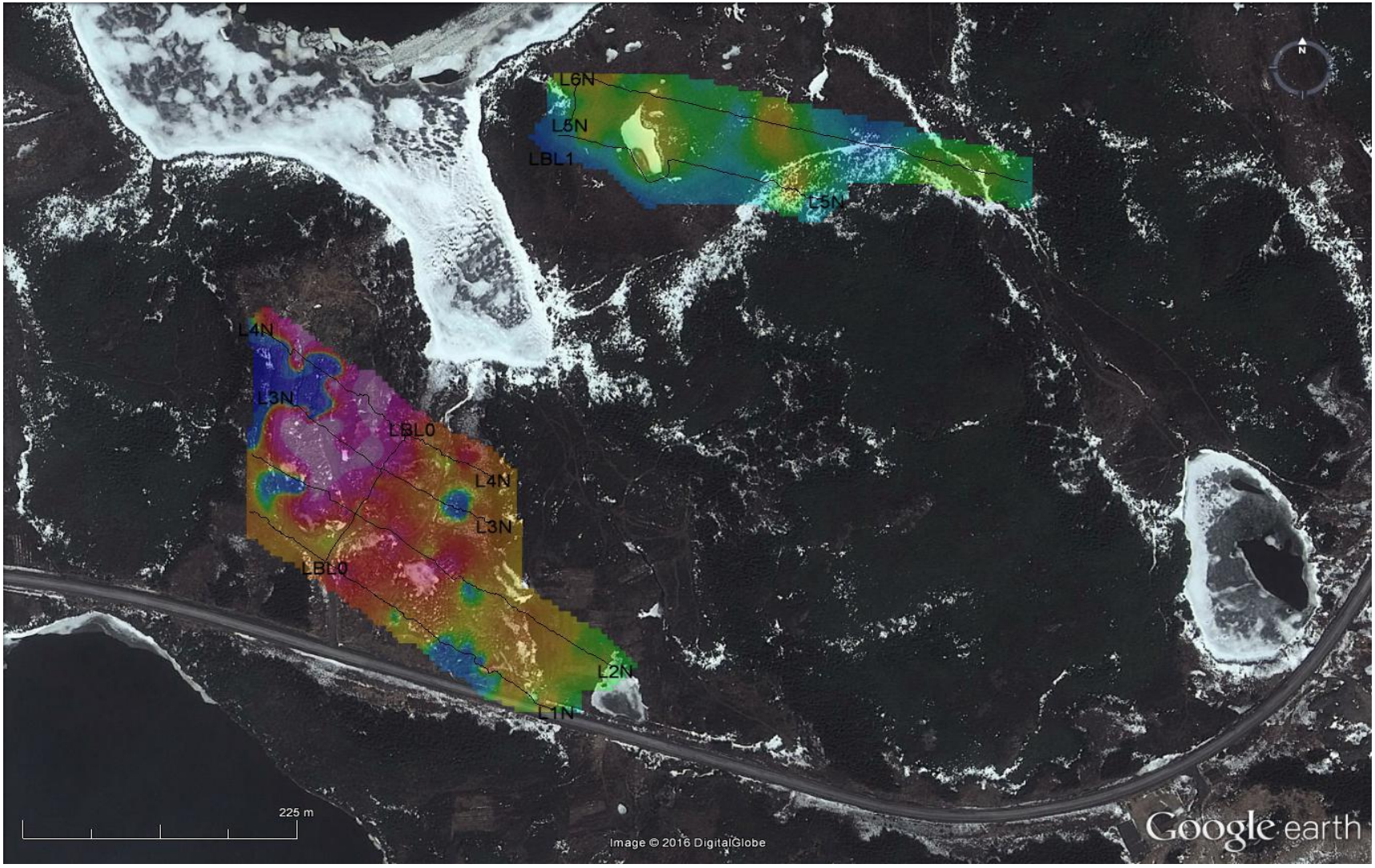


Figure 16: Lord's Cover Grid TMI Magnetics over Google Earth Topography

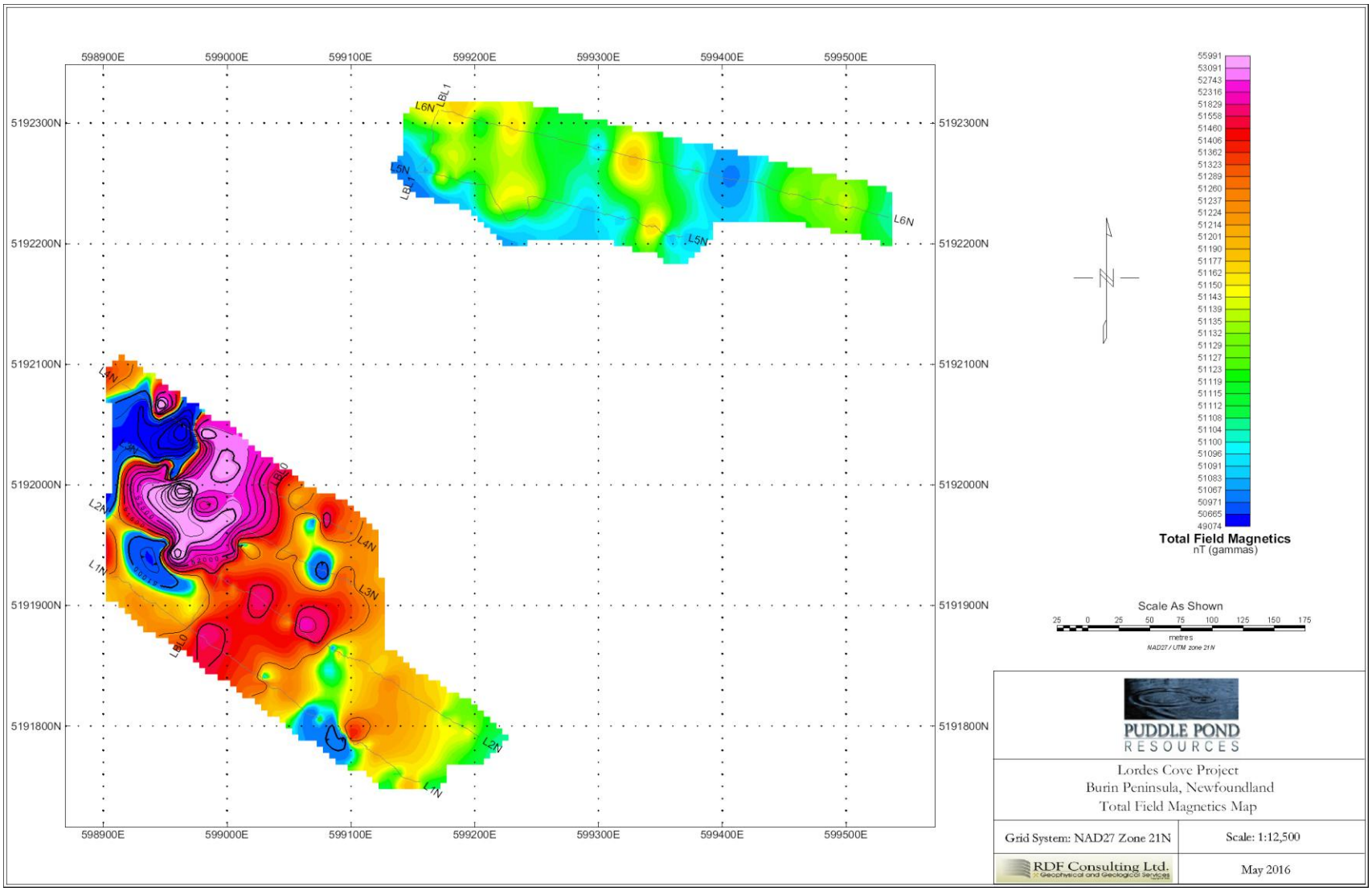


Figure 17: Lord's Cove Grid TMI Magnetics Map

VII. CONCLUSIONS AND RECOMMENDATIONS

The data obtained from the ground magnetometer survey over both the Heritage and Lord's Cove Grid areas was generally of high quality. No significant problems were encountered with data quality for the field or base units.

Additional field work is required to prove or disprove the interpretations made in this report. Field outcrop mapping would be helpful in refining the geology map and help understand how it relates to the magnetic signature of the area. Although outcrop is limited, this exercise would be worthwhile. Should more information be required about dips of units, a 2D modeling exercise will help better interpret dips of geology in the region.

Based on the results of the Heritage grid work, all areas of magnetic lows thought to be related to epithermal alteration should be investigated particularly where structural features and IP/Resistivity anomalies are known to exist. Particular attention should be given to the linear hosting the Turpin and Pinnacle Showings. This structure may be significantly longer than initially thought.

VIII. CERTIFICATES OF QUALIFICATIONS

I, R. Dean Fraser, of the town of Paradise, Newfoundland do hereby certify:

That I am a registered Professional Geophysicist/Geologist with the Association of Professional Engineers and Geoscientists of Newfoundland and Labrador.

