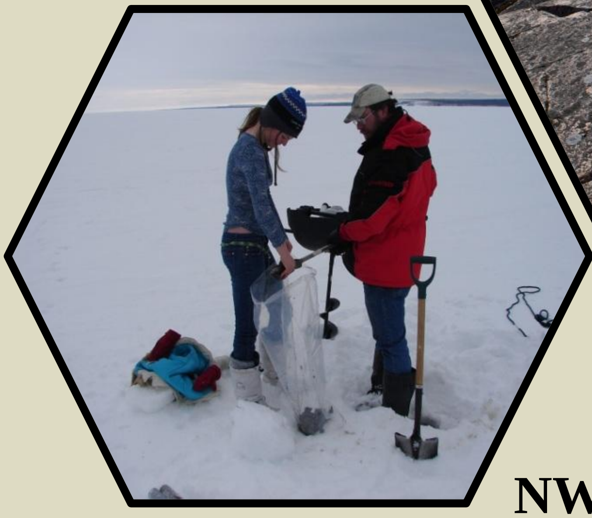

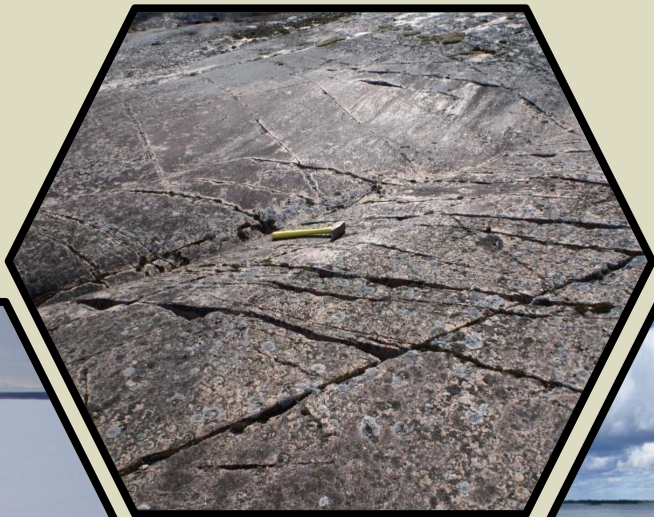

# NWT Open File 2013-02

## **Non-Renewable Resource Assessment ( Minerals):**
## Kwets'ootł'àà Candidate Protected Area,
## NTS 085J, 085K

D.M. Watson

*Recommended Citation:* ***Watson, D.M., 2013.***, **Non-Renewable Resource Assessment ( Minerals):** Kwets'ootł'àà Candidate Protected Area, NTS 085J, 085K. *NWT Open File 2013-02.*

>>> NORTHWEST TERRITORIES GEOSCIENCE OFFICE

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# NWT OPEN FILE 2013-02

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This publication can be obtained from the Northwest Territories Geoscience Office at the address and website above.

**Cover Photographs (clockwise from top left)**: sampling clay from the bottom of North Arm, joints in smooth glaciated granite outcrop, North Arm.

## INTRODUCTION

*Background*

The non-renewable resource (mineral) potential of the Kwets'ootł'àà Candidate Protected Area has been evaluated by the Northwest Territories Geoscience Office as part of a Non-renewable Resource Assessment under step 5 of the Northwest Territories Protected Area Strategy. Non-renewable resource assessments also support the Government of Canada's Minerals and Metals Policy (1996) that states the mineral potential of an area should be fully considered before the decision to create a protected area on federal lands is taken.

Kwets'ootł'àà which means rock-muskeg-bay was identified for protection by the Tłįchǫ government. In June 2010, the Canadian Wildlife Service agreed to sponsor Kwets'ootł'àà as a candidate National Wildlife Area.

Preliminary background work on the NRA was started in June 2010, and geological field work and sampling carried out in mid-August. An airborne magnetic survey was carried out over the winter of 2010/11 in support of this assessment. The results of this survey have been released as NWT Geoscience Office Open File 2011-04 (NTGO, 2011).

*Location and Access*

The Kwets'ootł'àà Candidate Protected Area (KCPA) (the Kwets'ootł'àà study area, or KSA in this report) lies at the northern end of North Arm of Great Slave Lake, in the Canadian Northwest Territories (Figure 1). It comprises an area of approximately 660 $km^2$, within the limits of 62.8 to 62.4$^o$ N. and 116.1 and 115.1$^o$ W. The KSA occupies a shoreline area surrounding the northernmost end of the North Arm, several islands in the lake as well as a strip of land along its southern limit, and another along Highway 3.

The area contains a few scattered cabins and hunting/fishing camps occupied during various seasons, but no permanent dwellings. The communities of Rae and Edzo (Behchoko) adjoin the KSA to the north. Access to the KSA is by water on Great Slave Lake, or from Highway 3 which passes along the northern and eastern sides of the area.

