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Ontario

Report on a Diamond Drill Hole Program

and

Report on a Surface UTEM-5 Ground Geophysical Survey

(As completed by Lamontagne Geophysics Ltd., for:)

NORONT

AT5 Property

Ring of Fire, James Bay Lowlands
BMA 526862
Porcupine Mining District, Ontario

May 10, 2017

AT5 Property
2016 Exploration Report
Diamond Drill Report and
Borehole EM & Surface UTEM-5 Survey

Report prepared for:

NORONT RESOURCES LIMITED
Suite 400 – 110 Yonge Street
Toronto, Ontario
M5C 1T4

Report prepared by:

Matt Downey, M.Sc., P.Geo.
Manager, Lands & Data
Noront Resources

May 10, 2017
127 Pages

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1. Introduction

From August 18, 2016 to October 6, 2016, Noront Resources Ltd. ("Noront") completed a one-hole diamond drill program, as well as follow-up Borehole EM ("BHEM") and Surface UTEM-5 ("SUTEM") surveys, on their AT5 Property, which lies on Noront's Mining Lease CLM503, in the township of BMA 526 862 (NTS 043D09), in the Porcupine Mining District (Figures 1, 2, and 3). Lamontagne Geophysics Ltd. ("Lamontagne") was contracted by Noront to perform the BHEM and SUTEM surveys. This SUTEM survey was a small 4-line program that tied onto the Lamontagne SUTEM survey completed over the AT5 Property earlier in the year (February 23 to March 14, 2016).

Noront's 2016 Exploration focus was on Ni-Cu-PGE sulphide mineralization in the footwall zone of the Ring of Fire ultramafic intrusive suite, which hosts the majority of the magmatic sulphide mineralization in the Ring of Fire (Eagle's Nest, Blue Jay/AT12, AT12 extension, F2 Zone, Contact Zone, NW Breccia). Noront holds nearly the entire Ring of Fire ultramafic footwall contact zone and thus holds a significant package of land on which to explore for further Ni-Cu-PGE mineralization (Figure 4).

The ground that Noront holds in the ultramafic intrusive and footwall contact zones has been divvied into Areas 1 through 10, with Areas 1 and 2 covering a large area just north, northwest, and northeast of the Eagle's Nest and Blackbird deposits (this area also covers the AT5 and AT6 anomalies). Area 3 covers the Blue Jay Ni-Cu-PGE prospect and surrounds (formerly known as AT12). Area 5 covers the footwall contact zone in the area of the Big Daddy chromite deposit (a Joint Venture with KWG Resources), and Area 6 covers the footwall contact zone in the area of the Black Thor and Black Label chromite deposits. Area 6 is also host to Ni-Cu-PGE footwall sulphide mineralization that was discovered by Cliffs Natural Resources in the AT12 Extension, F2 Zone, Contact Zone, and NW Breccia Zone (Figure 4).

The overall plan for the 2016 Exploration program involved initial ground geophysical surveying of focus areas (namely, Areas 1, 2, 3, 5, and 6) by Insight IP, which would then provide target areas for follow-up surveying by Lamontagne Geophysics' UTEM-5 system. The UTEM-5 survey was carried out to test anomalies outlined by earlier exploration, to detect/outline new conductors, and to detect/outline deeper features and potential depth continuations of shallow features. The UTEM surveying would then, ideally, delineate drill targets.

The diamond drilling in 2016 was focused on a new and deep conductive anomaly that was discovered during the SUTEM survey at AT5 earlier in the year. The purpose of the original SUTEM survey at AT5 was to test anomalous chargeability (which had been detected from the IP Area 1 and Area 2 surveys) on the northwest flank of the AT5 magnetic anomaly, an area interpreted to lie on the hangingwall/footwall contact of the ROF ultramafic intrusion with the basement tonalite. This contact represents the stratigraphic bottom of the ultramafic intrusive body and it was hoped it would contain an embayment favourable for sulphide emplacement, as well as sulphide mineralization (Figures 5a and 5b).

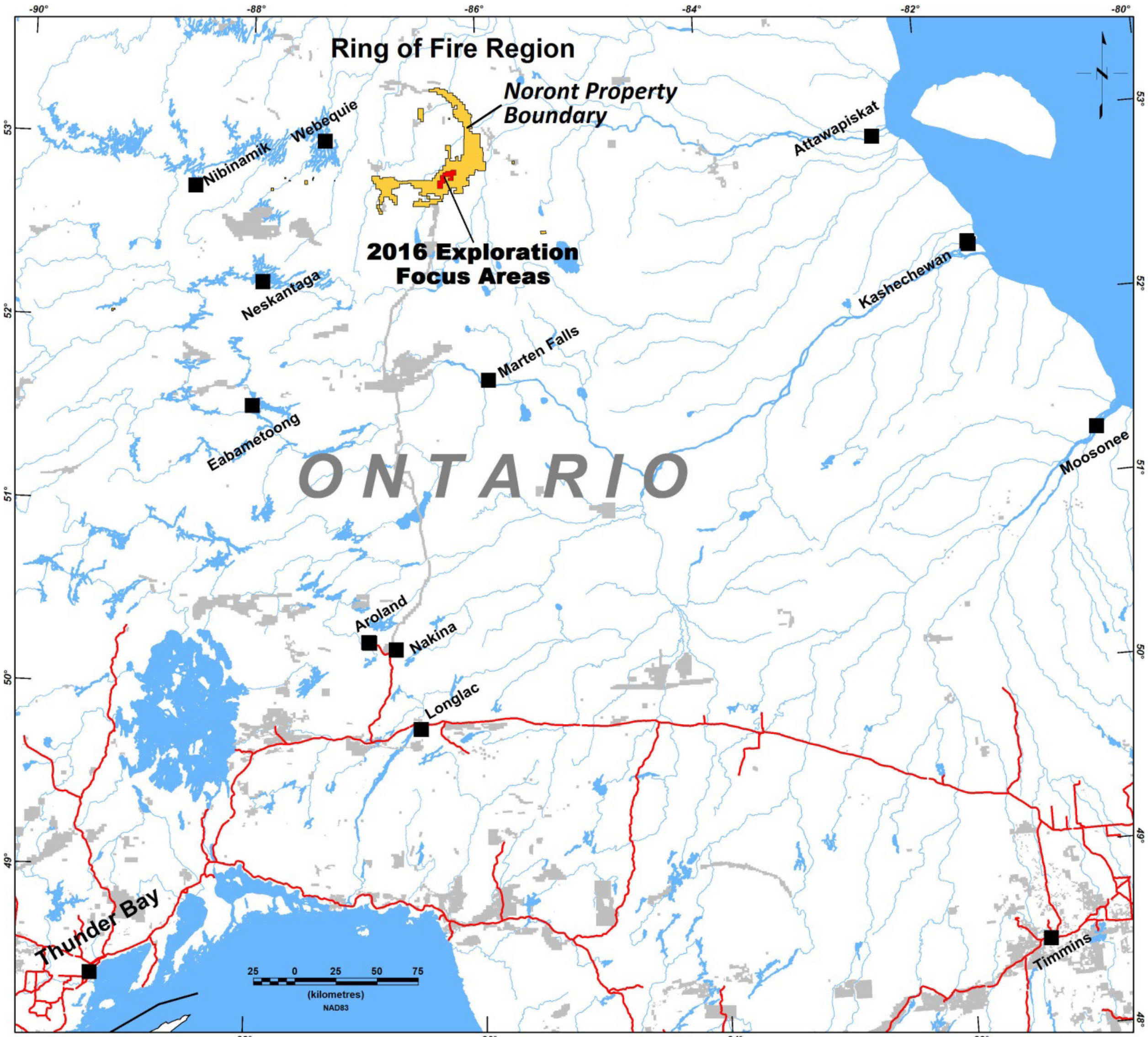

Figure 1: General location map in Ontario.

The original SUTEM survey data was modeled by Lamontagne. In doing so, they were able to create an EM Plate that was modeled at or near the hangingwall/footwall contact, with a depth to top of ~750m, an 800m strike length and a conductance of at least ~100 Siemens (Figures 5a and 5b).

Although the aim in most drill programs is to intersect mineralization, the main purpose of the single deep drill hole at AT5 was to serve as a platform hole for BHEM and DDH wedging. Because of the depth of the EM conductive plate at AT5, the plan was to drill close to the modeled deep EM conductive plate and then do borehole EM, at depth, to delineate and vector into any conductors. If any were discovered by BHEM, drill wedging off of the main hole would be performed to further vector onto the conductive anomalies.

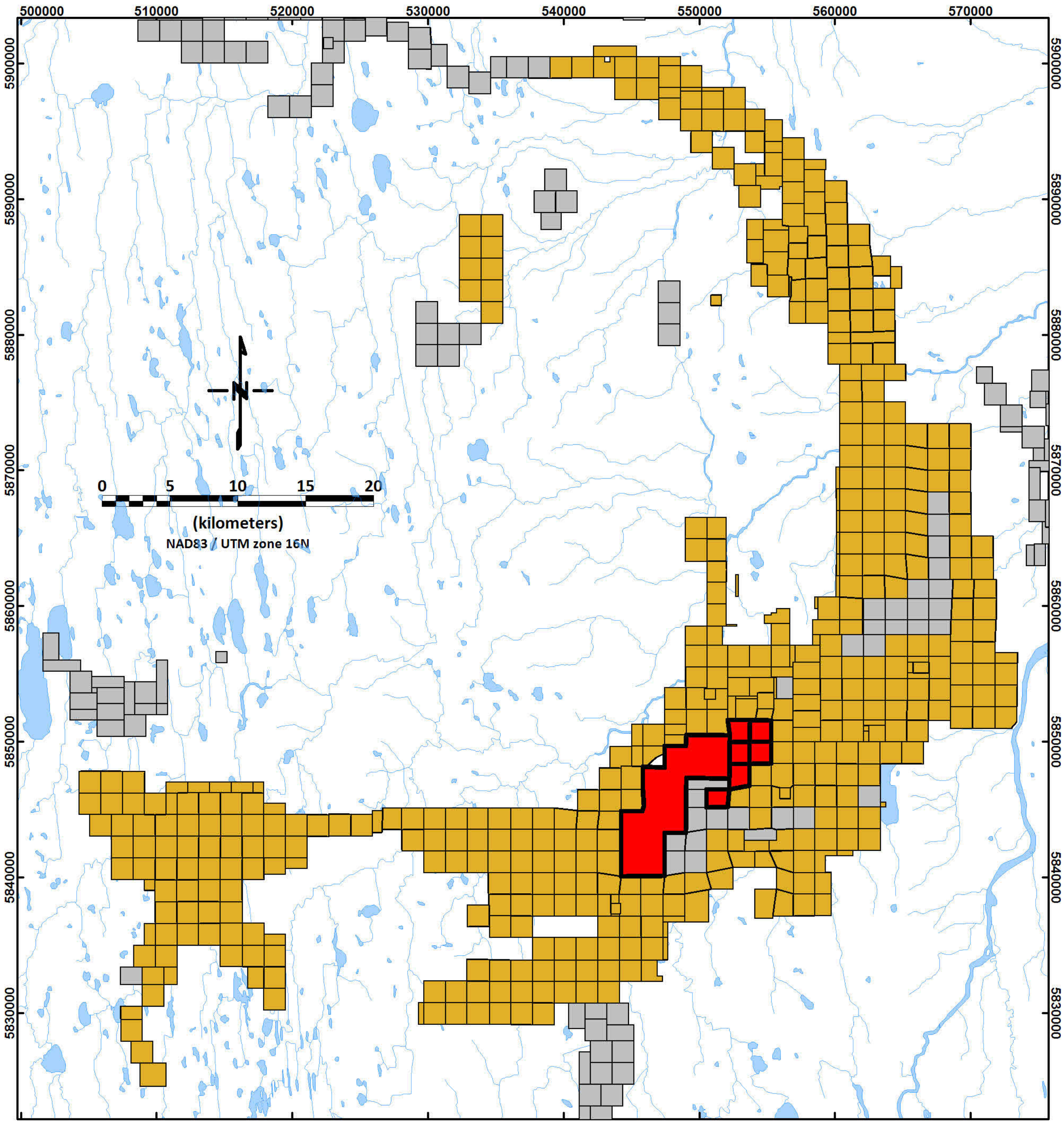

Figure 2: Ring of Fire claim map, with mining leases shown. Claims in yellow are of Noront Resources; claims in grey are of other companies. Claims in red are those of Noront's (including Noront's mining lease) on which exploration was completed in 2016.

Diamond drill hole NOT-16-1G001 was drilled by Cyr Drilling from August 18, 2016 to September 20, 2016. This hole was then surveyed by Lamontagne's BHUTEM4 system, starting on September 21st. The hole was surveyed to a depth of 1160m. The BHUTEM4 data was evaluated in conjunction with SUTEM and other geophysical data collected to date and it was decided to follow-up the BHEM survey with targeted surface UTEM-5 data while the crew was still on site. This new UTEM-5 survey covered an area of approximately 0.27 km^2 (or 27

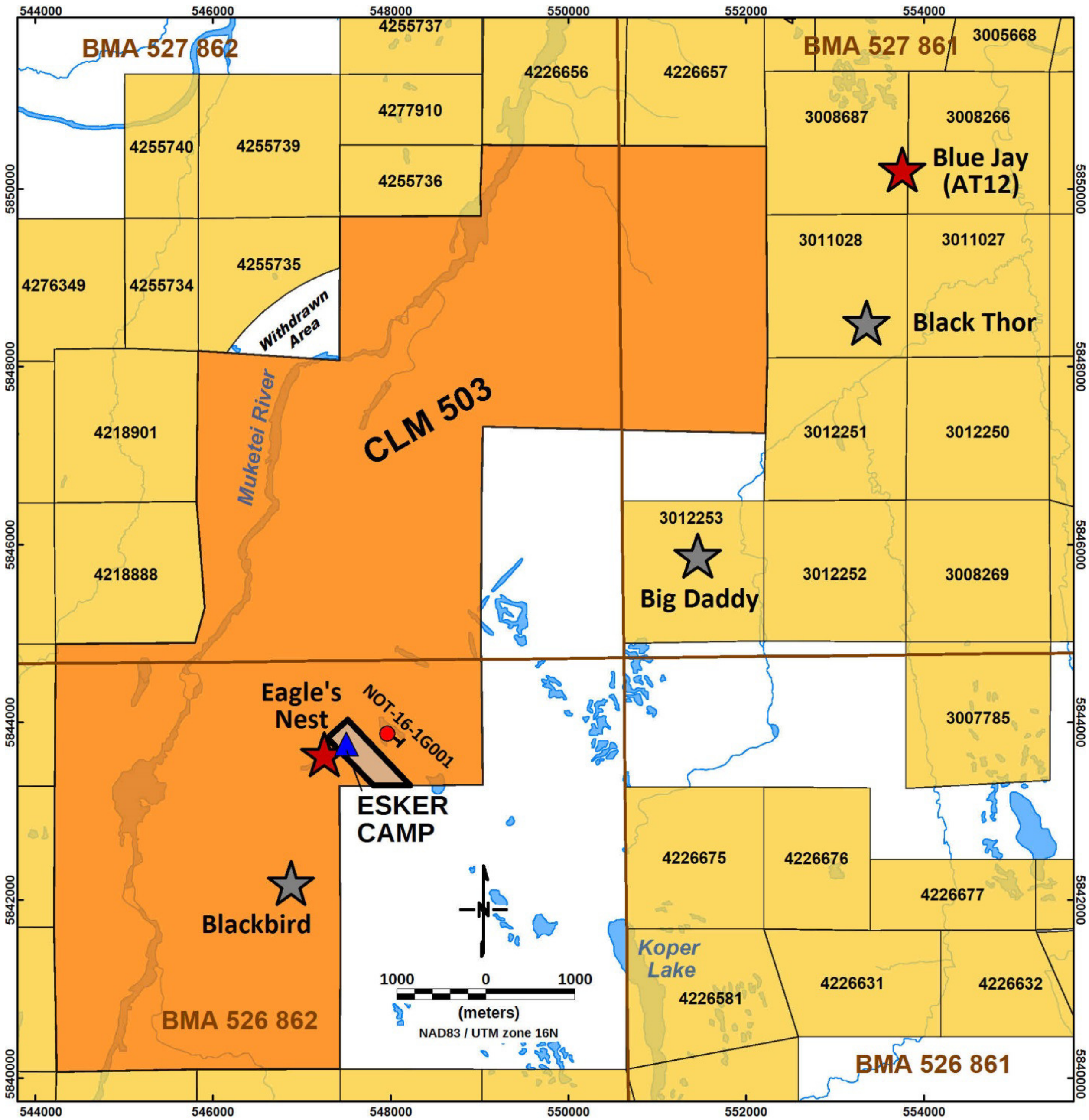

Figure 3: Property claim map. All claims shown (in yellow) belong 100% to Noront Resources, with the exception of claims 3012253, 3012252, and 3008269, which are 72% Noront – 28% KWG. Orange claims are those being filed for work herein. CLM503 is Noront's Mining Lease. Black polygon represents UTEM-5 survey outline. Red symbol represents drill hole collar.

hectares), with 5 line km of surveying being completed across 4 lines. This survey tied onto the survey completed by Lamontagne earlier in the year (Figures 5a and 5b).

This program, as detailed within this report, represented the last phase of Noront's 2016 exploration program.

Hereby presented in detail is the AT5 diamond drill program (Appendix 1) and follow-up BHEM and SUTEM surveying (Appendix 2).

2. Exploration History

Between 1959 and 1988, there was sporadic exploration for diamonds by companies such as Consolidated African Selection Trust, De Beers South Africa (1962), and Monopros Limited (the Canadian subsidiary of De Beers), until the discovery of the Attawapiskat diamondiferous kimberlite field by Monopros Limited in 1988. In the early to mid-1990s, joint ventures partners Spider Resources Inc. ('Spider') and KWG Resources Inc. ('KWG') conducted an airborne magnetic survey throughout the northern part of the James Bay Lowlands focusing on diamond exploration. They discovered the Good Friday and MacFadyen kimberlites in the Attawapiskat cluster, as well as the five Kyle series kimberlites, that lie to the east of the property being reported herein.

In 2002, De Beers Canada Inc. entered into a joint venture with Spider and KWG after discovering the McFaulds No. 1 volcanogenic massive sulphide (VMS) deposit while searching for kimberlites in 2001. Subsequent work by Spider and KWG, following another Spider/KWG airborne magnetometer survey, led to the discovery of the McFaulds No. 3 deposit and other related VMS occurrences nearby.

The discovery of these deposits, and the recognition of the region as a greenstone belt with great potential for further discoveries of base metal deposits, led to a staking rush by junior mining companies (including Noront) that began in December 2002 and continued well into 2003. The staking rush and subsequent exploration led to the discovery of six additional VMS deposits in 2003 by other junior exploration companies in the region.

Noront has been exploring the general area since early 2003, shortly after the VMS mineralization was discovered near McFaulds Lake by De Beers Canada. Noront acquired their initial claims by staking in August 2003 and followed that up with additional claim staking in January 2006, in the fall of 2007, and in the spring of 2008. Geophysical surveys (VTEM and ground magnetometer) conducted between 2004 and 2006 identified magnetic targets that were drilled in 2006 by Probe Mines Ltd. on Noront-held claims. It was this drilling that led to the identification of ultramafic rock, which thus highlighted the potential for Ni-Cu-PGE-Cr mineralization in the area.

Noront discovered the Eagle One (now termed Eagle's Nest) magmatic massive sulphide (MMS) deposit while searching for VMS mineralization in 2007. Following this discovery, Noront commissioned airborne and ground geophysical surveys to aid in the search for other similar deposits nearby. Noront completed a large-scale airborne geophysical survey in the fall of 2007 using Aeroquest Ltd. and their AeroTEM system. This was then followed by ground geophysical surveying (magnetics and gravity) by JVX Ltd., which was completed in the early part of 2008 on the Grid 1 property, as well as in late 2008 and early 2009 on the Grid 2 property. In 2008, Noront completed another large-scale airborne geophysical survey (Geotech VTEM) over nearly all of Noront's claims in the Ring of Fire region.

Following these surveys, a total of twelve anomalous conductive and magnetic targets were chosen for further exploration, in the hopes of finding another MMS deposit in the host ultramafic rocks. These targets were given a project designator, 'AT', and a number (1 through12), and most were investigated through diamond drilling. This led to the 2008 discovery of the Eagle Two shear hosted sulphide deposit nearby, as well as the AT12 (now

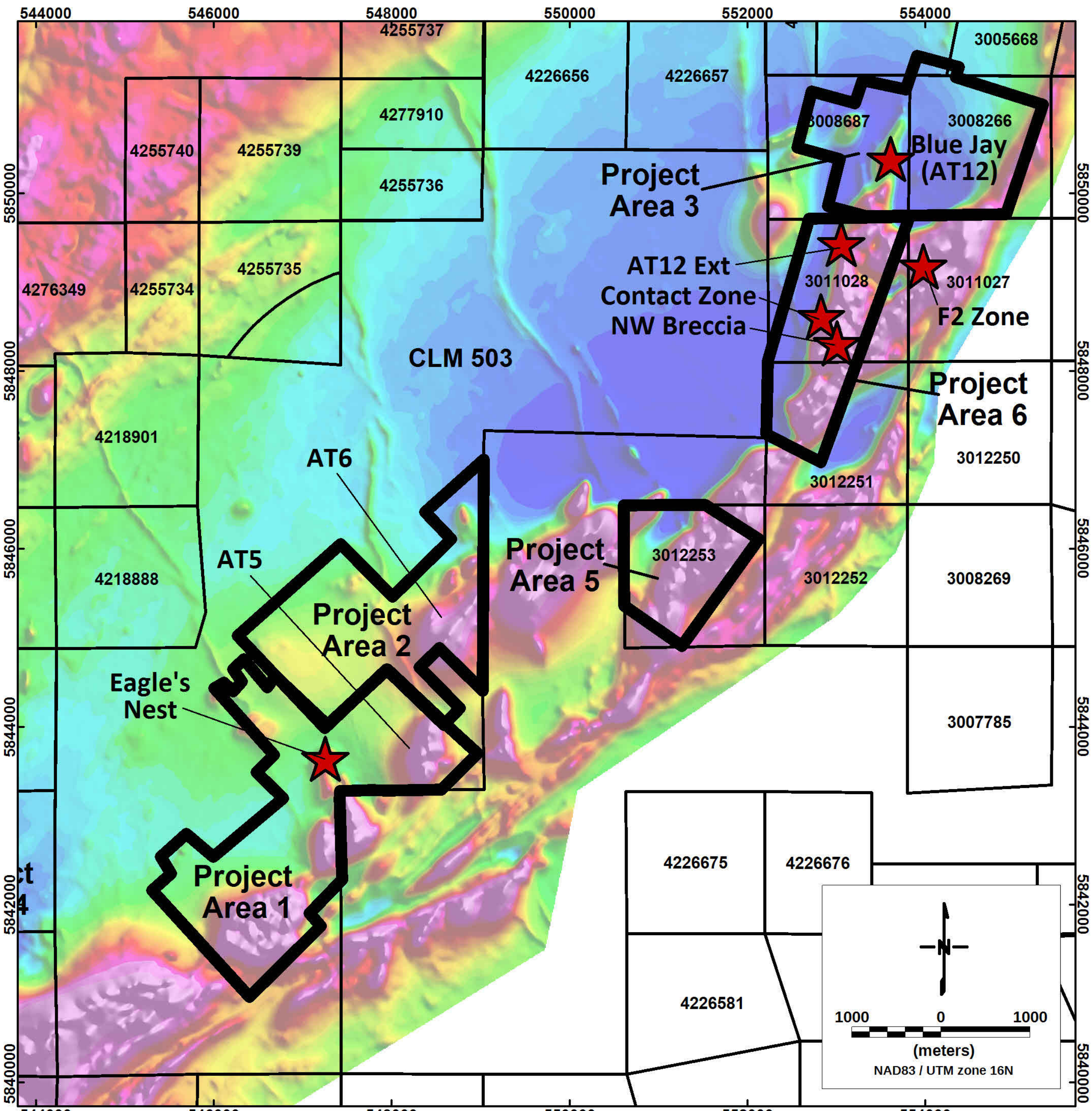

Figure 4: 2016 Exploration Focus Areas. Total magnetic intensity in background. Claims shown are of Noront Resources.

called Blue Jay) MMS deposit to the northeast of Eagle's Nest. It was the drilling of the Eagle Two deposit that led to the later discovery of the Blackbird chromite deposits in 2008 and the Blackstone/AT1 chromite occurrence in 2010, which are both hosted by the same ultramafic complex as Eagle's Nest. In 2009, the Thunderbird vanadium occurrence was discovered further to the east of Blackbird – Eagle Two – Eagle's Nest in a large mafic body (thought to the be the

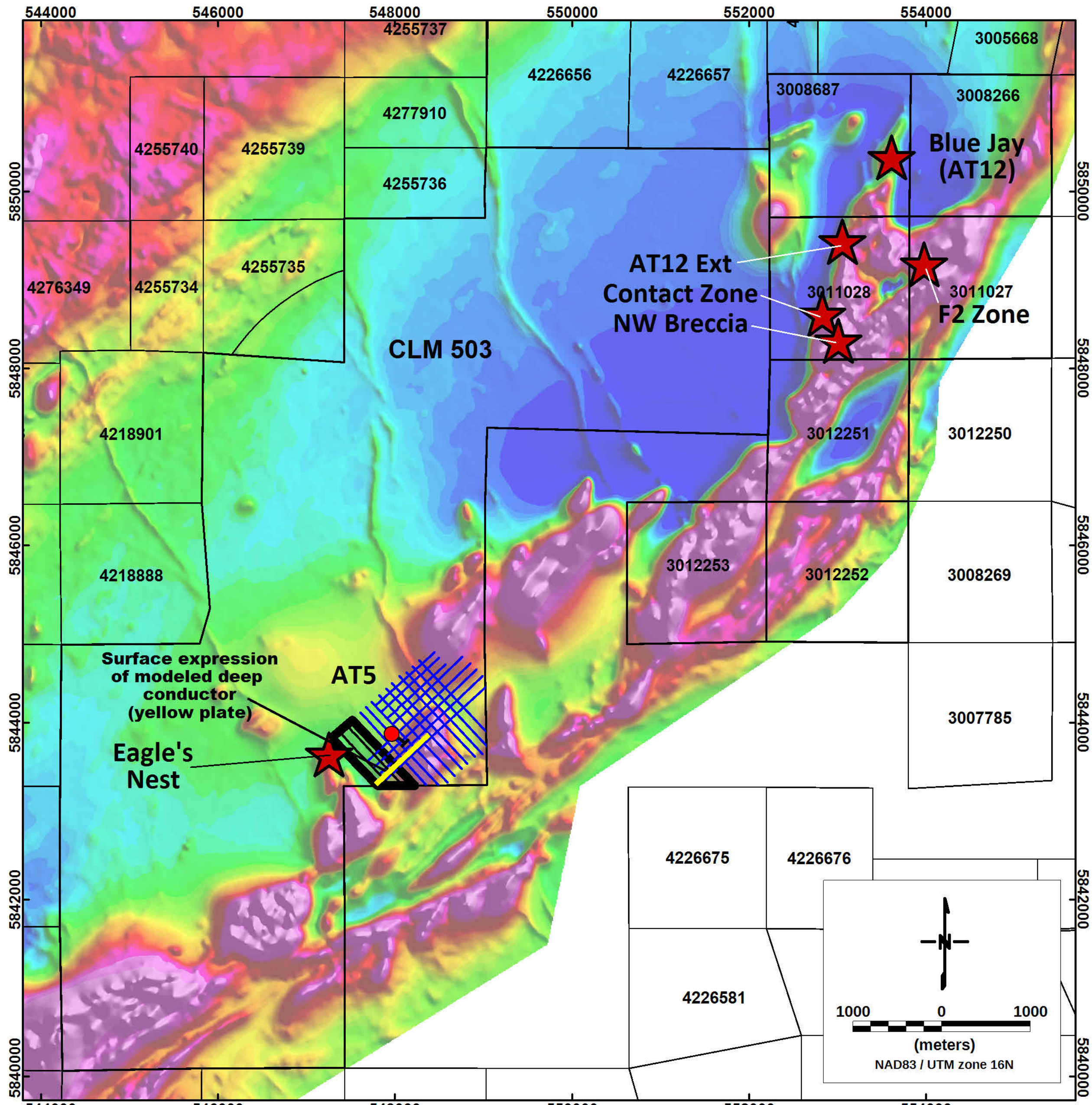

Figure 5a: Location map of drilling and Lamontagne Surface UTEM-5 survey over the AT5 property. The thick black polygon represents the survey outline; thinner lines represent surveyed lines. The blue lines represent the original 2016 AT5 UTEM survey, which was completed from February 23 – March 14, 2016. Red symbol is the drill hole collar. Total magnetic intensity in the background.

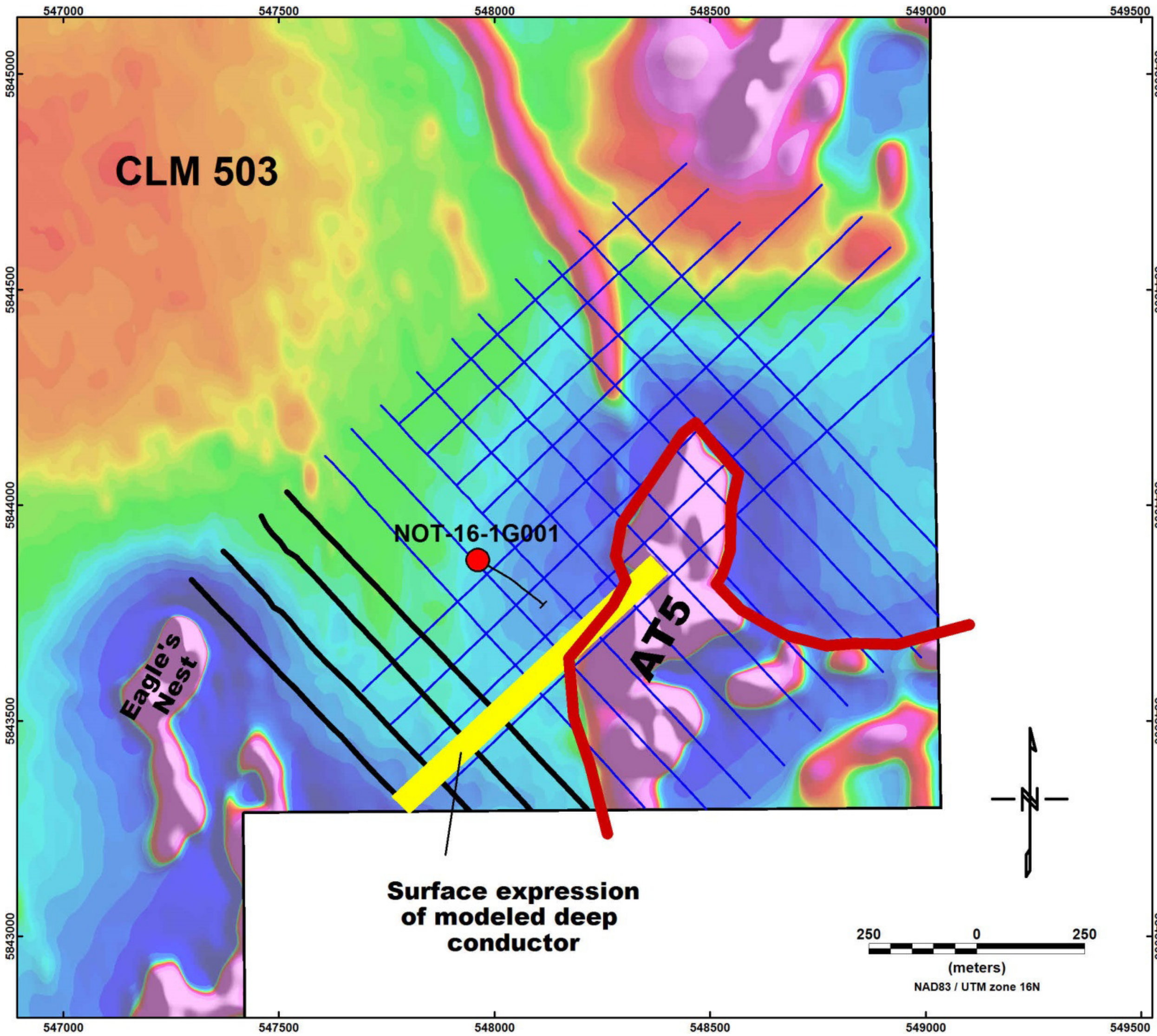

Figure 5b. Close-up location map of drilling and Lamontagne Surface UTEM-5 survey over the AT5 property. Survey lines for the follow-up SUTEM survey (September 18 – October 6, 2016) shown in black; SUTEM lines from first 2016 survey (February 23 – March 14, 2016) shown in blue. Heli-GT first vertical derivative is in the background. The yellow polygon represents the surface expression of the top of the modeled UTEM-5 conductive plate, which lies approximately 750m below surface. The thick red line represents the ultramafic-tonalite contact, and the collar and drill hole trace of NOT-16-1G001 are shown.

compliment to the Eagle's Nest – Blackbird ultramafic body), and in late 2009, the Triple J gold occurrence was discovered in the area of Eagle Two and Blackbird, in a contact zone between the granodiorite and Blackbird-hosting peridotite. In January 2010, a resource model and National Instrument 43-101 report was released on the Blackbird Chromite deposits, entitled "Technical Report on the Mineral Resource Estimate for the Blackbird Chrome Deposits, James Bay Lowlands, Northern Ontario, Canada". The resource model and report were created by Micon International Ltd. In April 2011, an updated resource model and National Instrument 43-

101 report was released for the Eagle's Nest Sulphide deposit, entitled "Technical Report on the Updated Mineral Resource Estimate for the Eagle's Nest Property, McFaulds Lake Project, James Bay Lowlands, Ontario, Canada". The resource model and report were created by Micon International Ltd. And in May 2012, an updated resource model and National Instrument 43-101 report was released for the Blackbird Chromite deposits, entitled "Technical Report on the Updated Mineral Resource Estimate for the Blackbird Chrome Deposits, McFaulds Lake Property, James Bay Lowlands, Ontario, Canada". The resource model and report were again created by Micon International Ltd. In 2010, Noront completed yet another large-scale airborne geophysical survey (Terraquest High Resolution Magnetic and VLF-EM Airborne Survey) over nearly all of Noront's claims in the Ring of Fire region.

Noront completed a preliminary feasibility study in October 2011 (Burgess et al. 2011) to evaluate the development of the Eagle's Nest deposit, a high-grade Ni-Cu-Pt-Pd mineralized pipe-like body that is approximately 60 by 200 metres wide, and extends to depths beyond 1600 metres. This study indicated that the proposed mine infrastructure would be constructed underground. A contained, buried pipeline would then pump and transport a slurry of nickel-copper concentrate from the mill at the Eagle's Nest mine site to Webequie Junction, 90 kilometres west of the proposed mine site. From there, the concentrate would be dewatered and loaded for bulk transportation along a proposed 210 kilometre-long all-season road to Highway 808 north of Pickle Lake, Ontario. Transportation would then continue along the existing highway through Pickle Lake to the proposed Savant Lake concentrate handling facility. Development of a 105 kilometre-long winter road would provide a road connection from Webequie Junction to the Eagle's Nest mine site. This proposed infrastructure plan is termed the "East-West Corridor Alternative". In May, 2012, the Ontario Government announced their support for a north-south access route (the "North-South Corridor Alternative"), which provides access to the Ring of Fire via an access road from Nakina, Ontario. Noront adopted this proposed infrastructure corridor as the base case for the Eagle's Nest project in their 2012 feasibility study (Burgess et al. 2012). However, Noront has retained the originally designed East-West Corridor as an alternative, and in order to support construction activities, Noront plans to upgrade the existing winter road along the existing East-West Corridor from Pickle Lake to Webequie, in conjunction with the First Nations that currently use this route. This will include increasing funding to develop the main winter road towards Webequie and development of a new winter road leading east to the project site from south of Webequie, at Webequie Junction.

Insight IP was conducted over the Eagle's Nest – Blackbird property area in 2011-2012, and was followed by limited drilling of IP targets in 2012. IP was also conducted over the AT12/Blue Jay property, and drilling took place there as well. Valuable information on the geology of these areas was gained, but no deposits were uncovered.

In 2015, Noront purchased Cliffs Chromite Far North (formerly Spider Resources) and Cliffs Chromite Ontario (formerly Freewest Resources), thereby purchasing all property formerly owned by Cliffs Natural Resources in the Ring of Fire. In doing so, Noront purchased a 100% ownership in the Black Thor & Black Label chromite deposits, a 70% and controlling interest in the Big Daddy chromite deposit, an 85% and controlling interest in the McFaulds Lake VMS deposits and occurrences, and a 50% interest in the Kyle kimberlite occurrences. As a result, Noront now owns the majority of property in the Ring of Fire, and with it, all major deposits and much of the prospective ground.

In August 2016, Noront purchased a 75% interest in the Butler Lake and Sanderson properties from MacDonald, both located in the Ring of Fire area of Northern Ontario. MacDonald will carry a 25% interest in the two properties until the issuance of a NI 43-101 compliant resource on either property, at which time MacDonald will have the option to convert the interest into a 1% NSR. If MacDonald does not elect to convert, Noront can elect to purchase the remaining 25% from MacDonald. If neither company chooses their respective options, then a joint venture arrangement will be formed in order to develop the properties.

Noront's exploration plan for the Ring of Fire for 2017 involves Ni-Cu-PGE exploration in and around its flagship property of Eagle's Nest, as well as in the Sanderson area, and VMS exploration on the McFaulds and Butler properties.

3. Property Description and Location

The AT5 Property is located in the James Bay Lowlands of Northern Ontario in the Porcupine Mining District, at approximately 548350mE, 5843985mN using NAD83 / UTM Zone 16N. It is located approximately 75 kilometres east of the community of Webequie, 125 kilometres northeast of the community of Neskantaga, 125 kilometres northwest of the community of Marten Falls, 285 kilometres north of the town of Nakina, and is immediately north of the Eagle's Nest deposit (Figure 1).

Noront's land package in the Ring of Fire contains 495 unpatented mineral claims and one mining lease totaling 115,556 hectares of ground and mineral exploration rights. In 2016, Noront's multifaceted exploration program focused on a total of six claims, as well as Noront's mining lease (Table 1).

Exploration personnel were accommodated at the Esker Camp (547500mE, 5843730mN). Access to the field survey area was by snowmobile, and the crews mobilized to site every day from Esker Camp. Access to the Esker Camp is by snowmobile, helicopter, ATV, or Argo from the Koper Lake base camp (~4 km southeast of the camp), which is serviced by fixed wing (ice or float planes) from Nakina, Ontario, or from the First Nation community of Webequie.

3.1 Claims Being Filed for Assessment

This phase of the AT5 exploration program only covered portions of Noront's mining lease, CLM 503 (G# 60100775). This lease comprises former Noront mining claims P 3005670, P 3006707, P 3006708, P 3006709, P 3012256, P 3012259, P 3012260, P 3012261, P 3012262, P 3012264, P 3012265, P 4218890, P 4218902, P 4218903, P 4218904, P 4226701, P 4226702, P 4226703, P 4226704, and P 4226705. The lease comprises 4100.44 hectares of mining rights and 3510.31

hectares of surface rights, which are owned 100% by Noront Resources, and has a 21-year term which is up for renewal July 31, 2034. It is located in the township areas of BMA 526 862 and BMA 527 862 (NTS 043D09 and 043D16), in the Porcupine Mining District (Figure 3). Please refer to Table 1 for a claim-by-claim detail of township/area, recording date, due date, ownership, and number of units/hectares.

Claim Number	Units	Township/ Area	Recording Date	Claim Due Date	Ownership
3008266	16	BMA 527 861	2003-Jul-31	2019-Feb-28	Noront Resources 100%
3008687	16	BMA 527 861	2003-Oct-08	2019-May-08	Noront Resources 100%
3011027	16	BMA 527 861	2003-Apr-22	2019-Apr-22	Noront Muketei Minerals 100%
3011028	16	BMA 527 861	2003-Apr-22	2019-Apr-22	Noront Muketei Minerals 100%
3012251	16	BMA 527 861	2003-Apr-22	2019-Apr-22	Noront Muketei Minerals 100%
3012253	16	BMA 527 861	2003-Apr-22	2020-Apr-22	Noront Muketei 72% - Canada Chrome 28%
CLM503 (G 60100775)	**4100 ha**	**BMA 526 862 BMA 527 861 BMA 527 862**	**2013-Aug-01**	**2034-Jul-31**	**Noront Resources 100%**

Table 1: Listing of claims & lease on which exploration was done during Noront's 2016 exploration program. Those highlighted in bold red text are those being filed for assessment herein.

3.2 Personnel

Noront's 2016 exploration team consisted of Ryan Weston (VP Exploration), Matt Downey (Manager, Lands & Data), Matt Deller & Roland Landry (Project Geologists), and Jeremy Brett (Consulting Geophysicist with MPH Consulting). They were all involved in the planning, targeting, and execution of the exploration program. Rob Lyght and Cory Exell, Noront geotechs, were involved in line cutting and geo-referencing.

Noront contracted the drilling to Cyr Drilling of Winnipeg, Manitoba. Matt Deller and Roland Landry were the geologists who logged the core. Ryan Weston, VP Exploration of Noront, oversaw the project to complete the work described herein.

Noront contracted the geophysics to Lamontagne Geophysics Ltd., of Kingston, Ontario. Rob Langridge oversaw the project and wrote the report, while the Lamontagne field crew consisted of Phil Guimond (crew chief/operator), Gerry Lafortune (BH/Rx/Tx operator), Richard Lahaye (Rx/Tx operator), and Bill Dingwall (Tx operator/electronics). Yves Lamontagne provided valuable insight. Numerous personnel from the communities of Webequie and Marten Falls were also employed by Noront as line cutters and geophysical assistants.

4. Geology

4.1 Regional Geology

The project area is situated in the Ring of Fire ('ROF') in Northern Ontario (also known as the McFaulds Lake area). This area is underlain by rocks of the northwestern part of the Archean Superior Province, which is the world's largest continuously-exposed Archean craton. The northwestern Superior Province is composed of a series of major Mesoarchean volcanic and plutonic belts trending from west to east that each formed as separate microcontinents <3.0 Ga, and are separated by younger Neoarchean metasedimentary belts and crustal-scale faults. These continental fragments underwent rifting and lateral transport through processes considered to be a mixture of modern horizontal plate tectonics (such as those presently operative in largely oceanic domains such as the western Pacific Ocean) and vertical plate tectonics (those that would have occurred during the Archean when the continents were thinner, hotter, and less dense). Later subduction of the oceanic crust between these microcontinents eventually led to their collision and amalgamation to form the current geometry of the Superior Province (Figure 6).

The Eagle's Nest Area Property lies within the McFaulds Lake greenstone belt, which lies within the North Caribou terrane of the western Superior Province (Stott et al. 2010; Stott 2011), formerly known as the Sachigo Subprovince, the Sachigo Superterrane, and the North Caribou Superterrane (Rayner and Stott 2005; Percival et al. 2006; Stott 2007). The North Caribou terrane is comprised of a centrally-located core flanked by the Island Lake domain in the north and west, the Uchi domain in the south, and the Oxford-Stull domain in the north and east (Stott et al. 2010; Stott 2011). The terrane is dominated by two major periods of plutonic and metamorphic activity at 2.895-2.89 Ga and 2.86-2.85 Ga, but the subdomains within it (Island Lake, Uchi, and Oxford-Stull) contain evidence of Neoarchean magmatism and sedimentation (Stott et al. 2010). Along the margins of the North Caribou core there are remnants of a platformal sedimentary succession of quartzite, arkose, and iron formation (evidence of an older continental margin). This is overlain by mafic to komatiitic lavas which are believed to be the product of rifting of the protocontinental landmass circa 2.99-2.98 Ga (Percival et al. 2006; Stott 2008). Following rifting, the area underwent periodic episodes of plutonism, arc volcanism, sedimentation, accretion of fragments of intra-oceanic island arcs, and related obduction of oceanic crust as a result of the subduction of oceanic crust underneath it on both its northern and southern margins. The crust accreted onto the margins of the North Caribou core during this period is recognized as the Island Lake domain on the northern and western margins, the Oxford-Stull domain on the northern and eastern margins, and the Uchi domain on the southern margin (Stott 2008; Stott et al. 2010; Stott 2011). It is thusly interpreted that the North Caribou terrane forms a Mesoarchean core upon which subsequent Neoarchean crust was added (Percival et al. 2006; Stott 2008; Stott et al. 2010). As well, several older greenstone belts, from 3.0 to 2.9 Ga, are preserved in the terrane, as are ca. 3.0 to 2.9 Ga rift sequences (Stott et al. 2010). This terrane also experienced repeated episodes of deformation and medium- to high-grade metamorphism between 3.0 and 2.7 Ga (Percival et al. 2006; Stott 2007, 2008).