That I received my Bachelor of Science degree in Geology/Geophysics from Memorial University of Newfoundland in 1992.

That I have practiced my profession as both an Exploration Geophysicist and Geologist continuously since 1992.

That I do not hold and interest in the property related to this report.

Dated at Paradise, Newfoundland this 10th day of May, 2016.

_____

Dean Fraser, P.Geo

APPENDIX A

Geophysical Equipment Specifications

Potassium

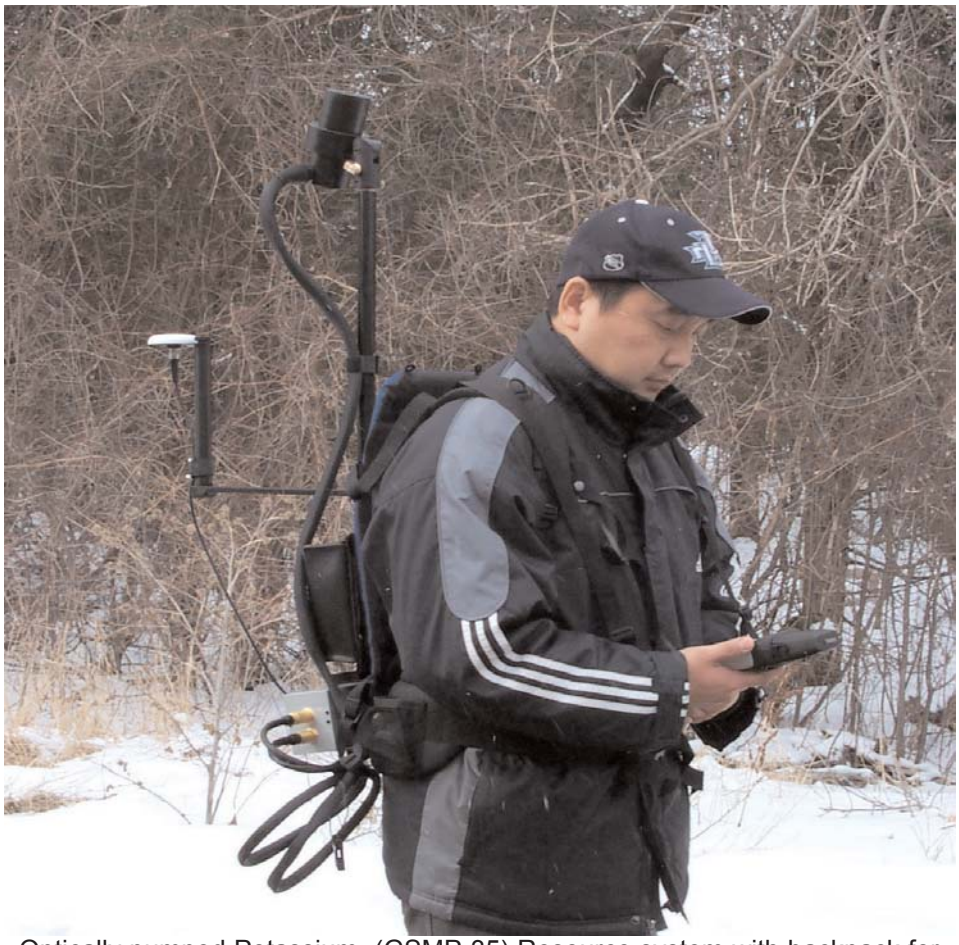
Resource Mag / Grad (GSMP-35)

The new Potassium Resource system is the highest sensitivity and absolute accuracy magnetometer today. It is designed for ground applications where data quality, cost control and ruggedness are the keys for project success.

New technologies provide even more value:

- **Highest sensitivity available at 3.5 pT / root Hz at 1 Hz**
- **Fast sampling at 5 Hz; ideal for walking / vehicular surveys**
- **Integrated backpack for convenience and high productivity**
- **GPS elevation values for input into geophysical modeling routines**
- **<1.0 m standard GPS for high resolution surveying**
- **Easy-to-use mapping and navigation capabilities for enhanced survey performance**
- **Proven reliability based on 10 years of R&D**

And all of these technologies come complete with the most attracive savings and warranty in the business.



Optically pumped Potassium (GSMP-35) Resource system with backpack for electronics, light weight sensors and cables.

Looking for minerals, diamonds or oil & gas, and the optimal technologies to assist you in acquiring high quality magnetic or gradiometric data for analysis and decision making?