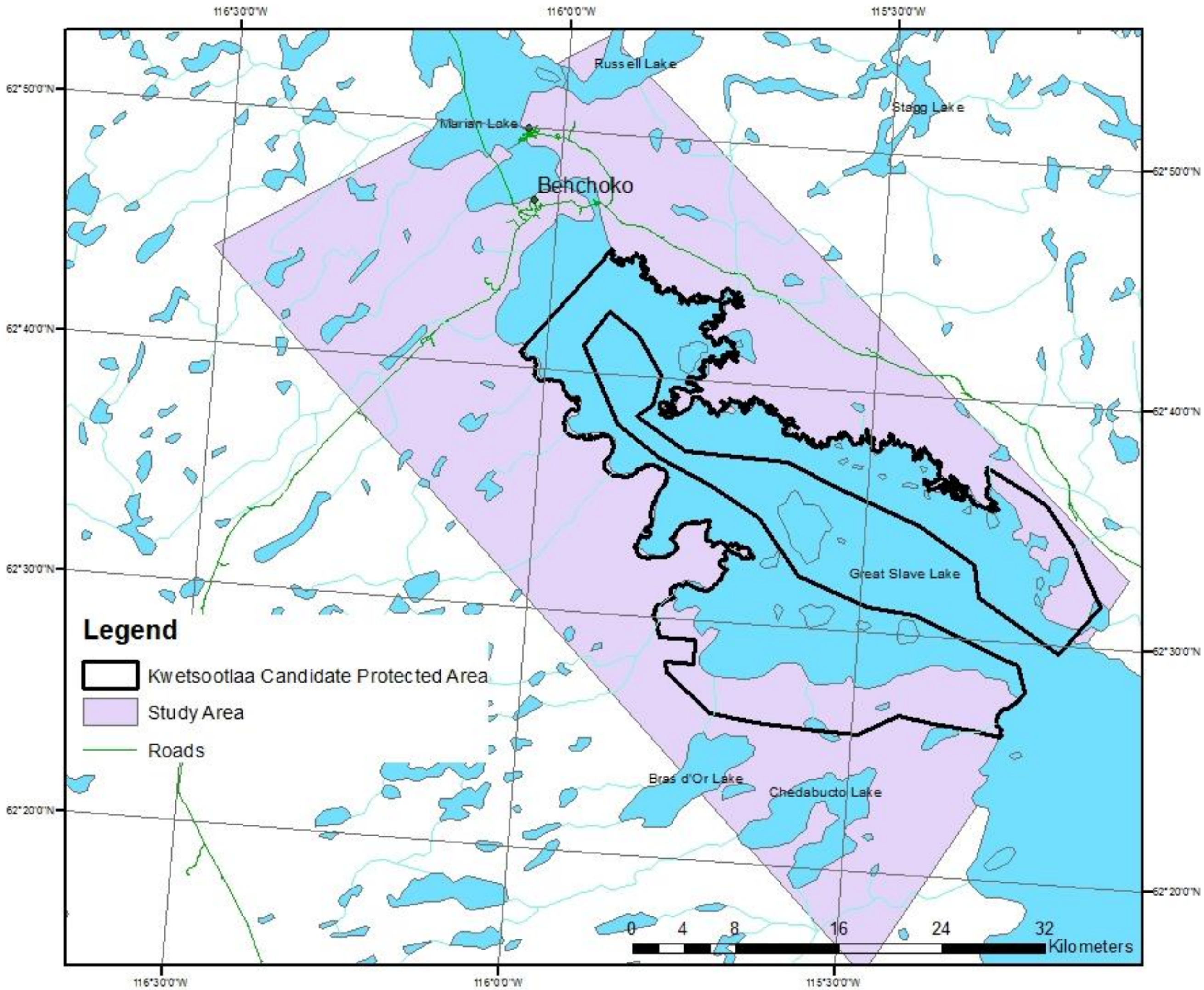


*Figure 1. Location of Candidate Protected Area and Study Area.*

*Climate and ecology*

The KSA straddles the boundaries of two ecoregions – the Taiga Shield High Boreal and the Taiga Plain High Boreal ecoregions (Figure 2). Both ecoregions have similar climate although the topography and geological history results in different ecological regimes.

The closest weather reporting station with climate data covering long periods is the one at Yellowknife approximately 75 km to the southeast. The mean annual temperature ranges from -3 to -6$^{o}$C with January the coldest at -26 to -28$^{o}$C average and July the warmest at 15 to 16$^{o}$C. Annual precipitation ranges from 280 to 360 mm, evenly divided between snow and rain.

The study area, although enclosing parts of both ecozones does not extend onto the upland to the west, and therefore does not include the karst, limestone escarpments and calcareous soils typical of the Taiga Plains ecoregion. Instead, in the portion east of North Arm, low rolling outcrops of Precambrian intrusive and metamorphic crystalline bedrock dominates. The soil is thin, bouldery till veneers with varying amounts of glaciofluvial sand and gravel. Vegetation is commonly black spruce with mixed poplar and birch. Jack pine is common on thin soils over areas of exposed bedrock. To the west of North Arm, the bedrock is flat laying limestones and dolomite with similar thin soils and vegetation.

This part of Great Slave Lake is characterized by a high suspended load of clay carried into the North Arm mainly by the Snake River via Frank's Channel. The clay is deposited in North Arm resulting in large areas of shallow water with a mud bottom and little plant growth.