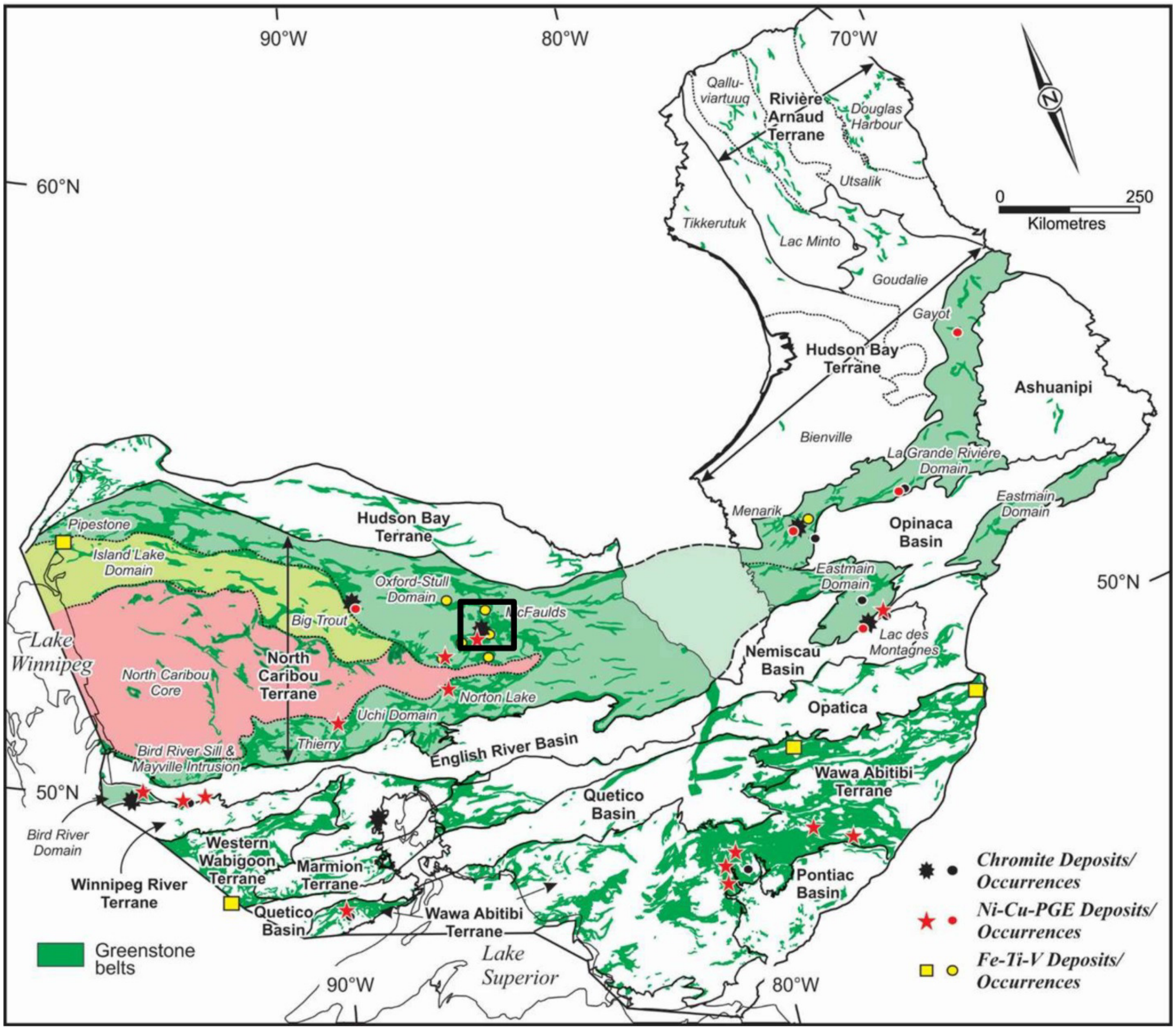

Figure 6: Geology of the Superior Province in Canada (from Houlé et al. 2015). The McFaulds Lake Greenstone Belt is in the centre of the figure.

The Oxford-Stull domain (Thurston et al. 1991; Oxford-Stull Subprovince of Rayner and Stott 2005), which contains the McFaulds Lake greenstone belt at its eastern limit of exposure, runs east-southeast and forms the northern-eastern portions of the North Caribou terrane. It stretches from northwestern Manitoba to north-central Ontario where it extends under the Paleozoic cover rocks of the James Bay Lowlands (Figure 6). Across the breadth of the Oxford-Still domain, there is a preponderance of Neoarchean U/Pb zircon ages in volcanic and plutonic rocks (Stott et al. 2010). As well, this domain is distinguished from other domains of the North Caribou terrane by its lack of pre-3.0 Ga crustal ages as determined by U-Pb dating and Sm-Nd isotope systematics (Stott et al. 2010). It includes several assemblages ranging in age from Mesoarchean (2.87 to 2.83 Ga) to Neoarchean volcanism at 2.72 to 2.71 Ga (Stott 2008). U/Pb zircon analyses of volcanic and plutonic rocks near the James Bay Lowlands region give ages from 2.737 Ga to as young as 2.683 Ga, and Nd model ages suggest relatively juvenile crustal growth (Rayner and Stott 2005; Stott 2008; Stott et al. 2010). Mesoarchean crystallization ages are somewhat scarce, and are generally restricted close to the northern and southern boundaries of the domain (Stott et al. 2010).

At the southern boundary of this domain lies a series of major ductile shear zones that separate it from the Island Lake domain and the rest of the North Caribou terrane. In the McFaulds Lake area this boundary is called the Stull-Wunnummin fault. The southern contact of the Oxford-Stull domain with the Island Lake domain shows a prevalence of Mesoarchean zircon ages and isotopic evidence suggests that the two domains share a constructive history prior to the development of the Stull-Wunnummin fault (Stott 2008). The northern boundary of the Oxford-Stull domain is the North Kenyon fault, a major ductile strike-slip deformation corridor that separates the entire North Caribou terrane from the Hudson Bay terrane to the north, which is recognized as another older (> 3.0 Ga) continental fragment (Stott et al. 2010).

4.2 Ring of Fire Geology and the McFaulds Lake Greenstone Belt

A key feature of the McFaulds Lake area is a prominent linear magnetic high (associated with laterally extensive formational conductors) that is continuous for up to tens of kilometers, and forms a semi-circle, ~60 kilometres in diameter from north to south, as seen on the regional airborne magnetic anomaly maps. This prominent linear magnetic high is known as the Ring of Fire (ROF). The ROF has been interpreted as a regionally extensive iron formation, or more probably a series of ferrogabbroic intrusions, that was deposited/intruded along the margins of a regional scale granodiorite pluton, one that had been intruded into and caused doming of supracrustal rocks of the Oxford-Stull domain. Along the length of the ROF magnetic high, it is generally intercalated with mafic to intermediate lavas and tuffs and intruded by a variety of mafic to intermediate sills and dykes. Although original theories included iron formation as the sulphur source, there is little evidence for the existence of large volumes of iron formation in the ROF area. There are, however, extensive ferrogabbroic intrusions, which would not account for the Sulphur, but may be accountable for the extensive magnetic highs in the ROF.

Due to the near-total absence of outcrops, no such greenstone belt was recognized in the McFaulds Lake area until 1999 (Percival et al. 1999). Since then, however, much work has been done, sparked by the discoveries from 2003-2007. The McFaulds Lake Greenstone Belt (MLGB), as it is now termed (Metsaranta and Houlé 2011, 2012, and 2013), is comprised of six lithotectonic assemblages, which have all been age-dated and are listed here from youngest to oldest: the Tappan Assemblage (< ca. 2702 Ma); the Muketei Assemblage (ca. 2735 Ma); the Winiskisis Assemblage (ca 2757 Ma, < ca. 2714 Ma); the Victory Assemblage (2797-2781 Ma); the Attawapiskat Assemblage (2820-2811 Ma); and the Butler Assemblage (ca. 2828 Ma; Mungall et al. 2010; Metsaranta and Houlé 2011, 2012, and 2013). See Figure 7 for a summary map of the MLGB geology. This data suggests that the MLGB has had a complex history of volcanism, sedimentation, and deformation spanning from at least ca. 2828 Ma to 2702 Ma (Metsaranta and Houlé 2013). The Muketei Assemblage is the most fertile of the assemblages and is host to roughly half of all known occurrences in the Ring of Fire, including the major ultramafic Ni-Cu-PGE and chromite deposits (Eagle’s Nest, Black Thor, Blackbird, Big Daddy), as well as the McFaulds Lake VMS deposits and occurrences.

The Muketei Assemblage displays a complex history of volcanism, sedimentation, and plutonism, with two ages of volcanic deposition, two ages of felsic plutonism, one mafic-ultramafic intrusive event, and one ferrogabbroic event. A period of mafic to felsic volcanism was the first to occur (with synvolcanic granitic intrusion), and has been dated at 2782.2 +/- 5.2 Ma (Mungall et al. 2010). This volcanism was proceeded shortly after by the intrusion of large tonalitic bodies at 2773.4 +/- 0.9 Ma (Mungall et al. 2010 and R. Metsaranta, pers. comm.). This event in turn was proceeded by a very significant and short period of intermediate to felsic

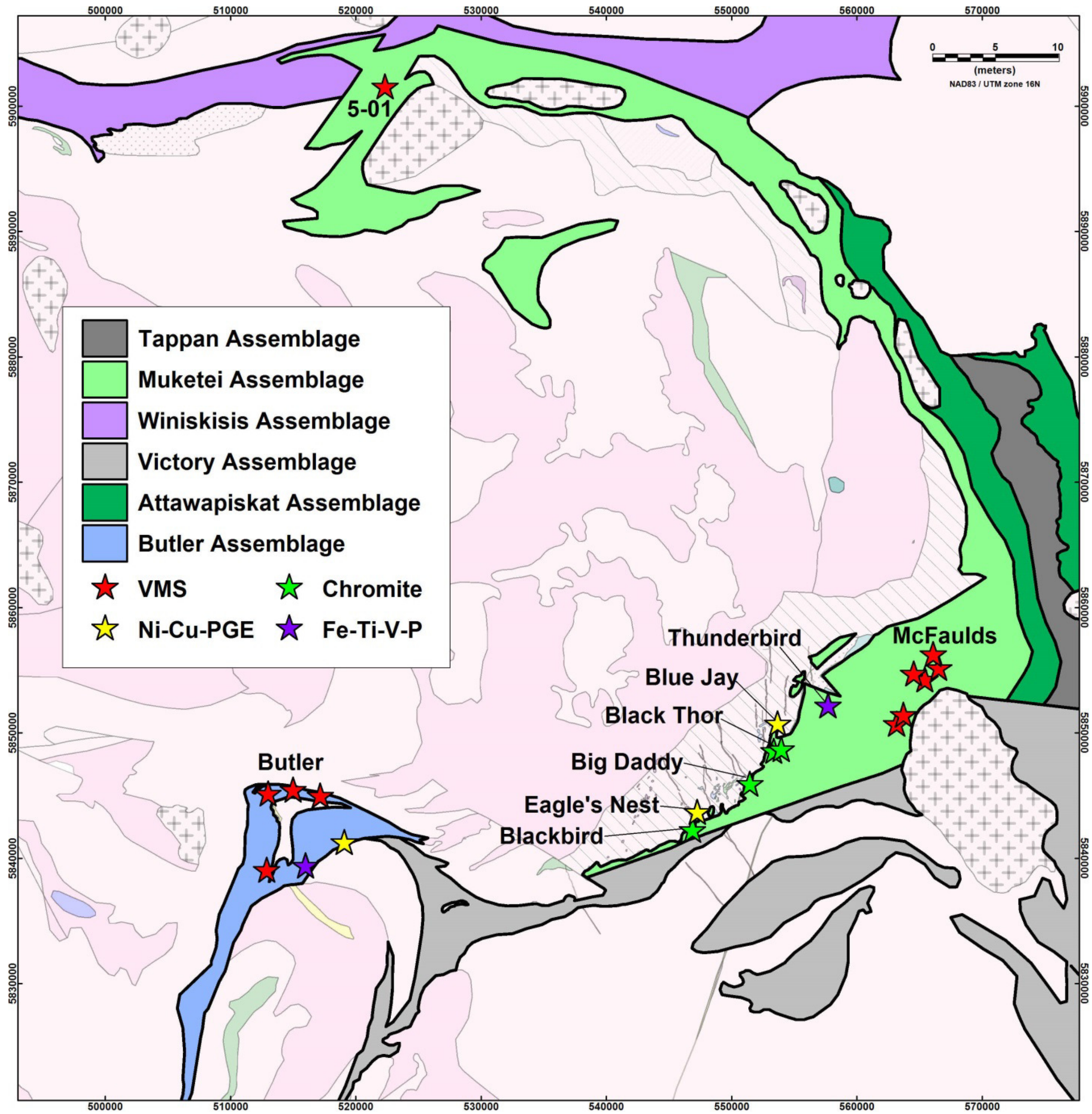

Figure 7: Geological Assemblages of the McFaulds Lake Greenstone Belt (modified from Metsaranta and Houlé 2013).

volcanism and mafic to ultramafic intrusion at 2734 Ma, which marks the main deposition of the Muketei Assemblage (Mungall et al. 2010, Metsaranta and Houlé 2011, 2012, and 2013, and R. Metsaranta, pers. comm.). Many drill core samples from a variety of rock types in the Muketei Assemblage have been age-dated and all have been found to lie, within error, very close to this date. Ultramafic sills and dykes, which host the Ni-Cu-PGE and Cr deposits, and which also cut the 2773.4 Ma footwall tonalite, have been dated at 2734 Ma. Intermediate volcanics, which lie stratigraphically beneath and above the felsic volcanics which host the McFaulds Lake VMS deposits and occurrences, have been dated at 2734 Ma as well. Finally, the ferrogabbroic intrusions, which host the Fe-Ti-V-P mineralization in the ROF, have an age of 2733 Ma. Late granitic intrusions cap the activity in the area, and have been dated at ca. 2728 to 2698 Ma (R. Metsaranta, pers. comm.).

4.3 Property Geology

Several magmatic Ni-Cu-PGE sulphide occurrences, such as the Eagle's Nest and Blue Jay/AT12 deposits, are hosted in ultramafic dykes that lie structurally beneath the ROF magnetic high. Extensive layered ultramafic sills (which are considered to form the main intrusion) consisting of dunite, harzburgite, orthopyroxenite, and chromite lie structurally on top of the aforementioned ultramafic dykes. These sills were preferentially developed at the horizon formerly occupied by the ferrogabbros. This most likely occurred via magmatic assimilation (Figure 8).

The current theory for the formation of the Eagle's Nest magmatic sulphide deposit, as well as other nearby sulphide and chromite deposits, is that a mantle plume appeared beneath the margin of the North Caribou microcontinent around 2735 Ma. Passing up through extensional faults, the ultramafic komatiitic parental magma interacted with sulphide-bearing metasediments (including iron formation), causing saturation with sulphide liquid and the collection of massive to net-textured magmatic sulphides in short-lived orthocumulate-textured mush zones at the bases of dykes (Eagle's Nest, Eagle Two, AT12 deposits). In places, these feeders formed into substantial sills, and in these sills, in higher, longer-lasting sill-like feeders, chromite and olivine were segregated mechanically into layers and lenses from the highly contaminated komatiite magma (Blackbird, Black Creek, Big Daddy, Black Thor, Black Label deposits). The magma residual to the deposition of the sulphide, dunite, chromitite, peridotite and pyroxenite crystallized as a layered intrusion, leading to the deposition of norite, anorthosite, ferrogabbro, and V-rich titanomagnetite layers (Thunderbird deposit). Heat-driven circulation of hydrothermal fluids through the older, pre-existing and overlying sedimentary and volcanic rocks caused the deposition of massive Cu-Zn sulphide mineralization (VMS) where these fluids vented at the sea floor during volcanism. Subsequent metamorphic fluid flow through shear zones caused the formation of mesothermal Au mineralization in the Triple J Gold occurrence directly adjacent to the Blackbird and Eagle Two deposits (Figure 8). The AT5 anomaly was discovered by early drilling to contain ultramafic intrusive rocks of the Eagle's Nest – Blackbird igneous complex. However, until 2016, the area had been under-explored.

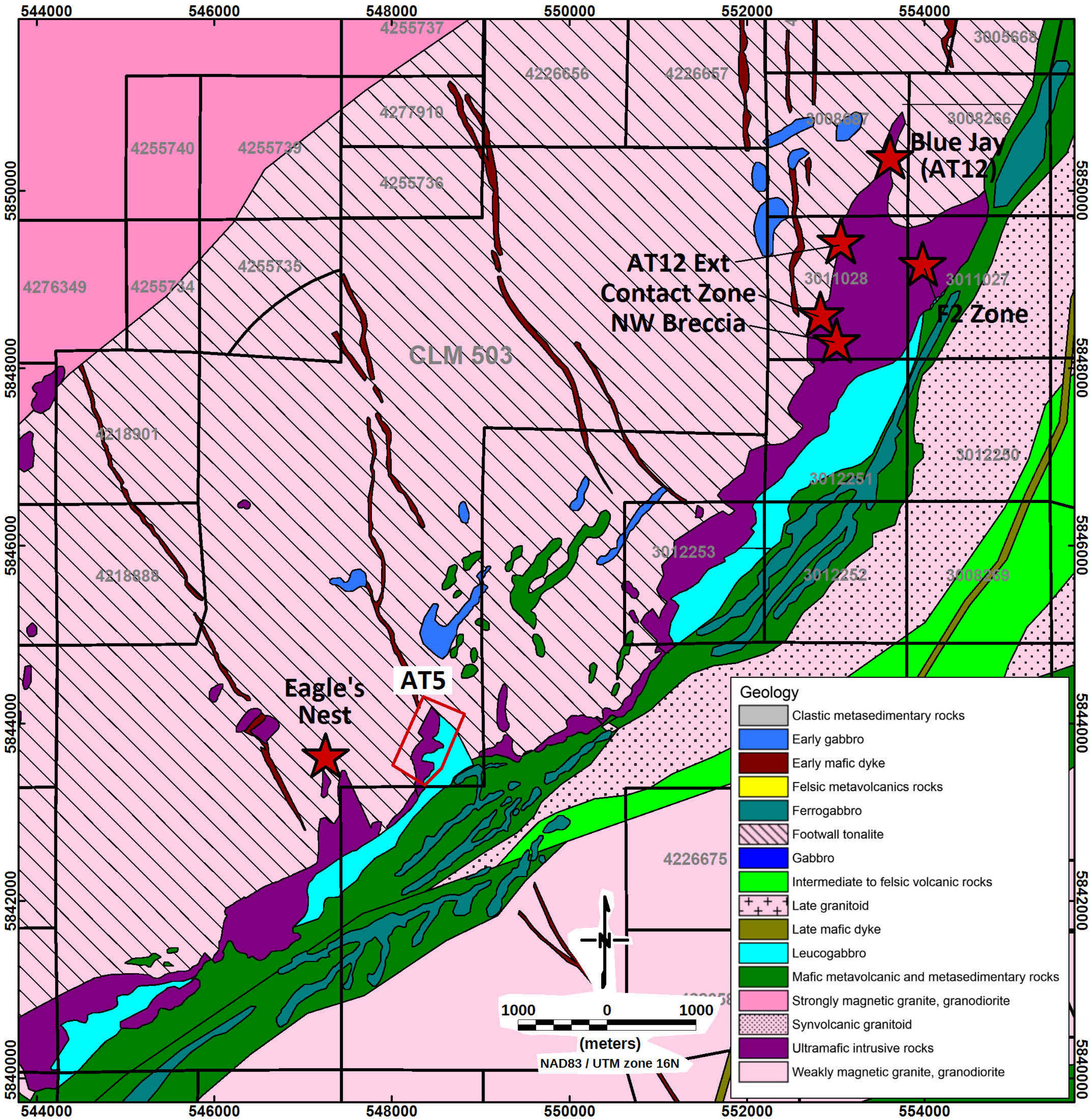

Figure 8: Property Geology

The Black Thor – Black Label Igneous Complex is a mantle derived, layered ultramafic intrusion, and was emplaced along the contact of the uplifted gneissic dome and the McFaulds Lake Greenstone Belt. Sulphide droplets separated from the melt as an immiscible liquid and settled towards the base of the intrusion because of their greater densities, accumulating as massive sulphides in embayments and producing the basal contact zone sulphide mineralization (i.e. at the AT12 Extension, Contact Zone, F2 Zone, and NW Breccia Zone). Base and precious metals (Ni-Cu-PGEs) were scavenged from the melt into sulphide droplets due to their chalcophile affinity. The ultramafic magma became oversaturated in chromite via magma mixing, contamination, a decrease in oxygen fugacity, and/or an increase in pressure, which led to the chromite mineralization seen in the Black Thor and Black Label areas. Continual pulses of magma led to further chromite mineralization. The Igneous Complex was subsequently intruded by a late websterite intrusion that crosscut and brecciated older rocks in the area.

Sulphides were subsequently precipitated and possibly remobilized within magmatic breccias formed along the margins of the websterite intrusion (e.g. F2 Zone and NW Breccia Zone). The Igneous Complex was then intruded by a late biotite gabbro intrusion (Figure 8).

The Eagle's Nest deposit is a subvertically dipping body of massive and net-textured magmatic sulphide minerals (pyrrhotite, pentlandite, and chalcopyrite) and magnetite in the form of a sheet about 200 metres long, as much as several tens of metres thick, and at least >1000 metres deep. It strikes northeast-southwest and occupies the northwestern margin of a vertically inclined serpentinized peridotite dyke. Near the surface, the massive sulphides are confined to the northwestern tip edge of this intrusive body, and are bordered to the south and southeast by thicker zones of net-textured sulphides, which are hosted by serpentinized peridotite. At depth, there are occurrences of massive sulphides further to the east within the dyke, although they tend to be concentrated near the western and northern extremities. The dyke is closed off both at its northern and southern ends and plunges vertically or very steeply to the south (Figure 8).

5. Diamond Drill Program

For this project, crews of drillers were employed by Cyr Drilling, a drill contractor from Winnipeg, Manitoba. They drilled NQ core in the single drill hole. Drill supervision, core processing, and core logging was done at the Esker Camp by Noront geologists and geotechnicians. Geologists Matt Deller and Roland Landry logged the core, while geotechnicians Rob Lyght and Cory Exell processed it. Noront's exploration team of Ryan Weston, Jeremy Brett, Matt Deller, Roland Landry, and Matt Downey oversaw the project.

5.1 NOT-16-1G001 Drill Hole Description

This hole was drilled to a depth of 1302.5m. From surface to a depth of 828.7m, the hole encountered granodiorite-tonalite of the ROF footwall tonalite. At 828.7m, the hole intersected the ROF ultramafic intrusive suite, with pyroxenite being intersected from 828.7m to 857.1m. At that point, the hole intersected peridotite to a depth of 976.8m, at which point dunite was encountered. The dunite unit lasted until 1225.6m, and which point the hole intersected another pyroxenite unit, which was intersected until the end of the hole at 1302.5m. No significant sulphide mineralization was encountered in the hole.

A total of 94 samples (82 assay/geochemistry samples, 2 duplicates, and 10 standards) were taken from the hole. Although no significant sulphides were encountered, appreciable amounts of Pt and Pd were, from 1283-1291m. This 8m intersection averaged 0.23g/t Pd and 0.13g/t Pt. These results are summarized in Table 2, below.

Hole	From (m)	To (m)	Length (m)	Pd (g/t)	Pt (g/t)	Total PGEs (g/t)
NOT-16-1G001	1283	1284	1.0	0.24	0.18	0.42
NOT-16-1G001	1284	1285	1.0	0.11	0.18	0.29
NOT-16-1G001	1285	1286	1.0	0.12	0.13	0.25
NOT-16-1G001	1286	1287	1.0	0.76	0.19	0.95
NOT-16-1G001	1287	1288	1.0	0.13	0.05	0.18
NOT-16-1G001	1288	1289	1.0	0.02	0.02	0.04
NOT-16-1G001	1289	1290	1.0	0.04	0.06	0.10
NOT-16-1G001	1290	1291	1.0	0.41	0.24	0.65
Composite	1283	1291	8.0	0.23	0.13	0.36

Table 2: Assay highlights from NOT-16-1G001

All samples were shipped from Esker Camp to Activation Laboratories ('ActLabs') in Thunder Bay, Ontario, for sample preparation. Analyses were either performed at the Actlabs facilities in Ancaster or Thunder Bay, Ontario. All samples were selected on-site by a Noront geologist, and were cut in half by diamond core saw. Individual samples were labelled, placed in plastic sample bags, and sealed. Groups of samples were then placed into durable rice bags or pails that shipped out on an ongoing basis. The remaining coarse reject portions of the samples remain in storage at Noront's storage facility in Thunder Bay as required in the event that further work is needed. A QA/QC program was implemented to monitor all assays from the drilling program. Samples were assembled in batches (although only one batch was needed for this program). Included the batch were certified reference standards (placed every 10 samples) and duplicates placed every 40th sample.

A master plan map, collar location table, local plan map and cross-section, drill log, and assay certificate is given in Appendix 1. Figure 5b, above, and Figure 9, below, also represent the location of the drilling with respect to the SUTEM survey.

6. Geophysical Program

Lamontagne Geophysics Ltd., of Kingston, Ontario, carried out and completed the BHEM and SUTEM follow-up surveys on the AT5 Property. Rob Langridge oversaw the project and wrote the report, while the Lamontagne field crew consisted of Phil Guimond (crew chief/operator), Gerry Lafortune (BH/Rx/Tx operator), Richard Lahaye (Rx/Tx operator), and Bill Dingwall (Tx operator/electronics). Yves Lamontagne provided valuable insight.

The BHEM survey of drill hole NOT-16-1G001 was conducted to a depth of 1160m. The BHEM data was evaluated in conjunction with SUTEM and other geophysical data collected to date and it was decided to follow-up the BHEM survey with targeted surface UTEM-5 data while the crew was still on site. The follow-up SUTEM survey covered an area of approximately 0.27 km^2 (or 27 hectares), with 5 line km of surveying being completed along 4 lines. This survey tied onto the survey completed by Lamontagne earlier in the year (Figures 5a and 5b). The Lamontagne report is provided as Appendix 2. It contains BHEM & SUTEM loop layouts, maps, and all EM profiles collected from the survey.

7. Conclusions and Recommendations

From August 18, 2016 to October 6, 2016, Noront completed a one-hole diamond drill program, as well as follow-up BHEM (BHUTEM4) and SUTEM (UTEM-5) surveys, on their AT5 Property, which lies on Noront's Mining Lease CLM503. The drilling was done by Cyr Drilling and the geophysical program by Lamontagne Geophysics.

The diamond drilling was focused on a new and deep conductive anomaly that had been uncovered by an SUTEM survey over the AT5 property in February and March, 2016. This anomaly had been modeled by Lamontagne and an EM conductivity plate created. This plate had a conductance of 100 Siemens, which is well below that of significant Ni-Cu sulphide mineralization. Regardless, this anomaly presented a new target for the AT5 area and a new Ni-Cu sulphide mineralization target for Noront in the Ring of Fire (Figure 9).

The main purpose of the drilling was to drill a deep hole to come within a short distance of the conductive plate. The hole would then perform as a platform hole for BHEM surveying, which would ideally vector into any conductive anomalies. If ideal anomalies presented themselves, then DDH wedging would take place off of the main drill hole.

Noront drilled NOT-16-1G001 at AT5, near the ROF ultramafic intrusive footwall contact. The drill hole intersected granodiorite/tonalite to a depth of 828.7m, at which point it intersected pyroxenite, peridotite, and dunite of the ROF ultramafic intrusive suite, which lasted until the end of the hole at 1302.5m. Although valuable knowledge was gained about the ROF ultramafic intrusive suite in this area, no sulphide mineralization was encountered. With that said, a small, 8m intersection of 0.36g/t Pt + Pd was intersected between 1283 and 1291m, and this is promising for PGE exploration in the ROF in the future (Figure 9).

After the hole was drilled, BHEM surveying took place, as well as a small 4-line (5km total) follow-up SUTEM survey (Figure 9). No new anomalies were discovered by either EM survey.

Based on the results from the drilling and follow-up EM surveys, no new anomalies and targets presented themselves, and thus no significant sulphide mineralization was expected at AT5. As a result of this, it is recommended that no further work be carried out on the AT5 property, as it is deemed to contain no mineralization.

Respectfully submitted:

Matt Downey, M.Sc., P.Geo., May 10, 2017

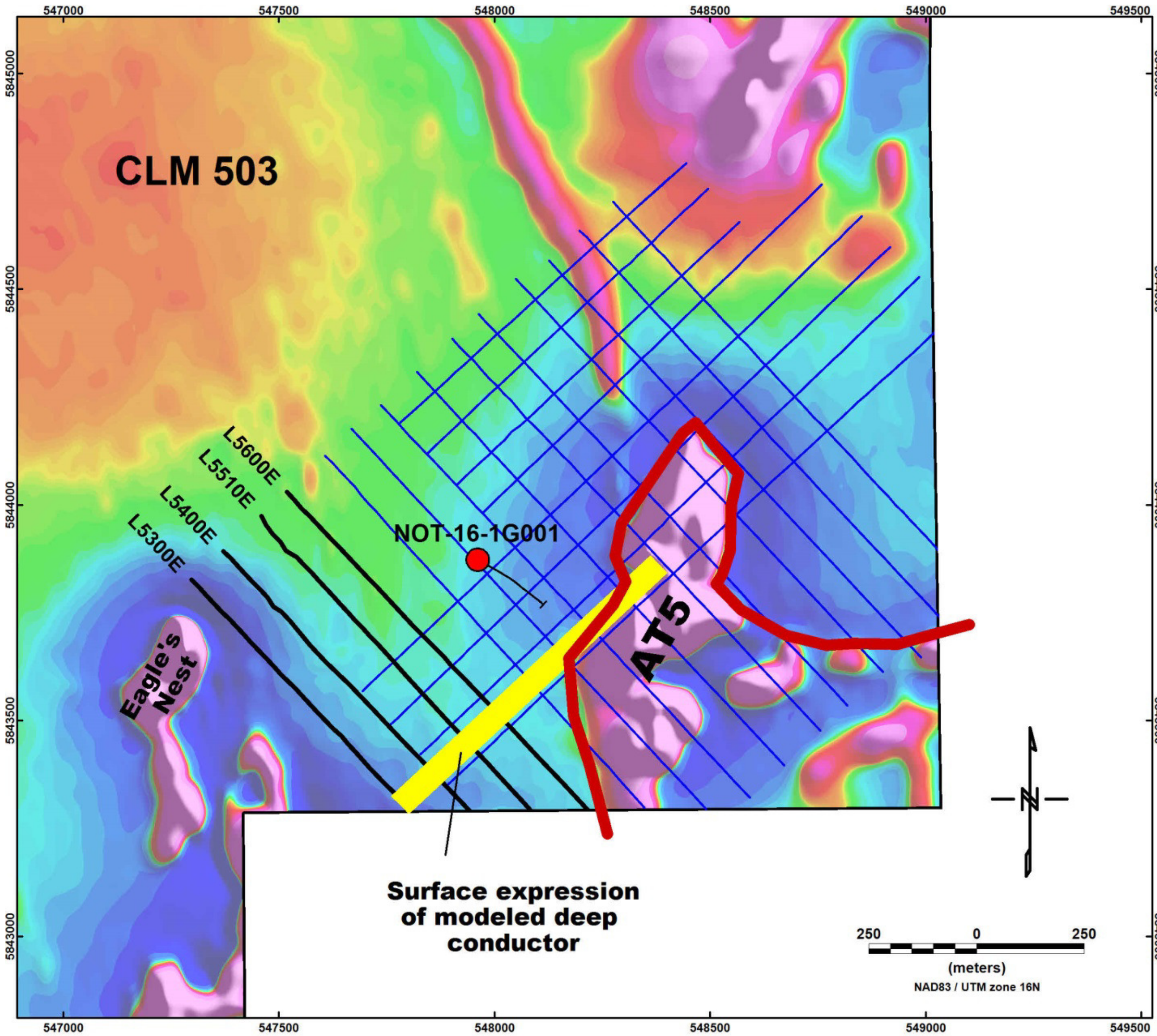

Figure 9: Map of drilling and Lamontagne Surface UTEM-5 survey over the AT5 property. Survey lines for the follow-up SUTEM survey (September 18 – October 6, 2016) shown in black; SUTEM lines from first 2016 survey (February 21 – March 17, 2016) shown in blue. Heli-GT first vertical derivative is in the background. The yellow polygon represents the surface expression of the top of the modeled UTEM-5 conductive plate, which lies approximately 750m below surface. The thick red line represents the ultramafic-tonalite contact, and the collar and drill hole trace of NOT-16-1G001 are shown.

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CERTIFICATE

I, Matt Downey, M.Sc., P. Geo., of 34 Glen Dhu Drive, Whitby, Ontario, do hereby certify that:

1. I am a geologist in the Province of Ontario with twelve years of experience in the mineral exploration industry. I have an Hon. B.Sc. from the University of Toronto, Toronto, Ontario (2002) and an M.Sc. from the University of Waterloo, Waterloo, Ontario (2005).
2. I have worked in the Ring of Fire as a geologist and data manager since September 2008.
3. I have studied the project area thoroughly, and have visited the project area a number of times since 2009.
4. I obtained my P. Geo status within the Province of Ontario (APGO) in March, 2011.
5. I am responsible for the preparation of this report, except as provided for or disclaimed in the report, based on the sources and documents described in the report.
6. As of the date of this report, I am not aware of any material fact or material change with respect to the subject matter of this report, which is not reflected in this report, the omission to disclose which makes this report misleading.
7. I am the Manager, Lands & Data for Noront Resources Ltd. and handle land and data management, map and geological report preparation, and aid in Noront's exploration projects.
8. I hereby give my consent to Noront Resources to use this report in support of their application for assessment credit on the subject property.

Matt Downey, M.Sc., P. Geo., May 2017
Toronto, Ontario

Appendix 1

Noront 2016 Exploration Program

AT5 Diamond Drill Program

Master Plan Map

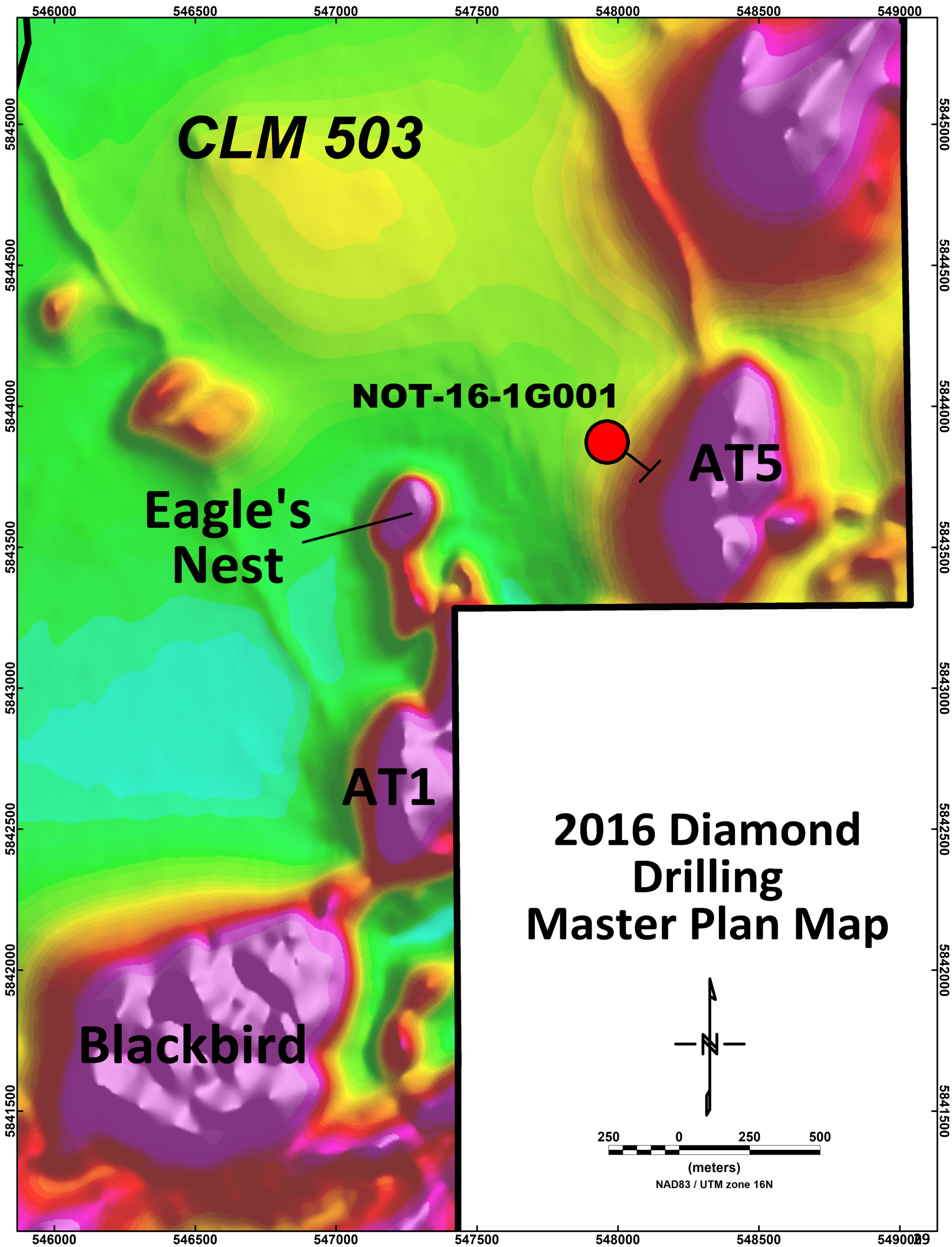
Collar Table

Local Plan Map

Vertical Cross Section

Drill Log

Assay Certificate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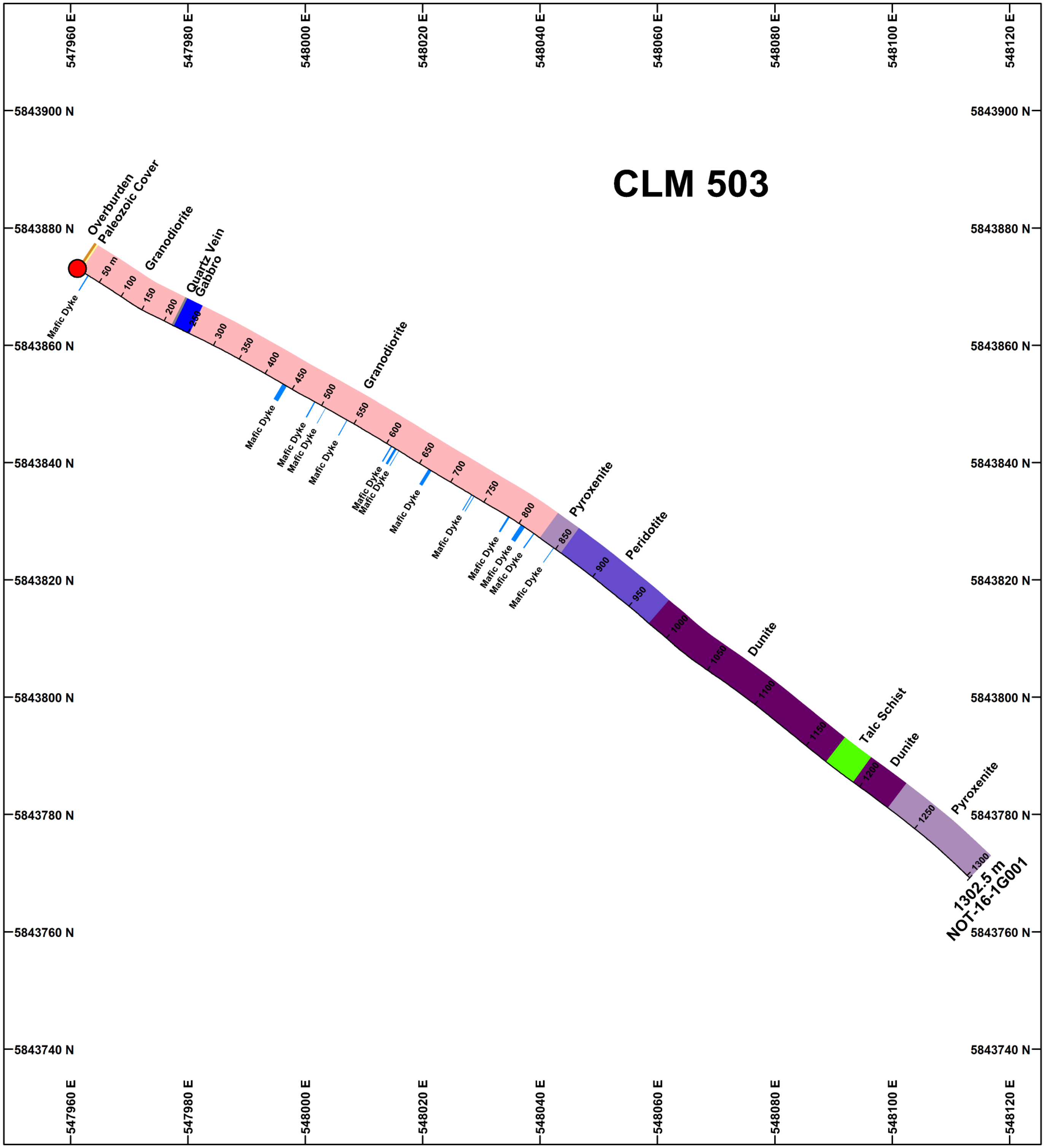
5842000
5841500
CLM 503
NOT-16-1G001
AT5
Eagle's Nest
AT1
Blackbird
2016 Diamond Drilling Master Plan Map
250
0
250
500
(meters)
NAD83 / UTM zone 16N

2016 AT5 Drill Program - Collar Table

Hole Number	Easting	Northing	Elevation	Azimuth	Dip	Metres Drilled	Start Date	End Date	Mining Lease	Township	Contractor
NOT-16-1G001	547961.18	5843873.09	176.51	123.75	-86.2	1302.5	18-Aug-16	20-Sep-16	CLM 503	BMA 526 862	Cyr Drilling



HOLES PLOTTED

TOTAL 1

NOT-16-1G001

ROCK CODES

Colour	Rock Type
	Dunite
	Gabbro
	Granodiorite
	Paleozoic Cover
	Overburden
	Peridotite
	Pyroxenite
	Quartz Vein
	Talc Schist
	Mafic Dyke

PLAN SPECS:

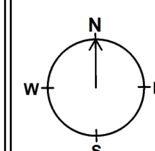
REF. PT. E, N	548000 m	5844000 m
EXTENTS	176.7 m	194.5 m

SCALE 1 : 750

(m)

-10 0 10 20 30

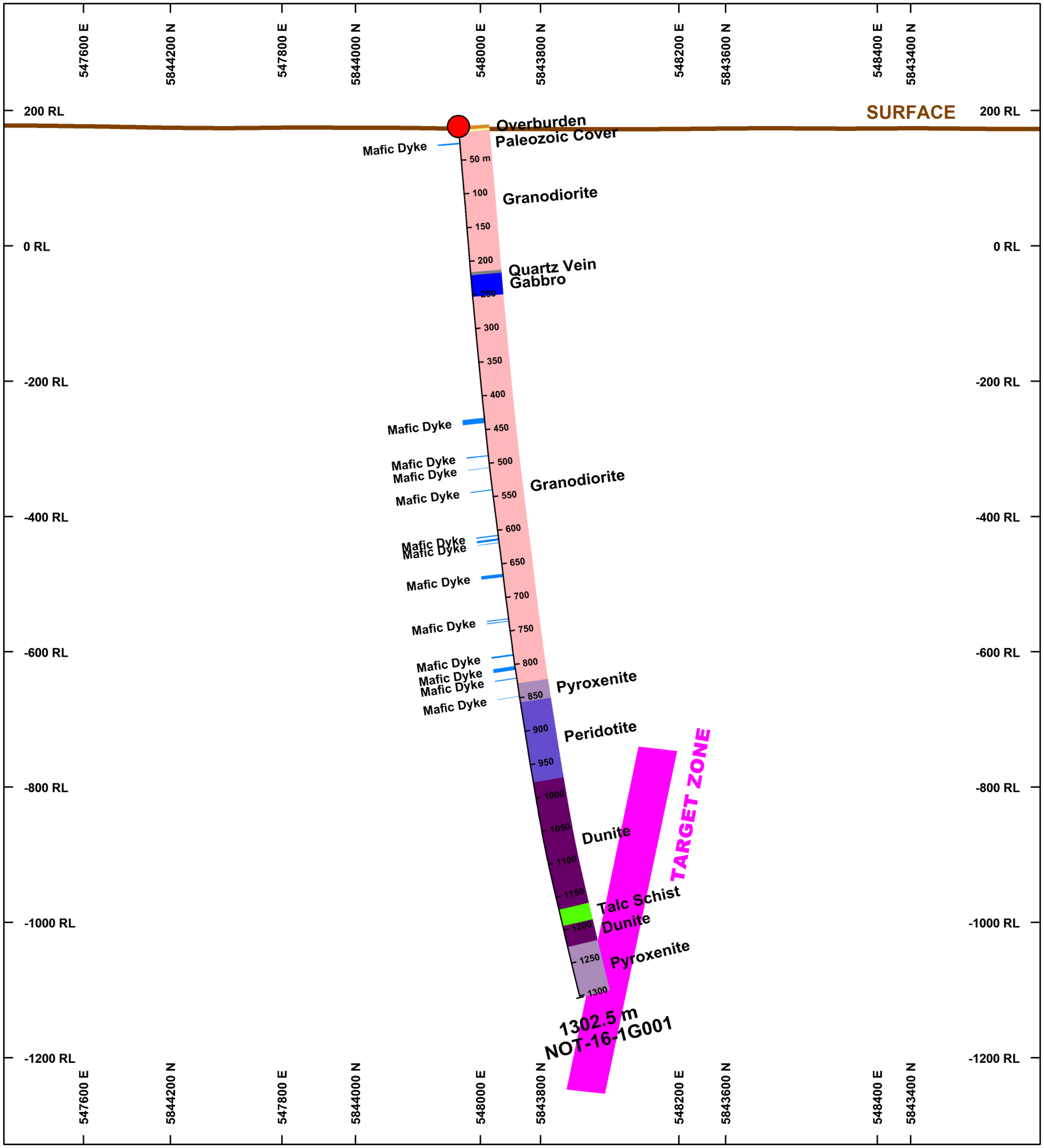
NAD83 / UTM zone 16N



Drill Plan Map

2016 AT5 Drill Program

NOT-16-1G001



HOLES PLOTTED

TOTAL 1

NOT-16-1G001

ROCK CODES

Colour	Rock Type
	Dunite
	Gabbro
	Granodiorite
	Paleozoic Cover
	Overburden
	Peridotite
	Pyroxenite
	Quartz Vein
	Talc Schist
	Mafic Dyke

Plate Model of Conductive Anomaly (modeled from SUTEM)

SECTION SPECS:

REF. PT. E, N	548042 m	5843820 m
EXTENTS	1531 m	1686 m
SECTION TOP, BOT	358 m	-1328 m
TOLERANCE +/-	50 m	

SCALE 1 : 6500

(m)

-50 0 50 100 150 200 250 300

NAD83 / UTM zone 16N

AZIMUTH = 137°

N W E S

Cross Section

2016 AT5 Drill Program

NOT-16-1G001

April 18, 2017	**DIAMOND DRILL LOG**	**AT5 PROJECT**

Hole Number:	**NOT-16-1G001**	Units: Metric

Cover Page

Project Name:	AT5 Ni-Cu-PGE Project	Coordinates Grid:	UTM83-16				
		Coordinate Type Code:	GPS				
Date Started:	Aug 18, 2016	Easting (m):	547961.182	Collar Azimuth:	123.75	Claim #:	CLM 503
Date Completed:	Sep 20, 2016	Northing (m):	5843873.087	Collar Dip:	-86.16	Township:	BMA 526 862
Logged By:	Matthew Deller Roland Landry	Elevation (m):	176.508	Final Depth (m):	1302.50	NTS Zone:	NTS 043/D09
BHEM:	Yes	Hole Size:	NQ	Contractor:	Cyr Drilling		
MPP Logged:	Yes	Core Stored:	Yes	Core Stored At:	Esker Camp		
Casing Depth (m):	8	Hole Cemented:	No	Workplace:	Esker Camp		

Hole Purpose:	Test AT5 deep conductor identified by Surface UTEM survey. Was meant to be a platform hole for BHEM and DDH wedging.
Hole Results:	The plan was to drill to depth to reach the SUTEM conductor, and then conduct BHEM to further determine where the conductor may lie. It was found that no strong BHEM conductors existed. As well, no mineralization was found and thus the deep conductor was probably related to serpentinization of the ultramafic body or magnetite. No sulphide mineralization was encountered. One positive was the definition of the orientation and style of the ROF ultramafic intrusive suite at depth in this location.