Then, Terraplus has the solution you have been seeking. The new optically pumped Potassium Resource Magnetometer is specially designed for your needs … establishing a new standard in data quality, cost control and ruggedness.

The result of more than a decade of development, the resource mag is a backpack-mounted version of the proven GSMP-40 ground magnetometer with many key new features.

Features span a variety of functions, including import, display, navigation, surveying, sampling, and more. The new system also supports GPS … another important capability for today's production-minded explorationist.

Data Quality

High data quality is assured through the resource magnetometer's sensitivity, gradient tolerance and minimal heading error. Sensitivity is 3.7 pT / root Hz at 5 Hz - the highest in the industry. This makes the system effective for mapping subtle anomalies and structure in resource exploration applications.

The instrument also has a gradient tolerance in excess of 35,000 nT / m, making it ideal for mapping highly ferrous geological units such as those typically encountered in mineral exploration. In addition, the system has the lowest heading (orientation) error, thereby resulting in the "cleanest" magnetic readings possible.

Cost Control

In the past five years, industry rationalization has resulted in a greater

emphasis on cost control for magnetomter and gradiometer surveys. With the new Potassium Resource Magnetometer, the emphasis is also on cost control, through the following features:

* Useability - Easy menu-driven operation using a Personal Digital Assistant (PDA)

* Display - Easy-to-read display with specific settings for presenting real-time data on PDA

* Navigation / GPS - The industry's most versatile navigation technology for surveying without cut grids for significant cost savings

* Import - Streamlined import of maps for georeferenced walking surveys

* Large Capacity Memory - Survey a whole day without concern for memory space or the need to dump the memory during the survey

Ruggedness

Resource exploration often requires traveling to remote locations and operating instruments in less than ideal conditions (heat, cold, damp, etc.).

The new Potassium magnetometer has excellent environmental specifications as well as other capabilities that contribute to robustness. These include rugged packaging on an ergonomic backpack, and robust sensors … the main component of any magnetometer system.

Terraplus - Your Geophysical Equipment Supplier

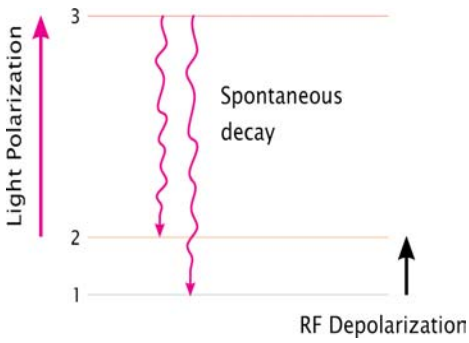
Established in 1989, Terrraplus is one of the largest suppliers of geophysical instrumentation in Canada, and other parts of the world. The company prides itself on its attention to customer needs and finding the exact solution to earth science instrumentation requirements.

Terraplus also has one of the largest rental pools in Canada and the world with many types of systems, including magnetometers and gradiometers, available.

Theory of Operation

A typical alkali vapour magnetometer consists of a glass cell containing an evaporated alkali metal (i.e. alkali atoms).

According to quantum theory, there is a set distribution of valence electrons within every population of alkali atoms. These electrons reside in two energy levels as represented by the numbers 1 and 2 in the figure below.



Light of a specific wavelength is applied to the vapour cell to excite electrons from level 2 to 3 only. This process (called ***polarization***) reduces the number of atoms with electrons at level 2. The result is that the cell stops absorbing light and turns from opaque to transparent.

Electrons at level 3 are not stable and spontaneously decay back to levels 1 and 2. Eventually, level 1 becomes fully populated and level 2 is fully depopulated.

At this point, RF ***de-polarization*** comes into play. Here, we apply RF power of a wavelength that corresponds to the energy difference between levels 1 and 2 to move electrons from level 1 back to level 2.

The significance of de-polarization is that the **energy difference between levels 1 and 2 (i.e. the frequency of the RF depolarizing field) is directly proportional to the magnetic field.**

The system detects the fluctation of light intensity (i.e. modulation) as the cell becomes opaque and transparent, and measures the corresponding frequency. The frequency value is then converted to magnetic field units.

Specifications

Performance

Sensitivity:	0.0035 nT / √Hz @ 1 Hz
Resolution:	0.0001 nT
Absolute Accuracy:	+/- 0.1 nT
Dynamic Range:	20,000 to 120,000** nT
Gradient Tolerance:	30,000 nT/m
Sampling Rate:	1 hour to 20 Hz
Operating Temperature	-20°C to +55°C

** High Field (300,000 nT) Option Available

Orientation

Sensor Angle: Optimum angle 30° between sensor head axis & field vector.

Orientation: 10° to 80° & 100° to 170°

Heading Error: < 0.1 nT between 10° to 80° and 360° full rotation about axis.

Storage - 16 MB (# of Readings)

Gradiometer:	1,398,101
Magnetometer:	2,097,152
Base:	1,398,101

Dimensions and Weights

Sensor: 141 x 64mm (external dia.), and < 1.3 kg

Electronics Box: 30.6cm x 8.5cm x 7.5cm and 1.6 kg

Power

Power Supply: 18 to 35 V DC

Power Requirements: Approx. 25 W at start up, dropping to 8 W after warm-up

Power Consumption: 8 W typical at 20°C

Warm-up Time: <15 minutes @ -40°C

Outputs

Cycled measurements of the Total Magnetic Field with position & time as digital readout or as ASCII format through an RS-232 COM port. Pre-amplifier outputs are continuous signals at the Potassium Larmor frequency which is proportional to the magnetic field (7 Hz/nT).

Components

Sensor, pre-amplifier box, all cables, backpack, manual & ship case.

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Terraplus

GSM-19 v7.0

Overhauser Magnetometer / Gradiometer / VLF

Introduction

The GSM-19 v7.0 Overhauser instrument is the total field magnetometer / gradiometer of choice in today's earth science environment - representing a unique blend of physics, data quality, operational efficiency, system design and options that clearly differentiate it from other quantum magnetometers.

With data quality exceeding standard proton precession and comparable to costlier optically pumped cesium units, the GSM-19 is a standard (or emerging standard) in many fields, including:

* **Mineral exploration (ground and airborne base station)**
* **Environmental and engineering**
* **Pipeline mapping**
* **Unexploded Ordenance Detencion**
* **Archeology**
* **Magnetic observatory measurements**
* **Volcanology and earthquake prediction**

Taking Advantage of the Overhauser Effect

Overhauser effect magnetometers are essentially proton precession devices except that they produce an order-of magnitude greater sensitivity. These "supercharged" quantum magnetometers also deliver high absolute accuracy, rapid cycling (up to 5 readings / second), and exceptionally low power consumption.

The Overhauser effect occurs when a special liquid (with unpaired electrons) is combined with hydrogen atoms and then exposed to secondary polarization from a radio frequency (RF) magnetic field.