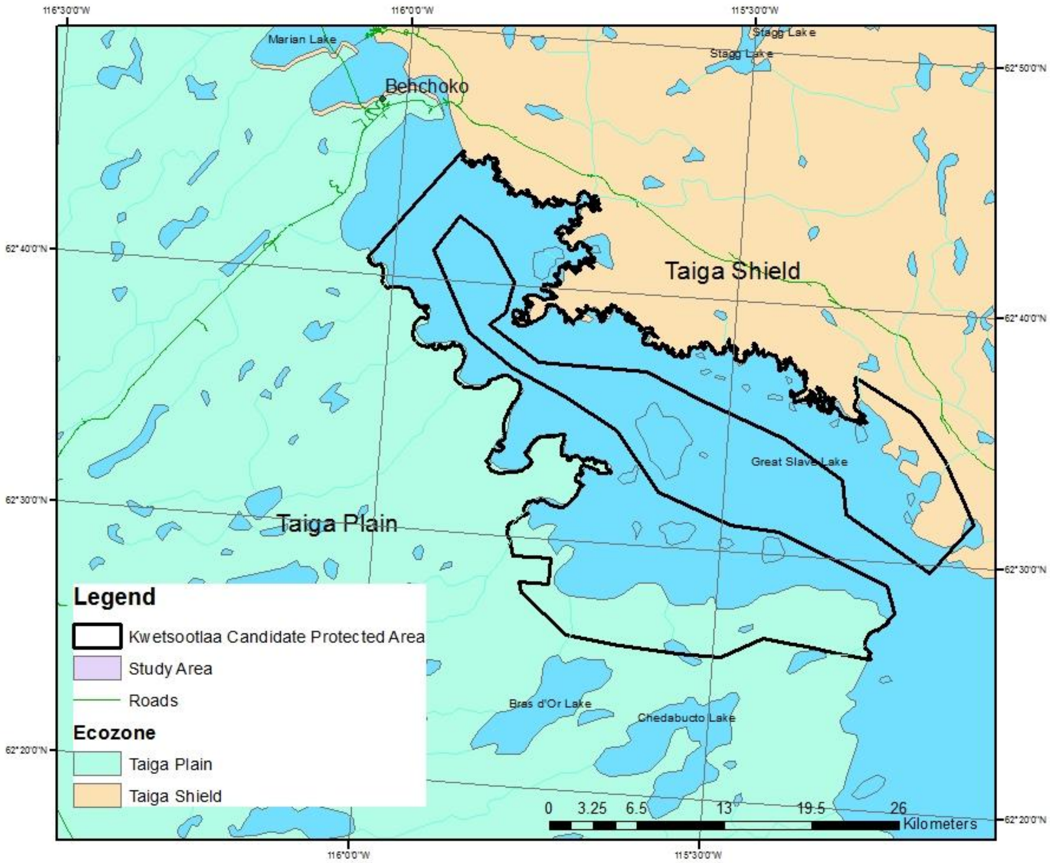


*Figure 2. Ecozones of the KSA.*

*Previous Work*

The KCPA lies in an area that has been of interest both for economic geology reasons and for its position at the edge of the Slave province and the extension of the Wopmay Orogen/Great Bear Magmatic zone. As a result it has been the target of reports by both researchers and mining company geologists.

The geology of the Horn River map area which lies mainly to the west of the North Arm has been described by Douglas and Norris ( 1960) and a map issued at 1:500,000 (Douglas and Norris, 1960). The area to the east has similarly been the subject of a memoir by Henderson ( 1985), with the accompanying A series map ( Henderson, 1985). A more extensive stratigraphy of the Palaeozoic section has been described by Norris ( 1965).

Basement structures and the evolution of the Precambrian lithosphere have been the subject of many papers including by Ghandi et al ( 2001), Hammer et al (1992, Cook and Erdmer ( 2005), Maclean (2006), and Hoffman (1987).

The surficial geology of the area has been discussed by Craig (1965) and most recently is the subject a paper on predictive mapping using Landsat imagery by Stevens et al (2012). J.D.

Mollard and Associated, a Yellowknife consulting firm prepared reports on surficial materials for the city of Yellowknife and for the Department of Indian Affairs and Northern Development. (1992, 1996). These reports are unpublished but copies are available from the NTGO library.

An 8 map series of Gamma Ray Spectrometry maps has been published by the Geological Survey of Canada ( Carson et al, 2001), as well as the aeromagnetic survey conducted as part of this assessment and already released as NWT Open File 2011-04 (NTGO 2011). Some of the assessment reports filed on nearby mineral claims have geophysics data included with them, however these properties fall outside the study area.

Although there has been no mineral development or reported exploration within the boundaries of the proposed protected area, there has been activity in the nearby area. Government studies have included Ghandi (1994), and Byron et al (2009). Industry has reported assessment work from claims adjacent and to the west of the candidate protected area. ( Assessment reports 015278 - Wesstrom (1993),0015590 - Nickerson (2009), 017965 - Nichols (1968), 083059 - Klein (1992), 083105 - Wagner (1993), .83517 - Ostensoe (1995) , 084575 - Williams et al (2001) , 084609 - Covello (2002)) .

## GEOLOGY

*Overview*

As is the case with the ecozones, the study area is split into two areas by a line roughly through the centre of the North Arm. To the west and southwest, Palaeozoic rocks of the Interior Platform unconformably overlie the Precambrian basement, although the contact is not seen at surface. (Figure 3) A Palaeozoic outlier occurs at Rae Point. East and northeast of North Arm, is underlain by Precambrian intrusive and metamorphic rocks. Multiple sets of Proterozoic dykes cut the Archean gneissic and plutonic rocks.

*Precambrian*

The Precambrian basement in the study area has been described by Douglas and Norris ( 1959), and Henderson ( 1985). The area is divided into two zones. The eastern portion (east of the North Arm) is underlain by rocks of the Slave craton which has remained essentially stable since the close of the Archean era 2.5 Ga ago (Henderson, 1985). Within the study area these rocks are represented by a variety of granite, granodiorite and related intrusions. They are cut by several sets of Proterozoic dykes as well as a series of north-north-westerly trending short displacement faults.

The Precambrian basement in the western portion of the area is covered by Palaeozoic rocks of the Interior Platform. This area is underlain partially by rocks of the Great Bear Magmatic Zone (GBMZ) of the Wopmay Orogen (Ghandi et al 2001) to the west and partially by the Slave craton rocks to the east. The boundary is hidden and is interpreted from regional seismic and aeromagnetic data (Lowe and Seeman, 1996). The basement rocks in this area have been identified as granodiorite and metasedimentary/volcanic rocks as well as magnetite bearing iron formations from drill core obtained by exploration companies and reported as assessment work ( Williams et al, 2001 and Covello, 2002). The Great Bear Magmatic zone also hosts giant quartz veins (Byron et al 2009) that outcrop on the western shore of the North Arm near the northern boundary of the project area. These are the only outcrops of GBMZ rocks in the KCPA.

The eastern part of the KCPA is underlain by the western margin of the Archean Slave Province. The geology of this area is dominated by the Stagg monzogranite and Awry Granite intrusions (ca 2.6 billion years ago) with associated low pressure and high temperature metamorphism. During the Paleoproterozoic these intrusions were cut by swarms of dykes intruded along and across pre-existing NNW-trending brittle fault and fracture zones. These dykes belong to several groups including the Ghost swarm (1884 Ma, Davis and Bleeker, 2007), NW Indin (Henderson, 1985a). These dykes are cut in turn by 1.85Ga lamprophyre dykes that show flow textures and chilled margins.