DETAILED LOG

Hole Number: NOT-16-1G001 Units: METRIC

Project Name:	AT5	Primary Coordinates Grid: UTM83-16		Destination Coordinates Grid: UTM83-16		Collar Dip:	-86.16
Project Number:	AT5	North:	5843873.09	North:	5843873.09	Collar Az:	123.75
Location:	AT-5	East:	547961.18	East:	547961.18	Length:	1,302.50
		Elev:	176.51	Elev:	176.51	Start Depth:	0.00
Date Started:	Aug 18, 2016	Collar Survey: N	Plugged: N	Contractor:		Final Depth:	1,302.50
Date Completed:	Sep 20, 2016	Multishot Survey: N	Hole Size: NQ	Core Storage:	Esker Camp		
		Pulse EM Survey: N	Casing:				

Comments:

Sample Averages

Survey Data

Depth	Azimuth Decimal	Dip Decimal	Test Type	Flag	Comments	Depth	Azimuth Decimal	Dip Decimal	Test Type	Flag	Comments
0.00	123.75	-86.16	REF-GY	OK		10.00	124.18	-84.66	REF-GY	OK	
20.00	121.86	-84.80	REF-GY	OK		30.00	121.40	-84.84	REF-GY	OK	
40.00	122.26	-84.84	REF-GY	OK		50.00	121.39	-84.89	REF-GY	OK	
60.00	122.85	-84.86	REF-GY	OK		70.00	122.96	-84.91	REF-GY	OK	
80.00	124.45	-84.96	REF-GY	OK		90.00	122.78	-84.94	REF-GY	OK	
100.00	123.32	-85.02	REF-GY	OK		110.00	124.36	-85.08	REF-GY	OK	
120.00	123.38	-85.14	REF-GY	OK		130.00	121.95	-85.23	REF-GY	OK	
140.00	122.56	-85.24	REF-GY	OK		150.00	117.54	-85.25	REF-GY	OK	
160.00	116.93	-85.27	REF-GY	OK		170.00	116.78	-85.23	REF-GY	OK	
180.00	116.24	-85.05	REF-GY	OK		190.00	116.33	-85.02	REF-GY	OK	
200.00	115.97	-84.94	REF-GY	OK		210.00	117.12	-84.88	REF-GY	OK	
220.00	115.97	-84.83	REF-GY	OK		230.00	117.39	-84.78	REF-GY	OK	
240.00	115.62	-84.71	REF-GY	OK		250.00	115.62	-84.71	REF-GY	OK	
260.00	116.29	-84.44	REF-GY	OK		270.00	116.20	-84.36	REF-GY	OK	
280.00	116.57	-84.37	REF-GY	OK		290.00	116.41	-84.43	REF-GY	OK	
300.00	116.44	-84.41	REF-GY	OK		310.00	116.85	-84.43	REF-GY	OK	
320.00	119.31	-84.35	REF-GY	OK		330.00	118.15	-84.29	REF-GY	OK	
340.00	118.70	-84.27	REF-GY	OK		350.00	119.55	-84.25	REF-GY	OK	
360.00	118.98	-84.23	REF-GY	OK		370.00	119.13	-84.21	REF-GY	OK	
380.00	119.56	-84.11	REF-GY	OK		390.00	119.23	-84.09	REF-GY	OK	
400.00	118.89	-84.03	REF-GY	OK		410.00	119.83	-83.99	REF-GY	OK	
420.00	120.02	-83.88	REF-GY	OK		430.00	120.56	-83.81	REF-GY	OK	
440.00	120.42	-83.84	REF-GY	OK		450.00	120.69	-83.69	REF-GY	OK	
460.00	118.74	-83.54	REF-GY	OK		470.00	118.43	-83.49	REF-GY	OK	
480.00	119.04	-83.37	REF-GY	OK		490.00	118.72	-83.39	REF-GY	OK	

DETAILED LOG

Hole Number: NOT-16-1G001 Units: METRIC

Survey Data

Depth	Azimuth Decimal	Dip Decimal	Test Type	Flag	Comments	Depth	Azimuth Decimal	Dip Decimal	Test Type	Flag	Comments
500.00	118.92	-83.08	REF-GY	OK		510.00	119.64	-82.80	REF-GY	OK	
520.00	119.17	-82.64	REF-GY	OK		530.00	119.48	-82.64	REF-GY	OK	
540.00	119.49	-82.55	REF-GY	OK		550.00	119.81	-82.52	REF-GY	OK	
560.00	122.42	-82.57	REF-GY	OK		570.00	119.91	-82.64	REF-GY	OK	
580.00	120.86	-82.63	REF-GY	OK		590.00	120.59	-82.55	REF-GY	OK	
600.00	121.68	-82.45	REF-GY	OK		610.00	120.35	-82.44	REF-GY	OK	
620.00	121.47	-82.27	REF-GY	OK		630.00	123.23	-82.35	REF-GY	OK	
640.00	120.91	-82.49	REF-GY	OK		650.00	121.23	-82.89	REF-GY	OK	
660.00	121.50	-83.11	REF-GY	OK		670.00	121.51	-82.99	REF-GY	OK	
680.00	121.04	-82.75	REF-GY	OK		690.00	120.44	-82.73	REF-GY	OK	
700.00	120.22	-82.64	REF-GY	OK		710.00	120.81	-82.56	REF-GY	OK	
720.00	121.58	-82.45	REF-GY	OK		730.00	120.51	-82.38	REF-GY	OK	
740.00	121.69	-82.35	REF-GY	OK		750.00	120.33	-82.19	REF-GY	OK	
760.00	120.29	-82.24	REF-GY	OK		770.00	120.67	-82.13	REF-GY	OK	
780.00	120.51	-81.83	REF-GY	OK		790.00	122.77	-81.71	REF-GY	OK	
800.00	123.22	-81.62	REF-GY	OK		810.00	123.99	-81.39	REF-GY	OK	
820.00	125.30	-81.24	REF-GY	OK		830.00	126.34	-81.19	REF-GY	OK	
840.00	125.50	-81.07	REF-GY	OK		850.00	125.51	-80.96	REF-GY	OK	
860.00	126.28	-80.89	REF-GY	OK		870.00	127.35	-80.89	REF-GY	OK	
880.00	126.26	-80.98	REF-GY	OK		890.00	128.12	-80.97	REF-GY	OK	
900.00	127.75	-80.91	REF-GY	OK		910.00	129.62	-80.95	REF-GY	OK	
920.00	128.42	-80.92	REF-GY	OK		930.00	129.33	-80.82	REF-GY	OK	
940.00	128.40	-80.66	REF-GY	OK		950.00	129.01	-80.63	REF-GY	OK	
960.00	130.64	-80.46	REF-GY	OK		970.00	132.16	-80.28	REF-GY	OK	
980.00	130.40	-80.29	REF-GY	OK		990.00	128.21	-80.23	REF-GY	OK	
1000.00	132.11	-80.25	REF-GY	OK		1010.00	131.45	-80.14	REF-GY	OK	
1020.00	128.56	-79.90	REF-GY	OK		1030.00	127.65	-79.63	REF-GY	OK	
1040.00	124.44	-79.49	REF-GY	OK		1050.00	125.41	-79.22	REF-GY	OK	
1060.00	124.00	-78.86	REF-GY	OK		1070.00	125.60	-78.73	REF-GY	OK	
1080.00	126.35	-78.45	REF-GY	OK		1090.00	126.25	-78.03	REF-GY	OK	
1100.00	128.05	-77.58	REF-GY	OK		1110.00	128.25	-77.19	REF-GY	OK	
1120.00	129.77	-77.01	REF-GY	OK		1130.00	128.52	-76.93	REF-GY	OK	
1140.00	129.58	-76.90	REF-GY	OK		1150.00	128.72	-76.80	REF-GY	OK	
1160.00	129.05	-76.73	REF-GY	OK		1170.00	127.77	-76.65	REF-GY	OK	
1180.00	127.52	-76.66	REF-GY	OK		1190.00	126.18	-76.62	REF-GY	OK	

Hole Number: NOT-16-1G001 Units: METRIC

Survey Data

Depth	Azimuth Decimal	Dip Decimal	Test Type	Flag	Comments	Depth	Azimuth Decimal	Dip Decimal	Test Type	Flag	Comments
1200.00	125.76	-76.74	REF-GY	OK		1210.00	126.56	-76.49	REF-GY	OK	
1220.00	126.84	-76.35	REF-GY	OK		1230.00	127.66	-76.34	REF-GY	OK	
1240.00	127.97	-76.29	REF-GY	OK		1250.00	129.25	-76.27	REF-GY	OK	
1260.00	128.83	-76.25	REF-GY	OK		1270.00	131.81	-76.33	REF-GY	OK	
1280.00	132.91	-75.93	REF-GY	OK		1290.00	133.03	-75.92	REF-GY	OK	
1300.00	133.67	-75.94	REF-GY	OK							

Detailed Lithology

From	To	Lithology	Sample Number	From	To	Length	Ni_pct_FINAL	Cu_pct_FINAL	Pt_ppm_FINAL	Pd_ppm_FINAL	Au_ppm_FINAL
0.00	5.80	Overburden, Over Burden Overburden									
5.80	9.10	Limestone, Limestone Very fine grained grey-beige limestone. Weakl layering present. 5% fossils throughout. Sharp contact with Archean unconformity. MINOR INTERVALS: Minor Interval: 8.60 - 9.10 Sandstone, Sandstone Small section of fine grained, grey-beige sandstone at base of proterozoic cover. Sharp lower contact at archean unconformity.									
9.10	24.90	Grndiorite, Granodiorite Massive fine to medium grained, grey-white granodiorite. Grains are sub-hedral to euhedral. Sections of very weak localized silicification. Weathering profile at unconformity from 9.1m to 11.3m. Small mafic dyke occurs from 24.3 - 24.5m at 25 DCA. MINOR INTERVALS: Minor Interval: 24.30 - 24.50 Maf Dyke, Mafic dyke Narrow mafic dyke occuring at 25 DCA. Moderate foliation parallel to contacts. Blocky due to breaks along foliation. Weak carbonate alteration.									
24.90	26.10	Maf Dyke, Mafic dyke Fine grained, grey, non-magnetic mafic dyke. Cummulate pyroxene with interstitial euhedral plagiclase crystals. Weak carbonate alteration and minor carbonate veinlets occuring as stringers sub-parallel to lower contact.									
26.10	142.85	Grndiorite, Granodiorite Massive fine to medium grained, grey-white granodiorite. Grains are sub-hedral to euhedral. Minor pottassic alteration associated with some stringer veinlets. Minor locallized foliation.									

DETAILED LOG

Hole Number: NOT-16-1G001 Units: METRIC

Detailed Lithology			Assay Data								
From	To	Lithology	Sample Number	From	To	Length	Ni_pct_FINAL	Cu_pct_FINAL	Pt_ppm_FINAL	Pd_ppm_FINAL	Au_ppm_FINAL
142.85	146.30	Grndiorite, Granodiorite This not the same gdo as surroyunding units, it is darker, and does not have the same crystal matrix, there is however fspar crystals within the ground mass, with chlorite and or bio alteration strong at both contacts. Moderate foln at 40 to 45 degrees. This unit is generally dark green to grey, other gdos are generally white to grey.									
146.30	216.35	Grndiorite, Granodiorite Massive, fine grained to medium grained . Grey-white granodiorite. Grains are sub-hedral to euhedral.									
216.35	221.00	Quartz Vn, Quartz vein Laminated, sugary white and glassy quartz vein system at contact between granodiorite and gabbro. Magnetite stringer/veinlet at upper contact. The section is roughly 60% quartz vein, 20% mafic intrusive and 20% granodiorite. From 220 - 221m there is 3-5% Po +/- Cpy as stringers that are roughly parallel to vein laminations. Minor chlorite alteration rims occur along boundry between mafic material and quartz.	113501	219.00	220.00	1.00	0.00	0.00	0.00	0.00	0.0
			113502	220.00	220.50	0.50	0.00	0.09	0.00	0.00	0.0
			113503	220.50	221.00	0.50	0.01	0.02	0.00	0.00	0.0
221.00	253.00	Gabbro, Gabbro Fine grained, dark green-grey, massive gabbro. Quartz vein system occurs along upper contact with granodiorite and is sharp at 30 DCA. Lower contact is sharp with granodiorite at 60 DCA. The unit coarsens from both contacts towards the center. Trace - 1% disseminated py from 227-228m. 1-3% disseminated and blebby Po +/- Cpy from 238.9 - 242m. The sulfide occurs throughout the ground mass as well as within and along anhealed fractures with carbonate infill. Non-magnetic but slightly higher then the granodiorite. The unit has weak pervasice chlorite alteration with sections of stronger chlorite + carbonate alteration. Sheared at 25 DCA from 235.1 - 236m. The lower contact is also sheared from 252 - 253m with 1-3% banded and disseminated Py. There are other small sections that are weak to moderately foliated. Small 2cm wide quartz carbonate veins with blebby Po occur at 224.5m and 243.8m.	113504	221.00	222.00	1.00	0.01	0.02	0.00	0.00	0.0
			113505	238.00	238.90	0.90	0.01	0.01	0.00	0.00	0.0
			113506	238.90	239.40	0.50	0.01	0.03	0.00	0.00	0.0
			113507	239.40	240.30	0.90	0.01	0.01	0.00	0.00	0.0
			113508	240.30	240.80	0.50	0.01	0.02	0.00	0.00	0.0
			113509	240.80	241.80	1.00	0.01	0.01	0.00	0.00	0.0
			113511	241.80	242.80	1.00	0.01	0.02	0.00	0.00	0.0
			113512	251.00	252.00	1.00	0.01	0.00	0.00	0.00	0.0
			113513	252.00	253.00	1.00	0.01	0.01	0.00	0.00	0.0
253.00	432.70	Grndiorite, Granodiorite Massive, generally grey white through out, with sections that are darker. Very minor qtz vnlts and very minor felsic dykelets.	113514	253.00	254.00	1.00	0.00	0.00	0.00	0.00	0.0
432.70	440.00	Maf Dyke, Mafic dyke Mafic dyke, similar to proceeding unit, dark green, generally fine grained. This unit does not have the same alteration, or bleaching at the contacts. Strong chlorite alteration at both contacts, with moderate biotite alteration also at lower contact.									
440.00	488.20	Grndiorite, Granodiorite Massive, generally grey white through out, with sections that are darker.									
488.20	489.40	Maf Dyke, Mafic dyke Grey-green, fine to medium grained, strongly foliated mafic dyke. Upper and lower contact are sharp at 30 DCA. Foliaion is parallel to contact. Moderate to strong chlorite alteration throughout.									

Hole Number: NOT-16-1G001 Units: METRIC

Detailed Lithology			Assay Data								
From	To	Lithology	Sample Number	From	To	Length	Ni_pct_FINAL	Cu_pct_FINAL	Pt_ppm_FINAL	Pd_ppm_FINAL	Au_ppm_FINAL
489.40	606.80	Grndiorite, Granodiorite Medium to coarse grained, massive, white-grey granodiorite. Non-magnetic. Localized foliation. Local silicification in crack-seal fracture zone from 510.5-511.3m. Cross cut by mafic dykes. MINOR INTERVALS: Minor Interval: 506.70 - 506.80 Maf Dyke, Mafic dyke Narrow mafic dyke with contacts at 20 degrees to the core axis. Strongly sheared parallel to the contacts. Moderate chlorite + carbonate alteration. Minor Interval: 539.10 - 540.10 Maf Dyke, Mafic dyke Grey-green mafic dyke with sharp contacts at 35 degrees to the core axis. Stronly sheared with sections of crenulation fabric. Moderate chlorite + carbonate alteration.									
606.80	608.20	Maf Dyke, Mafic dyke Fine grained, grey-green, non-magnetic mafic dyke. Weak crenulation fabric. Moderate to strong chlorite-carbonate alteration. Very sharp upper contact at 40 DCA and lower contact at 30 DCA with small (1cm) chill margin. Weak potasic alteration in granodiorite wall rock at lower contact.	113515	606.80	608.20	1.40	0.03	0.00	0.02	0.03	0.0
608.20	612.20	Grndiorite, Granodiorite Medium to coarse grained, massive, non-magnetic granodiorite. White and grey in colour. Weak potatsic alteration at contact with dyke at 608.2m.									
612.20	615.00	Maf Dyke, Mafic dyke Dark grey, white and green mafic dyke. Strong foliation with weak crenulation fabric. Plagioclase crystals aligned with foliation. Weak replacement chlorite alteration of mafic minerals. Weak carbonate alteration. Weakly sheared at upper and lower contacts. Upper contact is at 20 DCA and lower contact is at 45 DCA.	113516	612.20	613.60	1.40	0.03	0.00	0.02	0.03	0.0
			113517	613.60	614.90	1.30	0.03	0.00	0.02	0.02	0.0
615.00	664.90	Grndiorite, Granodiorite Grey-white, massive, non-magnetic granodiorite. Cross-cut by small mafic dyke. Rock is foliated at 20 DCA from 630-633m. Localized quartz veining from 652.7-662.7m. Small shear at 20 DCA from 663.6-664m. MINOR INTERVALS: Minor Interval: 618.30 - 618.80 Maf Dyke, Mafic dyke Moderately sheared mafic dyke with crenulation fabric. Biotite replacement alteration. Weak carbonate alteration. Sharp upper contact at 45 DCA and lower contact at 55 DCA. 1% secondary cubic pyrite at upper contact over a 5cm section.									
664.90	669.60	Maf Dyke, Mafic dyke Fine to medium grained, green-grey mafic dyke. Non-magnetic. Moderate to strong chlorite alteration of pyroxene. Interstitial plagioclase crystals are sub-hedral and relatively un-altered. Moderate crenulation fabric from 665-666m.	113518	665.00	666.50	1.50	0.03	0.01	0.02	0.02	0.0
			113519	666.50	668.00	1.50	0.02	0.01	0.01	0.01	0.0

DETAILED LOG

Hole Number: NOT-16-1G001

Units: METRIC

Detailed Lithology			Assay Data								
From	To	Lithology	Sample Number	From	To	Length	Ni_pct_FINAL	Cu_pct_FINAL	Pt_ppm_FINAL	Pd_ppm_FINAL	Au_ppm_FINAL
669.60	784.70	Grndiorite, Granodiorite Grey-white, medium to coarse grained, weak to moderately foliated granodiorite. Non-magnetic. Localized sections are strongly foliated. Trace disseminated Py. Cross cut by feldspar porphrytic mafic dykes. Strongly foliated to sheared from 759.2 - 765.6m with laminated bull white quartz veins occuring parallel to foliation. 1% cubic pyrite occuring along quartz vein margins. MINOR INTERVALS: Minor Interval: 731.60 - 731.80 Maf Dyke, Mafic dyke Medium grey, massive, feldspar porphyritic mafic dyke. Non-magnetic. 0.25% cubic pyrite. Sharp upper and lower contact at 65 DCA. Minor Interval: 732.00 - 732.50 Maf Dyke, Mafic dyke Medium grey, massive, feldspar porphyritic mafic dyke. 0.25-0.5% cubic pyrite. Sharp upper and lower contact at 65 DCA. Minor Interval: 735.10 - 735.90 Maf Dyke, Mafic dyke Medium grey, massive, feldspar porphyritic, mafic dyke. Sharp upper and lower contact at 65 DCA. Narrow chill margin. 0.25% cubic pyrite.									
784.70	786.80	Maf Dyke, Mafic dyke Fine to medium grained, grey, massive mafic dyke. Non-magnetic. Weak to moderately sheared at upper and lower contacts. 25% biotite throughout.	113521	784.70	785.70	1.00	0.02	0.01	0.01	0.01	0.0
			113522	785.70	786.80	1.10	0.02	0.01	0.01	0.01	0.0
786.80	802.70	Grndiorite, Granodiorite Medium to coarse grained, massive, non-magnetic granodiorite. Feldspar and quartz crystals are sub-hedral to euhedral. Rock is fresh and unaltered.									
802.70	808.10	Maf Dyke, Mafic dyke Massive, grey, non-magnetic mafic dyke. Upper and lower contact sharp at 30 and 20 degrees respectively. Fine to medium grained. 25% biotite.	113523	803.00	804.50	1.50	0.02	0.01	0.01	0.01	0.0
			113524	804.50	806.00	1.50	0.02	0.01	0.01	0.01	0.0
808.10	820.00	Grndiorite, Granodiorite Massive, medium to coarse grained, non-magnetic granodiorite. Strongly silicified and recrystalized through contact metamorphism from 818.4-820m. The rock becomes coarse grained in this section. MINOR INTERVALS: Minor Interval: 818.40 - 820.00 Grndiorite, Granodiorite Contact metamorphic halo. Recrystalized, moderately silicified. Less biotite content than protolith.									
820.00	821.20	Maf Dyke, Mafic dyke Fine grained, grey, moderately foliated mafic dyke. Non-magnetic. Ground mass of pyroxene with interstitial plagiolcase. Up to 25% biotite alligned parallel to foliation. Sharp upper conact at 25 DCA and lower contact at 45 DCA.	113525	820.00	821.20	1.20	0.02	0.01	0.02	0.02	0.0

DETAILED LOG

Hole Number: NOT-16-1G001 | Units: METRIC

Detailed Lithology			Assay Data								
From	To	Lithology	Sample Number	From	To	Length	Ni_pct_FINAL	Cu_pct_FINAL	Pt_ppm_FINAL	Pd_ppm_FINAL	Au_ppm_FINAL
821.20	828.70	**Grndiorite, Granodiorite** Medium to coarse grained. Weakly honfelds throughout. Stronger contact metamorphism at contacts from 821.2-821.4m and from 828.3-828.7m. These sections are moderately silicified and have lower biotite contecnt. Feldspar crystals throughout interval have been weakly sericitized throughout. Trace to 0.25% py + po from 828 - 828.7m.	113526	826.50	827.50	1.00	0.00	0.00	0.00	0.00	0.0
			113527	827.50	828.20	0.70	0.00	0.00	0.00	0.00	0.0
			113528	828.20	828.70	0.50	0.01	0.01	0.00	0.01	0.0
828.70	848.70	**Pyroxenite, Pyroxenite** Fine to medium grained, moderate to strongly foliated, olivine pyroxenite. Weakly magnetic. 30% biotite. Some sections have sub-rounded, medium grained olivine that give the core a spotted look. Strong Chill margin from 828.7 - 829m. Single xenolith of granodiorite with trace - 0.25% disseminated py + po occurs at 828.9m. Biotite appears to be an alteration mineral. Chilled intrusive cuts half the core at an acute angle from 847.6-847.8m. MINOR INTERVALS: Minor Interval: 828.70 - 829.00 Pyroxenite, Pyroxenite Strong chill margin of pyroxenite unit. A 1 x 3 cm xenolith of granodiorite occurs at 828.9m with trace - 0.25% disseminated py + po. Minor Interval: 847.60 - 847.80 Maf Dyke, Mafic dyke Very fine grained, grey, mafic intrusive. Appears chilled. Partially cuts the core sub-parallel to the core axis.	113529	828.70	829.20	0.50	0.08	0.01	0.09	0.24	0.0
			113531	829.20	830.00	0.80	0.09	0.00	0.01	0.04	0.0
			113532	830.00	831.00	1.00	0.06	0.00	0.02	0.07	0.0
			113533	831.00	832.00	1.00	0.02	0.00	0.00	0.00	0.0
			113534	832.00	833.00	1.00	0.03	0.00	0.00	0.00	0.0
			113561	833.00	834.00	1.00	0.09	0.00	0.01	0.02	0.0
			113562	834.00	835.00	1.00	0.09	0.00	0.01	0.02	0.0
			113563	835.00	836.00	1.00	0.38	0.00	0.06	0.19	0.0
			113564	836.00	837.00	1.00	0.07	0.00	0.01	0.03	0.0
			113565	837.00	838.00	1.00	0.06	0.00	0.01	0.04	0.0
			113566	838.00	839.00	1.00	0.06	0.01	0.04	0.05	0.0
			113567	839.00	840.00	1.00	0.03	0.01	0.02	0.02	0.0
			113568	840.00	841.00	1.00	0.03	0.01	0.01	0.02	0.0
			113569	841.00	842.50	1.50	0.08	0.00	0.02	0.03	0.0
848.70	857.10	**Pyroxenite, Pyroxenite** Massive, grey, weakly magnetic pyroxenite. Core is spun/ground from 849-851m but most of the core was recovered. Trace disseminated py + po throughout. Upper contact is folliated at 50 DCA with 1% pyrite occuring parallel to foliation.	113535	854.00	855.00	1.00	0.09	0.01	0.02	0.03	0.0
			113536	855.00	856.00	1.00	0.10	0.02	0.02	0.04	0.0
			113537	856.00	856.60	0.60	0.13	0.02	0.06	0.20	0.0
			113538	856.60	857.10	0.50	0.12	0.02	0.05	0.08	0.0

Hole Number: NOT-16-1G001 Units: METRIC

Detailed Lithology			Assay Data								
From	To	Lithology	Sample Number	From	To	Length	Ni_pct_FINAL	Cu_pct_FINAL	Pt_ppm_FINAL	Pd_ppm_FINAL	Au_ppm_FINAL
857.10	976.80	Peridotite, Peridotite Fine grained, massive, strongly magnetic peridotite to dunite. Black in colour. Very fine grained to aphanitic at lower contact from 857.1-857.2m. Fractured from 860.4-860.6m at 20 DCA with carbonate infill. Fractured at 25 DCA from 946.7-946.9m with carbonate infill. Section is moderately serpentinized. Carbonate is weathered with ankerite alteration. Tensional fractures sub-perpendicular to the core with carbonate infill occur from 963.7-964.3m. 1mm speck of native Cu with 3 pin prick specs adjecent in carbonate infil veinlet at 963.85m. A shear zone occurs from 970.2 - 972m. The rock surronding the shear has been serpentinized. Massive very fine grained carbonate occurs from 974-974.2m which is likely an alteration by product. Talc-serpentine-chrolrite alteration is very intense in sections. Carbonate veining has undergone ankerite alteration. Gradational contact into olivine melagabbro at 975.8m. MINOR INTERVALS: Minor Interval: 857.10 - 857.20 Peridotite, Peridotite Fine grained to aphanitic lower chill/contact.	113539	857.10	857.60	0.50	0.16	0.02	0.01	0.01	0.0
			110601	857.60	858.50	0.90	0.15	0.01	0.01	0.01	0.0
			113540	857.60	858.50	0.90	0.17	0.01	0.01	0.01	0.0
			113541	858.50	859.50	1.00	0.18	0.02	0.01	0.00	0.0
			113542	859.50	860.40	0.90	0.19	0.01	0.01	0.00	0.0
			113543	883.00	884.00	1.00	0.21	0.00	0.03	0.03	0.0
			113544	904.00	905.00	1.00	0.21	0.00	0.02	0.02	0.0
			113545	925.00	926.00	1.00	0.22	0.00	0.01	0.02	0.0
			113546	947.00	948.00	1.00	0.22	0.00	0.01	0.02	0.0
			113547	962.70	963.70	1.00	0.22	0.00	0.01	0.02	0.0
			113548	963.70	964.30	0.60	0.17	0.01	0.01	0.01	0.0
			113549	964.30	965.30	1.00	0.22	0.00	0.01	0.02	0.0
976.80	1148.00	Dunite, Dunite Medium grained, massive, moderate to strongly magnetic. Talc-serpentine vein occuring at 30 DCA from 1010 - 1010.1m. Shear zone with talc - serpentine - chlorite alteration from 1013.7-1014m at 30 DCA. Pervasive weak to moderat chlorite - carbonate +/- epidote alteration from 1014.5 - 1017.5m with trace to 0.25% disseminated Py + Po. Carbonate vein with pyrite filled fluid amygdules occurs at 45 DCA from 1021.3 - 1021.35m. Small shear zone with carbonate-serpentine-chlorite alteration from 1062.7-1063m. Carbonate veinlet with 5% pyrite occurs at 40 DCA from 1071.3-1071.35m. Talc-serpentine-chlorite vein occurs from 1095-1095.15m at 45 DCA.	113551	985.00	986.00	1.00	0.23	0.00	0.04	0.02	0.0
			113552	1013.50	1014.50	1.00	0.21	0.01	0.05	0.02	0.0
			113553	1014.50	1015.50	1.00	0.25	0.00	0.06	0.03	0.0
			113554	1015.50	1016.50	1.00	0.25	0.00	0.04	0.02	0.0
			113555	1016.50	1017.50	1.00	0.25	0.00	0.05	0.03	0.0
			113556	1021.00	1021.50	0.50	0.28	0.00	0.05	0.03	0.0
			113557	1123.00	1124.00	1.00	0.22	0.00	0.02	0.03	0.0
1148.00	1169.00	Dunite, Dunite Carbonate altered dunite. Light grey, white and green in colour. Softer than other dunite units. Visible olivine pseudomorphs. Quartz carbonate veinlets throughout, often faulted and fractured. Magnetic susceptibility is reduced due to alteration.	113558	1160.00	1161.00	1.00	0.22	0.00	0.02	0.07	0.0
1169.00	1194.00	Talc Sch, Talc schist Fine grained to medium grained talc-actinolite schist. Lighter in colour, quite softer, with greasy talc feel to core. Strongly sheared at 30-40 DCA. Quartz augens indicated high strain post fluid movement. Much lower magnetic susceptibility due to alteration of magnetite.									
1194.00	1201.60	Dunite, Dunite Carbonate altered dunite. Mag susc increases back to similar ranges outside of talc-schist. Light grey, fine to medium grained. Increasing hardness down hole. Some minor stringers and carbonate veinlets offten with some brittle deformation (minor offsets and fractures).									

Hole Number: NOT-16-1G001 Units: METRIC

Detailed Lithology

From	To	Lithology	Sample Number	From	To	Length	Ni_pct_FINAL	Cu_pct_FINAL	Pt_ppm_FINAL	Pd_ppm_FINAL	Au_ppm_FINAL
1201.60	1221.40	**Dunite, Dunite** Dark grey green perdiotite. Fine grained to medium grained, generally massive and weakly magnetic. Minor QCB veinlets and stringers locally. Texture is orthocumulate with oliven pseudomorphs. Last 40 cm is an alteration zone, with quartz and carbonate stringers that are crackle looking. Trace sulphides associated with this margin area.	113559	1202.00	1202.80	0.80	0.06	0.00	0.02	0.03	0.0
			113571	1214.00	1215.00	1.00	0.25	0.00	0.04	0.11	0.0
1221.40	1225.60	**Dunite, Dunite** Carbonate altered dunite. Tensional fractures occur sub-parallel to the core axis on either side of altered unit and are infilled with carbonate veinlets. Medium green and white. Late stage veinlets that have thin flaky biotite and quartz. Tiny crystals of magnetite are found throughout the main ground mass. Lower section is weakly brecciated, but annealed. Increased magnetics.	113572	1222.00	1223.20	1.20	0.20	0.01	0.04	0.06	0.0
1225.60	1252.10	**Pyroxenite, Pyroxenite** Medium to dark grey olivine pyroxenite. Fine to medium grained. Modereate to strongly magnetic. Gradational upper contact with dunite and lower contact into finer grained pyroxenite.	113573	1250.00	1251.00	1.00	0.26	0.00	0.03	0.06	0.0
1252.10	1287.00	**Pyroxenite, Pyroxenite** Very fine grained, weakly serpentinized pyroxenite. Dark black/green in colour, very low magnetics. Massive but blocky. Contacts are gradational, also quite hard in comparison to surrounding lithology.	113574	1281.00	1282.00	1.00	0.13	0.00	0.09	0.06	0.0
			113582	1282.00	1283.00	1.00	0.14	0.01	0.08	0.07	0.0
			113583	1283.00	1284.00	1.00	0.15	0.01	0.18	0.24	0.0
			113584	1284.00	1285.00	1.00	0.16	0.00	0.18	0.11	0.0
			113585	1285.00	1286.00	1.00	0.14	0.00	0.13	0.12	0.0
			113586	1286.00	1287.00	1.00	0.19	0.00	0.19	0.76	0.0
1287.00	1302.50	**Pyroxenite, Pyroxenite** Medium grained massive pyroxenite. Medium grey-green with a hint of brown colour. Moderate to strongly magnetic. Disseminated sulfide increases downhole to ~0.25%. There is an increase of stringers and veining down hole as it seems to be approaching a talc-carbonate alteration zone. Variable olivene content. EOH = 1302.5	113587	1287.00	1288.00	1.00	0.19	0.00	0.05	0.13	0.0
			113588	1288.00	1289.00	1.00	0.18	0.00	0.02	0.02	0.0
			113589	1289.00	1290.00	1.00	0.20	0.00	0.06	0.04	0.0
			113575	1290.00	1291.00	1.00	0.33	0.01	0.24	0.41	0.0
			113576	1291.00	1292.00	1.00	0.19	0.00	0.04	0.01	0.0
			113577	1292.00	1293.00	1.00	0.21	0.00	0.04	0.01	0.0
			113578	1299.00	1299.90	0.90	0.28	0.01	0.06	0.15	0.0
			113579	1299.90	1300.50	0.60	0.21	0.01	0.02	0.05	0.0
			113580	1299.90	1300.50	0.60	0.21	0.01	0.03	0.05	0.0
			113581	1300.50	1301.85	1.35	0.25	0.00	0.05	0.10	0.0

Samples

Sample Number	From	To	Ni_pct_FINAL	Cu_pct_FINAL	Pt_ppm_FINAL	Pd_ppm_FINAL	Au_ppm_FINAL
Sample Type ASSAY							
113501	219.00	220.00	0.0026	0.0027	0.0000	0.0000	0.0000
113502	220.00	220.50	0.0045	0.0917	0.0000	0.0000	0.0250
113503	220.50	221.00	0.0102	0.0192	0.0000	0.0000	0.0000
113504	221.00	222.00	0.0123	0.0158	0.0000	0.0000	0.0000
113505	238.00	238.90	0.0129	0.0086	0.0000	0.0000	0.0020
113506	238.90	239.40	0.0099	0.0255	0.0000	0.0000	0.0000
113507	239.40	240.30	0.0128	0.0086	0.0000	0.0000	0.0020

Hole Number: NOT-16-1G001 Units: METRIC

Samples

Sample Number	From	To	Ni_pct_FINAL	Cu_pct_FINAL	Pt_ppm_FINAL	Pd_ppm_FINAL	Au_ppm_FINAL
Sample Type ASSAY							
113508	240.30	240.80	0.0103	0.0169	0.0000	0.0000	0.0020
113509	240.80	241.80	0.0115	0.0094	0.0000	0.0000	0.0020
113511	241.80	242.80	0.0125	0.0160	0.0000	0.0000	0.0050
113512	251.00	252.00	0.0121	0.0027	0.0000	0.0000	0.0000
113513	252.00	253.00	0.0143	0.0100	0.0000	0.0000	0.0000
113514	253.00	254.00	0.0008	0.0020	0.0000	0.0000	0.0000
113515	606.80	608.20	0.0272	0.0011	0.0240	0.0270	0.0000
113516	612.20	613.60	0.0276	0.0014	0.0230	0.0260	0.0000
113517	613.60	614.90	0.0265	0.0024	0.0220	0.0220	0.0000
113518	665.00	666.50	0.0321	0.0131	0.0180	0.0170	0.0030
113519	666.50	668.00	0.0202	0.0121	0.0140	0.0080	0.0030
113521	784.70	785.70	0.0196	0.0058	0.0130	0.0120	0.0000
113522	785.70	786.80	0.0177	0.0092	0.0140	0.0100	0.0000
113523	803.00	804.50	0.0204	0.0075	0.0130	0.0130	0.0000
113524	804.50	806.00	0.0193	0.0071	0.0120	0.0090	0.0000
113525	820.00	821.20	0.0221	0.0054	0.0150	0.0170	0.0030
113526	826.50	827.50	0.0013	0.0014	0.0000	0.0000	0.0000
113527	827.50	828.20	0.0029	0.0016	0.0000	0.0000	0.0000
113528	828.20	828.70	0.0107	0.0059	0.0000	0.0140	0.0020
113529	828.70	829.20	0.0797	0.0108	0.0940	0.2350	0.0120
113531	829.20	830.00	0.0886	0.0025	0.0140	0.0420	0.0040
113532	830.00	831.00	0.0586	0.0008	0.0240	0.0710	0.0060
113533	831.00	832.00	0.0243	0.0006	0.0000	0.0000	0.0000
113534	832.00	833.00	0.0338	0.0009	0.0000	0.0000	0.0000
113561	833.00	834.00	0.0913	0.0016	0.0110	0.0220	0.0100
113562	834.00	835.00	0.0923	0.0026	0.0120	0.0210	0.0030
113563	835.00	836.00	0.3840	0.0002	0.0560	0.1880	0.0250
113564	836.00	837.00	0.0695	0.0025	0.0140	0.0300	0.0000
113565	837.00	838.00	0.0577	0.0031	0.0130	0.0420	0.0040
113566	838.00	839.00	0.0551	0.0118	0.0370	0.0450	0.0020
113567	839.00	840.00	0.0309	0.0149	0.0160	0.0210	0.0000
113568	840.00	841.00	0.0265	0.0068	0.0140	0.0180	0.0000
113569	841.00	842.50	0.0789	0.0003	0.0170	0.0300	0.0000
113535	854.00	855.00	0.0900	0.0138	0.0160	0.0270	0.0000
113536	855.00	856.00	0.1030	0.0166	0.0150	0.0370	0.0000
113537	856.00	856.60	0.1280	0.0212	0.0560	0.1960	0.0050
113538	856.60	857.10	0.1240	0.0182	0.0500	0.0810	0.0020
113539	857.10	857.60	0.1600	0.0235	0.0090	0.0090	0.0030
113540	857.60	858.50	0.1670	0.0144	0.0070	0.0060	0.0020

Hole Number: NOT-16-1G001 Units: METRIC

Samples

Sample Number	From	To	Ni_pct_FINAL	Cu_pct_FINAL	Pt_ppm_FINAL	Pd_ppm_FINAL	Au_ppm_FINAL
Sample Type ASSAY							
113541	858.50	859.50	0.1780	0.0172	0.0100	0.0000	0.0030
113542	859.50	860.40	0.1910	0.0083	0.0060	0.0000	0.0050
113543	883.00	884.00	0.2080	0.0009	0.0250	0.0280	0.0000
113544	904.00	905.00	0.2100	0.0010	0.0160	0.0170	0.0000
113545	925.00	926.00	0.2170	0.0005	0.0120	0.0180	0.0000
113546	947.00	948.00	0.2170	0.0006	0.0140	0.0170	0.0000
113547	962.70	963.70	0.2180	0.0002	0.0110	0.0160	0.0050
113548	963.70	964.30	0.1670	0.0081	0.0110	0.0130	0.0250
113549	964.30	965.30	0.2230	0.0005	0.0120	0.0180	0.0170
113551	985.00	986.00	0.2330	0.0018	0.0380	0.0230	0.0090
113552	1013.50	1014.50	0.2130	0.0056	0.0470	0.0240	0.0000
113553	1014.50	1015.50	0.2470	0.0008	0.0580	0.0250	0.0000
113554	1015.50	1016.50	0.2500	0.0010	0.0410	0.0230	0.0000
113555	1016.50	1017.50	0.2540	0.0011	0.0500	0.0250	0.0000
113556	1021.00	1021.50	0.2800	0.0022	0.0450	0.0330	0.0000
113557	1123.00	1124.00	0.2180	0.0002	0.0170	0.0340	0.0000
113558	1160.00	1161.00	0.2160	0.0018	0.0160	0.0710	0.0100
113559	1202.00	1202.80	0.0608	0.0006	0.0160	0.0330	0.0060
113571	1214.00	1215.00	0.2450	0.0005	0.0430	0.1050	0.0100
113572	1222.00	1223.20	0.2040	0.0091	0.0440	0.0600	0.0050
113573	1250.00	1251.00	0.2570	0.0002	0.0270	0.0580	0.0000
113574	1281.00	1282.00	0.1290	0.0025	0.0910	0.0580	0.0000
113582	1282.00	1283.00	0.1410	0.0133	0.0780	0.0680	0.0000
113583	1283.00	1284.00	0.1460	0.0089	0.1800	0.2440	0.0030
113584	1284.00	1285.00	0.1590	0.0033	0.1800	0.1050	0.0040
113585	1285.00	1286.00	0.1410	0.0009	0.1280	0.1170	0.0030
113586	1286.00	1287.00	0.1850	0.0048	0.1910	0.7590	0.0140
113587	1287.00	1288.00	0.1930	0.0007	0.0490	0.1270	0.0030
113588	1288.00	1289.00	0.1820	0.0002	0.0230	0.0190	0.0000
113589	1289.00	1290.00	0.2000	0.0017	0.0580	0.0430	0.0000
113575	1290.00	1291.00	0.3280	0.0067	0.2380	0.4090	0.0090
113576	1291.00	1292.00	0.1940	0.0004	0.0400	0.0090	0.0000
113577	1292.00	1293.00	0.2060	0.0004	0.0400	0.0140	0.0000
113578	1299.00	1299.90	0.2790	0.0073	0.0640	0.1460	0.0090
113579	1299.90	1300.50	0.2130	0.0096	0.0190	0.0470	0.0050
113581	1300.50	1301.85	0.2480	0.0014	0.0480	0.1000	0.0060
Sample Type DUP							
110601	857.60	858.50	0.1510	0.0129	0.0070	0.0050	0.0020
113580	1299.90	1300.50	0.2100	0.0069	0.0260	0.0510	0.0050

Date Submitted:	12-Oct-16
Invoice No.:	A16-10603
Invoice Date:	28-Oct-16
Your Reference:	Batch # 1541

Noront Resources Ltd.
110 Yonge Street, Suite 400
Toronto ON M5C 1T4
Canada

ATTN: GIS+Database Manager Matt Downey (Inv/res)

CERTIFICATE OF ANALYSIS

94 Core samples were submitted for analysis.

The following analytical package(s) were requested:

Code 1C-OES-Tbay Fire Assay ICPOES (QOP Fire Assay Tbay)
Code 1F2-Tbay Total Digestion ICP(TOTAL)

REPORT **A16-10603**

This report may be reproduced without our consent. If only selected portions of the report are reproduced, permission must be obtained. If no instructions were given at time of sample submittal regarding excess material, it will be discarded within 90 days of this report. Our liability is limited solely to the analytical cost of these analyses. Test results are representative only of material submitted for analysis.

Notes:

Values which exceed the upper limit should be assayed for accurate numbers.

Footnote: Bi is interfered by Cr overange for sample A16-10603-52~59, 75~78, 83~87, 89, 90. Thus they are not reported.