The unpaired electrons transfer their stronger polarization to hydrogen atoms, thereby generating a strong precession signal-- that is ideal for very high-sensitivity total field measurement.

In comparison with proton precession methods, RF signal generation also keeps power consumption to an absolute minimum and reduces noise (i.e. generating RF frequencies are well out of the bandwidth of the precession signal).

In addition, polarization and signal measurement can occur simultaneously - which enables faster, sequential measurements. This, in turn, facilitates advanced statistical averaging over the sampling period and/or increased cycling rates (i.e. sampling speeds).

The unique Overhauser unit blends physics, data quality, operational efficiency, system design and options into an instrumentation package that ... exceeds proton precession and matches costlier optically pumped cesium capabilities.

And the latest v7.0 technology up-grades provide even more value, including:

- **Data export in standard XYZ** (i.e. line-oriented) format for easy use in standard commercial software programs
- **Programmable export format** for full control over output
- **GPS elevation values** provide input for geophysical modeling
- **<1.5m standard GPS** for high-resolution surveying
- **<1.0 OmniStar GPS**
- **<0.7m for Newly introduced CDGPS**
- **Multi-sensor capability** for advanced surveys to resolve target geometry
- **Picket marketing / annotation** for capturing related surveying information on the go.

And all of these technologies come complete with the most attractive prices and warranty in the business!

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Maximizing Your Data Quality with the GSM-19

Data quality is a function of five key parameters that have been taken into consideration carefully in the design of the GSM-19. These include sensitivity, resolution, absolute accuracy, sampling rates and gradient tolerance.

Sensitivity is a measure of the signal-to noise ratio of the measuring device and reflects both the underlying physics and electronic design. The physics of the Overhauser effect improves sensitivity by an order of magnitude over conventional proton precession devices. Electronic enhancements, such as high-precision precession frequency counters enhance sensitivity by 25% over previous versions.

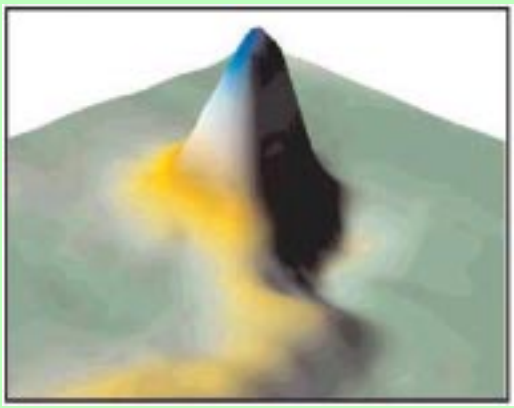
The result is high quality data with sensitivities of 0.022 nT / vHz. This sensitivity is also the same order-of magnitude as costier optically pumped cesium systems.

Resolution is a measure of the smallest number that can be displayed on the instrument (or transmitted via the download process). The GSM-19 has unmatched resolution (0.01mT)

This level of resolution translates into well-defined, characteristic anomalies; improved visual display; and enhanced numerical data for processing and modeling.

Absolute accuracy reflects the closeness to the "real value" of the magnetic field -- represented by repeatability of readings either at stations or between different sensors. With an absolute accuracy of +/- 0.1 nT, the GSM-19 delivers repeatable station-to-station results that are reflected in high quality total field results.

Similarly, the system is ideal for gradient installations (readings between different sensors do not differ by more than +/- 0.1 nT) -- maintaining the same high standard of repeatability.



Data from Kalahari Desert kimberlites. Courtesy of MPH Consulting (project managers), IGS c. c. (geophysical contractor) and Aegis Instruments (Pty) Ltd., Botswana.

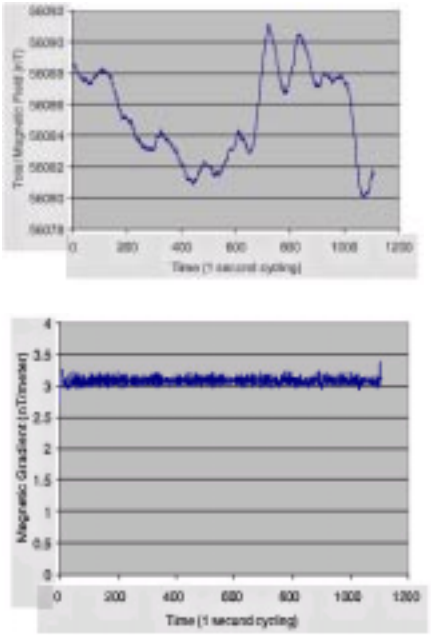
The GSM-19 gradiometer data are consistently low in noise and representative of the geologic environment under investigation.

Sampling rates are defined as the fastest speed at which the system can acquire data. This is a particularly important parameter because high sampling rates ensure accurate spatial resolution of anomalies and increase survey efficiency.

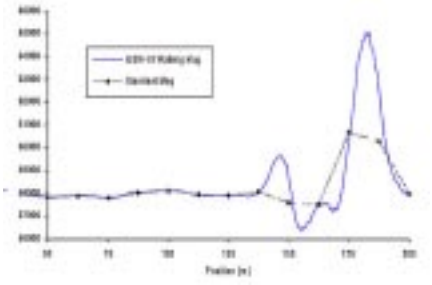
The GSM-19 Overhauser system is configured for two "measurement modes" or maximum sampling rates -- "Standard" (3 seconds / reading), and "Walking" (0.2 seconds / reading) These sampling rates make the GSM-19 a truly versatile system for all ground applications (including vehicle-borne applications).

Gradient tolerance represents the ability to obtain reliable measurements in the presence of extreme magnetic field variations. GSM-19 gradient tolerance is maintained through internal signal counting algorithms, sensor design and Overhauser physics. For example, the Overhauser effect produces high amplitude, long-duration signals that facilitate measurement in high gradients.

The system's tolerance (10,000 nT / meter) makes it ideal for many challenging environments -- such as highly magnetic rocks in mineral exploration applications, or near cultural objects in environmental, UXO or archeological applications.



Total Field and Stationary Vertical Gradient showing the gradient largely unaffected by diurnal variation. Absolute accuracy is also shown to be very high (0.2 nT/meter).



Much like an airborne acquisition system, the GSM-19 "Walking" magnetometer option delivers very highly-sampled, high sensitivity results that enable very accurate target location and / or earth science decision-making.

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Increasing Your Operational Efficiency

Many organizations have standardized their magnetic geophysical acquisition on the GSM-19 based on high performance and operator preference. This preference reflects performance enhancements such as memory capacity; portability characteristics; GPS and navigation; and dumping and processing.

Memory capacity controls the efficient daily acquisition of data, acquisition of positioning results from GPS, and the ability to acquire high resolution results (particularly in GSM-19's "Walking" mode).