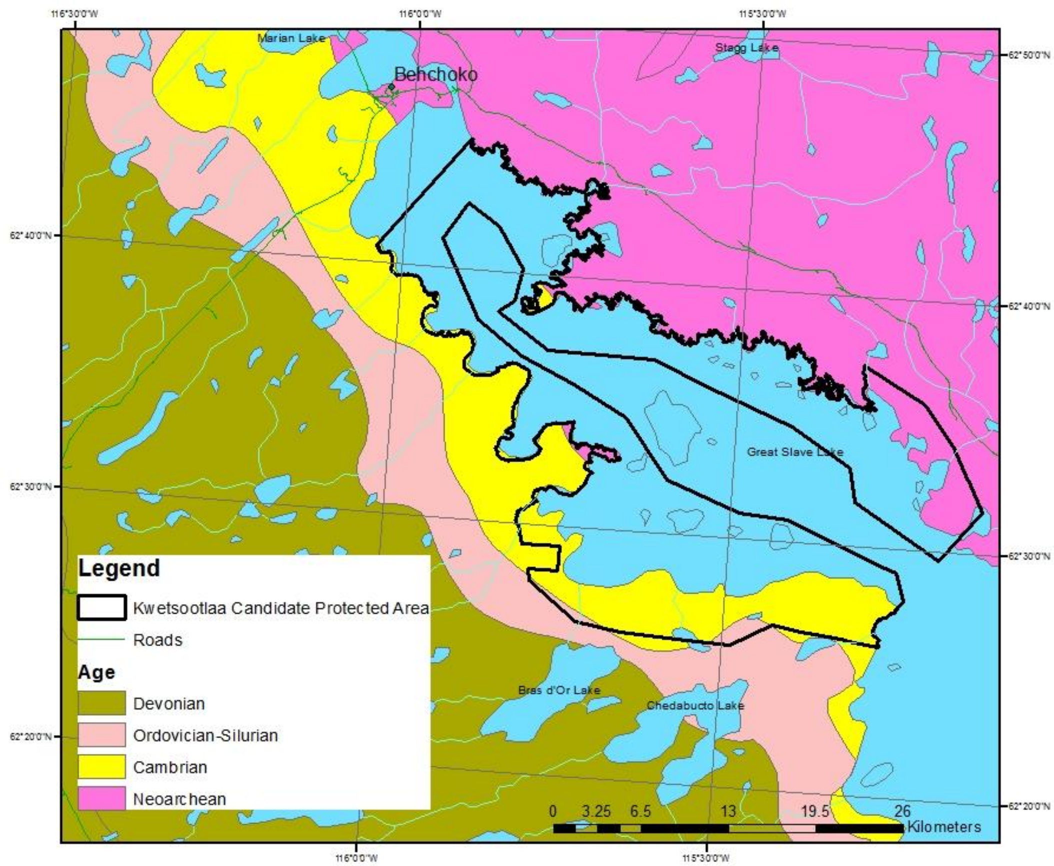


*Figure 3. Generalized geology.*
*Phanerozoic Platform*

The western part of the KCPA is covered by a succession of Phanerozoic sedimentary rocks that range in age from Cambro-Ordovician to Devonian in the exposed section, although further to the west there are Mesoproterozoic red beds of the Dessert Lake Basin between the Old Fort Island Formation and the underlying Archean Basement.

**Old Fort Island Formation**

The lowermost Phanerozoic rocks exposed in outcrop are the Cambrian Old Fort Island Formation consisting of whitish quartzose sandstone. This formation, representing the transgression of the Cambro-Ordovician sea across the Precambrian basement, is poorly exposed in outcrops along the shoreline of the North Arm and is probably the source of the sand at Whitebeach Point. Drilling by Allyn Resources (Covello, 2002) on the Bra claims (Figure 4) intersected from 20 to 260 m of sandstone.

**La Martre Falls Formation**

The contact between the La Martre Falls formation and the underlying Old Fort Island Formation is not exposed in outcrop. The predominant quartz rich sandstones with minor shale and mudstone of the lower formation change to shale with minor sandstone and sandy dolomite in the La Martre Falls Formation representing a transition to a deeper water environment. Diamond drilling on the Bucto Property west (Figure 4) of the KCPA intersected 18m of shales of the La Martre Falls Formation (Wagner, 1993). The amount of dolomite increases upward as the La Martre formation transitions into the massive dolomite of the Ordovician Chedabucto Lake Formation.

**Chedabucto Lake Formation**

The Chedabucto Lake Formation is a thick bedded to massive resistant dolomite that forms the prominent escarpment along the west side of the North Arm. The lower contact is transitional from the La Martre Falls formation while the upper contact is unconformable. A variety of middle Devonian rock types including evaporites, and limestones unconformably overlie this formation. The thickness is variable within the study area with thickness depending on oscillations in the Precambrian surface (Norris, 1965).

**Mirage Point Formation**

The Upper Ordovician (Norris, 1965) Mirage Point Formation is the youngest formation exposed near the project area. It outcrops along the shore of Great Slave Lake in the vicinity of Alexander and Gypsum Points as well as several locations along the western boundary of the area (Figure 3). The Mirage Point formation consists of thinly interbedded dolomite of various colours, sandy dolomite, gypsum, and other shallow water sequences. The thickness ranges up to 595 feet in the subsurface while a 6.5 ft. section is exposed at Gypsum Point (Norris, 1965).

*Surficial Geology*

The study area was glaciated during the Late Wisconsin glaciation (Stevens et al, 2012), reaching its maximum extent around 18,000 years ago. The area became ice free about 10,000 BP. The direction of ice flow was generally to the southwest as demonstrated by striae and fluted bedrock measurements. Eskers and drumlinoid features to the west of the study area also support this interpretation (Craig, 1965).