CERTIFIED BY:

Emmanuel Eseme , Ph.D.
Quality Control

ACTIVATION LABORATORIES LTD.
1201 Walsh Street West, Thunder Bay, Ontario, Canada, P7E 4X6
TELEPHONE +807 622-6707 or +1.888.228.5227 FAX +1.905.648.9613
E-MAIL Tbay@actlabs.com ACTLABS GROUP WEBSITE www.actlabs.com

		Au_ppb_ FA-ICP	Pd_ppb_ FA-ICP	Pt_ppb_ FA-ICP	Ag_ppm _TD-ICP	Al_%_TD -ICP	As_ppm_ TD-ICP	Ba_ppm _TD-ICP	Be_ppm _TD-ICP	Bi_ppm_ TD-ICP	Ca_%_T D-ICP	Cd_ppm _TD-ICP	Co_ppm _TD-ICP	Cr_ppm_ TD-ICP	Cu_ppm _TD-ICP	Fe_%_T D-ICP	Ga_ppm _TD-ICP	Hg_ppm _TD-ICP	K_%_TD -ICP	Mg_%_T D-ICP	Li_ppm_ TD-ICP	Mn_ppm _TD-ICP	Mo_ppm _TD-ICP
110601	O	2	5	7	< 0.3	1.89	< 3	< 7	< 1	< 2	0.80	0.7	102	6150	129	7.84	3	< 1	0.02	19.3	1	723	< 1
113501	O	< 2	< 5	< 5	< 0.3	1.41	< 3	157	< 1	< 2	0.80	< 0.3	10	70	27	1.88	5	< 1	0.59	0.75	15	270	2
113502	O	25	< 5	< 5	0.7	2.53	< 3	217	< 1	< 2	1.14	< 0.3	22	96	917	3.31	9	< 1	0.80	1.20	23	347	7
113503	O	< 2	< 5	< 5	< 0.3	5.41	< 3	239	< 1	4	3.91	< 0.3	43	143	192	7.42	16	< 1	0.92	3.31	46	1000	< 1
113504	O	< 2	< 5	< 5	0.3	7.38	< 3	93	< 1	5	7.38	< 0.3	48	165	158	9.68	16	5	0.60	4.18	23	1670	< 1
113505	O	2	< 5	< 5	0.5	7.45	< 3	20	< 1	4	7.46	< 0.3	44	162	86	9.28	15	4	0.19	4.42	20	1690	< 1
113506	O	< 2	< 5	< 5	1.3	7.15	< 3	22	< 1	3	8.57	< 0.3	58	84	255	9.99	17	2	0.18	3.48	21	1670	< 1
113507	O	2	< 5	< 5	0.3	7.24	< 3	26	< 1	4	7.36	< 0.3	44	202	86	9.20	14	< 1	0.22	4.43	22	1680	< 1
113508	O	2	< 5	< 5	< 0.3	6.99	< 3	18	< 1	4	8.01	< 0.3	41	116	169	9.61	16	4	0.17	3.72	20	1690	< 1
113509	O	2	< 5	< 5	0.3	5.23	< 3	19	< 1	4	7.21	< 0.3	44	179	94	9.16	14	< 1	0.15	3.79	19	1760	1
113510	O	204	1410	720	3.5	6.45	< 3	257	< 1	6	4.20	0.8	166	354	6870	13.6	11	3	0.66	3.93	12	1210	3
113511	O	5	< 5	< 5	< 0.3	7.50	5	27	< 1	2	7.35	< 0.3	48	161	160	10.1	16	6	0.24	4.22	22	1960	< 1
113512	O	< 2	< 5	< 5	< 0.3	7.38	< 3	48	< 1	2	7.83	< 0.3	43	145	27	9.72	15	3	0.45	4.33	21	1780	< 1
113513	O	< 2	< 5	< 5	< 0.3	7.35	< 3	397	< 1	3	5.88	< 0.3	48	199	100	10.0	17	2	2.67	4.59	79	1710	1
113514	O	< 2	< 5	< 5	< 0.3	7.29	< 3	328	< 1	< 2	1.72	< 0.3	4	19	20	1.51	15	< 1	1.05	0.40	18	332	2
113515	O	< 2	27	24	< 0.3	5.65	< 3	284	< 1	< 2	5.03	0.6	56	868	11	7.41	11	< 1	2.42	7.85	28	1560	3
113516	O	< 2	26	23	< 0.3	5.51	< 3	284	< 1	3	5.14	0.3	60	855	14	7.17	11	< 1	2.28	7.74	72	1610	7
113517	O	< 2	22	22	< 0.3	5.94	< 3	255	< 1	< 2	4.91	< 0.3	57	906	24	7.85	13	< 1	2.55	7.65	64	1670	17
113518	O	3	17	18	< 0.3	6.14	< 3	207	< 1	< 2	6.33	0.6	56	893	131	7.69	11	< 1	1.52	7.35	42	1520	< 1
113519	O	3	8	14	0.3	6.15	< 3	159	< 1	< 2	6.77	< 0.3	52	545	121	7.15	13	< 1	0.99	5.24	27	1360	< 1
113520	O	< 2	< 5	< 5	0.3	7.32	< 3	439	1	< 2	2.20	< 0.3	6	39	6	2.20	17	< 1	1.69	0.57	23	392	< 1
113521	O	< 2	12	13	0.4	6.71	< 3	340	< 1	< 2	5.81	0.5	48	631	58	7.53	13	< 1	2.74	5.74	61	1560	< 1
113522	O	< 2	10	14	< 0.3	6.69	< 3	303	< 1	< 2	6.38	0.7	48	461	92	7.48	13	< 1	2.36	5.61	54	1520	< 1
113523	O	< 2	13	13	< 0.3	6.78	< 3	189	< 1	< 2	6.86	0.6	47	387	75	7.39	12	< 1	1.40	5.88	37	1460	< 1
113524	O	< 2	9	12	0.4	6.58	< 3	272	< 1	3	6.61	0.9	48	341	71	7.24	12	< 1	1.58	5.61	38	1440	1
113525	O	3	17	15	0.6	6.41	< 3	351	< 1	< 2	5.83	0.6	51	456	54	7.26	13	< 1	2.03	6.53	62	1620	< 1
113526	O	< 2	< 5	< 5	0.3	7.72	< 3	375	< 1	< 2	2.73	< 0.3	7	22	14	2.24	18	< 1	1.21	0.69	15	441	< 1
113527	O	< 2	< 5	< 5	1.2	7.56	< 3	483	< 1	2	2.15	< 0.3	7	21	16	2.09	17	< 1	1.25	0.73	10	463	1
113528	O	2	14	< 5	0.4	7.53	< 3	152	< 1	< 2	2.18	< 0.3	11	65	59	2.05	17	< 1	0.36	1.21	4	460	2
113529	O	12	235	94	0.3	4.53	< 3	272	< 1	< 2	4.05	< 0.3	55	1110	108	6.18	11	< 1	1.81	6.20	38	1230	6
113530	O	1020	4750	1100	1.1	11.0	< 3	33	< 1	3	9.55	0.6	33	270	3470	4.32	10	< 1	0.08	3.63	3	593	56
113531	O	4	42	14	< 0.3	4.12	< 3	340	< 1	< 2	4.89	< 0.3	68	2400	25	8.13	11	< 1	2.84	10.5	64	1470	208
113532	O	6	71	24	0.5	5.29	< 3	344	< 1	< 2	3.92	< 0.3	55	1060	8	7.06	11	2	2.35	8.76	54	1250	5
113533	O	< 2	< 5	< 5	0.4	8.30	< 3	447	< 1	< 2	0.94	< 0.3	41	28	6	4.77	14	< 1	2.72	4.04	48	519	2
113534	O	< 2	< 5	< 5	0.4	8.02	< 3	476	< 1	2	1.27	0.5	48	139	9	5.64	14	< 1	2.35	5.12	55	667	< 1
113535	O	< 2	27	16	0.4	3.94	< 3	122	< 1	< 2	4.82	< 0.3	90	2010	138	6.74	5	< 1	1.53	13.1	37	942	1
113536	O	< 2	37	15	< 0.3	4.24	< 3	68	< 1	< 2	4.67	< 0.3	98	2480	166	6.49	6	< 1	0.89	15.1	23	931	3
113537	O	5	196	56	< 0.3	2.58	< 3	< 7	< 1	4	7.14	0.3	111	2900	212	5.25	3	< 1	0.03	15.0	5	1040	< 1
113538	O	2	81	50	< 0.3	2.39	< 3	< 7	< 1	3	7.16	< 0.3	99	2870	182	4.69	3	1	0.03	15.2	4	1040	4
113539	O	3	9	9	< 0.3	2.41	< 3	< 7	< 1	< 2	3.29	0.3	107	5080	235	6.73	3	1	0.03	17.5	3	801	< 1
113540	O	2	6	7	< 0.3	1.95	< 3	< 7	< 1	< 2	0.99	< 0.3	110	6010	144	7.86	2	< 1	0.01	19.5	1	723	< 1
113541	O	3	< 5	10	< 0.3	1.58	< 3	< 7	< 1	< 2	1.57	0.7	103	5800	172	7.46	2	< 1	< 0.01	19.2	2	741	< 1
113542	O	5	< 5	6	< 0.3	1.67	< 3	< 7	< 1	< 2	2.02	< 0.3	99	4610	83	6.91	1	< 1	< 0.01	19.5	< 1	864	< 1
113543	O	< 2	28	25	< 0.3	1.08	< 3	< 7	< 1	< 2	0.62	0.5	130	5730	9	7.16	< 1	< 1	< 0.01	21.4	< 1	1020	< 1
113544	O	< 2	17	16	< 0.3	1.02	< 3	< 7	< 1	< 2	0.76	0.8	126	5580	10	7.12	< 1	< 1	0.02	21.6	1	1160	< 1
113545	O	< 2	18	12	< 0.3	1.00	< 3	< 7	< 1	< 2	0.54	< 0.3	136	6180	5	7.48	< 1	< 1	0.03	22.2	3	1280	< 1
113546	O	< 2	17	14	< 0.3	1.02	< 3	< 7	< 1	< 2	0.42	< 0.3	134	7590	6	7.84	< 1	< 1	0.01	22.3	5	1160	< 1
113547	O	5	16	11	< 0.3	1.06	85	< 7	< 1	< 2	0.20	< 0.3	143	7730	2	8.62	< 1	< 1	< 0.01	22.0	2	1490	< 1
113548	O	25	13	11	0.6	0.18	196	90	< 1	9	5.28	0.9	78	5990	81	4.52	< 1	< 1	< 0.01	17.5	< 1	892	< 1
113549	O	17	18	12	< 0.3	0.99	206	9	< 1	< 2	0.34	0.9	119	8060	5	6.80	< 1	< 1	< 0.01	21.4	2	1080	< 1

		Au_ppb_ FA-ICP	Pd_ppb_ FA-ICP	Pt_ppb_ FA-ICP	Ag_ppm _TD-ICP	Al_%_TD -ICP	As_ppm_ TD-ICP	Ba_ppm _TD-ICP	Be_ppm _TD-ICP	Bi_ppm_ TD-ICP	Ca_%_T D-ICP	Cd_ppm _TD-ICP	Co_ppm _TD-ICP	Cr_ppm_ TD-ICP	Cu_ppm _TD-ICP	Fe_%_T D-ICP	Ga_ppm _TD-ICP	Hg_ppm _TD-ICP	K_%_TD -ICP	Mg_%_T D-ICP	Li_ppm_ TD-ICP	Mn_ppm _TD-ICP	Mo_ppm _TD-ICP
113550	O	136	1420	695	3.7	6.20	< 3	253	< 1	6	4.14	0.8	165	234	6760	13.2	12	4	0.63	3.88	12	1170	< 1
113551	O	9	23	38	< 0.3	0.80	6	< 7	< 1		0.48	< 0.3	139	> 10000	18	7.70	< 1	< 1	< 0.01	23.4	3	1250	< 1
113552	O	< 2	24	47	< 0.3	1.29	< 3	< 7	< 1		1.57	0.9	119	9740	56	6.60	1	< 1	< 0.01	21.7	2	771	< 1
113553	O	< 2	25	58	< 0.3	0.87	< 3	< 7	< 1		0.34	0.7	144	> 10000	8	7.91	< 1	1	< 0.01	23.6	3	1170	< 1
113554	O	< 2	23	41	< 0.3	0.81	< 3	< 7	< 1		0.38	< 0.3	145	> 10000	10	8.03	< 1	< 1	< 0.01	24.0	3	1240	< 1
113555	O	< 2	25	50	< 0.3	0.84	< 3	< 7	< 1		0.29	< 0.3	150	> 10000	11	8.12	< 1	< 1	< 0.01	24.4	3	1260	< 1
113556	O	< 2	33	45	< 0.3	0.86	< 3	< 7	< 1		2.21	< 0.3	139	> 10000	22	6.89	< 1	< 1	< 0.01	23.0	3	992	< 1
113557	O	< 2	34	17	< 0.3	0.36	< 3	< 7	< 1		0.06	0.8	124	> 10000	2	6.72	< 1	< 1	< 0.01	21.5	< 1	917	< 1
113558	O	10	71	16	< 0.3	0.73	< 3	< 7	< 1		0.15	< 0.3	123	> 10000	18	6.40	< 1	< 1	< 0.01	20.4	4	1040	< 1
113559	O	6	33	16	< 0.3	4.42	32	328	< 1	< 2	4.10	< 0.3	63	2650	6	6.71	9	< 1	2.98	9.39	45	1310	< 1
113560	O	2	< 5	< 5	0.3	7.18	< 3	523	< 1	< 2	1.98	< 0.3	7	26	13	2.29	15	< 1	1.80	0.95	45	389	< 1
113561	O	10	22	11	< 0.3	3.82	62	347	< 1	< 2	4.27	< 0.3	74	2230	16	7.02	9	< 1	2.60	11.3	45	1290	< 1
113562	O	3	21	12	< 0.3	3.70	< 3	337	< 1	< 2	4.57	< 0.3	74	2000	26	7.28	9	< 1	2.29	11.1	41	1390	< 1
113563	O	25	188	56	< 0.3	0.18	8	< 7	< 1	< 2	0.04	< 0.3	242	4060	2	8.03	< 1	< 1	0.02	23.1	< 1	906	< 1
113564	O	< 2	30	14	< 0.3	3.43	< 3	329	< 1	< 2	5.59	< 0.3	65	1310	25	8.21	10	< 1	2.24	10.5	50	1580	4
113565	O	4	42	13	< 0.3	2.80	< 3	229	< 1	< 2	6.63	< 0.3	57	1640	31	7.35	7	< 1	2.03	10.7	40	1690	< 1
113566	O	2	45	37	< 0.3	5.26	< 3	324	< 1	< 2	4.72	< 0.3	67	1210	118	7.03	10	< 1	2.22	8.88	63	1300	3
113567	O	< 2	21	16	0.3	4.67	< 3	295	< 1	< 2	4.45	0.4	55	900	149	6.42	10	< 1	1.52	6.67	52	1140	< 1
113568	O	< 2	18	14	< 0.3	6.18	< 3	197	< 1	< 2	6.99	0.4	50	846	68	6.97	10	< 1	1.02	7.13	55	1330	< 1
113569	O	< 2	30	17	< 0.3	4.45	< 3	339	< 1	< 2	5.28	< 0.3	70	2530	3	7.12	8	< 1	2.17	11.2	99	1370	< 1
113570	O	952	4600	1060	1.2	11.9	< 3	35	< 1	7	9.76	1.0	34	121	3790	4.55	11	< 1	0.09	3.81	4	594	60
113571	O	10	105	43	< 0.3	0.20	< 3	< 7	< 1	< 2	0.11	< 0.3	159	4960	5	8.72	< 1	1	< 0.01	25.9	2	1380	< 1
113572	O	5	60	44	< 0.3	0.20	< 3	< 7	< 1	< 2	0.37	< 0.3	119	3890	91	7.43	< 1	< 1	0.01	21.3	1	1610	< 1
113573	O	< 2	58	27	< 0.3	0.15	< 3	< 7	< 1	< 2	0.08	0.7	152	5240	2	8.61	< 1	< 1	< 0.01	24.9	< 1	1370	< 1
113574	O	< 2	58	91	< 0.3	0.75	< 3	9	< 1		0.58	< 0.3	99	> 10000	25	6.83	< 1	< 1	0.02	19.7	5	891	< 1
113575	O	9	409	238	< 0.3	0.62	< 3	< 7	< 1		0.03	< 0.3	184	> 10000	67	10.2	< 1	< 1	< 0.01	23.6	1	1360	< 1
113576	O	< 2	9	40	< 0.3	0.57	< 3	< 7	< 1		0.03	< 0.3	144	> 10000	4	9.80	< 1	< 1	< 0.01	23.9	2	1330	< 1
113577	O	< 2	14	40	< 0.3	0.44	< 3	< 7	< 1		0.04	< 0.3	126	> 10000	4	8.81	< 1	< 1	< 0.01	23.2	1	1290	< 1
113578	O	9	146	64	< 0.3	0.22	< 3	< 7	< 1	8	0.04	0.4	133	6960	73	6.45	< 1	< 1	< 0.01	22.7	< 1	901	< 1
113579	O	5	47	19	< 0.3	0.18	14	10	< 1	< 2	0.41	0.4	102	5170	96	6.74	< 1	< 1	< 0.01	21.8	2	1290	< 1
113580	O	5	51	26	< 0.3	0.17	< 3	10	< 1	< 2	0.53	< 0.3	108	4170	69	6.77	< 1	< 1	< 0.01	21.9	1	1300	< 1
113581	O	6	100	48	1.2	0.25	14	< 7	< 1	< 2	0.03	0.6	141	7200	14	8.24	< 1	< 1	< 0.01	24.1	< 1	1240	< 1
113582	O	< 2	68	78	< 0.3	0.59	< 3	< 7	< 1		0.02	0.9	104	> 10000	133	6.94	< 1	< 1	0.01	20.3	< 1	714	< 1
113583	O	3	244	180	< 0.3	0.67	< 3	7	< 1		0.06	< 0.3	103	> 10000	89	6.71	< 1	< 1	0.02	20.0	2	674	< 1
113584	O	4	105	180	< 0.3	0.65	< 3	< 7	< 1		0.07	0.6	118	> 10000	33	8.38	< 1	< 1	< 0.01	21.3	1	1010	< 1
113585	O	3	117	128	< 0.3	0.68	< 3	< 7	< 1		0.25	0.3	96	> 10000	9	6.49	< 1	< 1	< 0.01	20.8	1	647	< 1
113586	O	14	759	191	< 0.3	0.34	< 3	< 7	< 1		0.10	< 0.3	106	> 10000	48	6.74	< 1	< 1	< 0.01	20.5	< 1	621	< 1
113587	O	3	127	49	< 0.3	0.23	4	< 7	< 1	< 2	0.04	< 0.3	136	6640	7	8.94	< 1	< 1	< 0.01	24.2	2	1230	< 1
113588	O	< 2	19	23	< 0.3	0.33	< 3	< 7	< 1		0.04	< 0.3	135	> 10000	2	9.24	< 1	< 1	< 0.01	25.3	2	1310	< 1
113589	O	< 2	43	58	< 0.3	0.55	< 3	< 7	< 1		0.03	< 0.3	143	> 10000	17	9.84	< 1	< 1	< 0.01	24.1	1	1360	< 1
113590	O	120	1250	635	3.6	6.25	< 3	252	< 1	3	4.14	0.8	161	230	6840	13.2	12	4	0.63	3.90	12	1170	2
113591	O	62	1060	362	1.2	2.38	< 3	30	< 1	< 2	2.41	0.4	179	3080	2950	9.58	1	< 1	0.17	16.3	6	1130	< 1
113592	O	159	3790	1160	4.8	0.87	< 3	8	< 1	15	0.65	1.2	602	2930	8610	19.6	< 1	3	0.04	15.1	3	1040	< 1
113593	O	424	9980	1130	7.2	0.15	7	< 7	< 1	15	0.17	1.0	1770	508	> 10000	41.8	< 1	1	0.01	0.65	2	195	< 1
GXR-1	LABSTD				31.6	2.38	421	667	1	1380	0.89	2.3	9	19	1220	23.9	10	6	0.04	0.22	8	910	16
GXR-4	LABSTD				3.4	6.20	90	193	2	17	1.03	0.4	14	31	6410	2.85	16	< 1	3.42	1.64	11	142	318
CZN-3	LABSTD																						
SDC-1	LABSTD					8.03	< 3	630	3		1.12		19	41	36	4.81	21	< 1	1.79	1.04	35	895	
GXR-6	LABSTD				0.4	12.3	233	> 1000	1	< 2	0.16	< 0.3	14	55	76	5.81	27	< 1	1.94	0.61	34	1090	< 1
GBW 07239 Control	LABSTD																						

		Au_ppb_FA-ICP	Pd_ppb_FA-ICP	Pt_ppb_FA-ICP	Ag_ppm_TD-ICP	Al_%_TD-ICP	As_ppm_TD-ICP	Ba_ppm_TD-ICP	Be_ppm_TD-ICP	Bi_ppm_TD-ICP	Ca_%_TD-ICP	Cd_ppm_TD-ICP	Co_ppm_TD-ICP	Cr_ppm_TD-ICP	Cu_ppm_TD-ICP	Fe_%_TD-ICP	Ga_ppm_TD-ICP	Hg_ppm_TD-ICP	K_%_TD-ICP	Mg_%_TD-ICP	Li_ppm_TD-ICP	Mn_ppm_TD-ICP	Mo_ppm_TD-ICP
Oreas 72a (4 Acid Digest)	LABSTD						7						154	190	341	9.51							
MP-1b	LABSTD																						
DNC-1a	LABSTD							94					56	230	104		12				5		
PK2	LABSTD	4830	5870	4820																			
PK2	LABSTD	5070	6070	4960																			
CCU-1d	LABSTD																						
CPB-2	LABSTD																						
SBC-1	LABSTD						28	752	3	4		0.5	21	91	34		24				156		1
CDN-PGMS-25	LABSTD	476	1870	405																			
CDN-PGMS-25	LABSTD	487	1810	386																			
CDN-PGMS-25	LABSTD	491	1820	397																			
CDN-PGMS-25	LABSTD	542	1910	417																			
PTC-1b	LABSTD																						
SdAR-M2 (U.S.G.S.)	LABSTD							989	7	< 2		5.2	13	30	251		16	2			18		9
113511	LABDUP	5	< 5	< 5																			
113512	LABDUP				< 0.3	7.50	< 3	48	< 1	2	7.86	< 0.3	42	134	30	9.79	15	4	0.45	4.36	21	1790	< 1
113520	LABDUP	< 2	< 5	< 5																			
113526	LABDUP				0.3	7.64	< 3	374	< 1	< 2	2.73	< 0.3	7	25	14	2.23	18	< 1	1.20	0.69	14	439	< 1
113531	LABDUP	4	41	13																			
113544	LABDUP	< 2	16	16																			
113549	LABPREP	18	22	20	< 0.3	1.01	182	9	< 1	< 2	0.36	0.3	119	8010	7	6.68	< 1	< 1	< 0.01	21.8	2	1070	< 1
113549	LABPREP	18	22	20																			
113550	LABDUP				3.9	6.19	< 3	252	< 1	7	4.14	1.1	164	206	6690	13.2	11	5	0.63	3.87	12	1200	2
113554	LABDUP	< 2	24	42																			
113564	LABDUP	10	29	15	0.4	3.46	< 3	329	< 1	< 2	5.59	< 0.3	64	1320	25	8.22	11	< 1	2.25	10.5	50	1590	4
113571	LABDUP	10	105	42																			
113583	LABDUP	3	248	184																			
113589	LABDUP				< 0.3	0.55	< 3	< 7	< 1		0.03	< 0.3	143	> 10000	16	9.84	< 1	< 1	< 0.01	24.1	1	1340	< 1

	Na_%_TD-ICP	Ni_ppm_TD-ICP	P_%_TD-ICP	Pb_ppm_TD-ICP	Sb_ppm_TD-ICP	S_%_TD-ICP	Sc_ppm_TD-ICP	Sr_ppm_TD-ICP	Te_ppm_TD-ICP	Ti_%_TD-ICP	Tl_ppm_TD-ICP	U_ppm_TD-ICP	V_ppm_TD-ICP	W_ppm_TD-ICP	Y_ppm_TD-ICP	Zn_ppm_TD-ICP	Zr_ppm_TD-ICP	Cu_%_4Acid ICPOES	Ni_%_4Acid ICPOES
110601	0.02	1510	0.007	< 3	< 5	0.36	13	5	8	0.13	< 5	< 10	80	< 5	3	47	13		
113501	0.07	26	0.006	< 3	< 5	0.05	9	19	< 2	0.13	< 5	< 10	52	< 5	4	23	12		
113502	0.38	45	0.009	< 3	< 5	0.38	14	42	5	0.20	< 5	< 10	88	< 5	8	50	19		
113503	0.62	102	0.024	< 3	< 5	0.26	33	76	3	0.29	< 5	< 10	140	< 5	18	87	28		
113504	1.42	123	0.030	< 3	< 5	0.14	44	103	< 2	0.38	6	< 10	210	< 5	24	98	35		
113505	1.68	129	0.023	159	< 5	0.06	44	117	< 2	0.40	< 5	< 10	254	< 5	21	110	38		
113506	0.99	99	0.037	24	< 5	0.59	45	133	< 2	0.53	< 5	< 10	287	< 5	30	92	46		
113507	1.52	128	0.026	< 3	< 5	0.06	44	108	3	0.58	< 5	< 10	292	< 5	20	103	42		
113508	1.07	103	0.039	< 3	< 5	0.24	44	122	10	0.79	6	< 10	337	< 5	27	90	49		
113509	1.34	115	0.031	< 3	< 5	0.08	30	111	< 2	0.63	< 5	< 10	290	< 5	17	96	44		
113510	1.84	8560	0.061	40	< 5	3.37	13	275	2	0.63	< 5	< 10	112	< 5	12	110	65		
113511	1.69	125	0.028	< 3	< 5	0.10	46	130	< 2	0.29	< 5	< 10	232	< 5	26	121	42		
113512	1.72	121	0.025	< 3	< 5	0.03	45	130	< 2	0.27	< 5	< 10	196	< 5	25	97	39		
113513	1.28	143	0.032	7	< 5	0.23	45	111	< 2	0.56	< 5	< 10	257	< 5	24	137	35		
113514	3.91	8	0.018	5	< 5	0.05	< 4	212	6	0.12	< 5	< 10	19	< 5	7	32	83		
113515	1.06	272	0.018	< 3	< 5	< 0.01	31	49	< 2	0.27	< 5	< 10	162	< 5	11	106	35		
113516	0.72	276	0.018	< 3	< 5	< 0.01	31	92	< 2	0.28	< 5	< 10	165	< 5	11	120	41		
113517	0.50	265	0.019	< 3	< 5	0.03	33	99	< 2	0.29	< 5	< 10	174	< 5	12	124	39		
113518	0.95	321	0.023	< 3	< 5	0.06	35	95	< 2	0.35	< 5	< 10	193	< 5	15	101	42		
113519	1.24	202	0.025	< 3	< 5	0.14	30	140	< 2	0.41	< 5	< 10	202	< 5	14	73	48		
113520	3.36	11	0.036	6	< 5	< 0.01	5	293	< 2	0.22	< 5	< 10	34	< 5	13	41	128		
113521	0.74	196	0.024	107	< 5	0.04	36	120	< 2	0.35	< 5	< 10	189	< 5	15	126	29		
113522	0.94	177	0.024	< 3	< 5	0.15	38	130	< 2	0.26	< 5	< 10	151	< 5	16	115	24		
113523	1.75	204	0.024	< 3	< 5	0.07	37	143	< 2	0.37	< 5	< 10	202	< 5	15	86	36		
113524	1.61	193	0.023	156	< 5	0.07	37	145	< 2	0.38	< 5	< 10	204	< 5	15	141	35		
113525	1.91	221	0.024	33	< 5	0.02	35	164	< 2	0.35	< 5	< 10	188	< 5	14	173	56		
113526	4.04	13	0.037	< 3	< 5	0.02	5	349	< 2	0.20	< 5	< 10	33	< 5	10	50	112		
113527	4.38	29	0.035	21	< 5	0.01	5	314	< 2	0.19	< 5	< 10	33	< 5	10	56	120		
113528	5.28	107	0.031	< 3	< 5	0.04	6	334	< 2	0.18	< 5	10	33	< 5	10	35	138		
113529	2.43	797	0.057	< 3	< 5	0.14	15	220	< 2	0.25	< 5	< 10	109	< 5	9	74	59		
113530	1.12	599	0.003	27	< 5	0.55	9	101	< 2	0.06	< 5	10	44	< 5	2	67	< 5		
113531	0.27	886	0.015	< 3	< 5	0.05	21	19	< 2	0.21	< 5	< 10	132	< 5	7	97	27		
113532	1.56	586	0.046	6	< 5	0.01	21	61	< 2	0.22	< 5	< 10	118	< 5	9	86	65		
113533	4.24	243	0.165	< 3	< 5	0.01	14	187	< 2	0.38	< 5	< 10	119	< 5	7	62	123		
113534	3.94	338	0.158	< 3	< 5	0.02	16	150	9	0.37	< 5	< 10	126	< 5	8	73	113		
113535	0.17	900	0.011	17	< 5	0.27	25	17	9	0.16	< 5	< 10	117	< 5	6	34	23		
113536	0.13	1030	0.011	18	< 5	0.28	24	16	< 2	0.16	< 5	< 10	117	< 5	6	30	28		
113537	0.11	1280	0.011	< 3	< 5	0.51	22	23	9	0.13	< 5	< 10	95	< 5	8	20	20		
113538	0.09	1240	0.009	< 3	< 5	0.40	20	19	6	0.12	< 5	< 10	84	< 5	7	19	21		
113539	0.03	1600	0.007	< 3	< 5	0.43	15	9	< 2	0.11	< 5	< 10	86	< 5	4	36	12		
113540	0.01	1670	0.009	< 3	< 5	0.38	13	5	< 2	0.11	< 5	< 10	78	< 5	3	44	12		
113541	< 0.01	1780	0.007	< 3	< 5	0.34	12	38	< 2	0.10	< 5	< 10	75	< 5	3	50	10		
113542	< 0.01	1910	0.005	< 3	< 5	0.26	12	74	6	0.08	< 5	< 10	65	< 5	3	44	8		
113543	< 0.01	2080	0.004	4	< 5	0.04	9	3	< 2	0.06	< 5	< 10	55	< 5	2	57	8		
113544	< 0.01	2100	0.004	< 3	< 5	0.01	9	3	< 2	0.05	< 5	< 10	52	< 5	2	57	9		
113545	< 0.01	2170	0.004	3	< 5	0.01	9	3	< 2	0.06	< 5	< 10	54	< 5	2	64	9		
113546	< 0.01	2170	0.005	5	< 5	0.01	9	5	< 2	0.06	< 5	< 10	57	< 5	2	67	8		
113547	< 0.01	2180	0.004	3	< 5	0.02	9	15	< 2	0.06	< 5	< 10	55	< 5	1	74	9		
113548	< 0.01	1670	0.011	73	< 5	0.05	< 4	464	5	0.04	< 5	< 10	44	< 5	4	43	6		
113549	< 0.01	2230	0.004	4	< 5	0.05	9	29	3	0.05	< 5	< 10	53	< 5	2	53	9		

	Na_%_TD-ICP	Ni_ppm_TD-ICP	P_%_TD-ICP	Pb_ppm_TD-ICP	Sb_ppm_TD-ICP	S_%_TD-ICP	Sc_ppm_TD-ICP	Sr_ppm_TD-ICP	Te_ppm_TD-ICP	Ti_%_TD-ICP	Tl_ppm_TD-ICP	U_ppm_TD-ICP	V_ppm_TD-ICP	W_ppm_TD-ICP	Y_ppm_TD-ICP	Zn_ppm_TD-ICP	Zr_ppm_TD-ICP	Cu_%_4Acid ICPOES	Ni_%_4Acid ICPOES
113550	1.79	8590	0.056	41	< 5	3.31	13	270	< 2	0.36	< 5	< 10	83	< 5	12	110	60		
113551	< 0.01	2330	0.003	4	< 5	0.06	6	16	< 2	0.04	< 5	< 10	59	< 5	1	84	6		
113552	0.02	2130	0.013	< 3	< 5	0.12	6	4	5	0.05	< 5	< 10	64	< 5	2	59	6		
113553	< 0.01	2470	0.003	5	< 5	0.07	7	2	< 2	0.04	< 5	< 10	68	< 5	1	80	7		
113554	< 0.01	2500	0.003	5	< 5	0.06	6	2	< 2	0.04	< 5	< 10	61	< 5	1	72	< 5		
113555	< 0.01	2540	0.003	4	< 5	0.06	6	1	< 2	0.04	7	< 10	64	< 5	1	80	< 5		
113556	0.01	2800	0.003	< 3	< 5	0.12	7	18	< 2	0.04	< 5	< 10	60	< 5	2	70	< 5		
113557	< 0.01	2180	0.003	< 3	< 5	0.01	< 4	2	< 2	0.03	< 5	< 10	49	< 5	< 1	57	< 5		
113558	< 0.01	2160	0.003	< 3	< 5	0.15	6	6	< 2	0.03	< 5	< 10	51	< 5	< 1	65	< 5		
113559	0.99	608	0.048	9	< 5	0.02	19	48	< 2	0.21	< 5	< 10	101	< 5	8	91	48		
113560	3.22	19	0.036	5	< 5	0.03	6	236	9	0.21	< 5	10	38	< 5	10	40	104		
113561	0.14	913	0.045	< 3	< 5	0.04	15	22	< 2	0.23	< 5	< 10	111	< 5	8	89	51		
113562	0.16	923	0.012	< 3	< 5	0.06	20	17	< 2	0.23	< 5	< 10	119	< 5	9	87	33		
113563	< 0.01	3840	0.002	4	< 5	0.23	5	2	2	< 0.01	< 5	< 10	29	< 5	< 1	50	< 5		
113564	0.30	695	0.014	< 3	< 5	0.03	23	20	< 2	0.26	< 5	< 10	133	< 5	9	87	36		
113565	0.35	577	0.006	13	< 5	0.02	22	24	< 2	0.21	< 5	< 10	120	< 5	10	79	33		
113566	1.78	551	0.018	5	< 5	0.12	30	72	< 2	0.29	< 5	< 10	161	< 5	12	75	44		
113567	2.49	309	0.022	< 3	< 5	0.15	23	105	< 2	0.32	< 5	< 10	178	< 5	13	55	46		
113568	2.00	265	0.020	< 3	< 5	0.08	35	128	< 2	0.34	< 5	< 10	191	< 5	13	55	36		
113569	0.36	789	0.015	< 3	< 5	< 0.01	28	20	< 2	0.25	< 5	< 10	147	< 5	10	63	36		
113570	1.15	622	0.003	29	< 5	0.63	10	103	< 2	0.06	< 5	< 10	46	< 5	2	70	5		
113571	< 0.01	2450	0.001	98	< 5	0.03	5	< 1	< 2	< 0.01	< 5	< 10	30	< 5	< 1	66	< 5		
113572	0.02	2040	< 0.001	< 3	< 5	0.22	5	26	< 2	0.01	< 5	< 10	27	< 5	< 1	28	< 5		
113573	< 0.01	2570	0.001	4	< 5	0.02	< 4	< 1	< 2	< 0.01	< 5	< 10	32	< 5	< 1	61	< 5		
113574	0.02	1290	0.001	< 3	< 5	0.08	13	3	< 2	0.04	< 5	< 10	80	< 5	1	83	< 5		
113575	< 0.01	3280	0.002	32	< 5	0.21	5	1	< 2	0.02	< 5	< 10	84	< 5	< 1	135	< 5		
113576	< 0.01	1940	0.001	4	< 5	0.05	5	2	< 2	0.02	< 5	< 10	80	< 5	< 1	134	< 5		
113577	0.01	2060	0.001	6	< 5	0.09	5	6	< 2	0.02	< 5	< 10	60	< 5	< 1	98	< 5		
113578	< 0.01	2790	0.001	< 3	< 5	0.21	5	4	3	< 0.01	< 5	< 10	29	< 5	< 1	40	< 5		
113579	< 0.01	2130	0.001	< 3	< 5	0.19	4	21	8	< 0.01	< 5	< 10	25	< 5	< 1	41	< 5		
113580	< 0.01	2100	0.001	7	< 5	0.18	4	29	< 2	< 0.01	< 5	< 10	26	< 5	< 1	27	< 5		
113581	< 0.01	2480	0.001	19	< 5	0.07	5	2	< 2	0.01	< 5	< 10	38	< 5	< 1	65	< 5		
113582	< 0.01	1410	0.001	4	< 5	0.26	11	2	< 2	0.03	< 5	< 10	65	< 5	< 1	72	< 5		
113583	< 0.01	1460	0.001	< 3	< 5	0.17	12	3	< 2	0.04	< 5	< 10	72	< 5	< 1	76	< 5		
113584	0.01	1590	0.001	6	< 5	0.12	8	2	< 2	0.03	< 5	< 10	84	< 5	< 1	107	< 5		
113585	0.01	1410	0.001	< 3	< 5	0.08	12	2	< 2	0.04	< 5	< 10	74	< 5	< 1	84	< 5		
113586	< 0.01	1850	0.001	< 3	< 5	0.14	7	13	< 2	0.03	< 5	< 10	61	< 5	< 1	72	< 5		
113587	< 0.01	1930	0.002	4	< 5	0.06	6	1	< 2	0.01	< 5	< 10	29	< 5	< 1	41	< 5		
113588	< 0.01	1820	0.001	3	< 5	0.03	5	< 1	< 2	0.01	< 5	< 10	44	< 5	< 1	75	< 5		
113589	< 0.01	2000	0.001	25	< 5	0.05	5	< 1	< 2	0.02	< 5	< 10	74	< 5	< 1	123	< 5		
113590	1.79	8660	0.058	42	< 5	3.27	12	266	< 2	0.46	< 5	< 10	92	< 5	12	108	61		
113591	0.20	4710	0.012	8	< 5	1.89	14	26	< 2	0.13	< 5	< 10	84	< 5	5	103	22		
113592	0.06	> 10000	0.009	15	< 5	6.90	7	9	< 2	0.05	< 5	< 10	55	< 5	2	80	12		2.03
113593	0.03	> 10000	0.013	23	11	> 20.0	< 4	3	< 2	< 0.01	< 5	< 10	25	7	< 1	78	15	2.36	6.63
GXR-1	0.05	42	0.061	734	41	0.26	< 4	291	3	0.03	< 5	40	89	161	34	732	29		
GXR-4	0.48	39	0.127	47	< 5	1.77	8	206	2	0.29	< 5	< 10	85	33	14	68	42		
CZN-3																		0.676	
SDC-1	1.54	48	0.053	18	< 5		17	178		0.11	< 5	< 10	39	< 5		102	22		
GXR-6	0.09	28	0.036	93	< 5	0.02	28	36	< 2		< 5	< 10	114	< 5	13	131	65		
GBW 07239 Control																		0.005	0.003

	Na_%_TD-ICP	Ni_ppm_TD-ICP	P_%_TD-ICP	Pb_ppm_TD-ICP	Sb_ppm_TD-ICP	S_%_TD-ICP	Sc_ppm_TD-ICP	Sr_ppm_TD-ICP	Te_ppm_TD-ICP	Ti_%_TD-ICP	Tl_ppm_TD-ICP	U_ppm_TD-ICP	V_ppm_TD-ICP	W_ppm_TD-ICP	Y_ppm_TD-ICP	Zn_ppm_TD-ICP	Zr_ppm_TD-ICP	Cu_%_4Acid ICPOES	Ni_%_4Acid ICPOES
Oreas 72a (4 Acid Digest)		6750				1.71													
MP-1b																		3.02	
DNC-1a		252		5	< 5		31	128		0.29			141		16	57	35		
PK2																			
PK2																			
CCU-1d																		24.3	
CPB-2																		0.125	
SBC-1		86		25	< 5		20	174		0.53	< 5	< 10	216	< 5	32	182	117		
CDN-PGMS-25																			
CDN-PGMS-25																			
CDN-PGMS-25																			
CDN-PGMS-25																			
PTC-1b																		8.25	11.1
SdAR-M2 (U.S.G.S.)		53		812			5	147				< 10	23	9	30	776	114		
113511																			
113512	1.74	122	0.026	< 3	< 5	0.03	45	132	< 2	0.29	< 5	< 10	202	< 5	25	98	40		
113520																			
113526	4.05	13	0.037	< 3	< 5	0.02	5	347	3	0.20	< 5	< 10	34	< 5	10	50	120		
113531																			
113544																			
113549	< 0.01	2210	0.004	4	< 5	0.05	9	30	10	0.05	< 5	< 10	53	< 5	2	50	9		
113549																			
113550	1.77	8580	0.056	41	< 5	3.34	13	270	< 2	0.42	< 5	< 10	86	< 5	12	108	58		
113554																			
113564	0.30	689	0.014	13	< 5	0.03	23	20	< 2	0.26	< 5	< 10	133	< 5	10	87	36		
113571																			
113583																			
113589	< 0.01	2000	0.001	5	< 5	0.05	5	< 1	< 2	0.02	< 5	< 10	75	< 5	< 1	122	< 5		

Appendix 2

Noront 2016 Exploration Program

Surface UTEM-5 at AT5 and
Borehole EM of NOT-16-1G001 (AT5)

Lamontagne Geophysics Report

-2016 BHUTEM4/UTEM5-
AT5 Grid Survey Report
Ring of Fire
for
Noront Resources Ltd.

LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE

October, 2016

Rob Langridge, M.Sc.

CONTENTS

Figures

Appendices

INTRODUCTION

During the period of September 20th 2016 through October 3rd 2016 a BHUTEM4 and followup UTEM5 survey (overall surveying days: September 21st - October 2nd) was carried out by Lamontagne Geophysics Limited personnel for Noront Resources Ltd. on their property in the Ring of Fire area located in the James Bay Lowlands of Northern Ontario. The survey covered the AT5 Grid - location/layout of the AT5 Grid is shown in Figures 1 and 2. The BHUTEM4/UTEM5 survey was carried out to test anomalies outlined by earlier exploration, to detect/outline new conductors and to detect/outline deeper features and potential depth continuations of shallow features.

BH NOT-16-1G001 was surveyed with BHUTEM4 to a depth of 1160m using two transmitter loops - Loops 21 and 20 (Figure 2). The BHUTEM4 data was evaluated in conjunction with UTEM and other geophysical data collected to date and it was decided to followup the BH survey with targeted surface UTEM5 data while the crew was still on site.. and A total of 5.000 line km of BL/BT/Bz UTEM5 data was collected with the UTEM5 receiver using one transmitter loop - Loop 22 (Figure 2). For all stations on the three-component data were collected. The survey frequencies and coverage for the survey are summarized below

Grid AT5 BHUTEM4 NOT-16-1G001 surveyed: 0-1160m depth

S1:	3.7500Hz	(off-loop - loop to the gridSouth) -	Loop 2016-21
S2:	2.5000Hz	collar loop -	Loop 2016-20

Grid AT5 Surface UTEM5

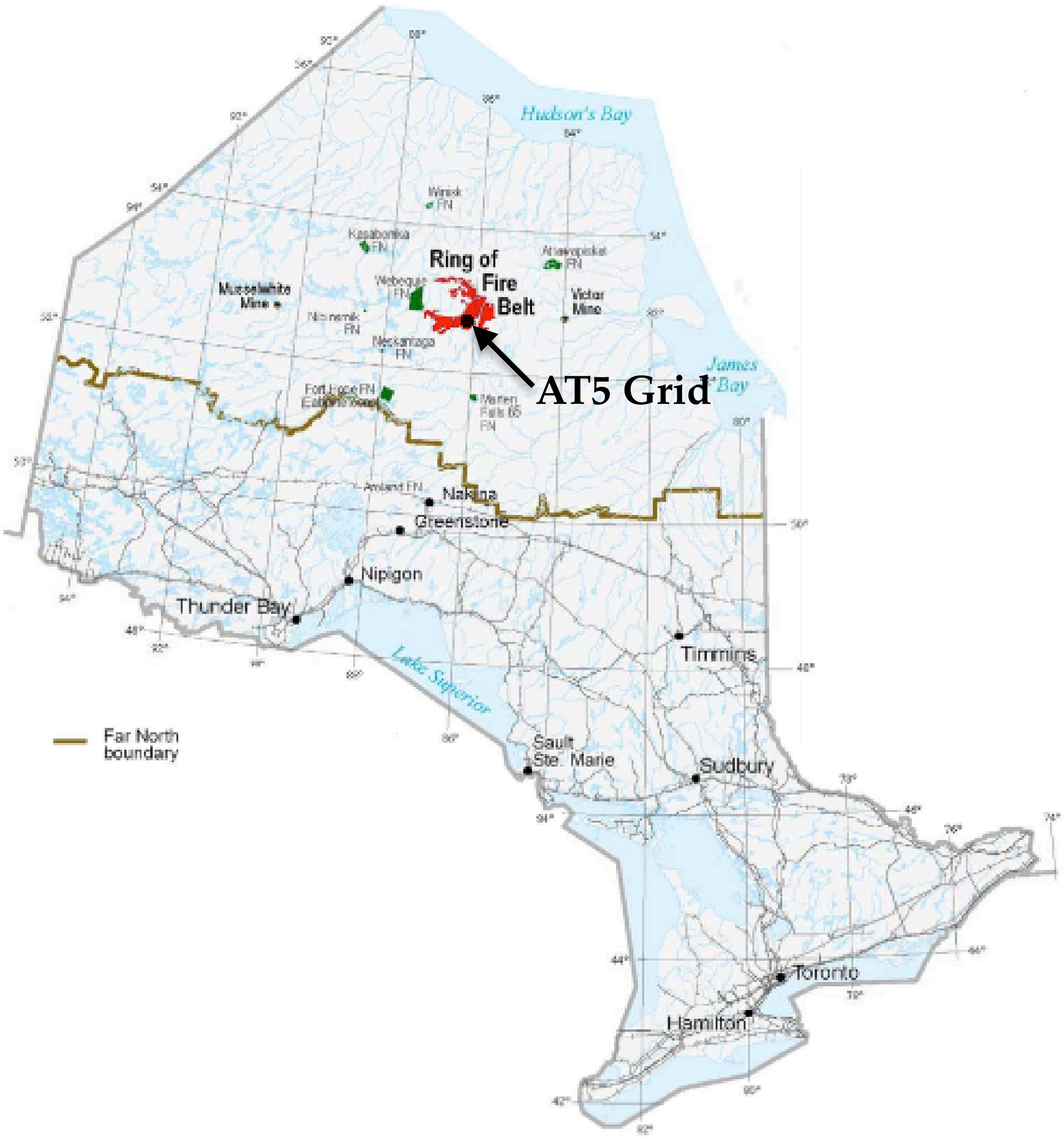
SE-NW Lines covering Lines 5300E to 5600E: 5.000km total

S1:	1.7857Hz	(off-loop - loop to the gridSouth) -	Loop 2016-22

This report documents the BHUTEM4/UTEM5 survey in terms of logistics, survey parameters and field personnel, outlines the data processing and discusses the results. Appendix A contains the UTEM data presented as profiles.