V7.0 upgrades have established the GSM-19 as the commercial standard for memory with over 1,465,623 readings (based on a basic configuration of 32 Mbytes of memory and a survey with time, coordinate, and field values).

Portability characteristics (ruggedness, light weight and power consumption) are essential for operator productivity in both normal and extreme field conditions.

GSM-19 Overhauser magnetometer is established globally as a robust scientific instrument capable of withstanding temperature, humidity and terrain extremes. It also has the reputation as the lightest and lowest power system available -- reflecting Overhauser effect and RF polarization advantages.

In comparison with proton precession and optically pumped cesium systems, the GSM-19 system is the choice of operators as an easy-to-use and robust system.

GPS and navigation options are increasingly critical considerations for earth science professionals.

GPS technologies are revolutionizing data acquisition -- enhancing productivity, increasing spatial resolution, and providing a new level of data quality for informed decision-making.

The GSM-19 is now available with real-time GPS and DGPS options in different survey resolutions. For more details, see the GPS and DGPS section.

The GSM-19 can also be used in a GPS Navigation option with real-time coordinate transformation to UTM, local X-Y coordinate rotations, automatic end of line flag, guidance to the next line, and survey "lane" guidance with cross-track display and audio indicator.

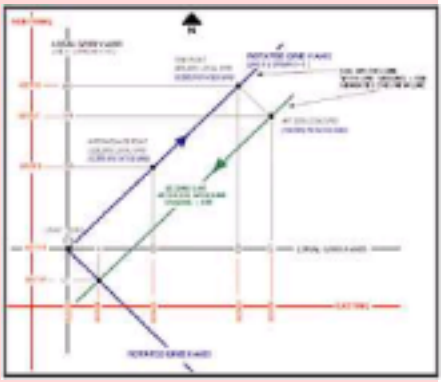
Other enhancements include way point pre-programming of up to 1000 points. Professionals can now define a complete survey before leaving for the field on their PC and download points to the magnetometer via RS-232 connection.

The operator then simply performs the survey using the way points as their survey guide. This capability decreases survey errors, improves efficiency, and ensures more rapid survey completion.

Dumping and processing effectiveness is also a critical consideration today. Historically, up to 60% of an operator's "free" time can be spent on low-return tasks, such as data dumping.

Data dumping times are now significantly reduced through GEM's implementation of high-speed, digital data links (up to 115 kBaud).

This functionality is faciliated through a new RISC processor as well as the new GSM-19 data acquisition / display software. This software serves as a bi-directional RS-232 terminal. It also has integrated processing functionality to streamline key processing steps, including diurnal data reduction. This software is provided free to all GSM-19 customers and regular updates are available.

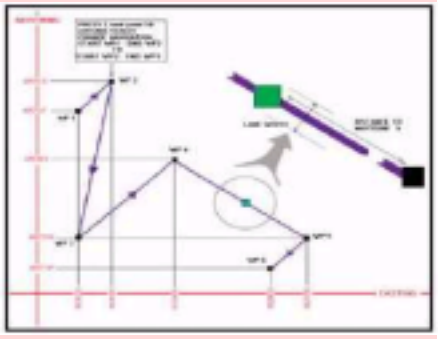


Navigation and Lane Guidance

The figure above shows the Automatic Grid (UTM, Local Grid, and Rotated Grid). With the Rotated Grid, you can apply an arbitrary origin of your own definition. Then, the coordinates are always in reference to axes parallel to the grid. In short, your grid determines the map, and not the NS direction.

The Local Grid is a scaled down, local version of the UTM system, and is based on your own defined origin. It allows you to use smaller numbers or ones that are most relevant to your survey.

The figure below shows how programmable-waypoints can be used to plan surveys on a point-by-point basis. Initially, you define waypoints and enter them via PC or the keyboard. In the field, the unit guides you to each point.



While walking between waypoints, lane guidance keeps you within a lane of predefined width using arrows (< - or - >) to indicate left or right. Within the lane, the display uses horizontal bars (- -) to show your relative position in the lane. The display also shows the distance (in meters) to the next waypoint.

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Adding Value through Options

When evaluating the GSM-19 as a solution for your geophysical application, we recommend considering the complete range of options described below. These options can be added at time of original purchase or later to expand capabilities as your needs change or grow.

Our approach with options is to provide you with an expandable set of building blocks:

* **Gradiometer**
* **Walking- Fast Magnetometer / Gradiometer**
* **VLF (3 channel)**
* **GPS (built-in and external)**

GSM-19G Gradiometer Option

The GSM-19 gradiometer is a versatile, entry level system that can be upgraded to a full-featured "Walking" unit (model GSM-19WG) in future.

The GSM-19G configuration comprises two sensors and a "Standard" console that reads data to a maximum of 1 reading every three seconds.

An important GSM-19 design feature is that its gradiometer sensors measure the two magnetic fields concurrently to avoid any temporal variations that could distort gradiometer readings. Other features, such as single-button data recording, are included for operator ease-of-use.

GSM-19W / WG "Walking" Magnetometer / Gradiometer Option

The GSM-19 was the first magnetometer to incorporate the innovative "Walking" option which enables the acquisition of nearly continuous data on survey lines. Since its introduction, the GSM-19W / GSM-19WG have become one of the most popular magnetic instruments in the world.

Similar to an airborne survey in principle, the system records data at discrete time intervals (up to 5 readings per second) as the instrument is carried along the line.

At each survey picket (fiducial), the operator touches a designated key. The system automatically assigns a picket coordinate to the reading and linearly interpolates the coordinates of all intervening readings (following survey completion during post-processing).

A main benefit is that the high sample density improves definition of geologic structures and other targets (UXO, archeological relics, drums, etc.).

It also increases survey efficiency because the operator can record data almost continuously. Another productivity feature is the instantaneous recording of data at pickets. This is a basic difference between the “Walking” version and the GSM-19 / GSM-19G (the “Standard” mode version which requires 3 seconds to obtain a reading each time the measurement key is pressed).

GSM-19 "Hands-Free" Backpack Option

The "Walking" Magnetometer and Gradiometer can be configured with an optional backpack-supported sensor. The backpack is uniquely constructed - permitting measurement of total field or gradient with both hands free.

This option provides greater versatility and flexibility, which is particularly valuable for high-productivity surveys or in rough terrain.

GSM-19GV "VLF" Option

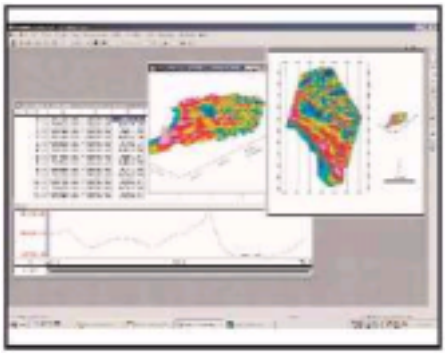
With its omnidirectional VLF option, up to 3 stations of VLF data can be acquired without orienting. Moreover, the operator is able to record both magnetic and VLF data with a single stroke on the keypad.