Following the retreat of the ice the region was covered by a large glacial lake (Glacial Lake McConnell) which occupied the area between Great Bear and Great Slave Lake, up to an elevation of about 280m. This lake deposited fine grained glaciolacustrine sediments in some areas and also reworked many of the glacial sediments. Surficial deposits, mainly of glacial origin, are found throughout the study area. Surficial deposits include glacial outwash, till, and reworked glaciofluvial materials. Raised beaches occur ca. 30-40 metres above the level of present Great Slave Lake, and are remnants of shorelines of proglacial Lake McConnell. Some of the sand and clay deposits may be of value as sources of material for construction and other purposes.

Economic Geology

Within the study area itself there has been little exploration for mineral commodities. Exploration in the area surrounding the study area has been for a variety of commodities ranging from Uranium and base metals to granite for building stone. A summary of the commodities explored for and their geological characteristics is given in Table 1.

*Table 1. Types of deposits previously explored for in the KSA.*

| **Commodity/Type** | **Area** | **Characteristics** | **Examples** |
|---|---|---|---|
| IOCG type copper/gold/rare earths | Western part of area. Great Bear Magmatic Zone | Magnetic and gravity anomalies, | Fab, Nod, Sue-Dianne, Mar, Fab, Kol, Jones, Nori, Gar |
| Giant Quartz Vein/ Uranium | Southern part of Great Bear Province | Associated with anomalously radioactive granites | Rayrock |
| Dimension Stone | Eastern side of study area | Uniform textured granites with few joints and fractures | Stagg River |
| Clay minerals | Northern part of North Arm | Fine clay reworked from glacial tills | Near mouth of Franks Channel |
| Silica sand | South-western shore | Coarse, well rounded sand high in silica | Whitebeach Point |
| Unconformity – associated Uranium ( Athabasca type U) | Western part of area. Basin roughly parallel to North Arm | “red-bed” sandstone | None yet established |

**Iron Oxide – Copper - Gold (IOCG) and similar**

One distinctive feature of the Great Bear Magmatic Zone is the occurrence of many magnetite rich veins and breccias (Ghandi 1994) as well as occurrences of uranium, copper, gold, bismuth and cobalt. Several properties have been taken to the advanced development stage, and one property is a past producer of uranium (Rayrock Mine). Although early work was in search of uranium (Rayrock in the 1950's, Sue-Dianne, Fab, Mar, Nod and others in the 1980's), uranium exploration has given way to exploration activity for base metals.

Exploration for IOCG and related deposits has employed mainly geophysical methods to find drill targets. This method is necessary since the GBMZ rocks are hidden beneath the Palaeozoic cover rocks which thicken westward from the erosional edge along the North Arm. The

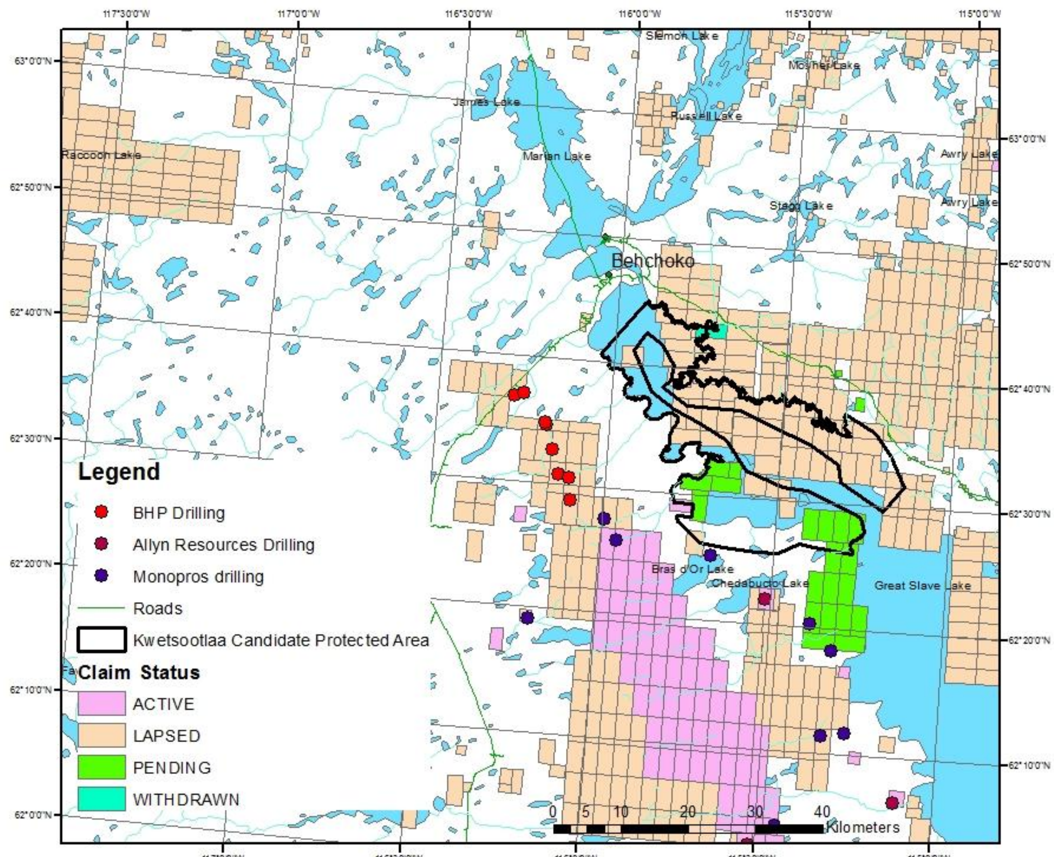


*Figure 4. Claim Status and location of drilling in vicinity of the KSA.*

geophysical methods employed, gravity and magnetics, are able to "see through" both water and the Palaeozoic cover rocks while providing clues to the underlying geology.