Other appendices contain:

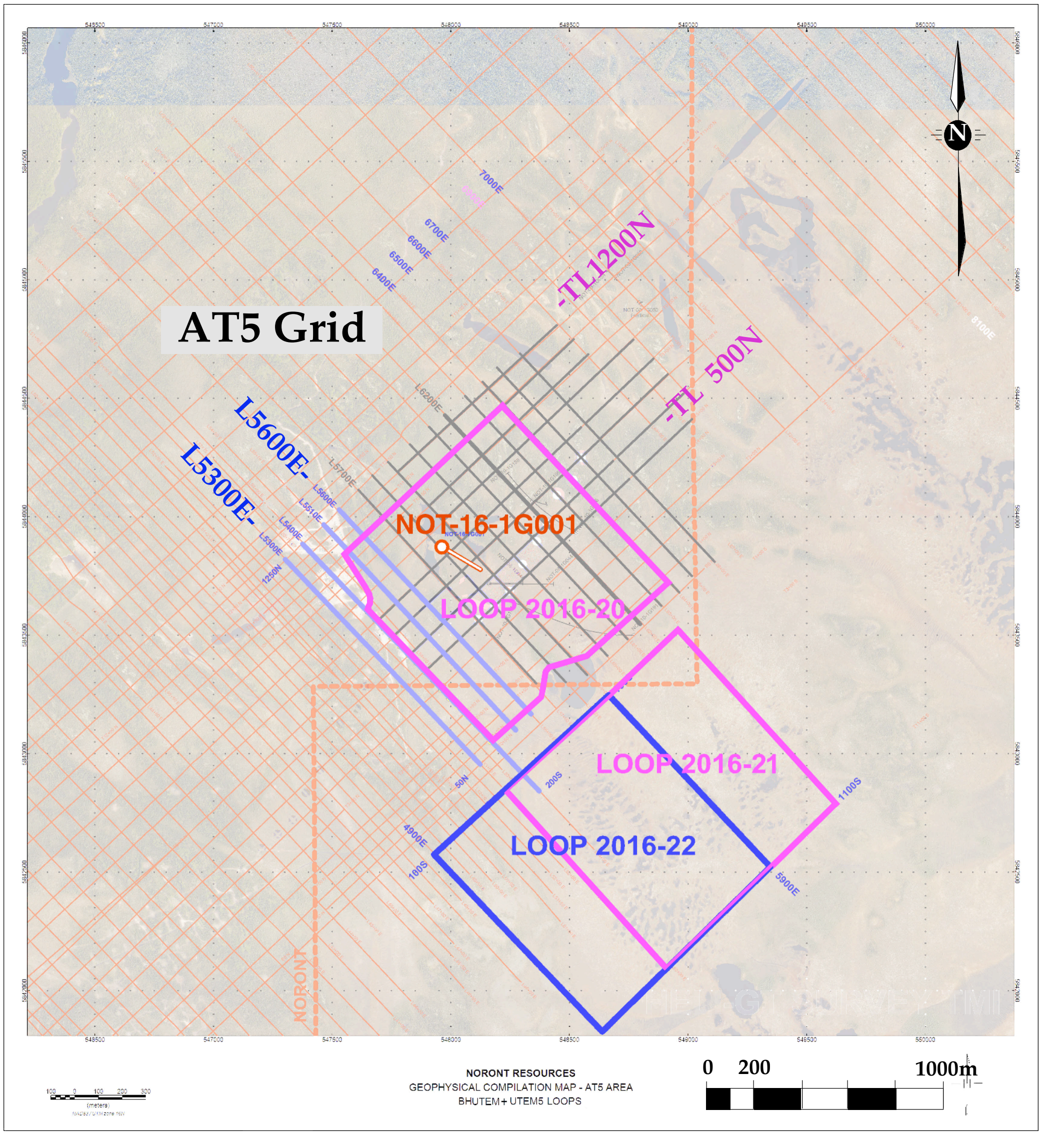
- List of Personnel/Production Diary (Appendix B)
- an outline of the UTEM5 System (Appendix C)
- an outline of the BUTEM4 System (Appendix D)
- Note on sources of anomalous Ch0 (Appendix E)



LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE

Noront Resources Ltd.
AT5 Grid BHUTEM4/UTEM5 Survey
Location Map

Figure 1



BoreHole NOT-16-1G001
surveyed from:
Loop 2015-21 S1 @ 3.7500Hz
Loop 2015-20 S2 @ 2.5000Hz

SE-NW Lines 5300E-5600N
surveyed from:
Loop 2015-22 S1 @ 1.7857Hz

NAD83 Zone 16N

LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE

Noront Resources Ltd.
AT5 Grid - BHUTEM4/UTEM5 Survey
Grid Map

Figure 2

SURVEY DESIGN

The BHUTEM4/UTEM5 survey was planned and carried out to test anomalies outlined by earlier exploration, to detect/outline new conductors and to detect/outline deeper features and potential depth continuations of shallow features.

This survey was planned to cover BH NOT-16-1G001 and to evaluate the results with the goal of determining a direction for followup work. It was determined that additional surface coverage would be the immediate followup and a surface UTEM5 survey was added to the BHUTEM4 coverage. grid and loop layout was designed by Noront Resources personnel in consultation with Lamontagne Geophysics. Loop size and location were selected to provide good coupling with the expected targets and to allow efficient coverage of the area of interest.

The survey parameters employed are as follows:

<u>Grid AT5 BHUTEM4</u>

NOT-16-1G001 surveyed: 0-1160m depth

Loop 2016-21	3.7500Hz - loop to the gridSouth	~1000x1000m loop
+Loop 2016-20	2.5000Hz - collar loop	~1000x1000m loop

- 30/20m stations to ~750m and then 10/15m to completion
- 12Ch single (minimum 110/120s) stacking (duplicates as required) as follows: frequencies for coverage (in the ratio 3:2) (Figure 3):
  - 3.7500Hz S1 - Loop 2016-21
    120sec stacking = 450 full-cycles/900 half-cycles
  - 2.5000Hz S2 Loop 2016-20
    110sec stacking = 276 full-cycles/552 half-cycles

Note: further details of frequencies/sampling/stacking are listed in Figure 3.

<u>Grid AT5 Surface UTEM5</u>

Loop 2016-22	1.7857Hz - loop to the gridSouth	~1000x1000m loop

- SE-NW lines with a spacing of 100m
- station interval of 50m reduced to 25m over the middle of the coverage
- three component measurements from a single Transmitter loop
- 12Ch repeat (minimum 2x120s) stacking (up to 8 repeats as required) as follows: frequency for coverage as per previous work (Figure 3):
  - 1.7857Hz S1 - Loop 2016-22
    min 2x120sec stacking = 430 full-cycles/860 half-cycles

Note: further details of frequencies/sampling/stacking are listed in Figure 4.

Noront Resources provided GPS (NAD83) locations for all survey stations and the transmitter loops. The LGL crews routinely collect handheld-GPS (Garmin eTrex) data for all transmitter loops for the purpose of control.

Note: Geometric control should be considered a mandatory part of the interpretation of any UTEM survey where the target is potentially non-decaying. Poor geometric control has the potential to both mask and invent Ch0 (latest time) conductors (Appendix E).

S1 - loop to gridSouth
3.7500Hz

off loop		frequency	3.750000	Hz	Sampling 1	
		period	0.266667	s	Loop 2016-21	
(5MHz clock)		half period	666666	0.2µs cycles		
(narrowest Ch=1unit)		XNP	**4444**	/halfperiod		
		width of unit channel	3.00030E-05	s		
		width of unit channel	30.0030	µs		
(symbol) channel		peak of tapered Ch (µs)	tapered Ch begins - unit -	tapered Ch ends - unit -	Maxwell equivalent boxcar Ch mid point (ms)	width (ms)
timing Ch13	⅄	15.00	-0.5	1.5	0.0315	0.0630
12	✗	45.00	0.5	3	0.1027	0.0788
11	+	90.01	1.5	6	0.2143	0.1418
10	Φ	180.02	3	12	0.4287	0.2835
9	⊽	360.04	6	24	0.8574	0.5671
8	⧖	720.07	12	48	1.7147	1.1341
7	⁊	1440.14	24	96	3.4295	2.2682
6	∡	2880.29	48	192	6.8590	4.5365
5	Σ	5760.58	96	384	13.7179	9.0729
4	□	11521.15	192	768	27.4359	18.1458
3	╲	23042.30	384	1536	54.8717	36.2916
2	╱	46084.61	768	3072	109.7434	72.5833
1	|	92169.22	1536	4269	188.0596	86.0981
0	○	128082.81	3072	4442.5	250.6185	43.1751
timing Ch15	⩸	133288.33	4269	4443.5	-3.2741	5.4973
timing Ch14	⊟	133318.33	4442.5	4444+0.5	-0.0315	0.0630
		TSS: sub-stack time =	**0.799999**	s		
		StackN: number of substacks =	**150**	substacks		
		stacking time =	120.00	s		
		cycles stacked =	450	cycles		
		half-cycles stacked =	900	half-cycles		

S2 - collar loop
2.5000Hz

off loop		frequency	2.500000	Hz	Sampling 2	
		period	0.400000	s	Loop 2016-20	
(5MHz clock)		half period	1000000	0.2µs cycles		
(narrowest Ch=1unit)		XNP	**4444**	/halfperiod		
		width of unit channel	4.50045E-05	s		
		width of unit channel	45.0045	µs		
(symbol) channel		peak of tapered Ch (µs)	tapered Ch begins - unit -	tapered Ch - unit -	Maxwell equivalent boxcar Ch mid point (ms)	width (ms)
timing Ch13	⅄	22.50	-0.5	1.5	0.0788	0.1575
12	✗	67.51	0.5	3	0.2569	0.1969
11	+	135.01	1.5	6	0.5359	0.3544
10	Φ	270.03	3	12	1.0717	0.7088
9	⊽	540.05	6	24	2.1434	1.4176
8	⧖	1080.11	12	48	4.2869	2.8353
7	⁊	2160.22	24	96	8.5737	5.6706
6	∡	4320.43	48	192	17.1474	11.3411
5	Σ	8640.86	96	384	34.2948	22.6823
4	□	17281.73	192	768	68.5896	45.3645
3	╲	34563.46	384	1536	137.1793	90.7291
2	╱	69126.91	768	3072	274.3586	181.4582
1	|	138253.83	1536	4269	470.1489	215.2453
0	○	192124.21	3072	4442.5	626.5463	107.9377
timing Ch15	⩸	199932.49	4269	4443.5	-8.1851	13.7433
timing Ch14	⊟	199977.50	4442.5	4444+0.5	-0.0788	0.1575
		TSS: sub-stack time =	**0.799999**	s		
		StackN: number of substacks =	**138**	substacks		
		stacking time =	110.40	s		
		cycles stacked =	276	cycles		
		half-cycles stacked =	552	half-cycles		

UTEM5 Frequency Selection

A target frequency is entered for each UTEM transmitter and the local powerline frequency are entered in the UTEM receiver. The actual frequencies used are selected by the receiver software to be as close to the entered target frequencies as possible while optimizing rejection of the other transmitters and powerline noise.
The minimum substack time is set by the receiver software to the shortest time that will include an integer number of cycles of each frequency used and 30Hz (the first harmonic of the 60 Hz powerline frequency).

Allowable stacking times are required to be a multiple of the minimum substack time.

Where responses extend to the latest time-channel measured (Ch0) the survey frequency can be lowered. Reducing the number of channels from 12 to 10 allows for a wider anti-aliasing filter bandwidth.
This can help improve S/N (signal-to-noise ratio) when dealing with high-frequency noise - eg. wind “whistling”.

The equivalent boxcar channels are centred on the median (by area) of the tapered Chs (Figure 5).

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Noront Resources Ltd.
BHUTEM4 Survey
Frequency / Chs details

Figure 3

S1 - loop to gridSouth
1.7857Hz

off loop		frequency	**1.785714**	Hz	**Sampling 1**	
		period	0.560000	s		
(5MHz clock)		half period	1400000	0.2µs cycles		
(narrowest Ch=1unit)		XNP	**4444**	/halfperiod	**Loop 2016-22**	
		width of unit channel	6.30063E-05	s		
		width of unit channel	63.0063	µs		
(symbol) channel		peak of tapered Ch (µs)	tapered Ch begins - unit -	tapered Ch ends - unit -	Maxwell equivalent boxcar Ch mid point (ms)	width (ms)
timing Ch13		31.50	-0.5	1.5	0.0315	0.0630
12		94.51	0.5	3	0.1027	0.0788
11	+	189.02	1.5	6	0.2143	0.1418
10	Φ	378.04	3	12	0.4287	0.2835
9		756.08	6	24	0.8574	0.5671
8	⧗	1512.15	12	48	1.7147	1.1341
7		3024.30	24	96	3.4295	2.2682
6		6048.61	48	192	6.8590	4.5365
5	Σ	12097.21	96	384	13.7179	9.0729
4	□	24194.42	192	768	27.4359	18.1458
3	\	48388.85	384	1536	54.8717	36.2916
2	/	96777.69	768	3072	109.7434	72.5833
1	|	193555.39	1536	4269	188.0596	86.0981
0	o	268973.94	3072	4442.5	250.6185	43.1751
timing Ch15		279905.54	4269	4443.5	-3.2741	5.4973
timing Ch14	⊟	279968.54	4442.5	4444+0.5	-0.0315	0.0630
		TSS: sub-stack time =	**2.800000**	s		
		StackN: number of substacks =	**43**	substacks		
		stacking time =	120.40	s		
		cycles stacked =	215.00	cycles		
		half-cycles stacked =	430.00	half-cycles		

UTEM5 Frequency Selection

A target frequency is entered for each UTEM transmitter and the local powerline frequency are entered in the UTEM receiver. The actual frequencies used are selected by the receiver software to be as close to the entered target frequencies as possible while optimizing rejection of the other transmitters and powerline noise.
The minimum substack time is set by the receiver software to the shortest time that will include an integer number of cycles of each frequency used and 30Hz (the first harmonic of the 60 Hz powerline frequency).

Allowable stacking times are required to be a multiple of the minimum substack time.

Where responses extend to the latest time-channel measured (Ch0) the survey frequency can be lowered. Reducing the number of channels from 12 to 10 allows for a wider anti-aliasing filter bandwidth.
This can help improve S/N (signal-to-noise ratio) when dealing with high-frequency noise - eg. wind “whistling”.

The equivalent boxcar channels are centred on the median (by area) of the tapered Chs (Figure 5).

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Noront Resources Ltd.
UTEM5 Survey
Frequency / Chs details

Figure 4

SURVEY LOGISTICS

A Lamontagne Geophysics crew and survey equipment mobilized from Kingston, Ontario, on September 18th, overnighting in Sudbury and Geraldton, arriving at Noront's Esker Camp on September 20th via the Nakina-Webequie-Esker Camp flight. Camp orientation was completed upon arrival and the rest of the day was spent laying out sections of Loops 2016-21/20. The Lamontagne crew consisted of Phil Guimond (crew chief/operator), Gerry Lafortune (BH/Rx/Tx operator), Richard Lahaye (Rx/Tx operator). Bill Dingwall (Tx operator/electronics) joined the crew on September 28th. The location of the project is shown in Figure 1 and the AT5 Grid locations are shown in Figure 2.

The BH loops were completed the following day. Borehole NOT-16-1G001 was dummied to a depth of 1180m and BHUTEM4 surveying began. The plan was to read the hole from two loops simultaneously but the transmitter for Loop 21 repeatedly gave an Open Loop Alarm (see Appendix B the Production Diary for more detail. As a result the hole was surveyed from the collar loop (Loop 20) only. At 1115m (45m from the bottom) the Loop 20 transmitter also shut down and could not be restarted. After several hours of troubleshooting and discussions with the LGL head office it was decided to ship two additional transmitters up from Sudbury.

The field crew spent the September 23rd walking Loop 21 checking that connections were solid and well-taped as well as lifting the loop wire out of surface water as much as possible. The two additional transmitters arrived and surveying of Borehole NOT-16-1G001 was completed the following day (September 24th) - although not without further transmitter issues.

The transmitter issues are mainly a result of the combination of the very wet surface conditions and the condition of the loop wire. After several surveys and a number of experienced and inexperienced loopers handling and splicing the wire there are a lot of splices, some of which are dubious, some of which are poorly taped. Testing shows that the loop wire is grounding.

Loop 21 is walked on the morning of September 25th in order to replace all dimes. During the day the crew is informed that further borehole surveying is suspended and the crew begins wire pickup. At 16h00 the crew is called back to camp and informed that a UTEM5 surface survey is planned as a followup to the BHUTEM4 survey. The rest of the day is spent working out logistics.

Over the period September 26-28th the crew retrieve and pack the BH gear, pick up Loops 21 and 20 and deploy Loop 22. The wire used in Loop 22 is edited in camp to minimize splicing and to ensure that all splices are solid and well-taped. B.Dingwall arrives in camp with the requisite surface gear on September 28th and UTEM5 surveying began the following day.

In general UTEM5 surveying went well. Surveying of 4 lines was completed over 4 days - September 29th-October 2nd. After the completion of surveying on October 2nd all wire was picked up from the AT5 Grid and the transmitter setup was dismantled and all gear packed up for demob. The crew and equipment were demobbed to Nakina airport on October 3rd and from there they continued south. Demobilization was completed on October 6th. A detailed description of the survey is in Appendix B - the Production Diary.

Surveying itself proceeded fairly smoothly for the duration of the project. A number of issues with transmitters resulted from the combination of the very wet surface conditions and the condition of the loop wire resulting in the transmitter loops grounding.

Weather conditions were typical for this time of year.. Transportation was by argo, helicopter and on foot. The survey equipment consisted of two BHUTEM4 equipment and probes, 2 UTEM4 Transmitters, 2 UTEM5 receiver/coils, as well as all necessary accessories, support equipment and backup equipment. Data was reduced on a field computer (MacBook) and UTEM profiles and digital data were made available/ emailed to the client daily.

SURVEY RESULTS

The results of the survey are summarized and presented as BHUTEM4 and UTEM5 profiles in Appendix A. The final AT5 Grid and loop locations are presented in Figure 2. The data presented in Appendix A are reduced with a UTM grid (NAD83). Overall the UTEM data quality is considered good. Note that Ch0 (latest time channel) profiles should be considered in conjunction with other available information (App. D).

BHUTEM4 Results

For BH NOT-16-1G001 a plot set of five profiles and two vector plots are provided for each of the two transmitter loops surveyed:

Grid AT5 BHUTEM4 NOT-16-1G001 surveyed: 0-1160m depth

S1:	3.7500Hz	(off-loop - loop to the gridSouth)	-	Loop 2016-21
S2:	2.5000Hz	collar loop	-	Loop 2016-20

The plot set is as follows: (as detailed in Appendix D: The BHUTEM4 System)

- 3 plots of Ch0 reduced secondary field:
  One plot for each for components: Bw, Bs, Bn and Bw.
  These 3 plots have the early-, intermediate- and latest-time channels on separate axes. The computed primary field in the direction of the component is plotted as a solid curve with the early-time channels.
- 1 total field plot:
  With all channels of each of the three components on a different axis.
  The tradeoff between mag/acc orientation is shown on the left.
  In most cases the Ch0 profile follows the primary field solid curve of each of the components indicating that the basic geometry of the hole relative to the loop is correct. This may not be true, however in very conductive environments where a large response may persist in Ch0.
- 1 plot comprised of magnetometer/accelerometer/temperature data/tradeoff
  magnetometer data on the right (top) axis
  accelerometer data on the middle right axis
  For the mag plots, 4 curves are presented. In red, the expected (no symbol) axial and observed axial (symbol W) and in black the expected total transverse and observed total transverse (symbol R) are plotted.
  For the acc plots, 2 curves are presented. In black the expected total transverse and observed total transverse (symbol R) are plotted.

  temperature data on the middle left axis
  The curve that is plotted is the residual temperature after the removal of a best fitting polynomial.

  tradeoff between mag/acc orientation is shown on the left (lower) axis.
  Probe orientation is a tradeoff between mag and accelerometer data.
- 2 Vector plots
  Map View vector plot: overhead view at the ~depth of interest
  Section vector plot:vertical section ~@ the section azimuth
  The loop and the projection of the hole are shown. Vector plots serve to clarify coupling with the primary field.

UTEM5 Surface Results

For each line surveyed the continuously normalized profiles have been plotted for the three components collected. Profiles are presented for the AT5 Grid. Note that in order to show the range of responses there are two sets of profiles plotted for the data:

- • all Chs from Ch12-Ch1 and Ch0
  • the 8 late Chs: Chs8-Ch1 and Ch0

For Transmitter Loop 22 the S1 profiles are presented. Four-axis profiles are presented in order of line number from west-to-east. The order is as follows:

Loop 2016-22 S1: 1.7857Hz Lines 5300E to L5600E

Note: all UTEM5 reports present data as:

- BL - in-line horizontal component (c1) - UTEM3 ~equivalent - Hx
  the L-azimuth direction is selectable
- BT - the transverse horizontal component (c2) - UTEM3 ~equivalent - Hy
  the T-azimuth direction is 90° counterclockwise from L-azimuth
- BZ -vertical component (c3) - UTEM3 equivalent - Hz

Outline of profile types:

BL BT Bz continuous norm Ch0 reduced

Continuous normalization is useful for detection of the presence of anomalies at any position on a profile. The anomaly shape is distorted by normalization to the local field. Near the wire (large field) continuously normalized Ch0 tends towards zero.

Note: Ch0 is later in time and narrower than Ch1 (Appendix C).

The BL/BT/Bz continuously normalized data are presented as 4-axis profiles:

top axis: Ch1-8/12	Bz	Ch0 Reduced
upper middle axis: Ch1-8/12	BT	Ch0 Reduced
lower middle axis: Ch1-8/12	BL	Ch0 Reduced
bottom axis: Ch0	BL BT Bz	Primary Field Reduced

A description of the standard plotting formats used and of the UTEM System is presented in Appendix C.

Note on digital data:

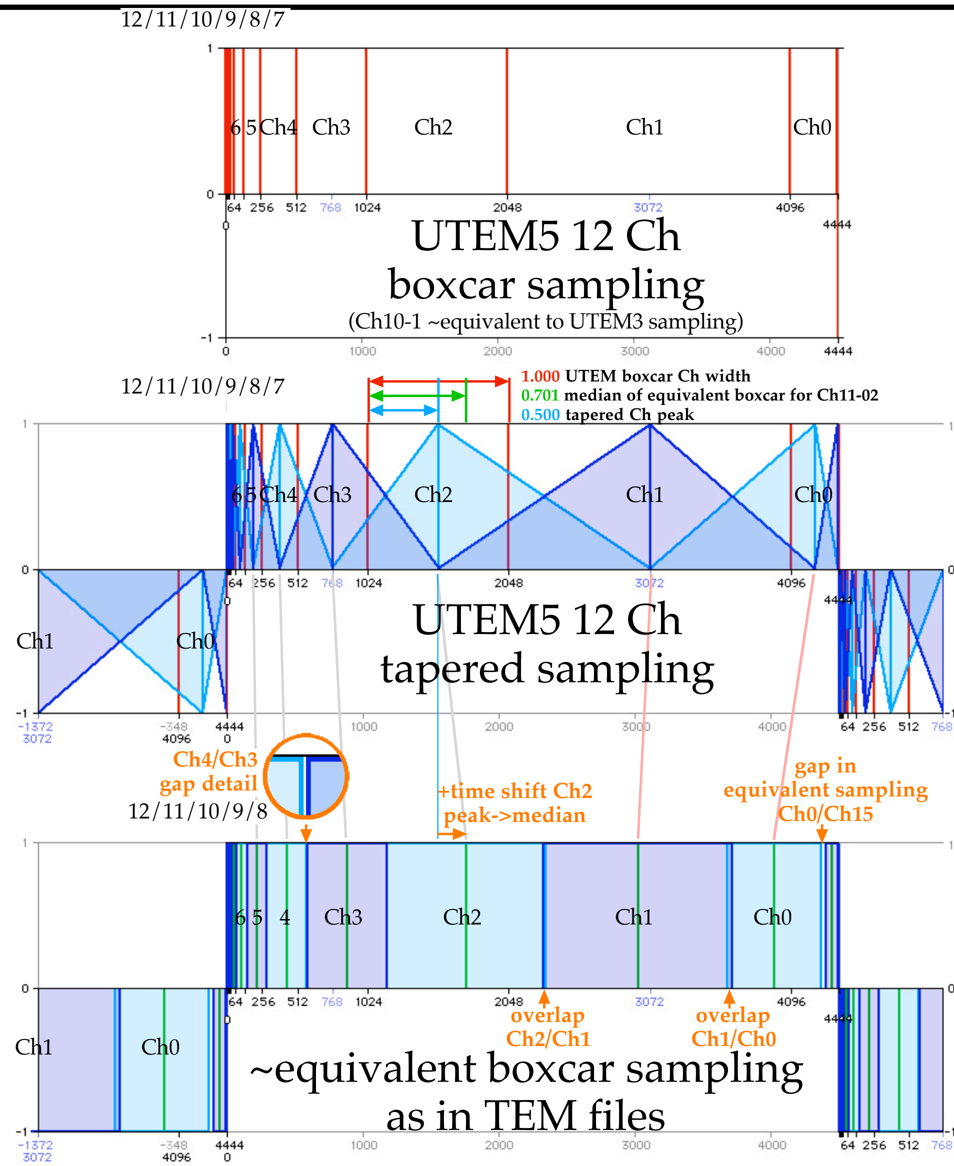
The standard formats of the UTEM5 data - raw, edited, reduced (3CH5) - are all included in the digital record of the AT5 Grid UTEM5 Survey accompanying this report. The 3cH5 files can be plotted using the 3C Plotter:

https://www.lamontagnegeophysics.com/plotter/

The 3C Plotter is a geophysical data plotter that runs in any modern web browser running locally on your machine or online. The 3C Plotter is designed to aid in visualization and interpretation of electromagnetic data. The output is in Scalable Vector Format (SVG), which means it can be presented in large format without loss in quality and is suitable for printing and exporting to pdf. The features of the plotter are outlined in the 3C Plotter Manual:

https://lamontagnegeophysics.com/plotter/manual.pdf

TEM files - compatible with Maxwell - are also included. For the TEM files the UTEM5 12 Ch tapered sampling has been approximated with an (~)equivalent boxcar sampling. The details of the equivalent boxcar channels are listed along with the standard sampling/Ch information in Figure 3 . In Figure 5 the UTEM5 boxcar and UTEM5 tapered samplings are shown and compared to the equivalent boxcar sampling.



Notes:
- **upper**: boxcar sampling equivalent to UTEM3 sampling
- **centre**: UTEM5 tapered sampling (Appendix C)
- **lower**: ~equivalent boxcar sampling in TEM files
  - Chs centred on the median (by area) of the tapered Ch
  - Ch area is the same as in UTEM5 tapered sampling
  - a Ch followed by a wider (or an equal-width) Ch :
    - the median time shifts to later than the tapered peak
    - Chs abut or gap between Chs (**gap detail Ch4/Ch3**)
  - for a Ch followed by a narrower Ch (Ch1 or Ch0):
    - the median time shifts to earlier than the tapered peak
    - ~overlap with previous Ch (**Ch2/Ch1** or **Ch1/Ch0**)

Note: The time shifts that result from the choice of centring the ~equivalent boxcar Chs on the median (by area) of the tapered Chs yield modeling results that will better match the actual conductivity values at early times (of a given decay). Applying a factor (~0.95/0.9) to reduce these time shifts somewhat will yield modeling results that better match actual conductivity values at later/late times (of a given decay).

LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTEE

UTEM5 12Ch Sampling
boxcar/tapered channel options
~equivalent boxcar sampling

Figure 5

Appendix A

1613-4

BHUTEM4 Profiles/Vectorplots

UTEM5 Profiles

BHUTEM4/UTEM5 Survey

AT5 Grid
Ring of Fire

for

Noront Resources Ltd.

Presentation

The results of the survey are summarized and presented as BHUTEM4 and UTEM5 profiles in Appendix A. The final AT5 Grid and loop locations are presented in Figure 2. The data presented in Appendix A are reduced with a UTM grid (NAD83). Overall the UTEM data quality is considered good. Note that Ch0 (latest time channel) profiles should be considered in conjunction with other available information (App. D).

BHUTEM4 Results

For BH NOT-16-1G001 a plot set of five profiles and two vector plots are provided for each of the two transmitter loops surveyed:

Grid AT5 BHUTEM4 NOT-16-1G001 surveyed: 0-1160m depth

S1: 3.7500Hz (off-loop - loop to the gridSouth) - Loop 2016-21
S2: 2.5000Hz collar loop - Loop 2016-20

The plot set is as follows: (as detailed in Appendix D: The BHUTEM4 System)

- 3 plots of Ch0 reduced secondary field (to Ch10):
  One plot for each for components: Bw, Bs, Bn and Bw.
  The tradeoff between mag/acc orientation is shown on the left.
  These 3 plots have the early-, intermediate- and latest-time channels on separate axes. The computed primary field in the direction of the component is plotted as a solid curve with the early-time channels.
- 1 total field plot (to Ch10):
  With all channels of each of the three components on a different axis.
  In most cases the Ch0 profile follows the primary field solid curve of each of the components indicating that the basic geometry of the hole relative to the loop is correct. This may not be true, however in very conductive environments where a large response may persist in Ch0.
- 1 plot comprised of magnetometer/accelerometer/temperature data/tradeoff
  magnetometer data on the right (top) axis
  accelerometer data on the middle right axis
  For the mag plots, 4 curves are presented. In red, the expected (no symbol) axial and observed axial (symbol W) and in black the expected total transverse and observed total transverse (symbol R) are plotted.
  For the acc plots, 2 curves are presented. In black the expected total transverse and observed total transverse (symbol R) are plotted.

  temperature data on the middle left axis
  The curve that is plotted is the residual temperature after the removal of a best fitting polynomial.

  tradeoff between mag/acc orientation is shown on the left (lower) axis.
  Probe orientation is a tradeoff between mag and accelerometer data.
- 2 Vector plots
  Map View vector plot: overhead view at the ~depth of interest
  Section vector plot:vertical section ~@ the section azimuth
  The loop and the projection of the hole are shown. Vector plots serve to clarify coupling with the primary field.

UTEM5 Surface Results

For each line surveyed the continuously normalized profiles have been plotted for the three components collected. Profiles are presented for the AT5 Grid. Note that in order to show the range of responses there are two sets of profiles plotted for the data:

- all Chs from Ch12-Ch1 and Ch0
- the 8 late Chs: Chs8-Ch1 and Ch0

For Transmitter Loop 22 the S1 profiles are presented. Four-axis profiles are presented in order of line number from west-to-east. The order is as follows:

Loop 2016-22 S1: 1.7857Hz Lines 5300E to L5600E

Note: all UTEM5 reports present data as:

- BL - in-line horizontal component (c1) - UTEM3 ~equivalent - Hx
  the L-azimuth direction is selectable
- BT - the transverse horizontal component (c2) - UTEM3 ~equivalent - Hy
  the T-azimuth direction is 90° counterclockwise from L-azimuth
- BZ -vertical component (c3) - UTEM3 equivalent - Hz

Outline of profile types:

BL BT Bz continuous norm Ch0 reduced

Continuous normalization is useful for detection of the presence of anomalies at any position on a profile. The anomaly shape is distorted by normalization to the local field. Near the wire (large field) continuously normalized Ch0 tends towards zero.

Note: Ch0 is later in time and narrower than Ch1 (Appendix C).

The BL/BT/Bz continuously normalized data are presented as 4-axis profiles:

top axis: Ch1-8/12	Bz	Ch0 Reduced
upper middle axis: Ch1-8/12	BT	Ch0 Reduced
lower middle axis: Ch1-8/12	BL	Ch0 Reduced
bottom axis: Ch0	BL BT Bz	Primary Field Reduced

A description of the standard plotting formats used and of the UTEM System is presented in Appendix C.

Note on digital data:

The standard formats of the UTEM5 data - raw, edited, reduced (3CH5) - are all included in the digital record of the AT5 Grid UTEM5 Survey accompanying this report. The 3cH5 files can be plotted using the 3C Plotter:

https://www.lamontagnegeophysics.com/plotter/

The 3C Plotter is a geophysical data plotter that runs in any modern web browser running locally on your machine or online. The 3C Plotter is designed to aid in visualization and interpretation of electromagnetic data. The output is in Scalable Vector Format (SVG), which means it can be presented in large format without loss in quality and is suitable for printing and exporting to pdf. The features of the plotter are outlined in the 3C Plotter Manual:

https://lamontagnegeophysics.com/plotter/manual.pdf

TEM files - compatible with Maxwell - are also included. For the TEM files the UTEM5 12 Ch tapered sampling has been approximated with an (~)equivalent boxcar sampling. The details of the equivalent boxcar channels are listed along with the standard sampling/Ch information in Figure 3 . In Figure 4 the UTEM5 boxcar and UTEM5 tapered samplings are shown and compared to the equivalent boxcar sampling.

AT5 Grid - BHUTEM4 coverage

NOT-16-1G001 surveyed: 0-1160m depth x 2 loop coverage

Loop 2016-21 (@ **3.750Hz**) off-loop - loop to the gridSouth
Loop 2016-20 (@ **2.500Hz**) collar loop

AT5 Grid - UTEM5 Surface coverage

Loop	Line	Coverage	m	components
Loop 2016-22 (@ **1.785714Hz**)	off-loop - loop to the gridSouth			
1 Loop coverage	Line 5300E	50N - 1250N	1200m	BL/BT/Bz
	Line 5400E	150S - 1250N	1400m	BL/BT/Bz
	Line 5510E	50N - 1250N	1200m	BL/BT/Bz
	Line 5600E	50N - 1250N	1200m	BL/BT/Bz
U5 BL/BT/Bz coverage		Loop 22	5000m	BL/BT/Bz
AT5 Grid Total U5		**1 loop coverage**	**5000m**	**BL/BT/Bz**

equalling:

- 15000m UTEM5 single component/single Tx coverage
- 5000m UTEM5 1 loop coverage
- 5000m UTEM5 **1.785Hz** BL/BT/Bz coverage

AT5 Grid

AT5 Grid - BHUTEM4 coverage

NOT-16-1G001 surveyed: 0-1160m depth x 2 loop coverage

Loop 2016-21 (@ **3.750Hz**) off-loop - loop to the gridSouth
Loop 2016-20 (@ **2.500Hz**) collar loop

AT5 Grid - BHUTEM4 Profiles

AT5 Grid

BH NOT-16-1G001
Loop 2016-21

3.750Hz frequency

continuous norm

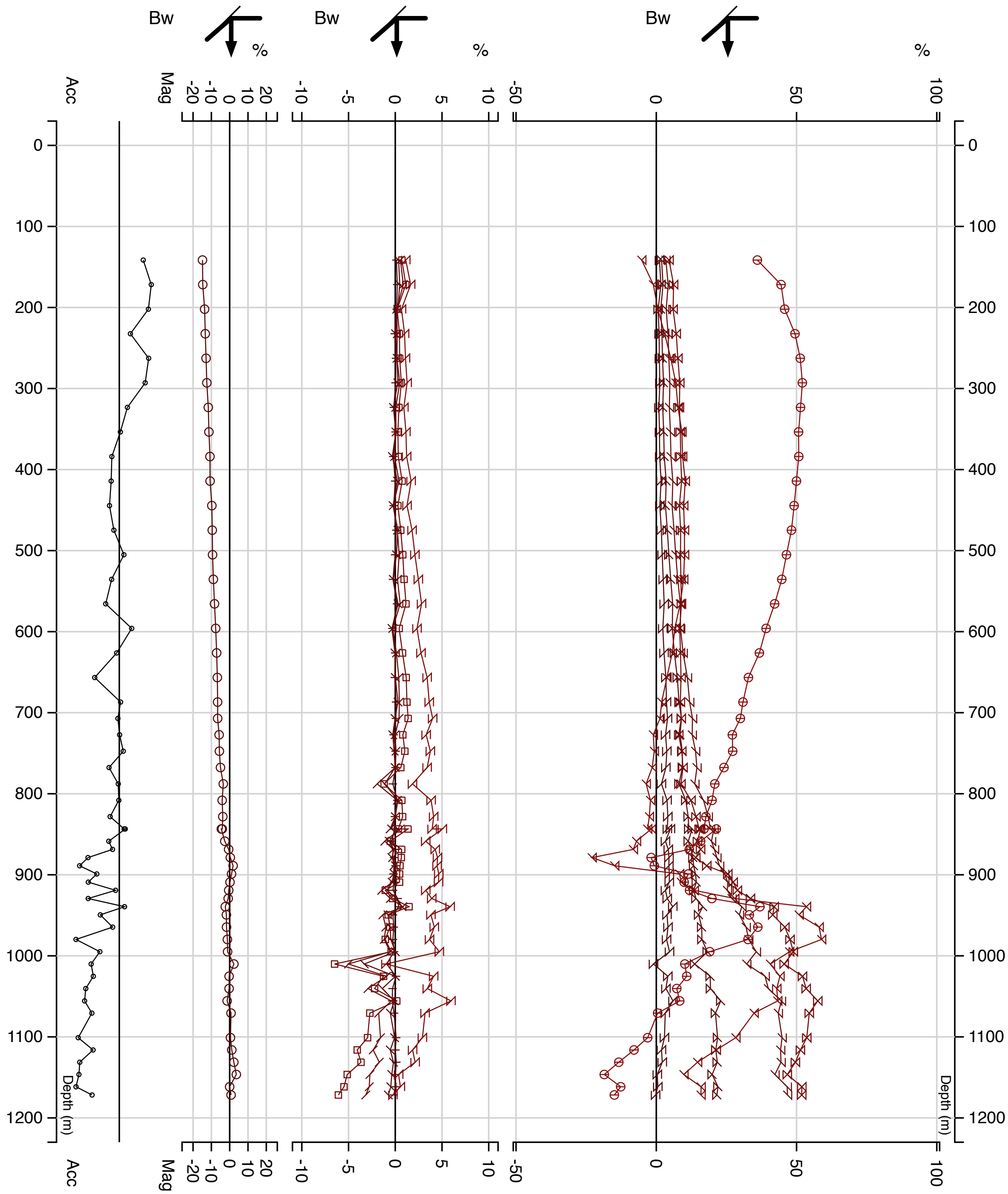
Ch0 reduced

Ch0-10 plotted

Plot set as follows: (as detailed in Appendix D: The BHUTEM4 System)

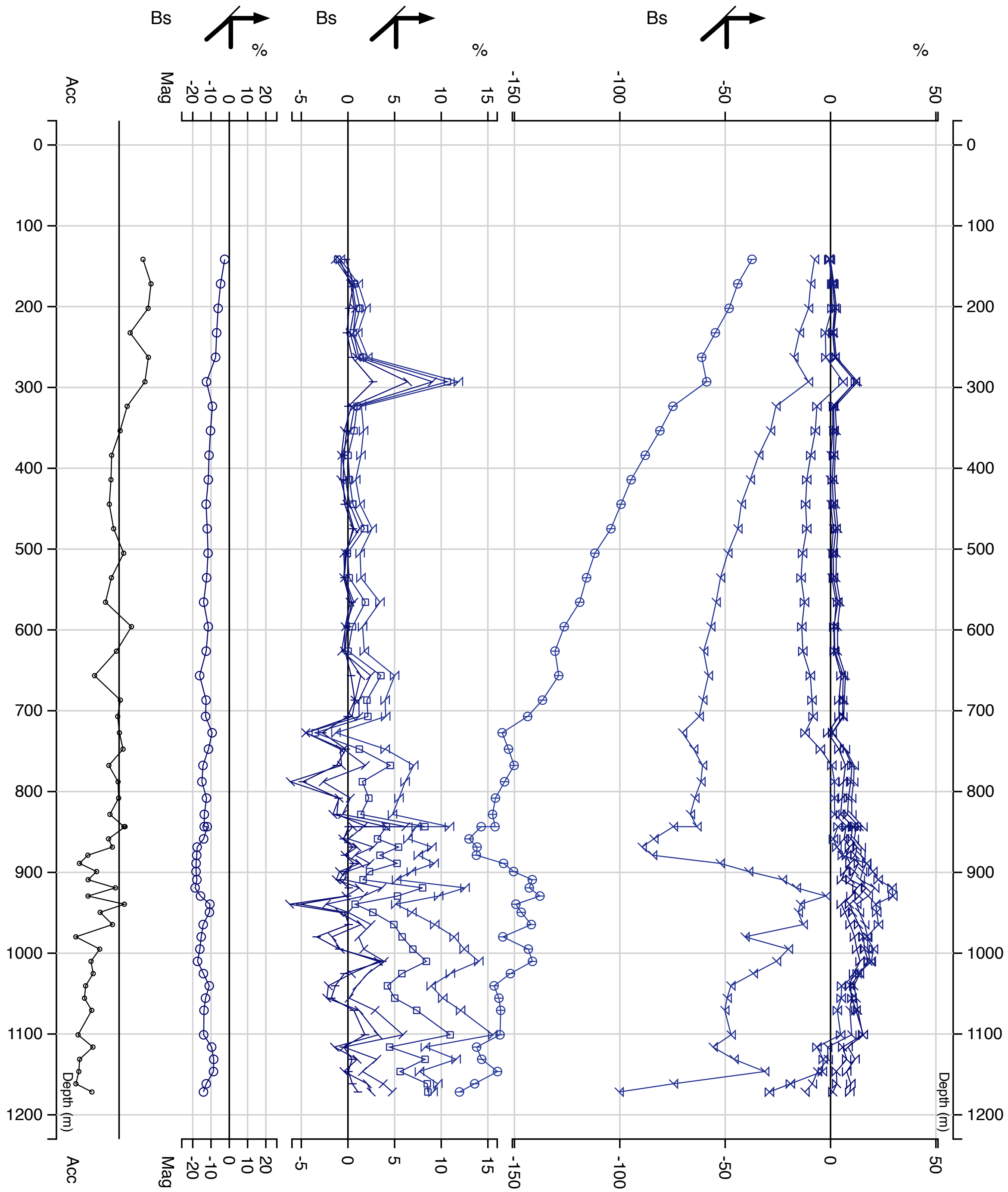
- 3 plots of Ch0 reduced secondary field (to Ch10):
  One plot for each for components: Bw, Bs, Bn and Bw.
- 1 total field plot (to Ch10):
  With all channels of each of the three components on a different axis.
- 1 plot comprised of magnetometer/accelerometer/temperature data/tradeoff
  magnetometer data on the right (top) axis
  accelerometer data on the middle right axis
  temperature data on the middle left axis
  tradeoff between mag/acc orientation is shown on the left (lower) axis.
- 2 Vector plots
  Map View vector plot: overhead view at the ~depth of interest
  Section vector plot:vertical section ~@ the section azimuth

NOT-16-1G001 - Loop 21 Profiles/Vectorplots pg 20



Hole: NOT-16-1G001 Loop: 21(south) Cpt: Bw S 313.0°Tr 0.00	(Chn - Ch0) / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 3.75Hz aS1Lp21_HNOT-16-1G001.3cH5 / 3-Axis tradeoff (Lp21 BW)	BHUTEM-4 Survey at: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-4 Surv: 17/9/16 Red: 21/10/16 Plot: 21/10/16

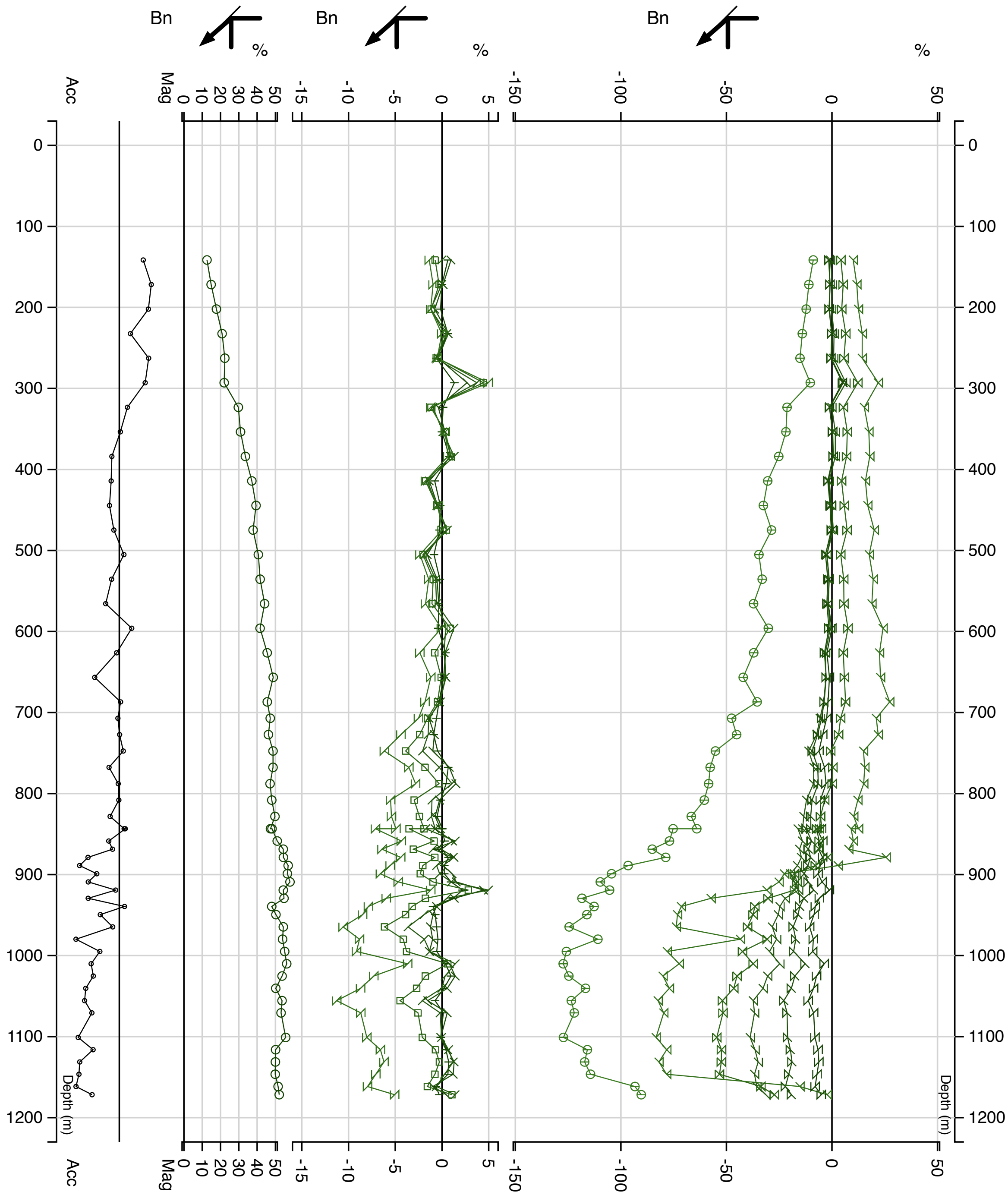
NOT-16-1G001 - Loop 21 Profiles



Hole: NOT-16-1G001 Loop: 21(south) Cpt: Bs S 313.0°Tr 0.00	(Chn - Ch0) / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 3.75Hz aS1Lp21_HNOT-16-1G001.3cH5 / 3-Axis tradeoff (Lp21 BS)	BHUTEM-4 Survey at: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-4 Surv: 17/9/16 Red: 21/10/16 Plot: 21/10/16