3rd Party Software - A One-Stop Solution for Your Potential Field Needs

As part of its complete solution approach, Terraplus offers a selection of proven software packages. These packages let you take data from the field and quality control stage right through to final map preparation and modeling.

Choose from the following packages:

* **Contouring and 3D Surface Mapping**
* **Geophysical Data Processing & Analysis**
* **Semi-Automated Magnetic Modeling**
* **Visualization and Modeling / Inversion**



Geophysical Data Processing and Analysis from Geosoft Inc.

GSM-19 with internal GPS board. Small receiver attaches above sensor

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Version 7 -- New Milestones in Magnetometer Technology

The recent release of v7.0 of the GSM-19 system provides many examples of the ways in which we continue to advance magnetics technologies for our customers.

Enhanced data quality:

* 25% improvement in sensitivity (new frequency counting algorithm)
* new intelligent spike-free algo rithms (in comparison with other manufacturers, the GSM-19 does not apply smoothing or filtering to achieve high data quality)

Improved operational efficiency:

* Enhanced positioning (GPS engine with optional integrated / external GPS and real-time navigationl)
* 16 times increase in memory to 32 Mbytes
* 1000 times improvement in processing and display speed (RISC microprocessor with 32-bit data bus) 2 times faster digital data link (115 kBaud through RS-232)

Innovative technologies:

* Battery conservation and survey flexibility (base station scheduling option with 3 modes - daily, flexible and immediate start)
* Survey pre-planning (up to 1000 programmable waypoints that can be entered directly or downloaded from PC for greater efficiency)
* Efficient GPS synchronization of field and base units to Universal Time (UTC)
* Cost saving with firmware up grades that deliver new capabilities via Internet

More About the Overhauser System

In a **standard Proton magnetometer,** current is passed through a coil wound around a sensor containing a hydrogenrich fluid. The auxiliary field created by the coil (>100 Gauss) polarizes the protons in the liquid to a higher thermal equilibrium.

When the current, and hence the field, is terminated, polarized protons precess in the Earth's field and decay exponentially until they return to steady state. This process generates precession signals that can be measured as described below.

Overhauser magnetometers use a more efficient method that combines electronproton coupling and an electron-rich liquid (containing unbound electrons in a solvent containing a free radical). An RF magnetic field -- that corresponds to a specific energy level transition -- stimulates the unbound electrons.

Instead of releasing this energy as emitted radiation, the unbound electrons transfer it to the protons in the solvent. The resulting polarization is much larger, leading to stronger precession signals.

Both Overhauser and proton precession, measure the scalar value of the magnetic field based on the proportionality of precession frequency and magnetic flux density (which is linear and known to a high degree of accuracy). Measurement quality is also calculated using signal amplitude and its decay characteristics. Values are averaged over the sampling period and recorded.

With minor modifications (i.e. addition of a small auxiliary magnetic flux density while polarizing), it can also be adapted for high sensitivity readings in low magnetic fields. (ex. for equatorial work)

GPS - Positioning You for Effective Decision Making

The use of Global Positioning Satellite (GPS) technology is increasing in earth science disciplines due to the ability to make better decisions in locating and following up on anomalies, and in improving survey cost effectiveness and time management.

Examples of applications include: Surveying in remote locations with no grid system (for example, in the high Arctic for diamond exploration)

* **High resolution exploration mapping**
* **High productivity ferrous ordnance (UXO) detection**
* **Ground portable magnetic and gradient surveying for environmental and engineering applications**
* **Base station monitoring for observing diurnal magnetic activity and disturbances with integrated GPS time**

The GSM-19 addresses customer requests for GPS and high-resolution Differential GPS (DGPS) through both the industry's only built-in GPS (as well as external GPS).

Built-in GPS offers many advantages such as minimizing weight and removing bulky components that can be damaged through normal surveying. The following table summarizes GPS options.

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GPS Options:

Description	Range	Services
GPS Option A		Time Reception only
GPS Option B	<1.5m	DGPS*
GPS Option C	<1.0m	Ag 114 DGPS*, OmniStar
GPS Option D	<0.7m <1.2m <1.0M	CDGPS, DGPS *, OmniStar.
Output		
Time, Lat / Long, UTM, Elevation and number of Satellites		
*DGPS with SBAS (WASS/EGNOS/MSAS)		

Key System Components

Key components that differentiate the GSM-19 from other systems on the market include the sensor and data acquisition console. Specifications for components are provided on the right side of this page.

Sensor Technology

Overhauser sensors represent a proprietary innovation that combines advances in electronics design and quantum magnetometer chemistry.

Electronically, the detection assembly includes dual pick-up coils connected in series opposition to suppress far-source electrical interference, such as atmospheric noise. Chemically, the sensor head houses a proprietary hydrogen-rich liquid solvent with free electrons (free radicals) added to increase the signal intensity under RF polarization.

From a physical perspective, the sensor is a small size, light-weight assembly that houses the Overhauser detection system and fluid. A rugged plastic housing protects the internal components during operation and transport.

All sensor components are designed from carefully screened non-magnetic materials to assist in maximization of signal-to-noise. Heading errors are also minimized by ensuring that there are no magnetic inclusions or other defects that could result in variable readings for different orientations of the sensor.

Optional omni-directional sensors are available for operating in regions where the magnetic field is near-horizontal (i.e. equatorial regions). These sensors maximize signal strength regardless of field direction.

Data Acquisition Console Technology

Console technology comprises an external keypad / display interface with internal firmware for frequency counting, system control and data storage / retrieval. For operator convenience, the display provides both monochrome text as well as real-time profile data with an easy to use interactive menu for performing all survey functions.

The firmware provides the convenience of upgrades over the Internet via its software. The benefit is that instrumentation can be enhanced with the latest technology without returning the system to us -- resulting in both timely implementation of updates and reduced shipping / servicing costs.

Performance

Sensitivity:	0.022 nT / vHz@1Hz
Resolution:	0.01 nT
Absolute Accuracy:	+/- 0.1 nT
Dynamic Range:	15,000 to 120,000 nT
Gradient Tolerance:	> 10,000 nT/m
Sampling Rate:	60+, 3, 2, 1, 0.5, 0.2 sec
Operating Temp:	-40C to +55C

Operating Modes

Manual:
Coordinates, time, date and reading stored automatically at minimum 3 second interval.

Base Station:
Time, date and reading stored at 3 to 60 second intervals.

Remote Control:
Optional remote control using RS-232 interface.