The results of magnetic and gravity surveys have been reported for properties in the Chedabucto Lake area (Assessment Reports 083105, 083059, 084609, and 084575). Drilling intersected magnetite bearing iron formation, magnetite bearing tuff, meta tuff, argillite as well as granitic rocks, some with magnetite concentrations (Figure 4). Iron concentrations reach 35% in the most promising hole. Anomalous concentrations of copper, arsenic, Light Rare Earth Elements and niobium are reported from various drill holes. Significant widths of anomalous grade were not reported, and no intersections of 'ore' grade are reported in the assessment files.

**Giant Quartz Vein / Uranium**

A series of giant quartz veins are found in many units of the southern Great Bear magmatic zone. These veins and stockworks occur as fillings in fracture and fault systems that developed due to the collision of the craton on which the Great Bear magmatic zone was developed with a continental block to the west. Some also occur along faults both subsidiary to and complimentary to the northeast trending faults as well as along the Wopmay Fault zone (Ghandi 1994).

The host structures of the veins are therefore quite old and have probably been activated several times. The long history of these structures would favour deposition of quartz and other minerals extracted from the country rock by circulating ground waters. The source of the uranium and associated minor copper is likely the felsic volcanic and granitic intrusions of the GBMZ. Metasedimentary rocks, mafic sheets and dykes are also possible metal sources.

The Rayrock Mine (30 km north of the study area) is the closest example of this type of deposit to the area. The country rock consists of gneissic granodiorite that has been crushed and mylonitized along the faults. The country rocks have been silicified, chloritized, epidotized and hematitized in zones ranging in width from a few centimetres to over 10 m.

An occurrence of secondary uranium mineralization was also reported (Nichols 1968) from the Stagg River area on the eastern side of the study area. Phosphuranylite, a secondary weathering product, was reported as occurring on altered quartz monzonite in the vicinity of a fault zone. The occurrence is not associated with giant quartz veins and no mineralization approaching commercial grade was encountered.

**Unconformity Related Uranium**

Proterozoic red beds have been confirmed by drilling to lie below the Phanerozoic cover in the "Dessert Lake Basin" west of the study area (figure 10). The red beds, up to 150 m thick, lie below the Cambrian sandstone of the Old Fort Island Formation, and the underlying weathered Southern Extension of the Slave and Bear Provinces. Weathering of uranium bearing granitic rocks of the Great Bear Magmatic Zone may have contributed to the possible formation of unconformity related uranium deposits. In spite of what seems like favourable geology, drilling to date has yet to discover uranium in these red beds.

**Dimension Stone**

The western portion of the study area is covered by Palaeozoic limestones and dolomites. The eastern half, on the other hand is underlain by a variety of "granitic" rocks that may be suitable for use as dimension stone. Granitic here is used to refer to any crystalline, non-sedimentary rock used in the dimension stone industry. This term is used to include true granites, basalt, anorthosite, gneisses and many other rock types that would not be called "granite" by petrologists.

The main requirements for “granite” to be used in the dimension stone industry are a uniform texture and colour, and the capability to extract large blocks – usually a function of joint spacing. Portions of both the Stagg and Awry granites appear to meet these requirements. The colour ranges from medium pink/red to light grey.(Figure 5) The area underlain by this rock is large and extends outside the study area.

Figure 5 .Polished sample of Awry Granite from Highway 3 road cut.

The Stagg granite has been the subject of an evaluation (Nickerson 2009) that concluded that there was the possibility to produce large blocks of unfractured stone which take an acceptable polish. Transportation, quarrying costs and selling prices were also deemed to be within an acceptable range. No additional work has been recorded for this property.

Granites from along the Yellowknife highway including adjacent to the study area were the subject of a poster presentation at the Yellowknife Geoscience Forum in 2009 (Ootes and Watson, 2009).

**Clay Minerals**

The KSA occupies the shoreline of the North Arm of Great Slave Lake. The depth of much of the North Arm is shallow and the bottom consists of deposits of mainly glacially derived clays brought down by the Marion and Snare Rivers and their tributaries. This clay by virtue of the riverine transportation is mainly free of coarser particles, remains suspended in the lake water and precipitates in the North Arm during the winter periods of ice cover.

The thickness of the clay layer is unknown, but in extent it covers the bottom of most of the North Arm. The mineralogical make-up of the clay is not known at this time. The clay has been used locally in Rae for pottery purposes but no examples were seen by the author. Clay from the bottom of North Arm has also been used by a local business as a mud pack in a local spa.

**Silica Sand**

In the southwest portion of the KSA in the vicinity of Whitebeach Point, are accumulations of coarse quartz rich sand that may be valuable sources of silica sand. These deposits are discussed in the report on Potential Silica Sand Deposits in the Northwest Territories (Levson et al, 2012).

Silica sand, consisting of almost entirely quartz, is a valuable industrial mineral commodity that is used for a variety of purposes. Depending on size distribution, purity and other mainly physical properties, silica sand may be used for glass manufacture, sand blasting, frac sand, sand filters, and other users.

Samples of sand from beaches near Whitebeach Point appear on preliminary investigation to meet the requirements for sand for fracking. It has high roundness and sphericity, contains material of the required size range, and does not appear to contain deleterious minerals (clay and iron minerals).

The sand that is found on the beaches is water worked and unconsolidated. Drilling to the west of the beach exposures has intersected sandstone of the Cambrian Old Fort Island Formation ranging in thickness from 10m (B3-1-02 on BRA3) to 260m ( B9-1-02 on BRA09) ( Covello, 2002). The sandstone is reported as fine to coarse grained and varying in colour. No outcrops that could be positively identified as sandstone were observed in the study area, however it is possible that the beaches are disaggregated sandstone ‘in place’, since their location corresponds to the expected outcrop footprint of the sandstone.

**Sand and Gravel**

Sand and gravel in the Behchoko area is obtained from several small glaciofluvial deposits as needed. These deposits are generally small and supply limited amounts of material for local building and road works. No potential sources of sand and gravel were investigated within the proposed protected area during the course of this study.