NOT-16-1G001 - Loop 21 Profiles

pg 22



Hole: NOT-16-1G001
Loop: 21(south)
Cpt: Bn
S 313.0°Tr 0.00

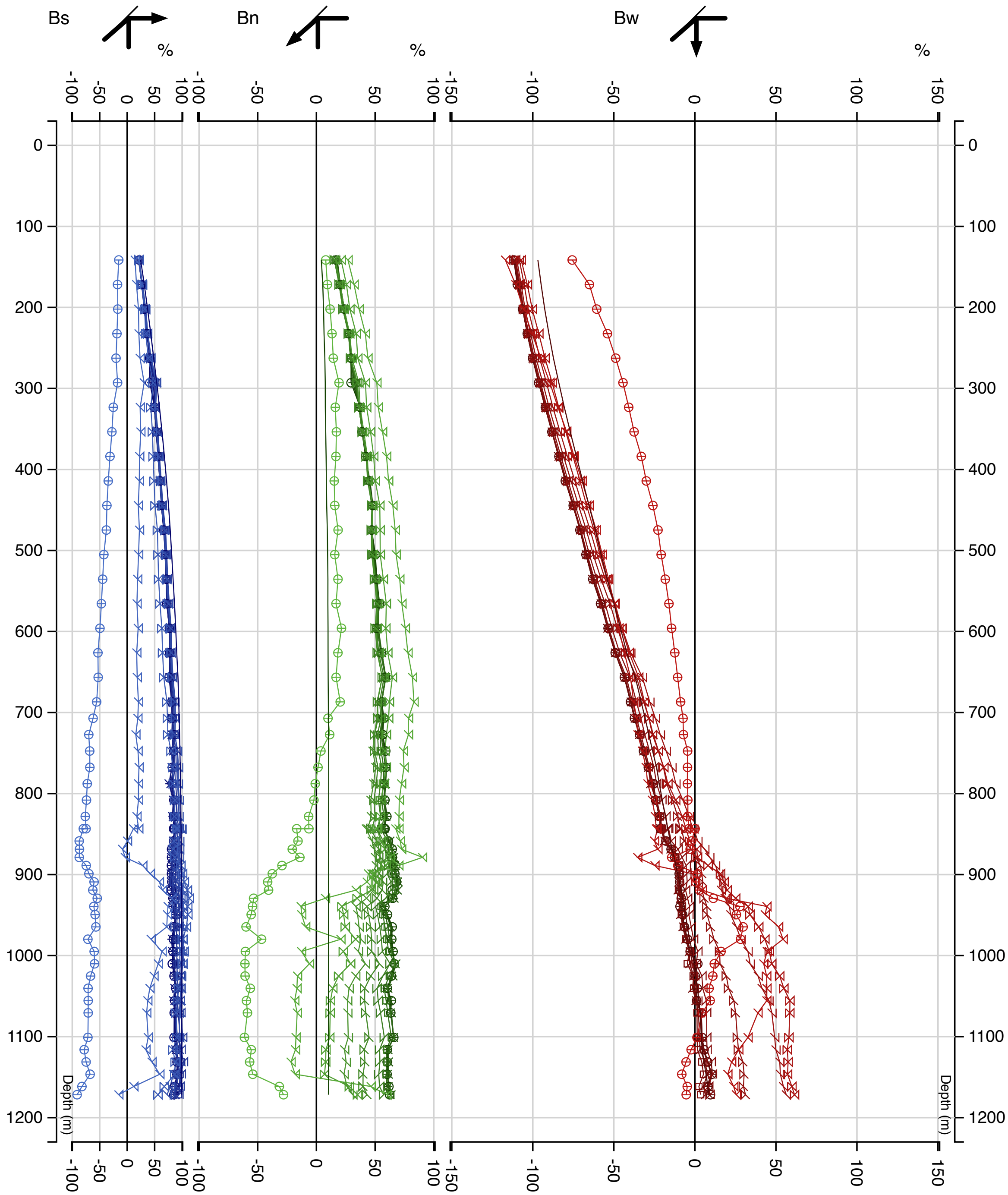
(Chn - Ch0) / |Bp| (%)
Cont norm @ Δz: 0m
Base Freq: 3.75Hz
aS1Lp21_HNOT-16-1G001.3cH5 / 3-Axis tradeoff (Lp21 BN)

BHUTEM-4 Survey at: AT-5
For: Noront Resources

LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE

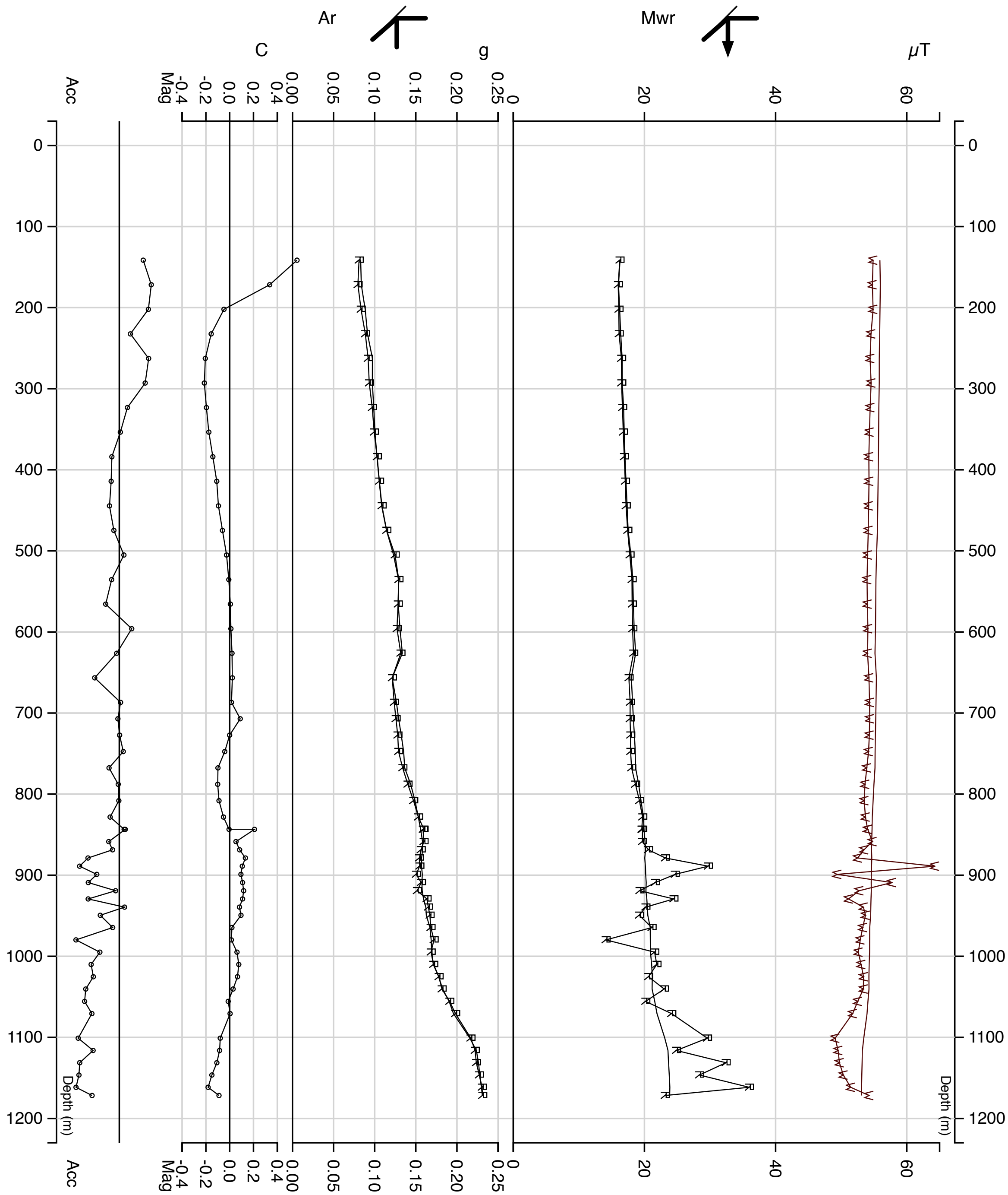
Job 1613-4
Surv: 17/9/16
Red: 21/10/16
Plot: 21/10/16

NOT-16-1G001 - Loop 21 Profiles



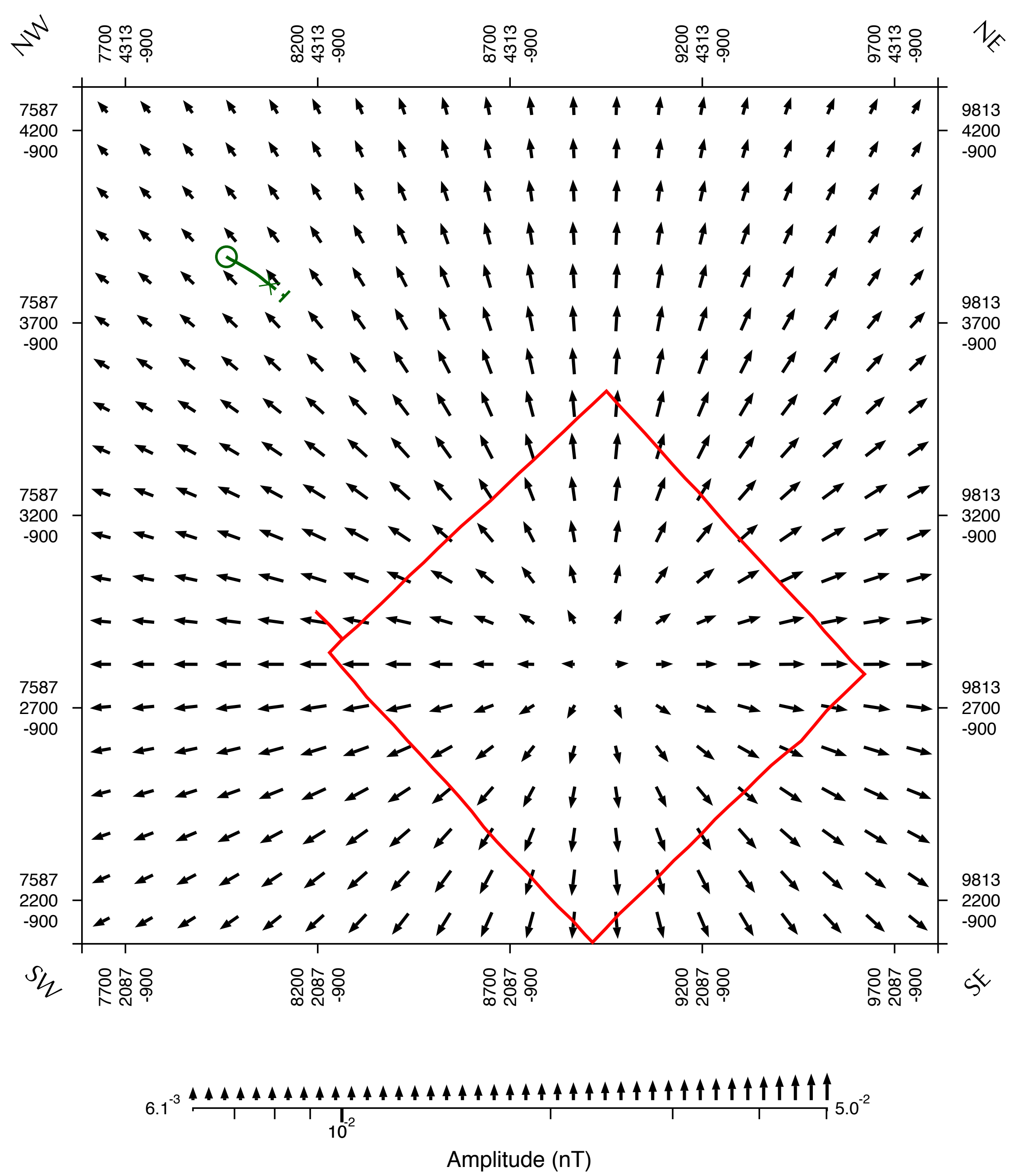
Hole: NOT-16-1G001 Loop: 21(south) Cpt: Bs, Bn, Bw S 313.0°Tr 0.00	Chn / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 3.75Hz aS1Lp21_HNOT-16-1G001.3cH5 / 3-Axis Noront Bh	BHUTEM-4 Survey at: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-4 Surv: 17/9/16 Red: 21/10/16 Plot: 21/10/16

NOT-16-1G001 - Loop 21 Profiles



Hole: NOT-16-1G001 Loop: 21(south) Cpt: (Mag & Acc) S 0.0° Tr 0.00	Field: n/a Normalization: n/a Base Freq: 2.5Hz aS1Lp21_HNOT-16-1G001.3cH5 / 3-Axis Mag-Acc*	BHUTEM-4 Survey at: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-4 Surv: 17/9/16 Red: 21/10/16 Plot: 24/10/16

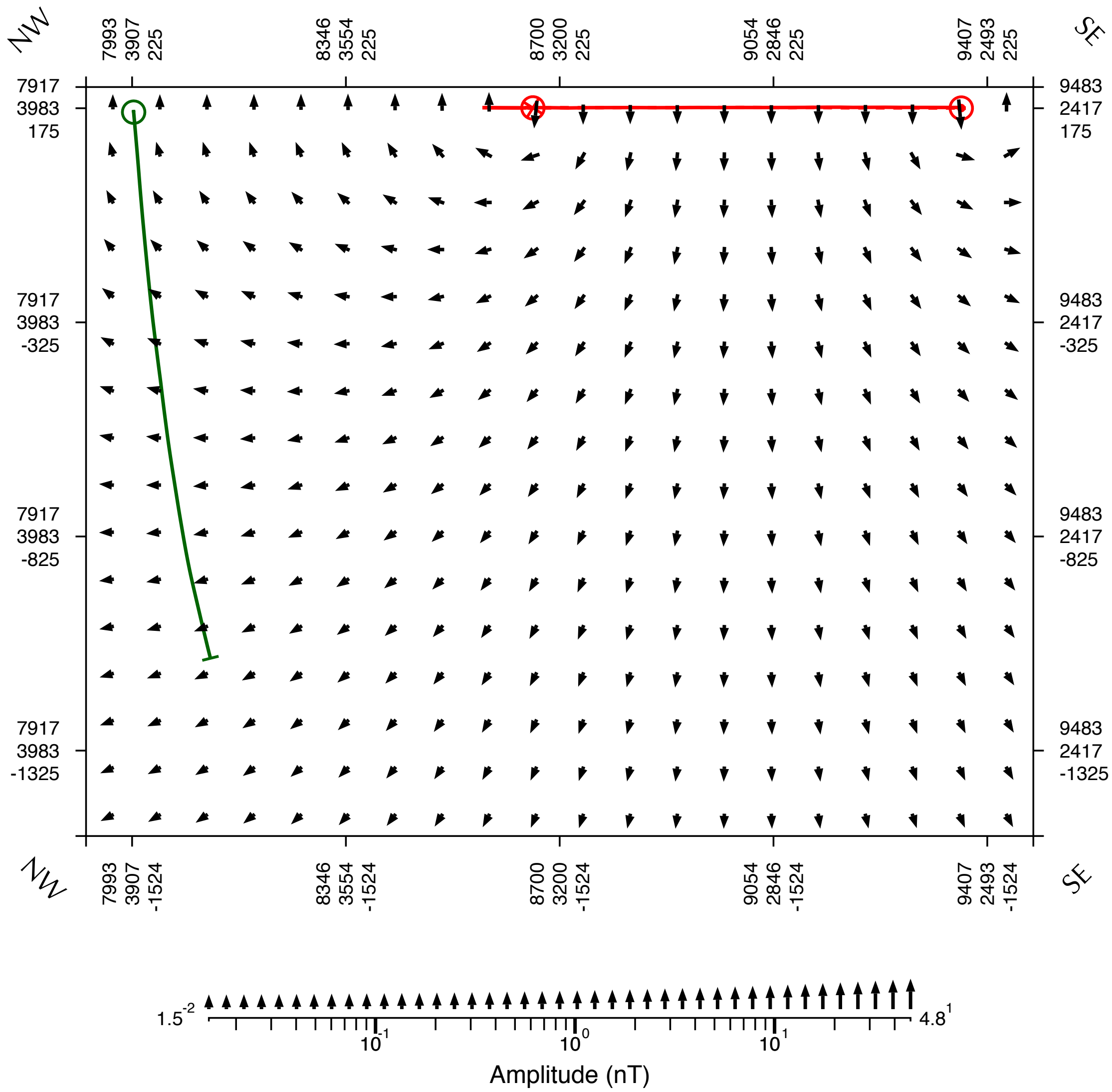
NOT-16-1G001 - Loop 21 Profiles



Dir / Dip: 0°/180° Traverse: bhNOT-16-1G001	Loop: Loop 21(south) I = 1 Shift = 0 0 0 Coupling: N/A File: Loop 20(north) vp	Survey Location: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-4 Plot: 21/10/1

NOT-16-1G001 - Loop 21 Vectorplots

pg 26



Dir / Dip: 45°/90° Traverse: bhNOT-16-1G001	Loop: Loop 21(south) I = 1 Shift = 0 0 0 Coupling: N/A File: Loop 21(south) vp	Survey Location: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-1 Plot: 21/10/1

NOT-16-1G001 - Loop 21 Vectorplots

pg 27

AT5 Grid

BH NOT-16-1G001
Loop 2016-20

2.500Hz frequency

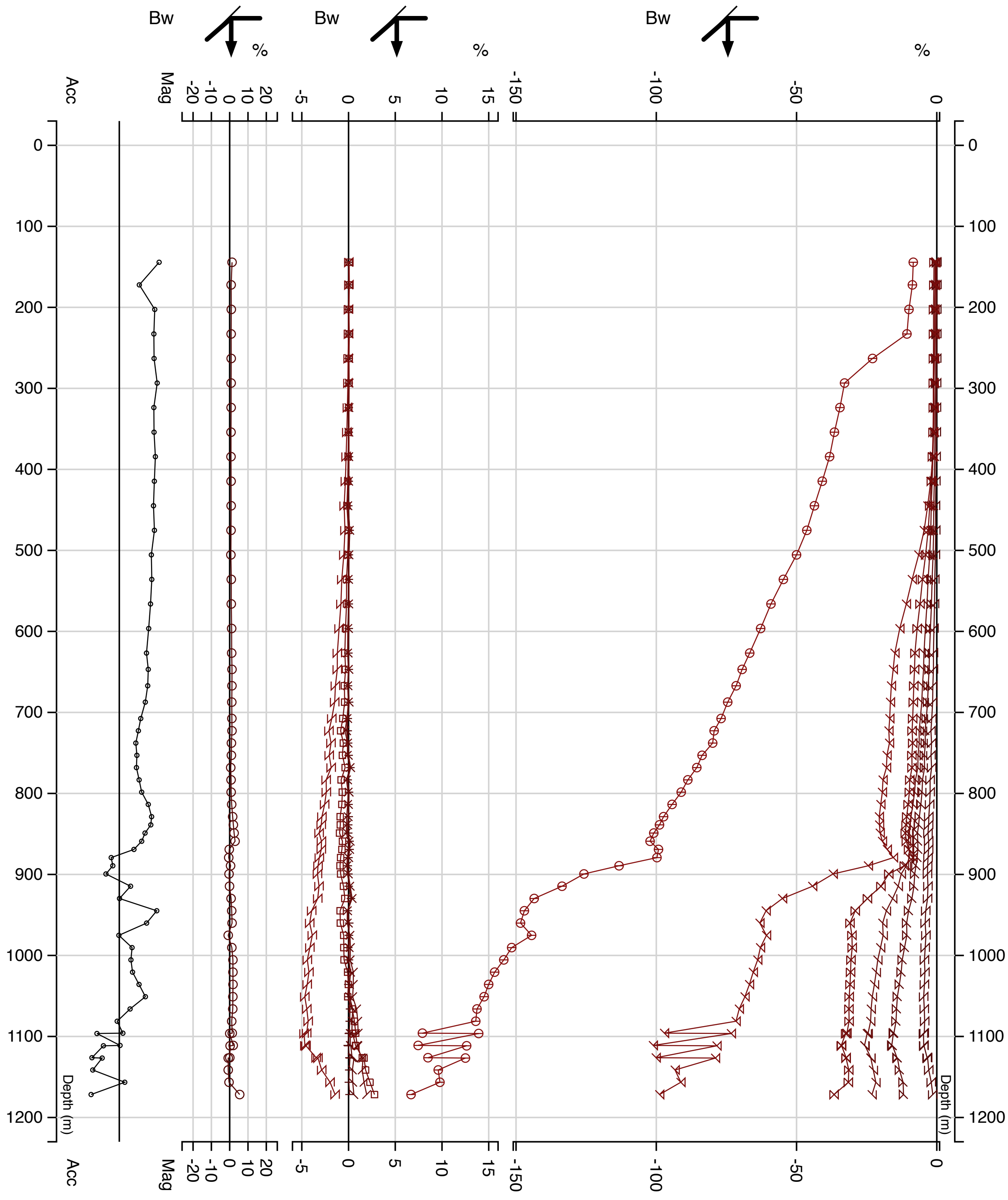
continuous norm

Ch0 reduced

Ch0-10 plotted

Plot set as follows: (as detailed in Appendix D: The BHUTEM4 System)

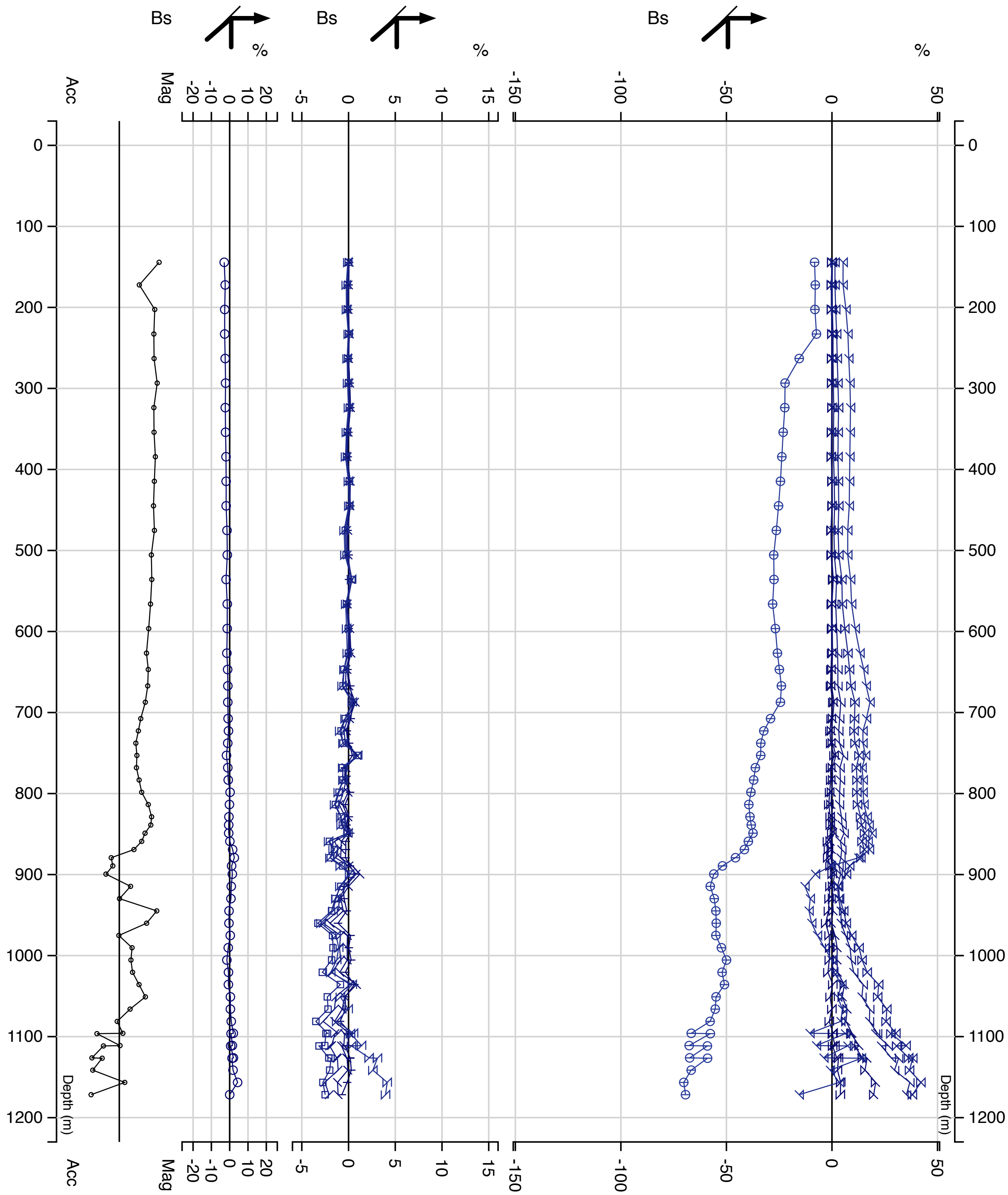
- 3 plots of Ch0 reduced secondary field (to Ch10):
  One plot for each for components: Bw, Bs, Bn and Bw.
- 1 total field plot (to Ch10):
  With all channels of each of the three components on a different axis.
- 1 plot comprised of magnetometer/accelerometer/temperature data/tradeoff
  magnetometer data on the right (top) axis
  accelerometer data on the middle right axis
  temperature data on the middle left axis
  tradeoff between mag/acc orientation is shown on the left (lower) axis.
- 2 Vector plots
  Map View vector plot: overhead view at the ~depth of interest
  Section vector plot:vertical section ~@ the section azimuth



Hole: NOT-16-1G001 Loop: 20(north) Cpt: Bw S 313.0°Tr 0.00	(Chn - Ch0) / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 2.5Hz aS2Lp20_HNOT-16-1G001.3cH5 / 3-Axis tradeoff (Lp20 BW)	BHUTEM-4 Survey at: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-4 Surv: 15/9/16 Red: 21/10/16 Plot: 25/10/16

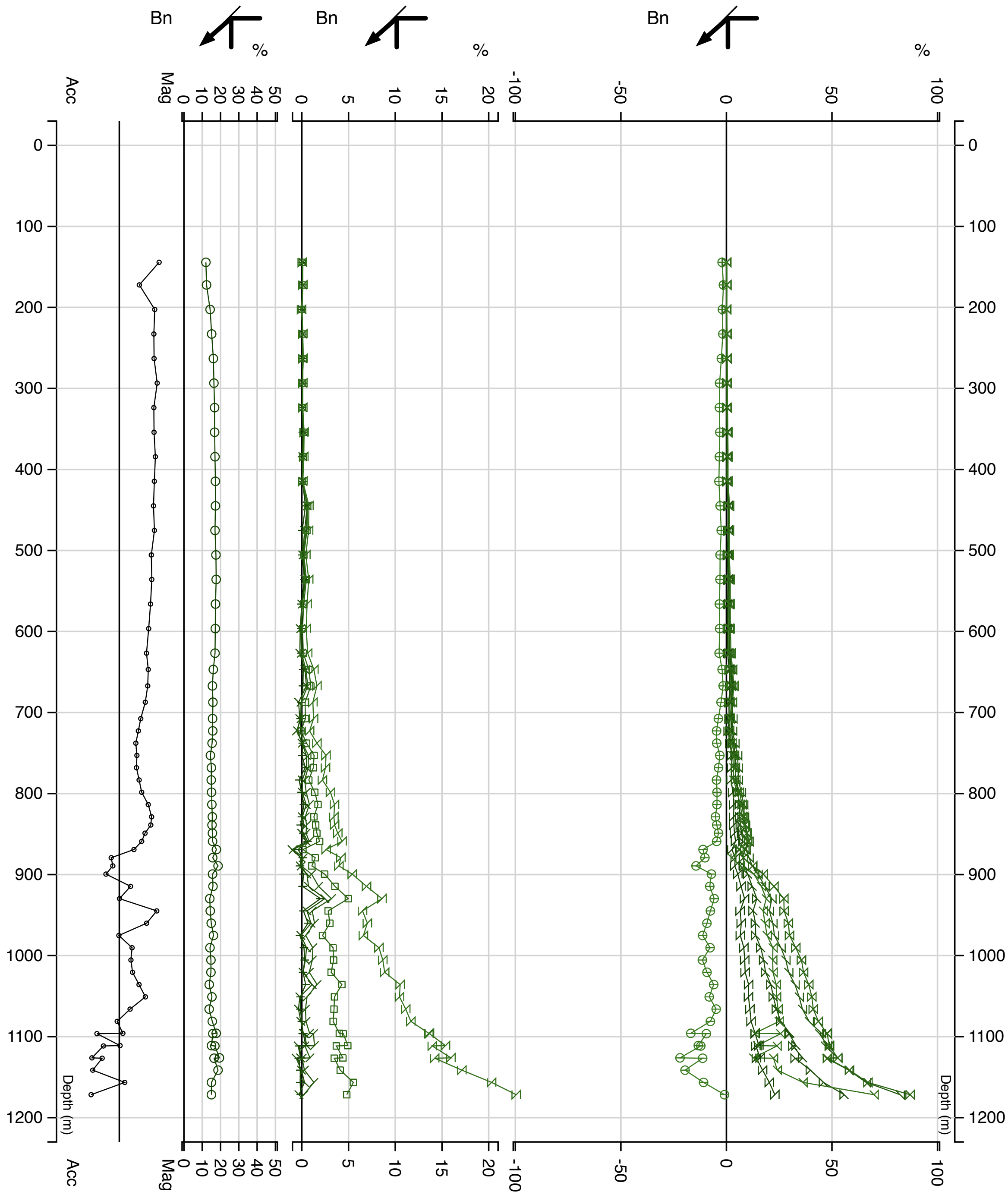
NOT-16-1G001 - Loop 20 Profiles

pg 29



Hole: NOT-16-1G001 Loop: 20(north) Cpt: Bs S 313.0°Tr 0.00	(Chn - Ch0) / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 2.5Hz aS2Lp20_HNOT-16-1G001.3cH5 / 3-Axis tradeoff (Lp21 BS)	BHUTEM-4 Survey at: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-4 Surv: 15/9/16 Red: 21/10/16 Plot: 21/10/16

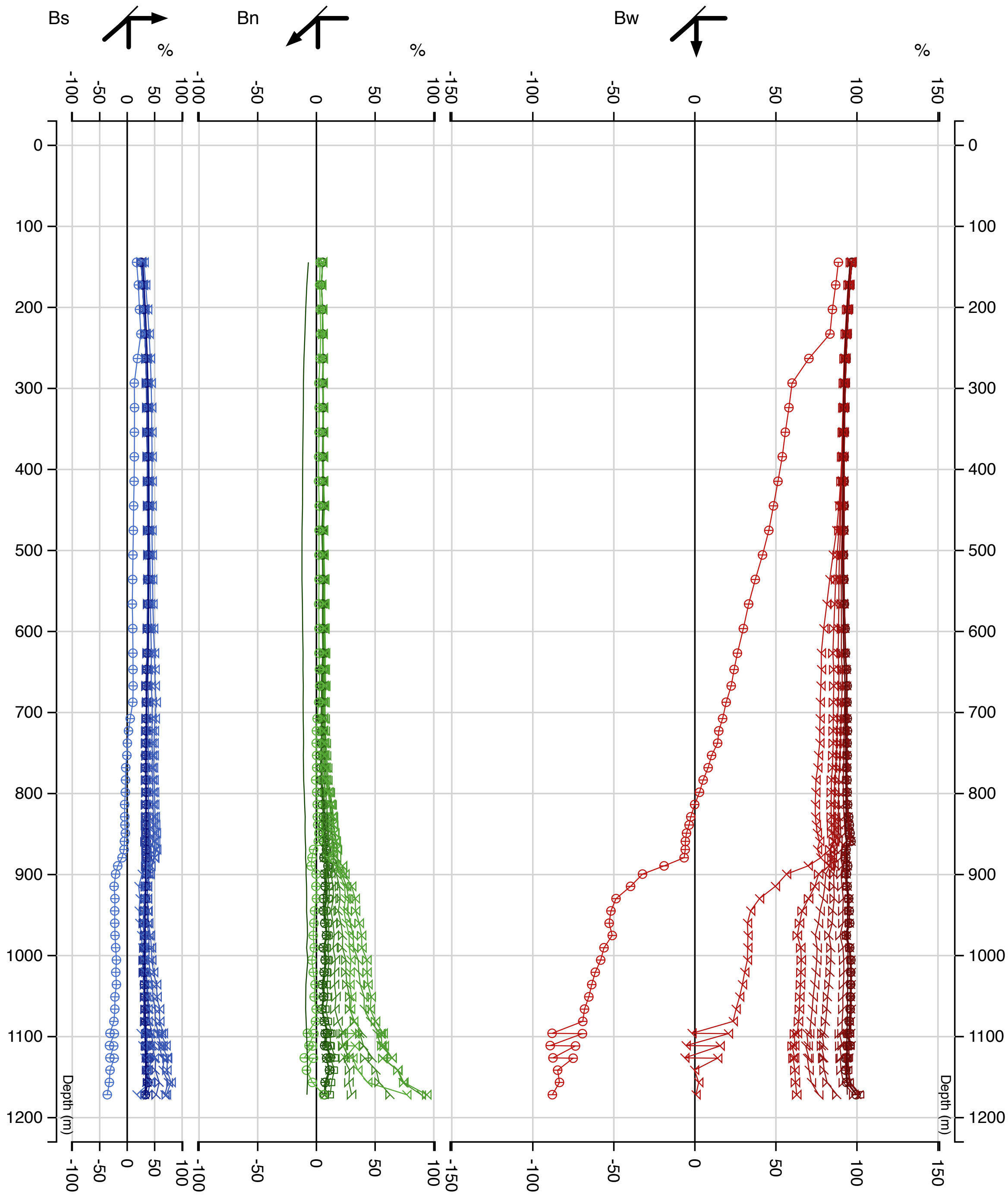
NOT-16-1G001 - Loop 20 Profiles



Hole: NOT-16-1G001 Loop: 20(north) Cpt: Bn S 313.0°Tr 0.00	(Chn - Ch0) / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 2.5Hz aS2Lp20_HNOT-16-1G001.3cH5 / 3-Axis tradeoff (Lp21 BN)*	BHUTEM-4 Survey at: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-4 Surv: 15/9/16 Red: 21/10/16 Plot: 21/10/16

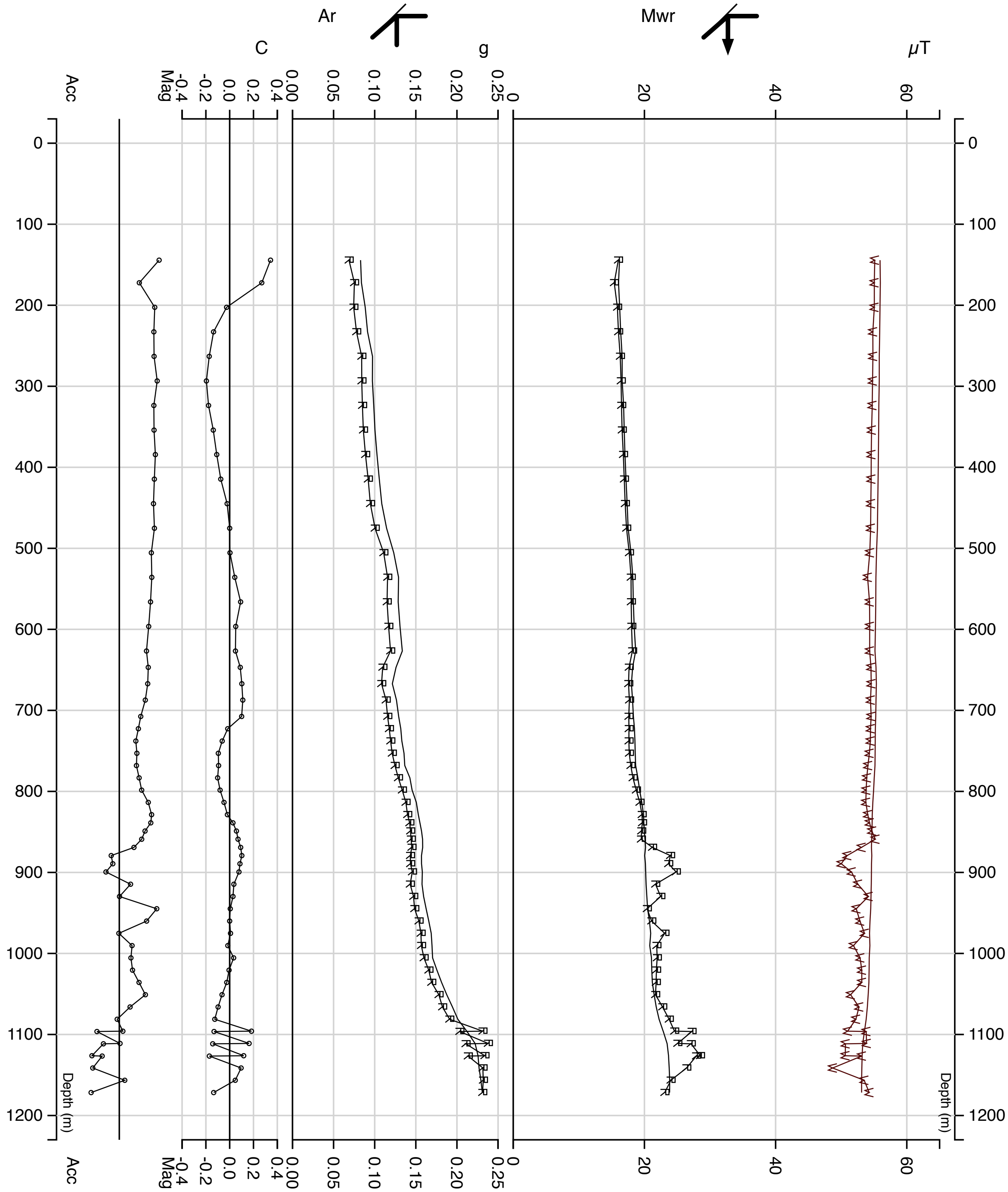
NOT-16-1G001 - Loop 20 Profiles

pg 31



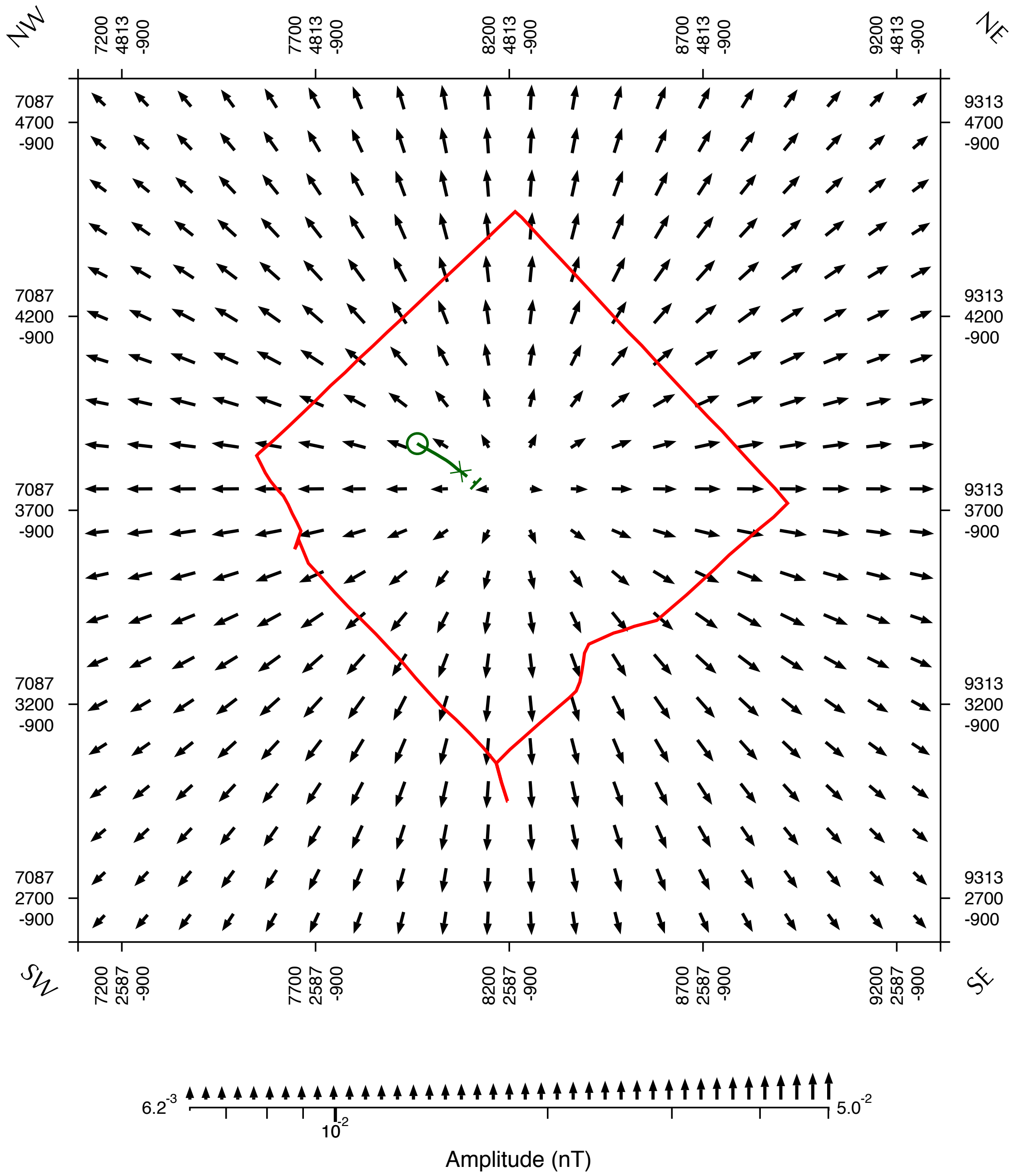
Hole: NOT-16-1G001 Loop: 20(north) Cpt: Bs, Bn, Bw S 313.0°Tr 0.00	Chn / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 2.5Hz aS2Lp20_HNOT-16-1G001.3cH5 / 3-Axis Noront Lp21	BHUTEM-4 Survey at: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-4 Surv: 15/9/16 Red: 21/10/16 Plot: 21/10/16

NOT-16-1G001 - Loop 20 Profiles



Hole: NOT-16-1G001 Loop: 20(north) Cpt: (Mag & Acc) S 0.0° Tr 0.00	Field: n/a Normalization: n/a Base Freq: 2.5Hz aS2Lp20_HNOT-16-1G001.3cH5 / 3-Axis Mag-Acc*	BHUTEM-4 Survey at: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-4 Surv: 15/9/16 Red: 21/10/16 Plot: 24/10/16

NOT-16-1G001 - Loop 20 Profiles



Dir / Dip: 0°/180° Traverse: bhNOT-16-1G001	Loop: Loop 20(north) I = 1 Shift = 0 0 0 Coupling: N/A File: Loop 20(north) vp	Survey Location: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-P Plot: 22/10/1