Input / Output:
RS-232 or analog (optional) output using 6-pin weatherproof connector

Storage - 32Mbytes (# of Readings)

Mobile:	1,465,623
Base Station:	5,373,951
Gradiometer:	1,240,142
Walking Magnetometer:	2,686,975

Dimensions

Console:	223 x 69 x 240 mm
Sensor:	175 x 75mm diameter cylinder

Weights

Console:	2.1 kg
Sensor and Staff Assembly:	1.0 kg

Standard Components

GSM-19 console, GEMLinkW software, batteries, harness, charger, sensor with cable, RS-232/USB cable, staff, instruction manual and shipping case.

Optional VLF

Frequency Range:	Up to 3 stations between 15 to 30.0 kHz
Parameters:	Vertical in-phase and out-of phase components as % of total field. 2 components of the horizontal field amplitude and total field strenght in pT
Resolution:	0.1% of total field

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APPENDIX B

Field Notes

FIELD NOTES – HERITAGE GRID

L40N – 450W - 500W: Stripping and channel sampling
L40N – 250W – 300W: Stripping and channel sampling
L37N – 225W – 250 W: Trench
L37N – 950W : Old camp/drum
L37N – 975W : HE07-15 DDH
L37N – 1075W: 2 DDH
L36N – Picket and chaining error problems noted
L34N – 1325: DH13-13 (casing causing magnetic high)
L32N – APPROX 1425W: HE13-15
L32N – 300W: Center of NE trending trench
L3075N – 1375W: HE14-15
L23N – 1150W-1175W: Mineralized Zone 2 DDH's
L6N – Start of line – Culvert near by
L5N – 1450W: Tire Rim
L4N – 775W: Road Showing – strong magnetic response

APPENDIX C

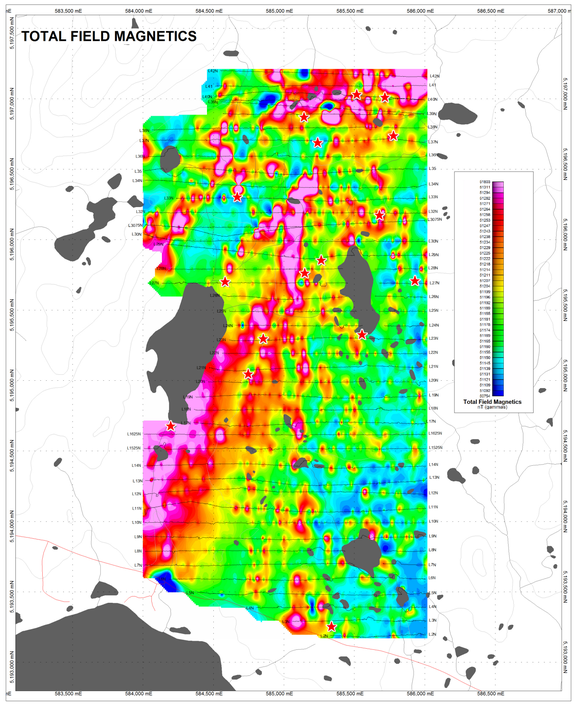
Map and Data Disk

(SEE ACCOMPANYING CD)