*Figure 6. Glaciofluvial sand in small pit southeast of Behchoko.*

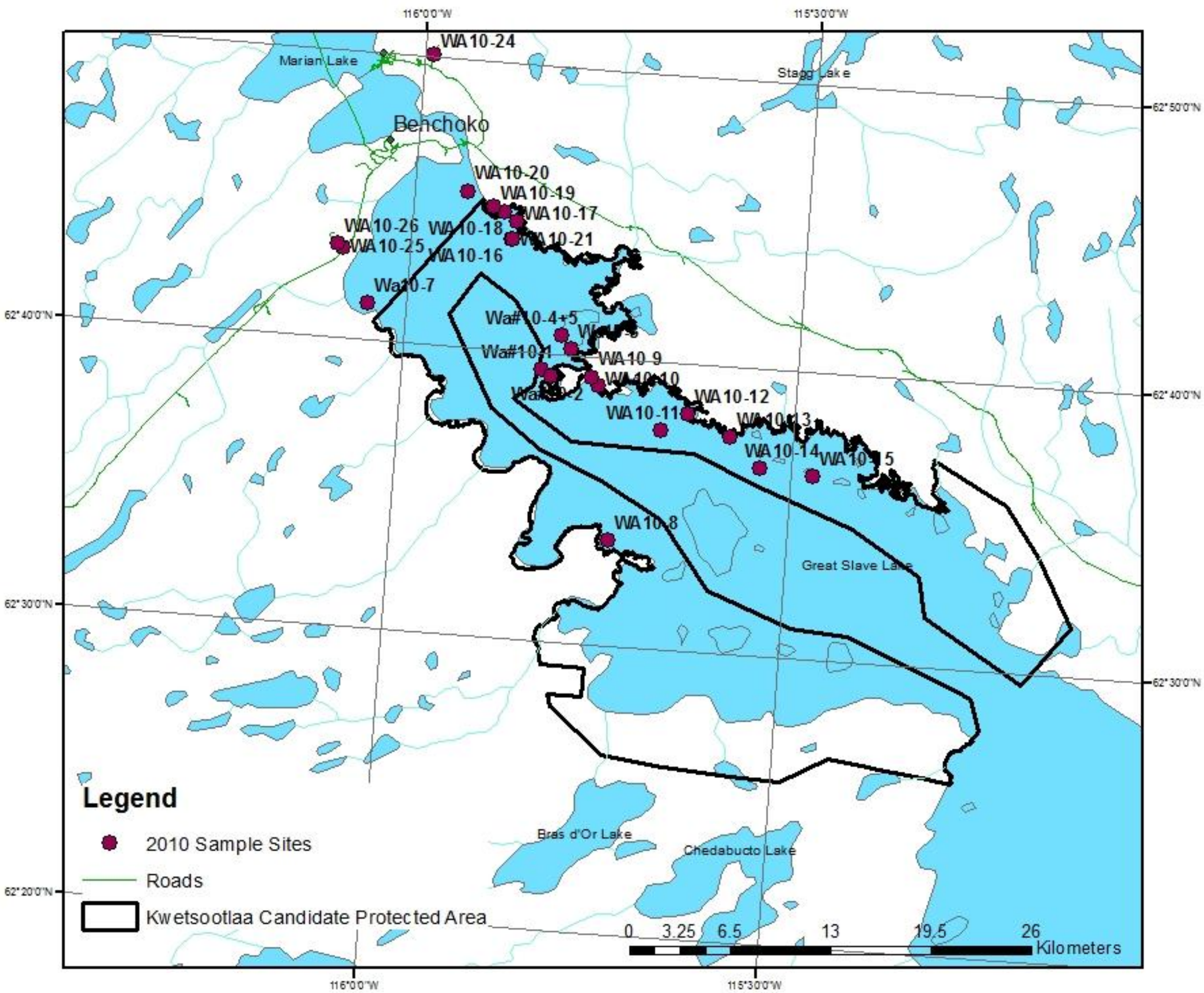


*Figure 7. Sample Locations. 2010 field season.*

Resource Assessment

## Geology and Sampling

During the 2010 field season two weeks were spent doing geological reconnaissance and sampling in the study area. Rocks exposed along the shoreline of North Arm were studied and sampled as well as outcrops accessible from roads on the north and east sides of the area (Figure 7). An additional trip was made to the area in the winter of 2010 to sample clay from the lake bottom in the vicinity of North Arm Park (Figure 8).

Samples were collected from various rock units observed and submitted to Acme Labs Vancouver for analysis. They were analysed by ICP-ES according to their A4 method. Analysis for C and S (Method 2A) were also carried out by Leco. Gold was assayed by fire assay with an AAS finish (Method G6). The analyses are all within normal values for the respective rock types. Two samples have slightly elevated values for copper, zinc and other metals but represent samples specifically selected because of visible alteration or sulphide weathering (Appendix A).

Samples were collected from the lake bottom (Figure 8) during the winter using an ice auger and PVC pipe. The thickness of clay is unknown but exceeds 30 cm, the maximum thickness penetrated by the hand driven pipe. The samples collected were uniformly fine grained with 100% passing a 200 mesh sieve. Test pieces made from the clay appear to have low shrinkage when air dried, however no measurements were made or firing tests done on this material.

*Figure 8. Collecting samples of bottom clay from North Arm.*

The geology observed during this field work is consistent with previously published work. Nothing was observed to indicate the possibility of economic mineralization or to encourage further work in search of same.

Geophysics

As part of the assessment of the KCPA an airborne geophysical survey was flown over the area. The results of this aeromagnetic survey have been released as NTGO Open File 2011-04 (NTGO 2011). The survey results were interpreted by Aurora Geosciences Ltd. whose report is included as Appendix B to this report. The survey outlined known geological units and structures and traces their extensions beneath the North Arm and younger rocks to the west.