NOT-16-1G001 - Loop 20 Vectorplots

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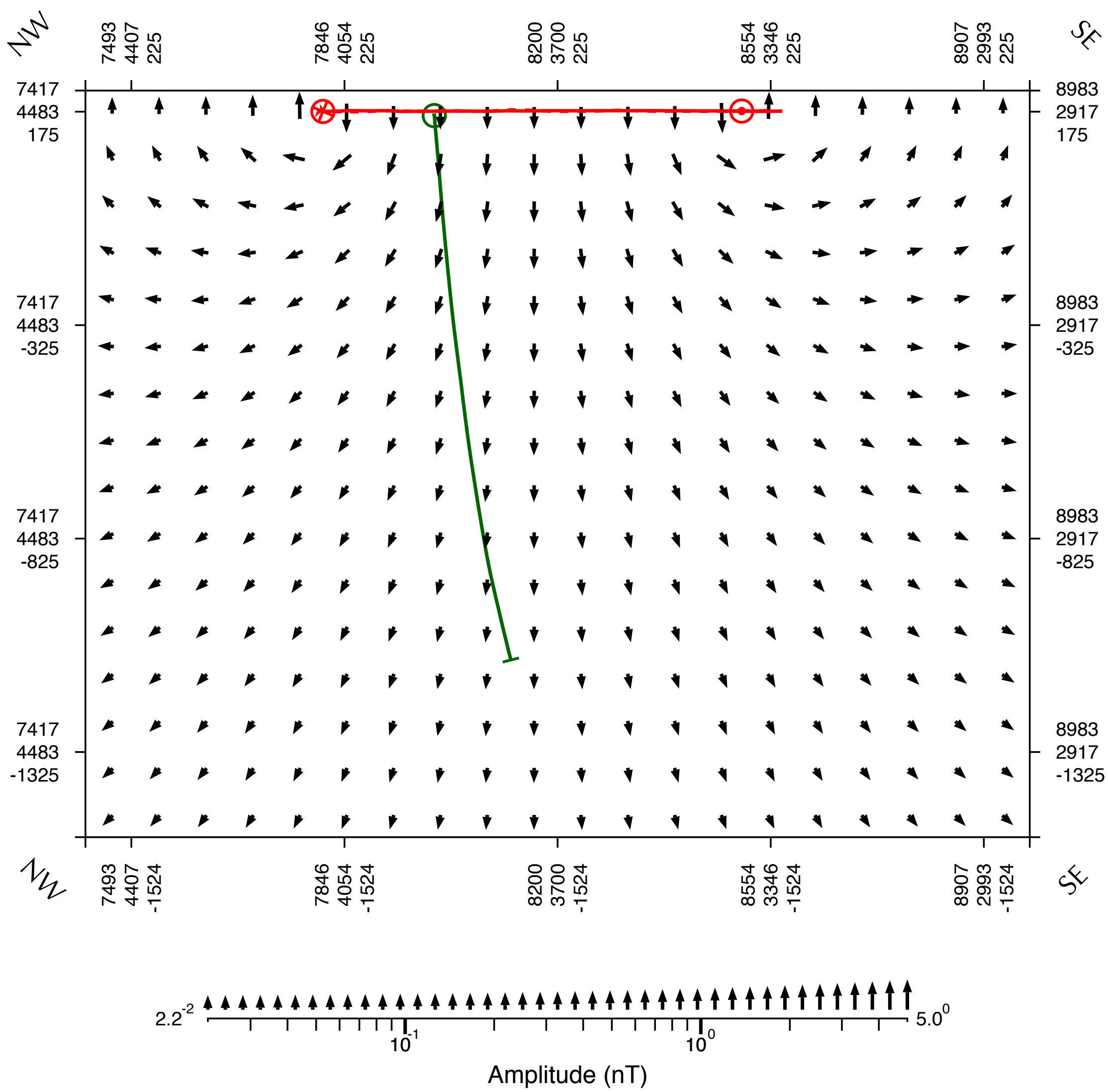


Dir / Dip: 45°/90° Traverse: bhNOT-16-1G001	Loop: Loop 20(north) I = 1 Shift = 0 0 0 Coupling: N/A File: Loop 20(north) vp	Survey Location: AT-5 For: Noront Resources LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613-1 Plot: 21/10/1

NOT-16-1G001 - Loop 20 Vectorplots

AT5 Grid
UTEM5 profiles

Loop 2016-22 (@ **1.785714Hz**) off-loop - loop to the gridSouth

1 Loop coverage	Line 5300E	50N - 1250N	1200m	BL/BT/Bz
	Line 5400E	150S - 1250N	1400m	BL/BT/Bz
	Line 5510E	50N - 1250N	1200m	BL/BT/Bz
	Line 5600E	50N - 1250N	1200m	BL/BT/Bz

AT5 Grid

Loop 2016-22

BL/BT/Bz

~1.785Hz frequency

continuous norm

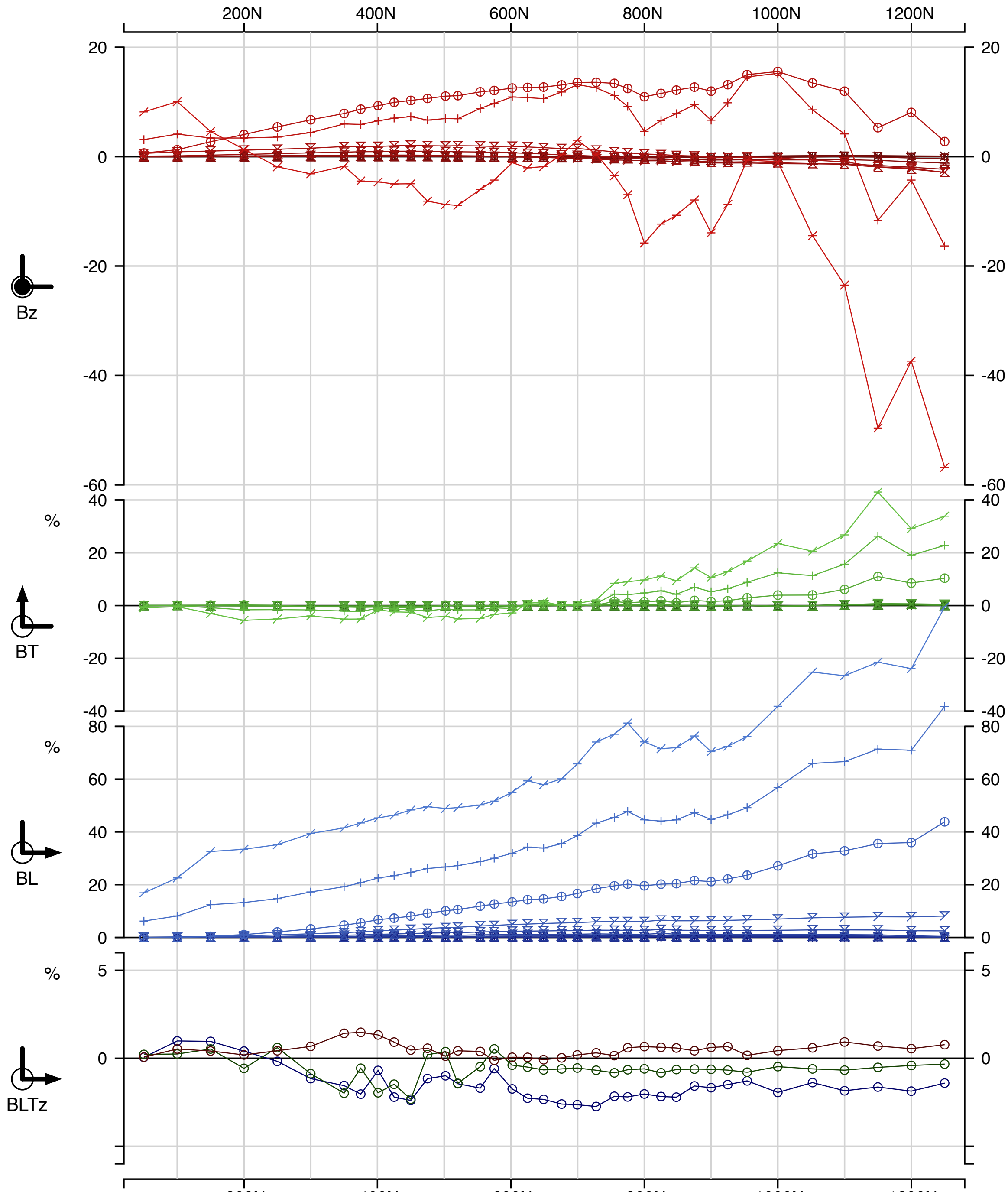
12Ch - Ch0 reduced

all Chs plotted

Loop 2016-22 (@ **1.785714Hz**) off-loop - loop to the gridSouth

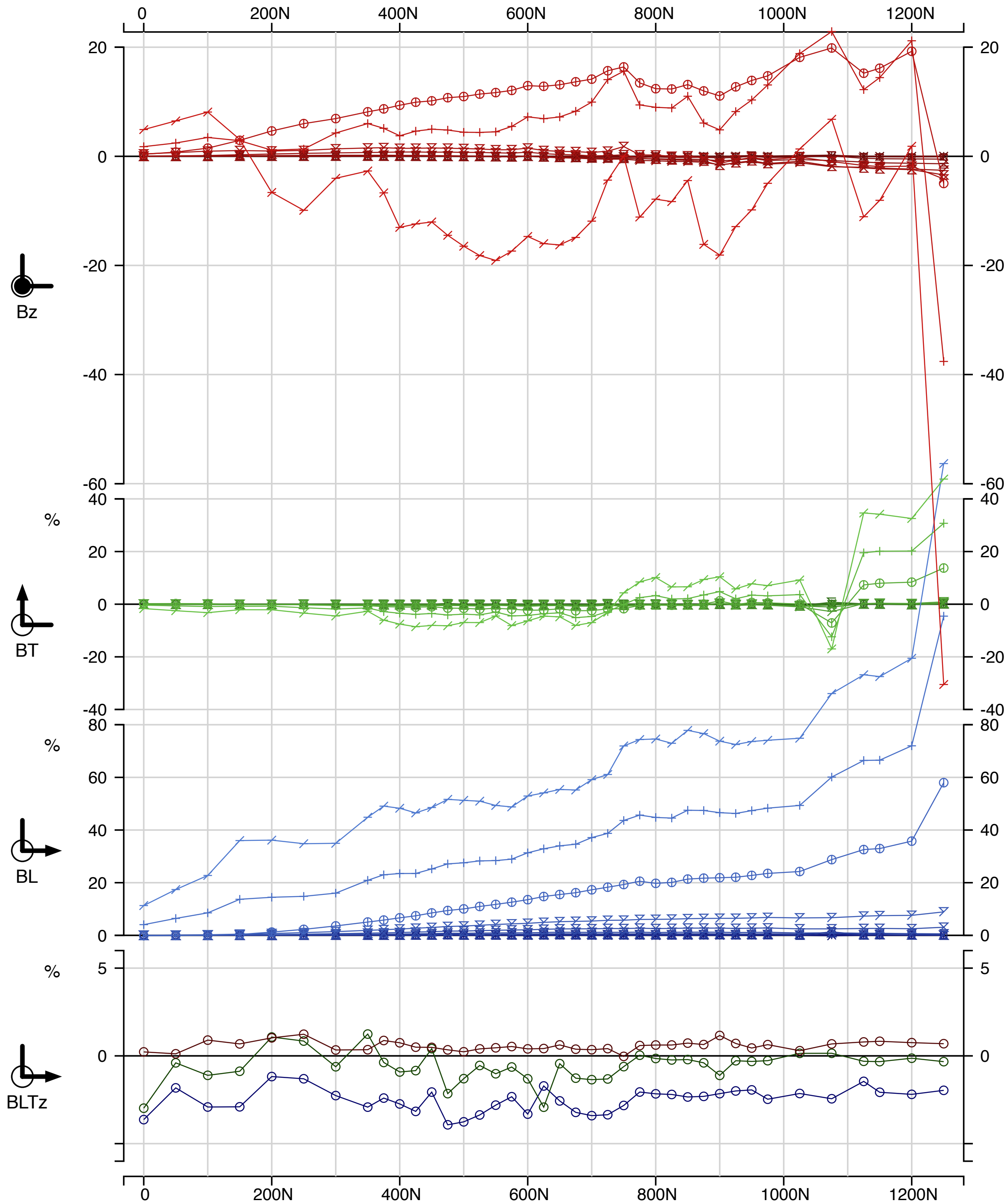
Line 5300E	50N - 1250N	1200m	BL/BT/Bz
Line 5400E	150S - 1250N	1400m	BL/BT/Bz
Line 5510E	50N - 1250N	1200m	BL/BT/Bz
Line 5600E	50N - 1250N	1200m	BL/BT/Bz

Loop 2016-22 - all Chs - B_{LTZ} pg 37



Line: L5300EA Loop: 2016-22S1 Cpt: BL, BT, Bz L 313.0°	(Chn - Ch0) / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 1.78571Hz aLp2016-22S1_L5300EA.3cH5 / 3-Axis S1*	UTEM-5 Survey at: AT5 For: NORONT LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613 Surv: 12/8/16 Red: 21/10/16 Plot: 21/10/16

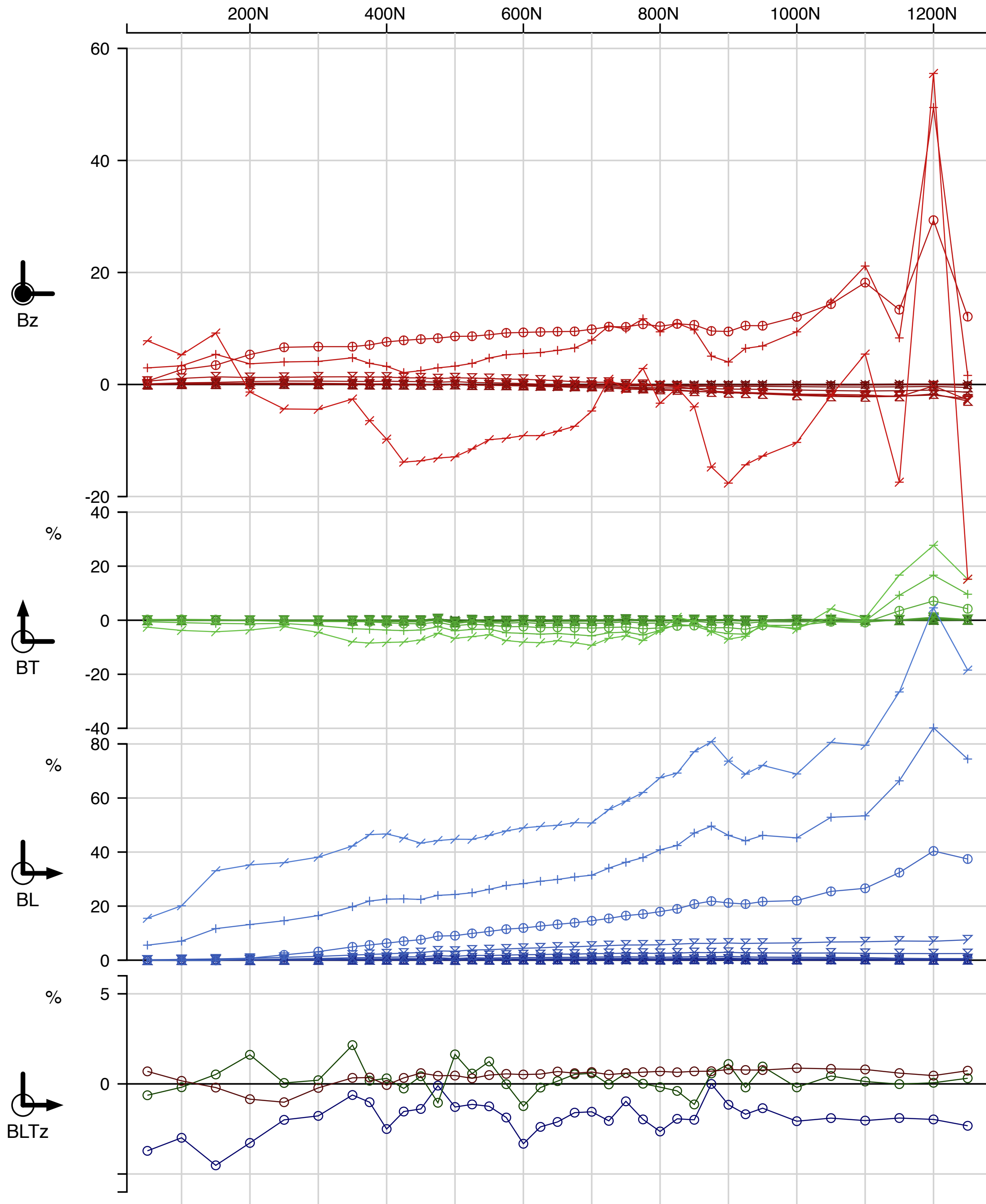
Loop 2016-22 - all Chs - B_{LTZ}



Line: L5400EA Loop: 2016-22S1 Cpt: BL, BT, Bz L 313.0°	(Chn - Ch0) / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 1.78571Hz aLp2016-22S1_L5400EA.3cH5 / 3-Axis S1*	UTEM-5 Survey at: AT5 For: NORONT LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613 Surv: 9/8/16 Red: 21/10/16 Plot: 21/10/16

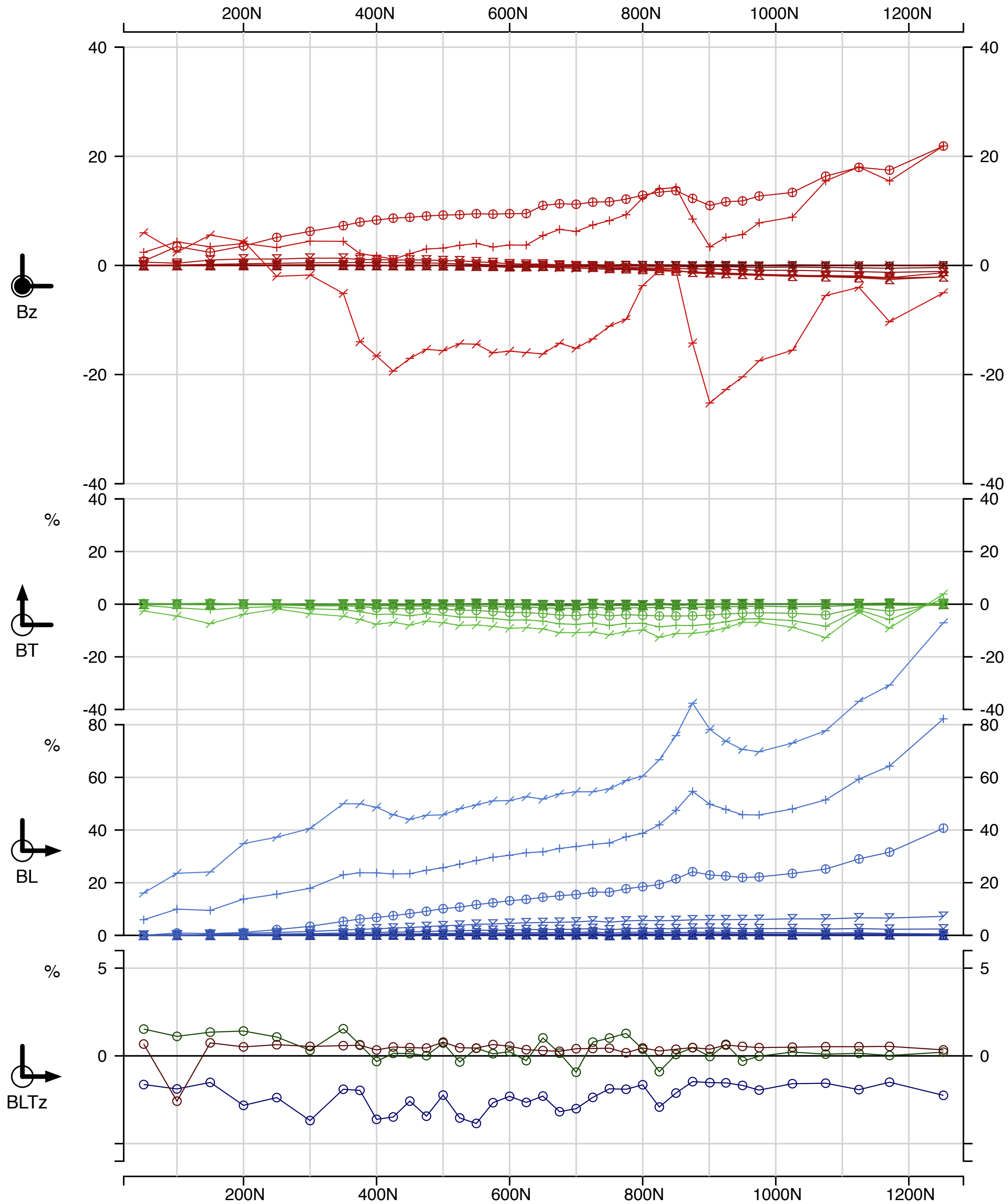
Loop 2016-22 - all Chs - B_{LTZ}

pg 39



Line: L5510EA Loop: 2016-22S1 Cpt: BL, BT, Bz L 313.0°	(Chn - Ch0) / lBpl (%) Cont norm @ Δz: 0m Base Freq: 1.78571Hz aLp2016-22S1_L5510EA.3cH5 / 3-Axis S1*	UTEM-5 Survey at: AT5 For: NORONT LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613 Surv: 11/8/16 Red: 21/10/16 Plot: 21/10/16

Loop 2016-22 - all Chs - B_{LTZ}



Line: L5600EA Loop: 2016-22S1 Cpt: BL, BT, Bz L 313.0°	(Chn - Ch0) / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 1.78571Hz aLp2016-22S1_L5600EA.3cH5 / 3-Axis S1*	UTEM-5 Survey at: AT5 For: NORONT LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613 Surv: 10/8/16 Red: 21/10/16 Plot: 21/10/16

Loop 2016-22 - all Chs - B_{LTZ}

AT5 Grid

Loop 2016-22

BL/BT/Bz

~1.785Hz frequency

continuous norm

12Ch - Ch0 reduced

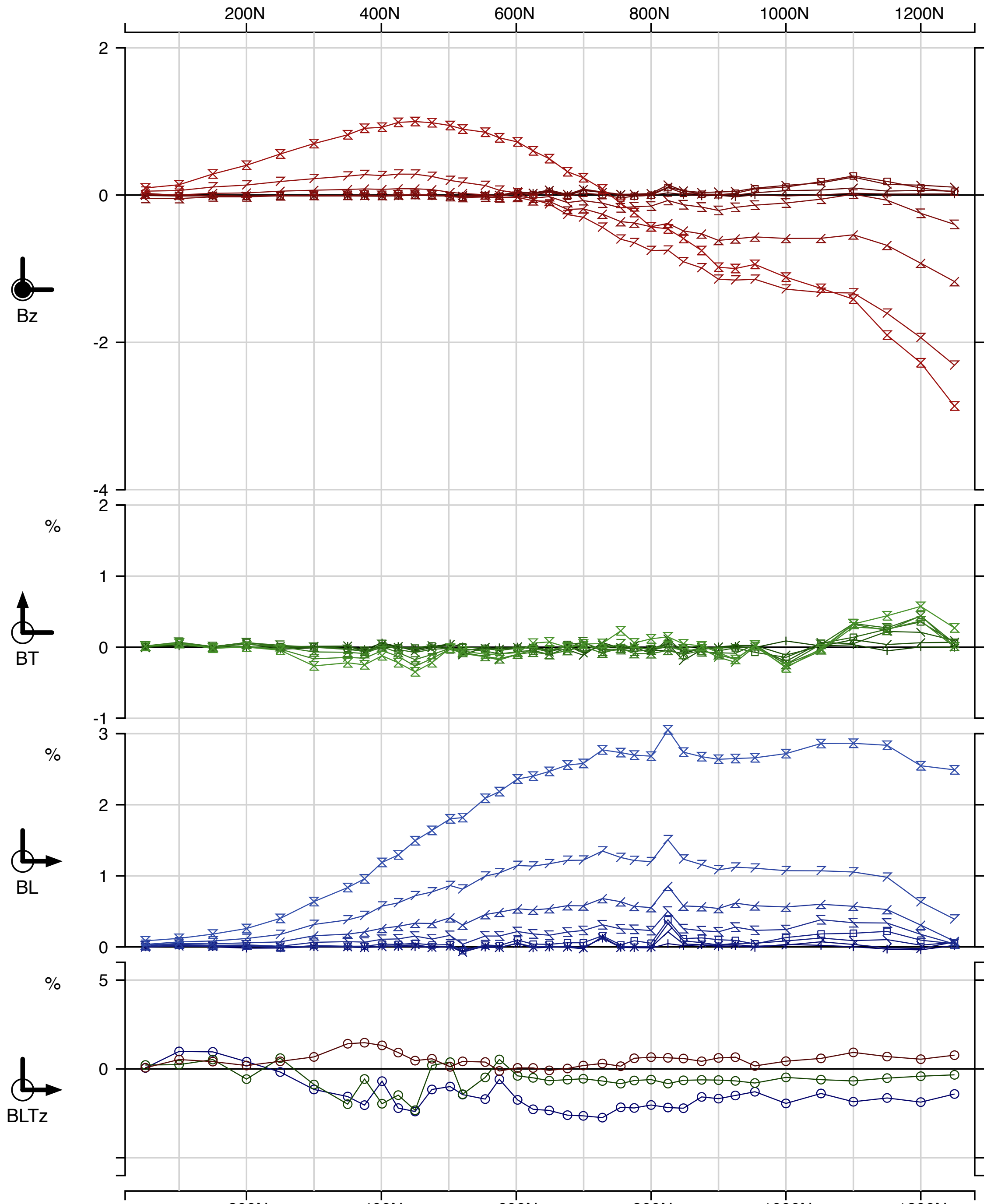
late Chs8-Ch0 plotted

Loop 2016-22 (@ **1.785714Hz**) off-loop - loop to the gridSouth

Line 5300E	50N - 1250N	1200m	BL/BT/Bz
Line 5400E	150S - 1250N	1400m	BL/BT/Bz
Line 5510E	50N - 1250N	1200m	BL/BT/Bz
Line 5600E	50N - 1250N	1200m	BL/BT/Bz

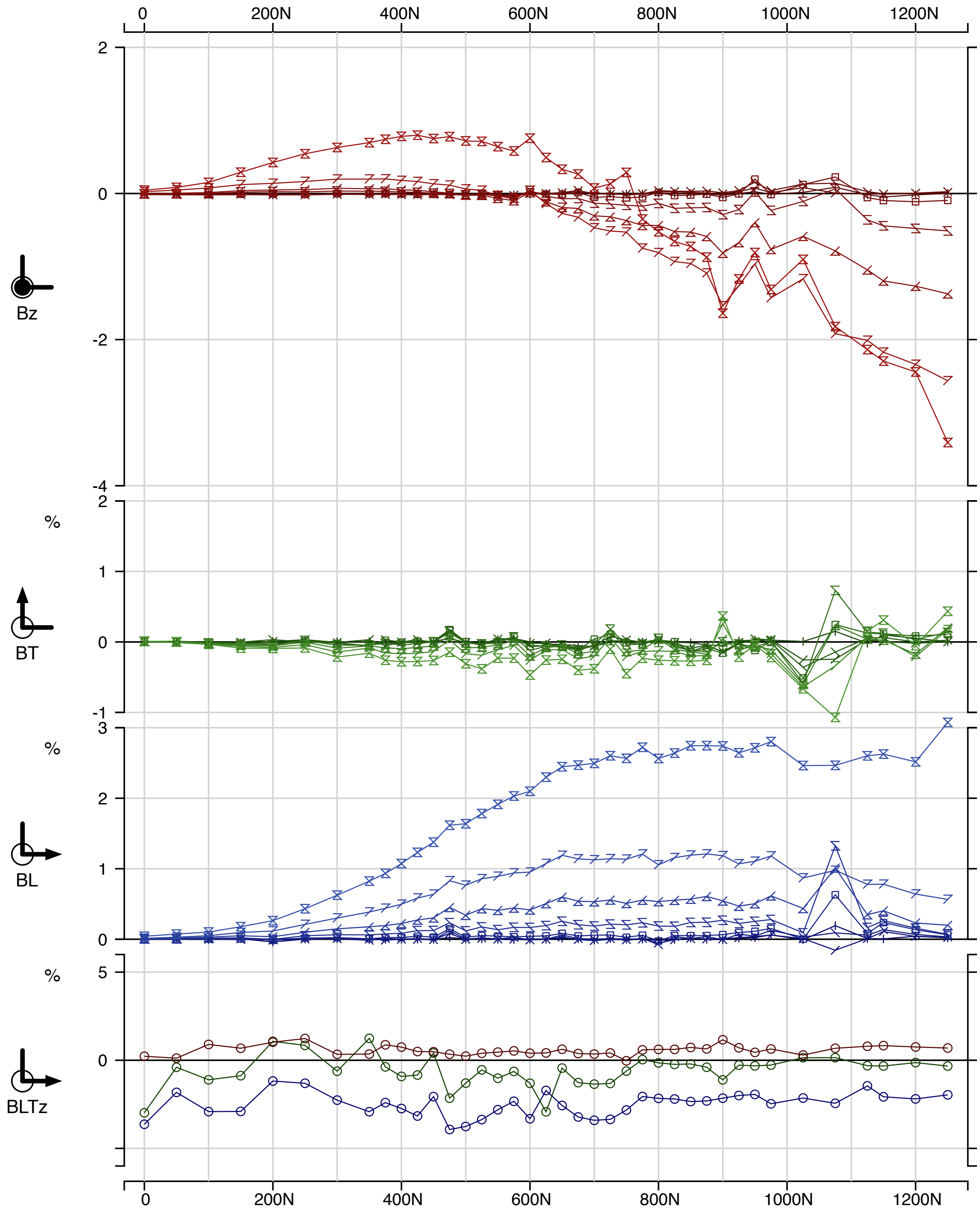
Loop 2016-22 - late Chs8-Ch0 - B_{LTZ}

pg 42



Line: L5300EA Loop: 2016-22S1 Cpt: BL, BT, Bz L 313.0°	(Chn - Ch0) / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 1.78571Hz aLp2016-22S1_L5300EA.3cH5 / 3-Axis S1 8late Chs	UTEM-5 Survey at: AT5 For: NORONT LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613 Surv: 12/8/16 Red: 21/10/16 Plot: 21/10/16

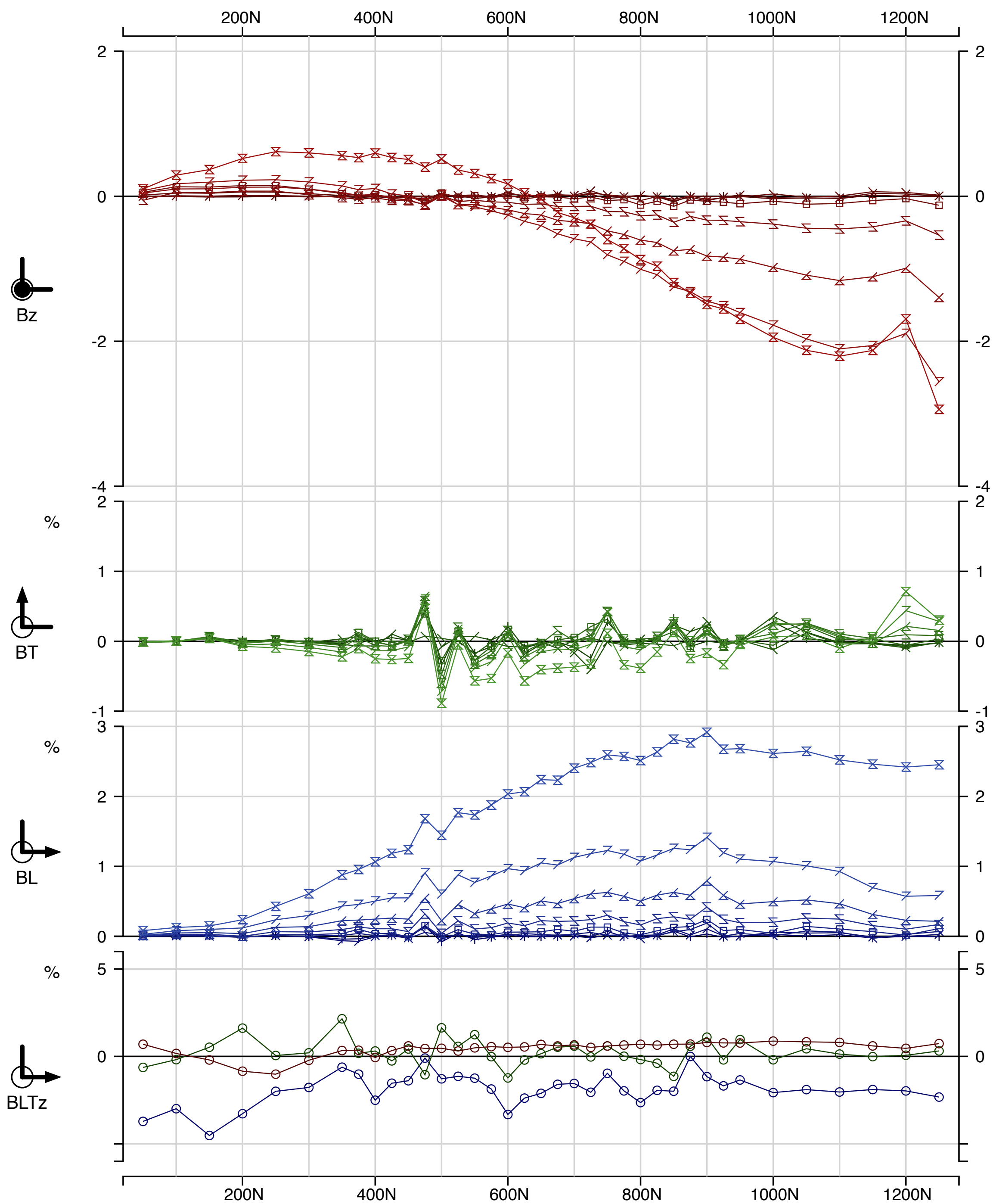
Loop 2016-22 - late Chs8-Ch0 - B_{LTZ}



Line: L5400EA Loop: 2016-22S1 Cpt: BL, BT, Bz L 313.0°	(Chn - Ch0) / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 1.78571Hz aLp2016-22S1_L5400EA.3cH5 / 3-Axis S1 8late Chs	UTEM-5 Survey at: AT5 For: NORONT LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613 Surv: 9/8/16 Red: 21/10/16 Plot: 21/10/16

Loop 2016-22 - late Chs8-Ch0 - B_{LTZ}

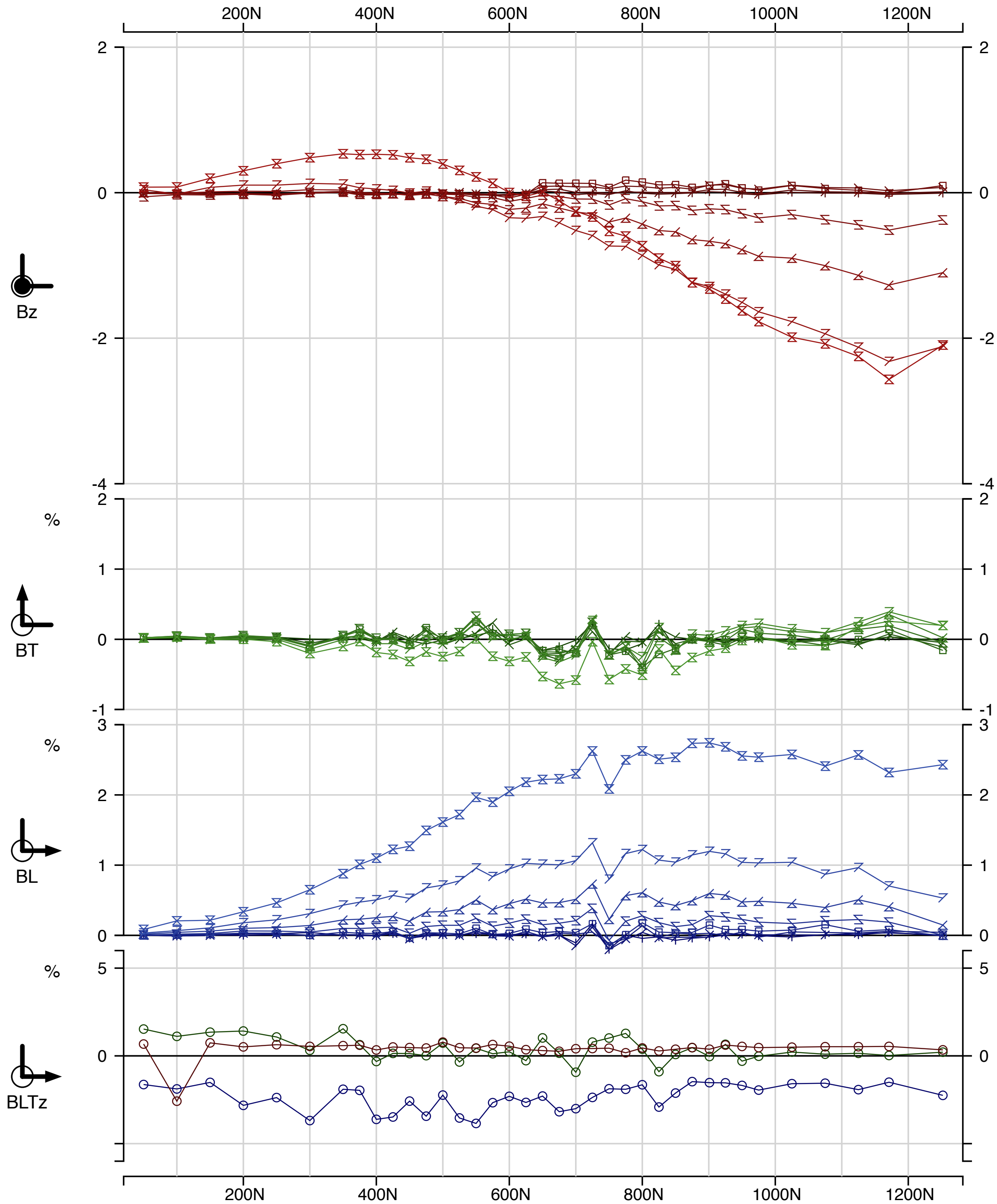
pg 44



Line: L5510EA Loop: 2016-22S1 Cpt: BL, BT, Bz L 313.0°	(Chn - Ch0) / |Bp| (%) Cont norm @ Δz: 0m Base Freq: 1.78571Hz aLp2016-22S1_L5510EA.3cH5 / 3-Axis S1 8late Chs	UTEM-5 Survey at: AT5 For: NORONT LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE Job 1613 Surv: 11/8/16 Red: 21/10/16 Plot: 21/10/16

Loop 2016-22 - late Chs8-Ch0 - B_{LTZ}

pg 45



Line: L5600EA
Loop: 2016-22S1
Cpt: BL, BT, Bz
L 313.0°

(Chn - Ch0) / |Bp| (%)
Cont norm @ Δz: 0m
Base Freq: 1.78571Hz
aLp2016-22S1_L5600EA.3cH5 / 3-Axis S1 8late Chs

UTEM-5 Survey at: AT5
For: NORONT

LAMONTAGNE GEOPHYSICS LTD GEOPHYSIQUE LTÉE
Job 1613
Surv: 10/8/16
Red: 21/10/16
Plot: 21/10/16

Loop 2016-22 - late Chs8-Ch0 - B_{LTZ}

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Appendix B

1613-4 Production Diary

BHUTEM4/UTEM5 Survey

AT5 Grid
Ring of Fire

for

Noront Resources Ltd.

Production Log 1613-4 BHUTEM4/UTEM5 Survey

BHUTEM4/UTEM5 Survey - AT5 Grid

Noront Resources Ltd.

Date	Rate - Production	Comments
September 18	Mob -	R.Lahaye loads the truck in the morning in Kingston and drives to Toronto to pick up P.Guimond. Continue to Sudbury. Crew: P.Guimond,R.Lahaye.
September 19	Mob -	Pick up G.Lafortune and more borehole gear in Sudbury and drive to Geraldton to overnight. Crew: P.Guimond,G.Lafortune,R.Lahaye.
September 20	Mob/L-3 -	Depart Nakina seaplane base at 08h30, arriving at Koper Lake at 10h00. After a brief safety orientation at noon, the crew unpacks the gear and heads out to the field @14h00 to lay approx. 3300m of wire on Loops 20 /21. Back in camp @17h45. Crew: P.Guimond,G.Lafortune,R.Lahaye.
September 21	L-3 -	G.Lafortune finishes laying the wire on Loop 20 and heads over to the drill site to check out the setup. Returns to camp to prepare the borehole gear. P.Guimond and R.Lahaye finish laying Loop 21 and the leads to the transmitter site. Return to camp to begin ferrying 4 loads of gear by Argo to the Tx site. By the end of the day the site is up and ready for surveying. Back in camp @17h00. Crew: P.Guimond,G.Lafortune,R.Lahaye.
September 22	1P-3 1115m	**Read: BH NOT-16-1G001** **Lp 20 0 - 1115m 2.500Hz** Dummy Hole NOT-16-1G001 to 1180m where a blockage is encountered. The original plan was to read the hole with two loops simultaneously but the transmitter for the southern off loop (Loop 21) had issues with the Open Loop Alarm that could not be resolved. Read the hole from the collar loop (Loop 20) only but at 1115m (45m from the bottom) the transmitter shut down and could not be restarted. After several hours of troubleshooting with no success it is decided that two replacement transmitters will be shipped up from Sudbury. Crew: P.Guimond,G.Lafortune,R.Lahaye.

September 23 L-3/D-3 - In the morning the crew walk the southern loop looking for possible causes for the Open Loop issues from the day before. This involves replacing or re-taping bad butt-connectors (dimes) and lifting the wire out of open water or wet ground to avoid possible current leakage through dimes. The replacement transmitters arrive in Nakina at 10h15 and at Koper Lake at 13h50. When the gear arrives in camp the two transmitters are slung out to the Tx site and the clocks in the control units are turned on (14h50). At 16h30 the clocks are sufficiently warmed up, the borehole probes are in place and the two transmitters are ready to be turned on. Unfortunately the Open Loop issues still plague Loop 21 and while attempting startup the Loop 21 transmitter malfunctions. With only 1 working transmitter in camp it is decided to stop surveying and return to camp to troubleshoot.

Crew: P.Guimond,G.Lafortune,R.Lahaye.

September 24 1P-3 1205m **Read: BH NOT-16-1G001**

Lp 21 0–1160m 3.750Hz
Lp 20 1115-1160m 2.500Hz

Out in the field by 07h30 to test all 4 transmitters on a dummy loop. Tx#4 and #10 are found to be down. Tested the southern loop with a 12v battery to check for continuity, everything checks out. Drive back to camp to discuss results with head office. Back to the tx site to start Tx#9 on the southern loop. Surveying underway by 12h40. At 15h35 the tx shuts off (Open Loop alarm and Oscillation alarm). Return to camp to troubleshoot with head office - possible overheating issues? Return to the tx site with an external fan to help cool the tx. Surveying back up at 18h00. Read Loop 21 to blockage (1160m), flip the loops and read Loop 20 on the way up to cover 45m missing from September 22. Back in camp @23h15.

Crew: P.Guimond,G.Lafortune,R.Lahaye.

September 25 L-3 - In preparation for the possibility of further borehole surveying, the southern loop is walked in order to replace all dimes. Approximately 1600m of wire is covered before a radio call is received informing the crew to return to camp. The crew is informed that further borehole surveying is suspended and all the loops should be picked up. The crew returns to the field to begin wire pickup. At 16h00 the crew is again called back to camp and informed that a UTEM5 surface survey is planned. Spent the rest of the day working out logistics.

Crew: P.Guimond,G.Lafortune,R.Lahaye.

September 26 S-3 - In the morning the borehole gear is brought back to camp and packed up. The rest of the day is spent editing wire for the surface loop (Loop 2016-22).

Crew: P.Guimond,G.Lafortune,R.Lahaye.

September 27 L-3 - Lay all of Loop 22 and pick up all the wire on Loop 21 that is not common with Loop 22. Pick up the south side of Loop 20. The tx site is dismantled and moved to a new location. Ferry the damaged transmitter and a generator back to camp.

Crew: P.Guimond,G.Lafortune,R.Lahaye.

September 28 L-3 - Pick up the remaining 3 sides of Loop 20 in the morning. Lay the leads for the new transmitter site and conduct a resistance to ground test to check for current leakage. Bill Dingwall arrives in camp at 12h30. Unpack the surface gear and start the clocks on the receivers. Head out to the tx site with Bill to test the transmitters on the new loop. Ferry two transmitters back to camp for repairs. One is ready by evening and the other will be bench-tested in the morning.

Crew: P.Guimond,G.Lafortune,R.Lahaye,B.Dingwall

September 29 P(2/1)-4 1400m Ferry the repaired transmitter to the field, set up the tx site and start the coils. The first part of the morning is spent collecting calibration data with both receivers at the wire. Surveying underway by 11h00. Back in camp @17h30. The survey crew is assisted by augering crew Steve Appel and Scott Mortson. B.Dingwall repairs Tx#10 in the evening.

AT5 **Loop 2016-22 S1 1.7857 Hz Tx8**

Line 54+00E	**1+50S**	**-**	**7+50N**	**R7P1**
Line 54+00E	**7+50S**	**-**	**12+50N**	**R1P3**

Crew: P.Guimond,G.Lafortune,R.Lahaye,B.Dingwall

September 30 P(2/1)-4 1450m Ferry the repaired transmitter #10 to the field for use as a backup, set up the tx site and start the coils. Surveying underway by 09h00. At 12h50 the generator goes down. Two men sent back to camp for a replacement. Upon starting the replacement generator, the transmitter fails to start up and the backup Tx#10 is put into service. Back to surveying by 13h35, completing L5600 at 17h20 . Everyone back in camp by 17h45. The survey crew is assisted by Steve and Scott today. Phil works solo on the northern parts of L5510 and L5600 near camp. Bill and Richard repair the generator in the evening (water in gas).

AT5 **Loop 2016-22 S1 1.7857 Hz Tx8, Tx10**

Line 55+10E	**10+00N - 12+50N**	**R1P3**
Line 56+00E	**9+50N - 12+50N**	**R1P3**
Line 56+00E	**0+50N - 9+50N**	**R7P1**

Crew: P.Guimond,G.Lafortune,R.Lahaye,B.Dingwall

October 01 P(2/1)-4 1425m Ferry the repaired generator to the field and return with the field generator which also has water in the gas tank. Surveying underway by 08h45. Shortly afterward Tx#8 goes down. Tx#10 is used as a replacement while Bill repairs Tx#8 in the field. Switch back to Tx#8 after repairs completed (1 hour). Complete surveying L5600 and Phil works solo on the north part of L5300. Everyone back in camp by 17h15. The survey crew is assisted by Steve and Scott today. Bill and Richard repair the generator in the evening (water in gas).