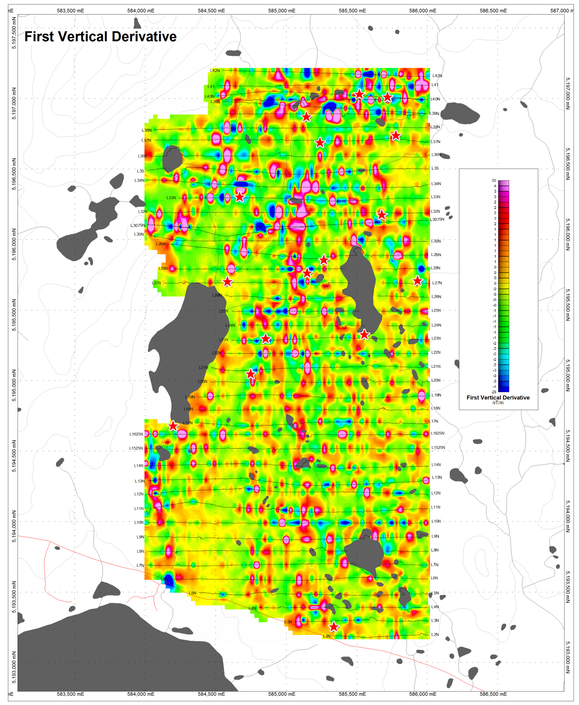
APPENDIX D

Heritage Geophysical Compilation Map

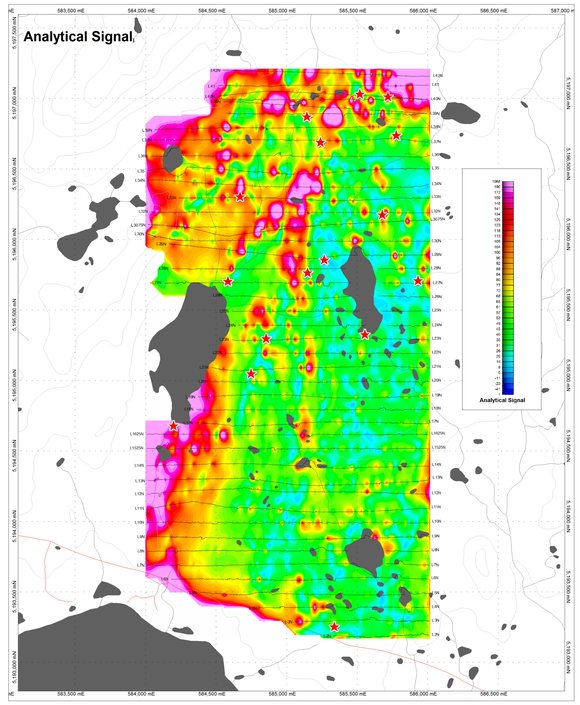
TOTAL FIELD MAGNETICS



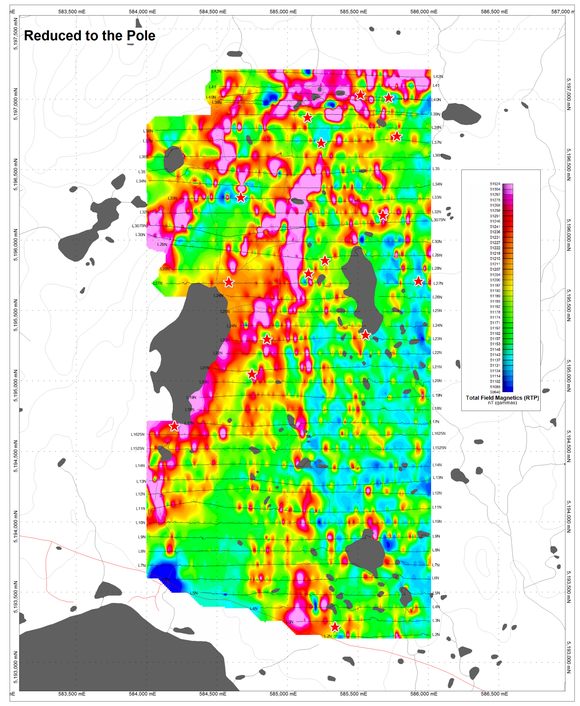
First Vertical Derivative



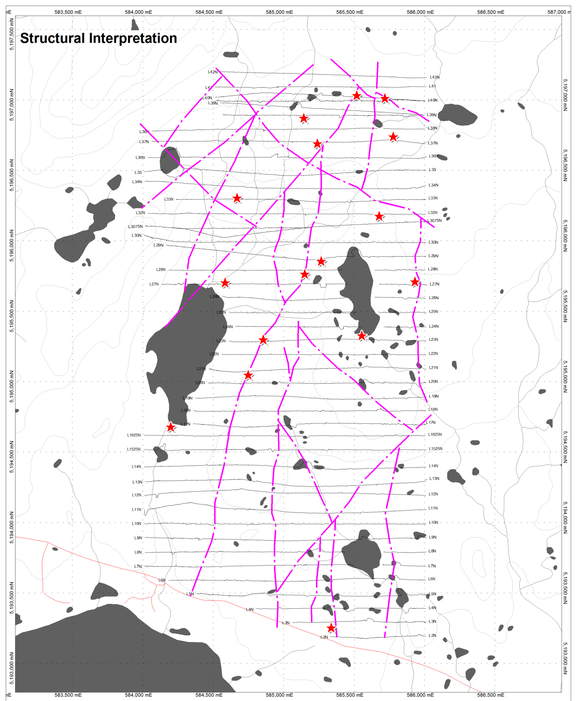
Analytical Signal



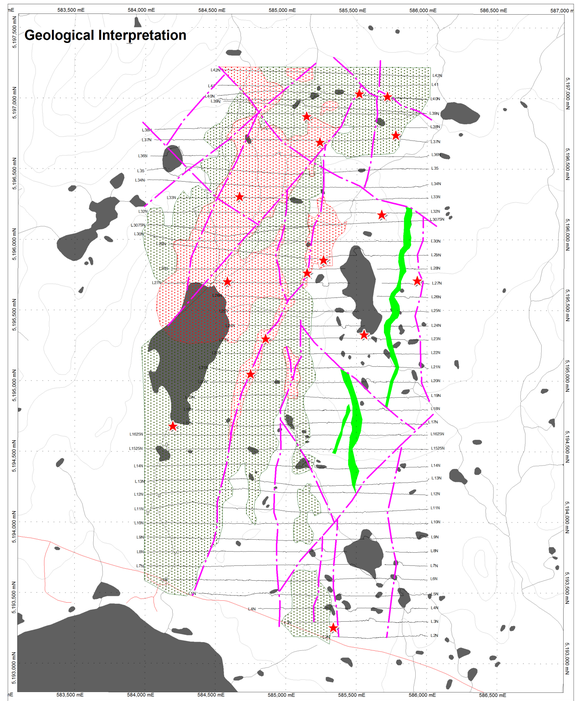
Reduced to the Pole



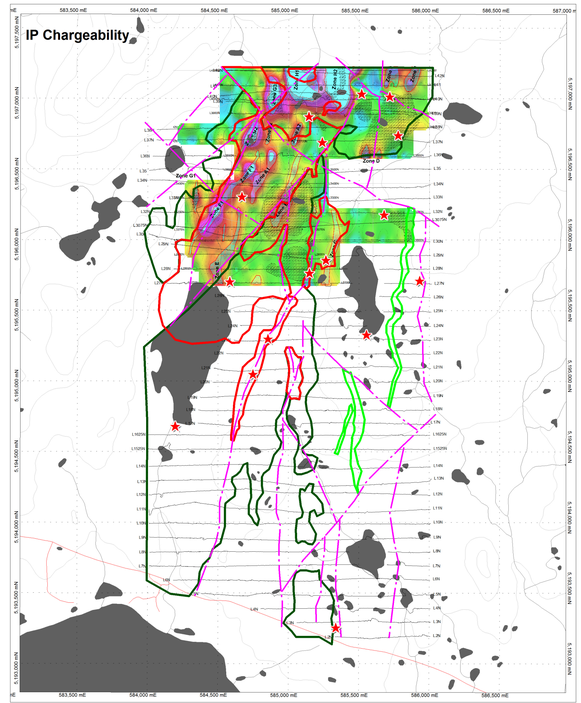
Structural Interpretation



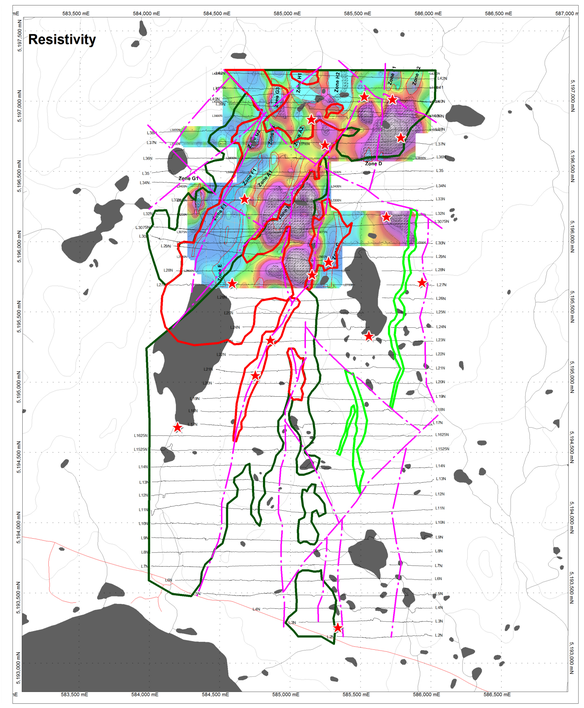
Geological Interpretation



IP Chargeability



Resistivity



LEGEND

- Interpreted Mafic Volcanics
- Interpreted Alteration Zone
- Interpreted Mafic Dike
- Interpreted Structral Feature
- Showing

SCALE

0 0.5 1

kilometers

Notes:
* IP/Resistivity work was supplied by Puddle Pond Resources Ltd.

PUDDLE POND RESOURCES

Heritage Gold Project
Burin Peninsula, Newfoundland
Geophysical Compilation Map

Scale 1:20,000	Coodinate System: NAD27/Zone 21	May 2016