AT5 **Loop 2016-22 S1 1.7857Hz Tx8/Tx10**

Line 55+10E	**0+50N - 10+00N**	**R7P1**
Line 53+00E	**7+75N - 12+50N**	**R1P3**

Crew: P.Guimond,G.Lafortune,R.Lahaye,B.Dingwall

October 02 P(2/1)-4 725m Start up the coils and transmitter and finish surveying L5300E. Complete surveying by 13h00 and head back to camp to reduce and check the data and drop off the survey gear. Back to the field to pick up all of Loop 22. The tx site is dismantled and all the gear is transported back to camp. Everyone back in camp by 17h15. The survey crew is assisted by Steve and Scott today. Pack up the equipment for demob in the evening.

AT5 **Loop 2016-22 S1 1.7857 Hz Tx8**

Line 53+10E	**0+50N - 6+00N**	**R7P1**
Line 53+00E	**6+00N - 7+75N**	**R1P3**

Crew: P.Guimond,G.Lafortune,R.Lahaye,B.Dingwall

Date	Rate - Production	Comments
October 03	Demob	-Load up the baskets and slings with gear in preparation for transport to Koper Lake in the morning. A delay flying out due to fog in Nakina. Two flights are required to mobilize all the gear and crew to Nakina, the final flight arriving at 17h30. Overnight in Geraldton. Crew: P.Guimond,B.Dingwall,R.Lahaye,G.Lafortune.
October 04	Demob	-The crew proceeds to Sudbury, dropping off G.Lafortune and overnighting. Crew: P.Guimond,B.Dingwall,R.Lahaye,G.Lafortune.
October 05	Demob	-The crew remains in Sudbury for the day, working on another project. Crew: P.Guimond,B.Dingwall,R.Lahaye.
October 06	Demob	-B.Dingwall travels from Sudbury to Kingston, P.Guimond, Sudbury- Toronto, and R.Lahaye, Sudbury-Kingston-Montreal. Crew: P.Guimond,B.Dingwall,R.Lahaye.

LEGEND

P(n/n)-x	Surface Production	(# of Rx/Tx) - # of personnel
L(n/n)-x	Looping	(# of Rx/Tx) - # of personnel
AL(n/n)-x	Advance Looping	(# of Rx/Tx) - # of personnel
S(n/n)-x	Standby	(# of Rx/Tx) - # of personnel
D(n/n)-x	Down	(# of Rx/Tx) - # of personnel
n/c(n/n)-x	no charge	(# of Rx/Tx) - # of personnel

BHUTEM4 data collected:

BH NOT-16-1G001	2 loop coverage	2x1160m	Bw/Bs/Bn
UTEM5 data collected:	1 loop coverage	5000m	BL/BT/Bz

Appendix C

The UTEM SYSTEM
- UTEM 5 -

- Introduction to UTEM5 -

The UTEM System

UTEM Data Reduction and Plotting Conventions

Data Presentation

UTEM5

The UTEM5 system collects 3-component data from up to 3 transmitter loops - three coupling angles - simultaneously - translating to superior target definition and improved detection of all targets. In addition:

• UTEM5 precision is at least an order of magnitude better than the UTEM3 system. Our current estimate is that the UTEM5 surface coil precision will prove to be better by a factor of 10-40 times. Improved sensitivity equals better depth penetration. It also translates to significantly shorter stacking times or alternatively, better precision for the same stacking time. The improvement in precision is greater at lower frequencies (<4Hz).

• UTEM5 surface equipment has a greater advantage at low frequency - <4Hz. The UTEM5 technical advantage is greatest in the search for targets that are deeper and more highly-conductive when (very) large-loops (geometry of the applied field is simpler). UTEM5, however, will be found to be extremely useful in numerous other applications.

• Figure C1 shows the UTEM5 channels when 12Ch sampling is selected. Channels are spaced in a binary, geometric progression across each half-cycle of the received waveform - giving just over 3 channels per decade. Ch**12**, the earliest channel, is (~)1/2**12** of the half-cycle wide. Ch**1**, the latest channel, is (~)1/2**1** of the half-cycle wide. The use of UTEM4/5 Transmitters and UTEM5 Receivers allows for the implementation of:
- Ch0 - a narrow Ch later than Ch1. Making Ch0 normalization an option.
- 3 timing channels - Ch13/14/15 (Figure C1) for 12Ch UTEM5 The timing Chs improve the operator’s ability to monitor Rx/Tx(s) synchronisation and allow for more precise phase correction/improved deconvolution.

• the UTEM5 rejection of non-survey frequencies including powerline noise is far superior to previous UTEM systems. One of the many features of the UTEM5 system that add up to the improved rejection is the option of tapered channel sampling (Figure C1).

The ability to simultaneously collect higher-precision, 3-component data from multiple transmitters (coupling angles) at low frequency is really what the UTEM5 system is designed for - to be efficient and precise. To date UTEM5 surveys using multiple transmitters operating at base frequencies as low as 0.25Hz have confirmed that both the sensitivity of the system and the rejection of non-survey frequencies (powerline noise etc.) is far superior to previous UTEM systems.

In terms of BH operations, UTEM5 Rx coupled with our existing BHUTEM4 system allows for the collection of 3-component data from multiple transmitters simultaneously. The precision improvement may not be that noticeable near surface - in high field strengths. But at depth - low field strength - we estimate up to a factor of 5 improvement in precision. That improvement, and the multiple transmitter option, will add up to a considerable increase in the ability to resolve deep, highly-conductive targets - allowing for the detection of smaller targets and targets more distant from the hole.

The UTEM SYSTEM

UTEM uses a large, fixed, horizontal transmitter loop as its source. Loops range in size from 300x300m to 4000x4000m and larger. Smaller loops are generally used over conductive terrain or for shallow sounding work. Larger loops are used over resistive terrain or where the ability of the system to resolve a response can be aided by the simpler geometry of the applied field. The UTEM receiver(s)/ transmitter(s) are typically synchronised at the beginning of a survey day and the Rx(s) operates remotely after that point. The Rx/Tx clocks are sufficiently accurate to maintain synchronisation.

Measurements are routinely taken to a distance of twice the loop dimensions and can be continued further depending on the local noise levels. Lines are typically surveyed:

- off-loop: out from an edge of the loop when the target is steeply dipping.
- inside-the-loop: when the target is ~flat-lying

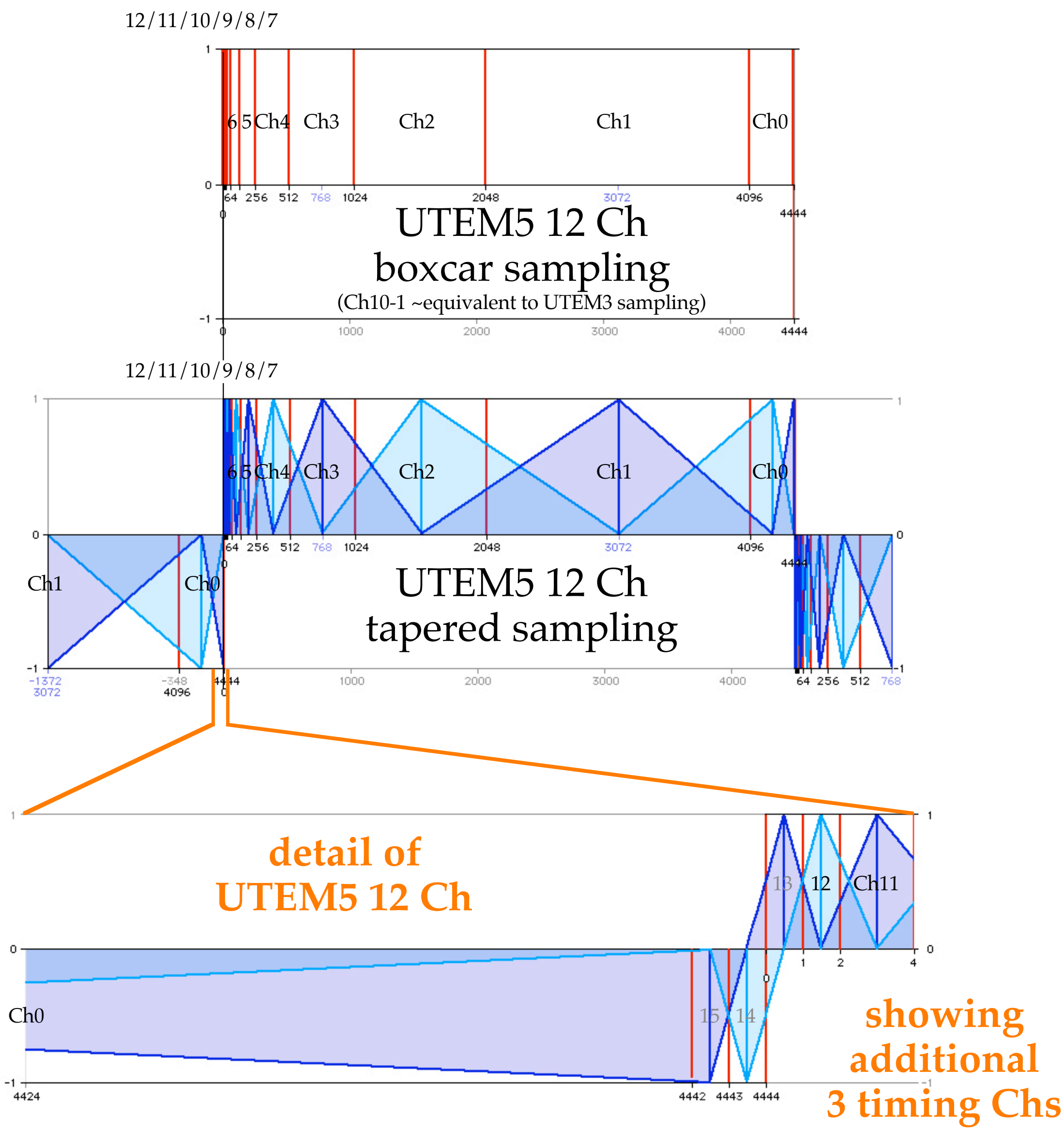
BHUTEM4 - the borehole version of UTEM - surveys have been carried out to depths up to 3000+ metres.

System Waveform

A UTEM transmitter passes a low-frequency current of a precisely regulated triangular waveform through the transmitter loop. The frequency can be set to any value within the operating range of the transmitter. A target frequency for each UTEM transmitter and the local powerline frequency are entered. The actual frequencies used are selected to be as close to the target frequencies as possible while optimising rejection of the other transmitters and powerline noise (60 Hz in North America/generally 50Hz elsewhere). Since the receiver coils responds to the time derivative of the magnetic field, the UTEM system really "sees" the step response of the ground. UTEM is the only time domain system which measures the step response of the ground. All other TDEM systems to date transmit a modified step current and "see" the (im)pulse response of the ground at the receiver. In practice, the UTEM waveform is filtered - pre-whitened - to optimize signal-to-noise. Deconvolution techniques produce the equivalent to the conceptual “step response” at the receiver.

System Sampling

The UTEM receiver measures the time variation of the magnetic field in the direction of the receiver coil at (typically) channels or delay times. UTEM channels are spaced in a binary, geometric progression across each half-cycle of the received waveform. Channel **12 (or Ch10)** is the earliest channel and it is $1/2^{12}$ of the half-cycle wide. Channel **1**, the latest channel, is $1/2^{1}$ of the half-cycle wide (see UTEM3 10Ch figure below and Figure C1). The measurements obtained for each of channels are accumulated over many half-cycles. The final channel value stored is the average of the measurements. The number of half-cycles averaged depends on the signal strength and the ambient noise.



Notes:
- boxcar sampling equivalent to UTEM3 sampling
- tapered sampling: improved powerline rejection
- the use of UTEM4/5 Transmitters and UTEM5 Receivers improves syncing/timing and allows for the implementation of:
  - Ch0 - a narrow Ch after (later than) Ch1.
    - Ch0 normalization is an option
  - 3 timing channels - Ch13/14/15 shown for 12Ch UTEM5
    - improved ability to monitor Rx/Tx(s) synchronisation.
    - improved deconvolution/phase correction.

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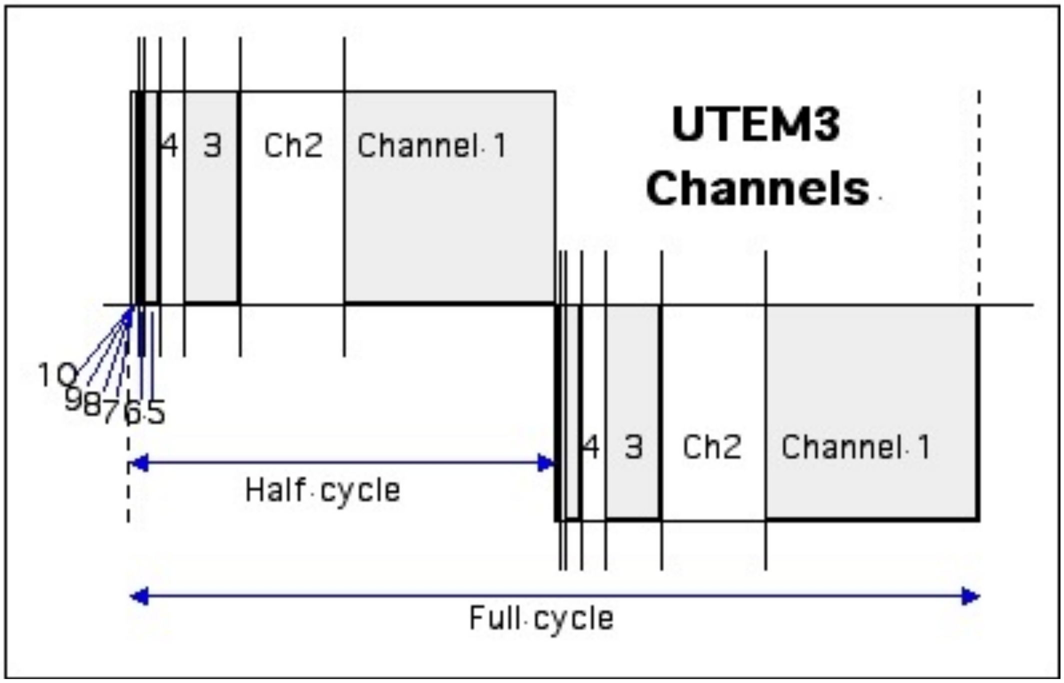
UTEM5 12Ch Sampling
boxcar/tapered options

Figure C1



System Configurations

During a surface UTEM5 survey the 3-component receiver coil is oriented along the survey line and the coil orientation is determined from the data from a set of three orthogonal accelerometers in the coil in combination with the GPS coordinates of the line. The 3 measured (raw) components of the magnetic field - uvw - are oriented and resolved into:

- u the horizontal transverse component BT(ransverse) ~UTEM3 Hy
- v the vertical component Bz ~UTEM3 Hz
- w the horizontal in-line component BL(ine) ~UTEM3 Hx

Note: the UTEM System is also capable of measuring the electric field. The two horizontal components,Ex and Ey can be measured using a dipole sensor comprised of two electrodes. E-field measurements are useful for outlining resistive features to which the magnetic field is not very sensitive.

BHUTEM4 surveys employ a 3-component receiver coil - longer and smaller in diameter than the surface coil. The borehole receiver coil forms part of a down-hole receiver package used to measure the axial (along-borehole) and the two transverse components of the magnetic field. Due to the distance between coil and receiver in borehole surveys the signal must be transmitted up to the receiver. In BHUTEM4 the signal is transmitted to surface digitally using a kevlar-reinforced fibre-optic cable as a data link. Using a fibre-optic link avoids signal degradation problems and allows surveying of boreholes to 3000+m. The cable is also very light - the specific gravity is ~1.0 - making the cable handling hardware quite portable.

The EM Induction Process

Any time-varying transmitted ("primary") field induces current flow in conductive regions of the ground below and around the transmitter loop (i.e. in the earth or "half-space"). This current flow produces a measurable EM field, the secondary field, which has an inherent "inertia" that resists the change in primary field direction. This “inertial” effect is called self-inductance; it limits the rate at which current can change and is only dependent on the shape and size of a conductive path.

It takes a certain amount of time for the transmitted current flow to be redirected (reversed) and re-established to full amplitude after the rate-of-change of the primary field reverses direction. This measurable reversal time is characteristic for a given conductor. In general, for a good conductor this time is greater than that of a poor conductor. This is because in a good conductor the terminal current level is greater, whereas its rate of change is limited by the inductance of the current path. The time-varying current causes an EMF in the sensor proportional to the time derivative of the current. This EMF decays with time - it vanishes when the reversal is complete - and the characteristic time of the EMF decay as measured by the sensor is referred to as the **decay time** of the conductor.

The large-scale current which is induced in the half-space by the primary field produces the half-space response as seen in typical UTEM profiles. This background response is influenced by the finite conductivity of the surrounding rock. Other currents may be induced in locally more conductive zones (conductors) that have longer decay times than the half-space response. The responses of these conductors are superimposed upon the background response. The result is that the UTEM receiver detects:

- the primary field waveform, a square-wave
- the half-space (background) response of the surrounding rock
- a slight-to-large response due to any conductors present.

The result is that in the presence of conductors the primary field waveform is substantially (and anomalously) distorted.

UTEM DATA REDUCTION and PLOTTING CONVENTIONS

The UTEM data as it appears in the data files is in total field form in nanoTesla (nT). These are total field values - the UTEM system measures during the "on-time" and as such samples both the primary and secondary fields.

For plotting purposes, the magnetic field data are transformed to other formats as required. The following is provided as a description of the various plotting formats used for the display of UTEM data. A plot format is defined by choices of choice of the *normalization* and *field type* parameters selected for display.

PLOT FORMATS

UTEM results can be expressed as a % of a normalizing field at some point in space. In **continuously normalized** form the normalizing factor (the denominator) is the magnitude of the computed local primary field vector. As the primary exciting field magnitude diminishes with increasing distance from the transmitter loop the response is continuously amplified as a function of offset from the loop. Although this type of normalization considerably distorts the response shape, it permits anomalies to be easily identified at a wide range of distances from the loop.

Note: An optional form of continuous normalization permits the interpreter to normalize the response to the magnitude of the primary field vector at a fixed depth below each station. This is useful for surface profiles which come very close to the loop. Without this adjustment option, the normalizing field is so strong near the loop that the secondary effects become too small in the presence of such a large primary component. In such circumstances interpretation is difficult, however; by "normalizing at some depth" the size of the normalizing field, near the loop in particular, is reduced and the resulting profile can be more effectively interpreted to a very close distance from the transmitter wire. The usual choice for the depth is the estimated target depth.

In **Absolute** profiles the data is presented in picoTesla (pT). Data presented in this format show the non-distorted shape of the field profiles. Unfortunately, the very large range in magnitude of anomalies both near and far from the loop means that small anomalies, particularly those far from the loop, may be overlooked on this type of plot in favour of presenting larger amplitude anomalies.
Note: Selecting the correct plot scales is critical to the recognition of conductors over the entire length of a Absolute profile. This presentation is often used for interpretation where an analysis of the shape of a specific anomaly is required. Absolute profiles are therefore plotted selectively as required during interpretation. An exception to this procedure occurs where surface data has been collected entirely inside a transmitter loop. The primary field does not vary greatly inside the loop, therefore, the benefits of continuous normalization are not required in the display of such results.

FIELD TYPE

The type of field may be either the **Total field** or the **Secondary field.** In general, it is the secondary field that is most useful for the recognition and interpretation of discrete conductors.

UTEM Results as Secondary Fields

Because the UTEM system measures during the transmitter on-time the determination of the secondary field requires that an estimate of the primary signal be subtracted from the observations. Two estimates of the primary signal are available:

1) UTEM Channel 0

One estimate of the primary signal is the value of the latest time channel observed by the UTEM System, Channel 0. When Channel 0 is subtracted from the UTEM data the resulting data display is termed ***Channel 0 Reduced***. This reduction formula is used in situations where it can be assumed that all responses from any target bodies have decayed away by the latest time channel sampled. The Channel 0 value is then a reasonable estimate of the primary signal present during Channels 1....10/12.

In practice the ***Channel 0 Reduced*** form is most useful when the secondary response is very small at the latest delay time. In these cases Channel 0 is indeed a good estimate of the primary field and using it avoids problems due to geometric errors or transmitter loop current/system sensitivity errors.

2) Calculated primary field

An alternate estimate of the primary field is obtained by computing the primary field from the known locations of the transmitter loop and the receiver stations. When the computed primary field is subtracted from the UTEM data the resulting data display is termed ***Primary Field Reduced***.

The calculated primary field will be in error if the geometry is in error - mislocation of the survey stations or the loop vertices - or if the transmitter loop current/system sensitivity is in error. Mislocation errors from loop/station geometry may give rise to very large secondary field errors depending on the accuracy of the loop and station location method used. Transmitter loop current/system sensitivity error is rarely greater than 2%. ***Primary Field Reduced*** is plotted in situations where a large Channel 0 response is observed. In this case the assumption that the Channel 0 value is a reasonable estimate of the primary field effect is not valid.

Note: for UTEM data profiles plotted in ***Channel 0 Reduced*** form the secondary field data for Ch0 itself are always presented in ***Primary Field Reduced*** form and are plotted on a separate axis. This plotting format serves to show any long time-constant responses, magnetostatic anomalies and/or geometric errors present in the data.

Mathematical Formulations

In the following expressions:

Rnj is the result plotted for the nth UTEM channel,
R1j is the result plotted for the latest-time UTEM channel, Channel 0,
Chnj is the raw component sensor value for the nth channel at station j,
Ch1j is the raw component sensor value for Channel 0 at station j,
BPj is the computed primary field component in the sensor direction
|BP| is the magnitude of the computed primary field at:
- a fixed station for the entire line (point normalized data)
- the local station of observation (continuously normalized data)
- a fixed depth below the station (continuously normalized at a depth).

Channel 0 Reduced Secondary Fields : Here, the latest time channel, Ch0 is used as an "estimate" of the primary signal and other channels are expressed as:

$$Rnj = (Chnj - Ch1j) / |BP| \times 100\%$$

Ch0 itself is reduced by subtracting a calculation of the primary field observed in the direction of the coil, **BP** as follows:

$$R1j = (Ch1j - BPj) / |BP| \times 100\%$$

Primary Field Reduced Secondary Fields **:** In this form all channels are reduced according to the equation used for Ch0 above:

$$Rnj = (Chnj - BPj) / |BP| \times 100\%$$

This type of reduction is most often used in cases where very good geometric control is available (leading to low error in the calculated primary field, **BPj**) and where very slowly decaying responses result in significant secondary field effects remaining in Ch0 observations.

UTEM Results as a Total Field

In certain cases results are presented as a % of the **Total Field**. This display is particularly useful, in borehole surveys where the probe may actually pass through a very good conductor. In these cases the shielding effect of the conductor will cause the observed (total) field to become very small below the intersection point. This nullification due to shielding effects on the total field is much easier to see on a separate ***Total Field*** plot. In cases where the amplitude of the anomalies relative to the primary field is small, suggesting the presence of poorly conductive bodies, the ***Total Field*** plot is less useful.

The data contained in the UTEM reduced data files is in ***Total Field***, continuously normalized form if:

$$Rnj = Chnj / |BP| \times 100\%$$

DATA PRESENTATION

All UTEM5 survey results are presented as profiles in an appendix of this report. For BHUTEM4 surveys the requisite Vectorplots, presented as plan and section views showing the direction and magnitude of the calculated primary field vectors for each transmitter loop, are presented in a separate appendix.

The symbols used to identify the channels on all plots (Appendix A) as well as the mean delay time for each channel (3.750Hz/12Ch) is shown in the following table (for details of frequencies used in this survey see figures in the report):

off loop		frequency	**3.750000**	Hz
		period	0.266667	s
(5MHz clock)		half period	666666	0.2µs cycles
(narrowest Ch=1unit)		XNP	**4444**	/halfperiod
		width of unit channel	3.00030E-05	s
		width of unit channel	30.0030	µs
(symbol) channel		peak of tapered Ch (µs)	tapered Ch begins - unit -	tapered Ch ends - unit -
timing Ch13	⅄	15.00	-0.5	1.5
12	✗	45.00	0.5	3
11	+	90.01	1.5	6
10	Φ	180.02	3	12
9	⅄	360.04	6	24
8	⧗	720.07	12	48
7	↗	1440.14	24	96
6	∡	2880.29	48	192
5	Σ	5760.58	96	384
4	□	11521.15	192	768
3	＼	23042.30	384	1536
2	／	46084.61	768	3072
1	|	92169.22	1536	4269
0	○	128082.81	3072	4442.5
timing Ch15	☰	133288.33	4269	4443.5
timing Ch14	⊟	133318.33	4442.5	4444+0.5

Note: With UTEM5 the number of Channels is routinely expanded to 12Chs (+Ch0) - from the standard UTM 10Ch sampling. There are tradeoffs involved in measuring additional earlier-time Chs - stacking time can be greatly increased by adding too many narrow(er) Chs. That said, when operating at a frequency of ~4Hz or lower, 2 Chs can be added without incurring significant penalty. 12Ch (+Ch0) sampling @4Hz brings the earliest delay time (Ch12) to 47.08μs - the equivalent of the earliest delay time when operating @15Hz with 10Ch sampling.

Notes on Standard plotting formats:

<u>Channel 0 Reduced</u> <u>form</u> - The data are typically displayed on three separate axes. This permits scale expansion and allows for the accurate determination of signal decay rates. The standard configuration is:

Top axis - early time channels and a repeat of the latest channel from the centre axis for comparison are plotted at a reduced scale.

Centre axis - intermediate-to-late-time channels are plotted on the centre axis using a suitable scale.

Bottom axis -the latest time channel (Ch0) is plotted alone in ***Primary Field Reduced*** form using the same scale as the centre axis.

<u>UTEM data in</u> ***<u>Primary Field Reduced</u>*** <u>form</u>:

All channels are displayed on a single axis. Typically they are plotted using peak-to-peak scale values of up to -200% - 200%.

<u>BHUTEM4 data plotted as total field profiles</u>:

The 3 components are expressed directly as a percentage of the ***Total Field***. Each three-axis data plot shows peak values of up to 100%.
Note: the measured total field value is plotted as a polarity-reference tool.

<u>BHUTEM4 data plotted as secondary field profiles</u>:

Check the title block of the plot to determine if the data is in:
Channel 0 Reduced form or in ***Primary Field Reduced*** form.
Note: the measured total field value is plotted as a polarity-reference tool.

Appendix D

The
BHUTEM4 SYSTEM

Data Reduction and Plotting Conventions

Data Presentation

INTRODUCTION

The BHUTEM4 downhole system is a three-axis downhole transient EM system which incorporates a low-noise coincident three-axis coil design, fully digital down the hole encoding and a fibre-optic probe-to-surface data link. The system allows three components of the transient magnetic field to be simultaneously averaged and stored. Probe orientation within the hole is monitored by integrated 3-axis magnetometer and 3-axis accelerometer devices. Temperature measurements taken to correct the accelerometer package can also be used to detect the thermal signature of ore bodies.

Waveform and Sampling

The UTEM transmitter passes a low-frequency (~1 Hz to 90 Hz) current of a precisely regulated waveform through the transmitter loop. The frequency may be set to any value within the operating range of the transmitter, but is usually set at 31 Hz so as to minimize power line effects (60 Hz noise). Lower base frequencies are used to survey highly conductive bodies with time constants much larger than the 16ms half-cycle.

Since the receiver coil responds to the time derivative of this magnetic field, it is said that the system really "sees" the step response of the ground. In practice, the transmitted waveform is tailored to optimize signal to noise and deconvolution techniques are employed within the system to produce an equivalent to this conceptual “step response” at the receiver. UTEM is the only time domain system which measures the step response of the ground. All other T.D.E.M. systems, to date, transmit a modified step current so that they "see" the (im)pulse response of the ground at the receiver.

The channel time gates as described in - Appendix C: The UTEM System - are programmable.

Probe Orientation

Because the probe is rotating freely in the hole the raw transverse components must be “rotated” to point in a consistent direction along the hole. The rotation process is a mathematical one which is performed after the data are collected but which requires a knowledge of the actual orientation of the probe in the hole at each station. The determination of the probe orientation is achieved using two independent tools; a three-axis magnetometer and a 3-axis accelerometer. Data from these devices are collected before each EM stack. In ideal situations, such as an inclined hole directed well away from magnetic north and away from large magnetic anomalies, either tool is capable of precise orientation of the probe. In a near vertical hole, the accelerometer becomes incapable of determining the probe orientation, while in a hole directed along the earth’s magnetic field, the same is true for the magnetometer. The data reduction software uses the best combination of the estimates derived by these two devices.

Coordinate Systems

The three observed components of the transient magnetic field are designated as Bu, Bv and Bw with: Bw being the axial component pointing down the hole and Bu and Bv oriented in a right-handed system with respect to Bw. The coordinate systems used to orient these transverse three-axis data are based on the concept of a drill section. The drill section is a vertical plane perpendicular to the geological strike and is in general the plane in which inclined holes would be drilled. It is specified by the drill section azimuth which is the azimuth of the positive coordinate direction within the plane. For instance, for a north-south section plane the drill section azimuth would be zero (due north) while for an east west section plane, it would be 090 (east). Usually a section azimuth is adopted for an entire survey area, even if the actual azimuths of individual holes are slightly different. Once the section is determined by the section azimuth, the out-of-section direction is 90 degrees clockwise from the section azimuth as seen in plan.

UTEM 4 data are presented in one of two coordinate systems. The coordinate system used is identified by the notation used for the components.

Hole based coordinate system

This is the most commonly used system. In this system the components are designated as Bs, Bn and Bw. Bw, the axial component is independent of the orientation of the probe in the hole. The Bn component lies on the plane perpendicular to the section plane. Bs lies as close as possible to the designated drill section plane while being perpendicular to the other two components.
Note: that Bs and the designated drill section plane are coincident only if the local hole azimuth is exactly the same as the designated section azimuth.

The hole based coordinate system is useful for several reasons. It is easiest to interpret the orientation of a conductive body relative to the trajectory of the hole, rather than in absolute terms. In this respect a hole-relative coordinate system is much easier to use. A second important reason is that the axial component has a substantially higher signal/noise than the transverse components. In the hole based system, the axial component is plotted as is and is not required to be combined with the transverse components.

Cartesian coordinate system

This is not a standard presentation. It may, however, be useful from time-to-time to present the data in the Cartesian system. In this system the BS component is in the section direction, the BN component is in the out of section direction, and the BZ direction is down. Note that in the Cartesian system, except in a vertical hole, every component is a linear combination of the three raw observed components.

Figures D1 and D2 show the main features of the geometry conventions and terminology used. In Figure D1 the transient field vector is designated as Btr, which is resolved into the axial, Bw, and the transverse, Btr, components. The transverse Btr is resolved into the Bs and Bn components where: Bn lies in the plane perpendicular to the designated drill section clockwise from Bs as seen in plan and Bs is perpendicular to both Bn and Bw Note that the drill hole itself does not lie in the designated drill section. Because of this the Bs component will not be exactly in the designated drill section in this example. The designated drill section itself is specified by the section azimuth, measured clockwise from geographic north.
Figure D2 shows the relationship of the hole geometry to the magnetic and gravitational fields used for orienting the probe. The magnetometer and accelerometer are both resolved into axial (Aw,Mw) and transverse (Atr,Mtr) components. For each device, it is the resolution of the computed transverse field direction with the two observed transverse signals which determines the probe orientation. The precision of orientation is greatest when the transverse field is a large component of the total.

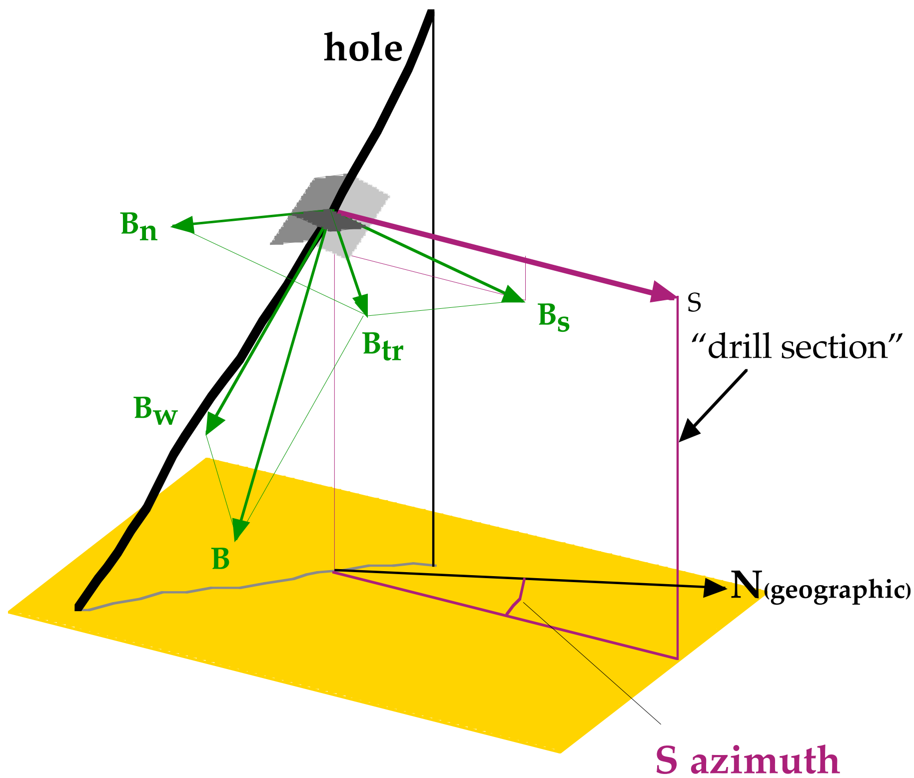
Orientation Device Selection

The factors which limit the precision of the magnetometer and accelerometer devices as orientation tools are:

Magnetometer	Accelerometer
magnetic anomalies	gravitational anomalies (insignificant)
errors in magnetic declination/inclination	orientation of gravitation field is precisely known
errors in surveyed azimuth/dip of hole	errors in surveyed azimuth/dip of hole
no significant temperature dependence	temperature calibration of accelerometer incorrect
magnetic tensor calibration	accelerometer tensor calibration

While these factors cannot be tracked individually on a routine basis, the total transverse magnetic and gravitational fields are independent of the rotation of the probe in the hole and they can be compared to their predicted values. The discrepancy between these is a measure of the “error” of the device as far as its use as an orientation tool and it forms a basis for the orientation tradeoff parameter, a. This is a parameter which varies from +1.0 for pure magnetometer, to -1.0 for pure accelerometer. In between, a linear weighted average between the probe orientations as determined by the mag and accelerometer is used.

BH UTEM ORIENTED COMPONENTS B_W, B_S, B_n



S(ection) azimuth: +ve clockwise from geographical north

Note:

STANDARD VIEW on a plotted Profile:

S to right of page
N towards observer
W axial down

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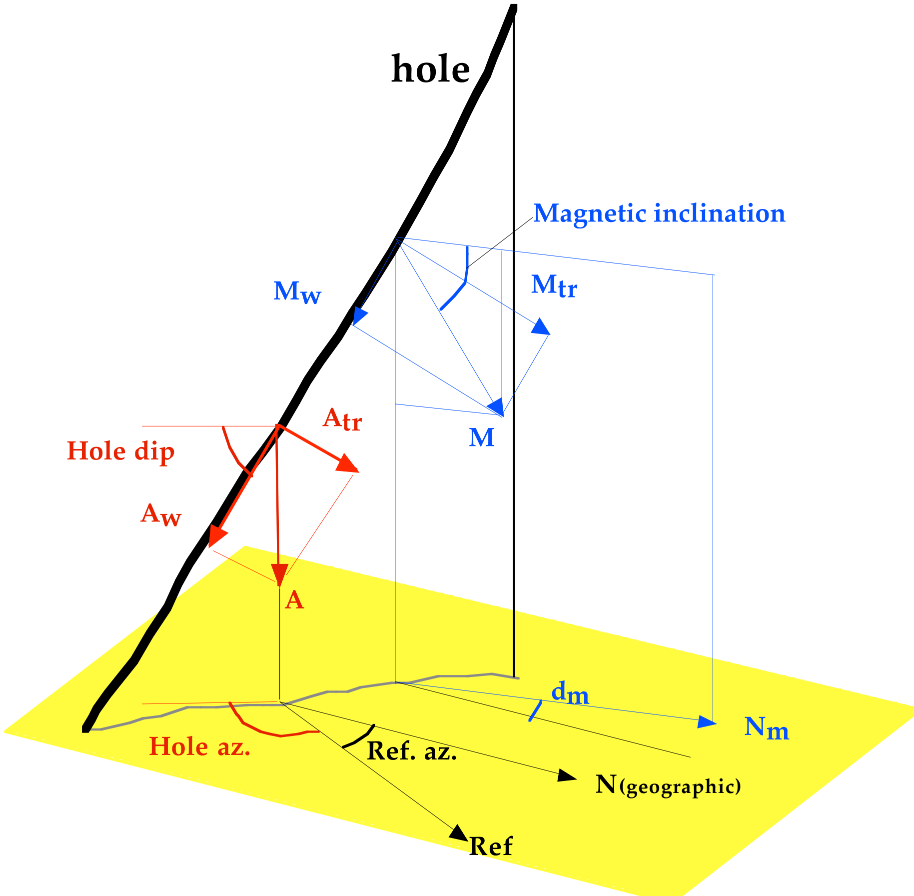
BHUTEM4 System
Oriented Components
Bw Bs Bn

Figure D1

HOLE GEOMETRY ANGLES



Ref. azimuth
d_m (magn. decl.) } +ve clockwise from geographical north

Hole dip
Magn. incl. } -ve down from horizontal

Hole azimuth +ve clockwise from Ref (reference direction)

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BHUTEM4 System
Hole Geometry Angles

Figure D2

Data Reduction

The kind of reduction applied to the raw data is indicated on each plot in the second field of the title block. The observed UTEM data represents a sum of the signal directly from the transmitter loop (Primary field) and the field resulting from eddy currents induced in conductive bodies and/or a conductive host rock (Secondary field). In the case of a Total Field plot the observed data are simply expressed as a percentage of a normalizing field which is either the primary field magnitude at a fixed point in space (Point Normalization) or the primary field magnitude at each station (Continuous Normalization). The Secondary Field is of most interest from an interpretive point of view. As such an estimate of the primary field must be determined and subtracted from the data. There are two ways in which this is done (see also Appendix C:: The UTEM System):

Primary Field Reduction:
The computed primary field is subtracted from all channels. This is designated by the formula (Chn-Bpc)/(|Bp|) in the title block of the plot.

Channel 0 Reduction:
The computed primary field is subtracted from Channel 0 the latest Channel measured. For all earlier channels, Channel 0 is subtracted as an estimate of the primary field. This is designated by the formula (Chn-Ch0)/(|Bp|) in the title block of the plot.
As in the Total field case, the |Bp| primary field magnitude in the denominator is either evaluated at a fixed point in space (Point Normalization) or at each station (Continuous Normalization).

BHUTEM4 Plots

The UTEM 4 3-axis data are usually presented as a set of five profile plots for each hole and loop surveyed. The data are plotted as a function of the distance down the hole. The depth axes are always labelled in metres but are also labelled in feet on imperial grids. Each axis which displays EM data indicates the component according to the conventions discussed above (Bs, Bn, Bw). As well, the component is indicated graphically by the direction of the arrow in the small coordinate axis system plotted at the end of each axis. To understand this system, consider that the plot is oriented with the axis down, that the section plane is the plane of the paper and that the section direction is to the right. The out of section component is then out of the page. The value of the geographic section azimuth is indicated in the second field of the title block of each of the plots along with the type of reduction and normalization. All plots include as well a profile on the lowest axis which shows the orientation tradeoff parameter used to derive the probe orientation.

In addition to the profile plots two vector lots - showing the orientation/field strength of the primary field - are included for each Borehole/Transmitter Loop combination surveyed:
Map View vector plot: overhead view at the ~depth of interest
Section vector plot: vertical section ~@ the section azimuth.

Standard BHUTEM4 Plot Suite

The plot set is comprised of five profile plots and two vector plots for each hole/ transmitter loop combination surveyed:

3 plots of Ch0 reduced secondary field:
One plot for each for components: Bw, Bs, Bn and Bw.
The tradeoff between mag and acc orientation is shown on the left.

These 3 plots have the early-, intermediate- and latest-time channels on separate axes. The computed primary field in the direction of the component is also plotted as a solid curve on the axis with the early-time channels.

1 total field plot:
With all channels of each of the three components on a different axis.
Each axis includes a plot of the primary field as a solid curve. In most cases the Ch0 profile follows the primary field curve of each of the components indicating that the basic geometry of the hole relative to the loop is correct. This may not be true, however in very conductive environments where a large response may persist in Ch0.

1 plot comprised of magnetometer/accelerometer/temperature data/tradeoff
- magnetometer data on the right (top) axis
- accelerometer data on the right middle axis

For the mag plots, 4 curves are presented. In red, the expected axial (no symbol) and observed axial (symbol W) and in black the expected total transverse (no symbol) and observed total transverse (symbol R) are plotted.
For the acc plots, 2 curves are presented. In black the expected total transverse (no symbol) and observed total transverse (symbol R) are plotted.
Discrepancies between the expected and the observed total transverse mag and accelerometer components can point to a number of problems including: incorrect hole dip, incorrect hole azimuth, poor mag/acc device calibration, magnetic anomalies and incorrect magnetic declination and/or inclination.

- temperature data on the left middle axis

The raw temperature profile taken down the hole is dominated by the geothermal gradient of about 18°C per kilometre of depth. Superimposed on this are small amplitude anomalies which may be beneficial in locating thermally conductive dipping ore bodies. The curve that is plotted is the residual temperature after the removal of a best fitting polynomial. The order of the polynomial used in indicated in the axis label of the plot.

- the tradeoff between mag and acc orientation is shown on the left (lower) axis.

Probe orientation is a tradeoff between mag and accelerometer data.

2 Vector plots
- Map View vector plot: overhead view at the ~depth of interest
- Section vector plot: vertical section ~@ the section azimuth

The loop and the projection of the hole are shown. Vector plots serve to clarify coupling with the primary field.

Appendix E

Note on sources of anomalous Ch0

Note: The data presented in this report are channel 0 normalized - the latest time channel plotted is Ch0. Traditionally in UTEM data the latest time channel plotted has been Ch1.

Note on sources of anomalous Ch0

This section outlines the possible sources of anomalous channel 0 which is not correlated to the Ch1-10/12 profiles on the upper axes of a channel 0 normalized plot.

1) **Mislocation of the transmitter loop and/or survey stations**

Mislocating the transmitter loop and/or the survey stations results in an error in the calculated primary field at the station and appears as an anomalous Ch0 value not correlated to channel 0 normalized Ch1-10/12. The effect is amplified near the loop front. This can be seen in the profiles - the error in Ch0 generally increases approaching the loop. As a rule a 1% error in measurement of the distance from the loop will result in, for off-loop surveys, an error in the Bz (vertical component) Ch0 of:

- 1% near the loop front (long-wire field varies as 1/r)
- 3% at a distance from the loop front (dipolar field varies as 1/r3)
- 2% at intermediate distances (intermediate field varies as ~1/r2)

The in-loop survey configuration generally diminishes geometric error since the field gradients are considerably lower. At the centre of the loop the gradient in the vertical field is essentially zero so it is difficult to introduce geometric anomalies near the loop centre. Near the loop sides and at the closest approach of the lines to the wire mislocation of the loop and the station becomes more critical. Typically loop sides are designed to be >200m from any survey stations.

Errors in elevation result in smaller errors in Bz but they can affect the chainage and accumulate along the line. Errors in elevation have a stronger affect on the two horizontal components, Bx and By.

2) **Magnetostatic UTEM responses**

Magnetostatic UTEM responses arise over rocks which generate magnetic anomalies. Such magnetic materials will amplify the total (primary + secondary) field of the UTEM transmitter which is sensed by the receiver coil. The secondary field is generated by subtracting a computed primary which does not include magnetic effects. This can give rise to strong and abrupt channel 0 anomalies when the source of the magnetics is at or near surface. This is the case in a number of places on these grids. UTEM magnetostatic anomalies differ from DC magnetic anomalies in the following three major ways:

1) In the case of DC magnetics the field is dipping N and is very uniform over the scale of the survey area while the UTEM field in-loop is vertical and it is stronger near the loop edges.
2) Most aeromagnetics are collected as total field while with UTEM we measure components - Bz, BL and BT..
3) DC magnetic instruments observe the total magnetization of the causative body which is due to its susceptibility as well as any remnant magnetization. An AC method such as UTEM will not respond to the remnant portion of the magnetization.

The larger amplitude of the UTEM Ch0 response is explained by the fact that the UTEM primary field is often more favourably coupled (magnetostatically speaking) to magnetic mineralization as compared to the earths field. Another factor could be the presence of a reverse remnant component to the magnetization.

Note: positive (negative) magnetic anomalies will cause:

- positive (negative) Ch0 anomalies in data collected outside the loop
- negative (positive) Ch0 anomalies in data collected inside the loop

3) **Extremely good conductors**

An extremely good conductor will be characterized by a time constant much longer than the half-period (@ 30Hz giving a time constant>>16ms). This will give rise to an anomalous Ch0 which is not correlated to the Ch1-10/12 data plotted on the upper axes of a channel 0 normalized plot.