In the north-eastern portion of the survey area (Figure 1 in Appendix B) the geophysics survey highlights the Indin and Dogrib dyke swarms cutting Awry and Stagg plutonic rocks. This interpretation is in line with previous survey and drilling results. The presence of northwest trending faults is also suggested by the termination or offset of features.

The western portion of the surveyed area is dominated by a broad, smooth area of lower magnetic strength. Drilling by BHP (Williams et al, 2001) in this area intersected Palaeozoic sediments covering granodiorite and mixed meta-sedimentary/volcanic rocks. Scattered high strength magnetic anomalies in this area have been tested by drill holes which found magnetite bearing iron formation.

A prominent feature visible on the magnetic maps is the teardrop shaped anomaly in the south-central area. Various possible interpretations could be made for this feature, including a large scale mafic intrusion, ring dykes and different phases of igneous rocks. Outcrops of magnetite bearing rhyodacite have been noted near Point du Lac on the northern edge of the anomaly. The straight western edge of the zone likely follows structures associated with the regional Wopmay Fault zone. BHP has drilled one of the magnetic highs paralleling this feature to the west. The rocks encountered contain disseminated sulphides including pyrrhotite which could explain the high magnetic readings.

Kimberlite pipes have a distinctive signature in aeromagnetic surveys. The data does not give any information on the diamond potential of the pipe, nor does the method used detect pipes that do not correspond to the model used to define them. Application of the modelling program to the data obtained from this survey shows that several magnetic anomalies formed by possible Kimberlite pipes exist on the survey area. There is no direct evidence of Kimberlite either through indicator minerals or drilling, and the existence of pipes is speculative based on the geophysics interpretation

## Summary and Conclusions

This assessment covers the area referred to in this report as the “study area” (Figure 1). This area is larger than the Candidate Protected area, as shown in the figure. For most purposes, the Candidate protected area is a narrow strip along the shore of the North Arm, and a scenario where a resource would need to be developed within that strip of shoreline cannot be envisioned. There is no evidence of resources within the shore strip that do not occur elsewhere.

Iron Oxide Copper Gold Deposits

There is some potential for IOCG type mineralization in the western portion of the study area. Geophysics studies and previous drilling have outlines areas with favourable geophysical signatures and have recovered magnetite bearing iron formation as well as anomalous amounts of copper, arsenic and other elements. To date no ore grade intersections have been recovered from drill holes within the study area. IOCG mineralization is present in similar rocks to the north at the Fab, Nod, Sue-Diane and other properties. The potential for this type of mineralization is low to moderate.

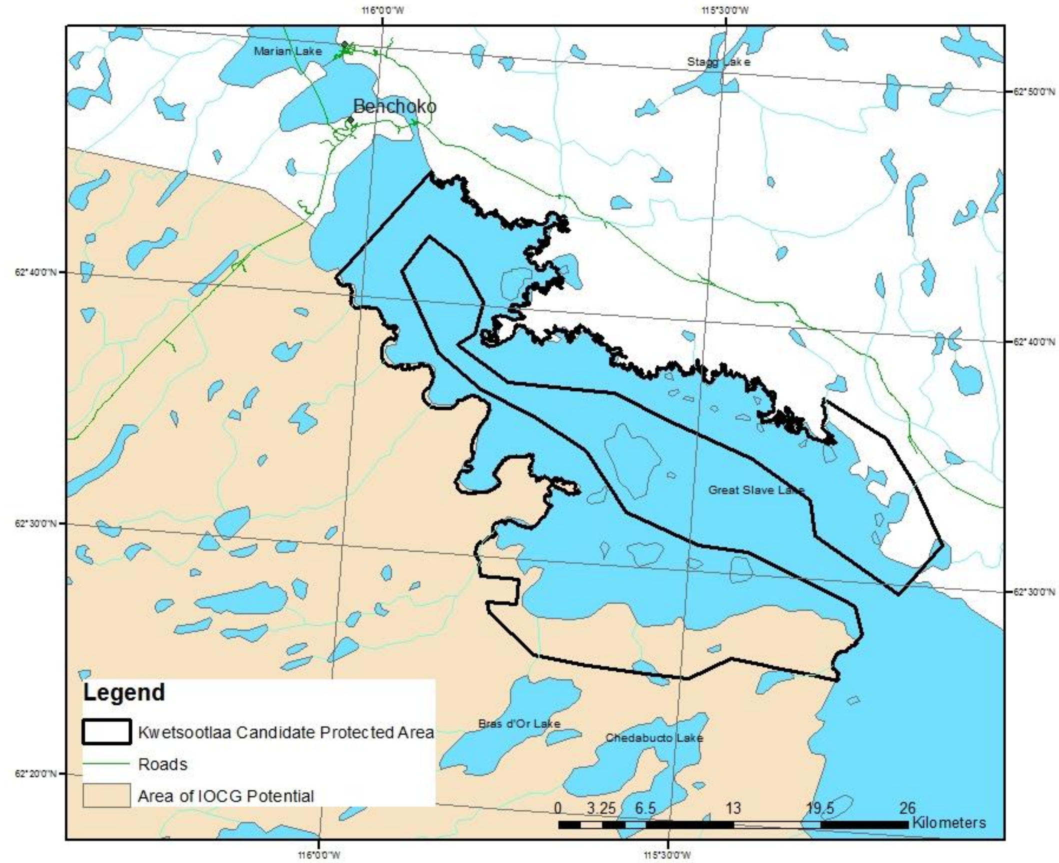


*Figure 9. Area with potential for IOCG deposits.*

Unconformity Related Uranium

The Dessert Lake Basin (Figure 10) has favourable geology for the occurrence of unconformity type uranium deposits. The basin lies to the west of the Candidate Protected area beneath the Phanerozoic cover rocks. The potential for this type of deposit is low to medium based on favourable geology but no reported occurrences to date from limited exploration.

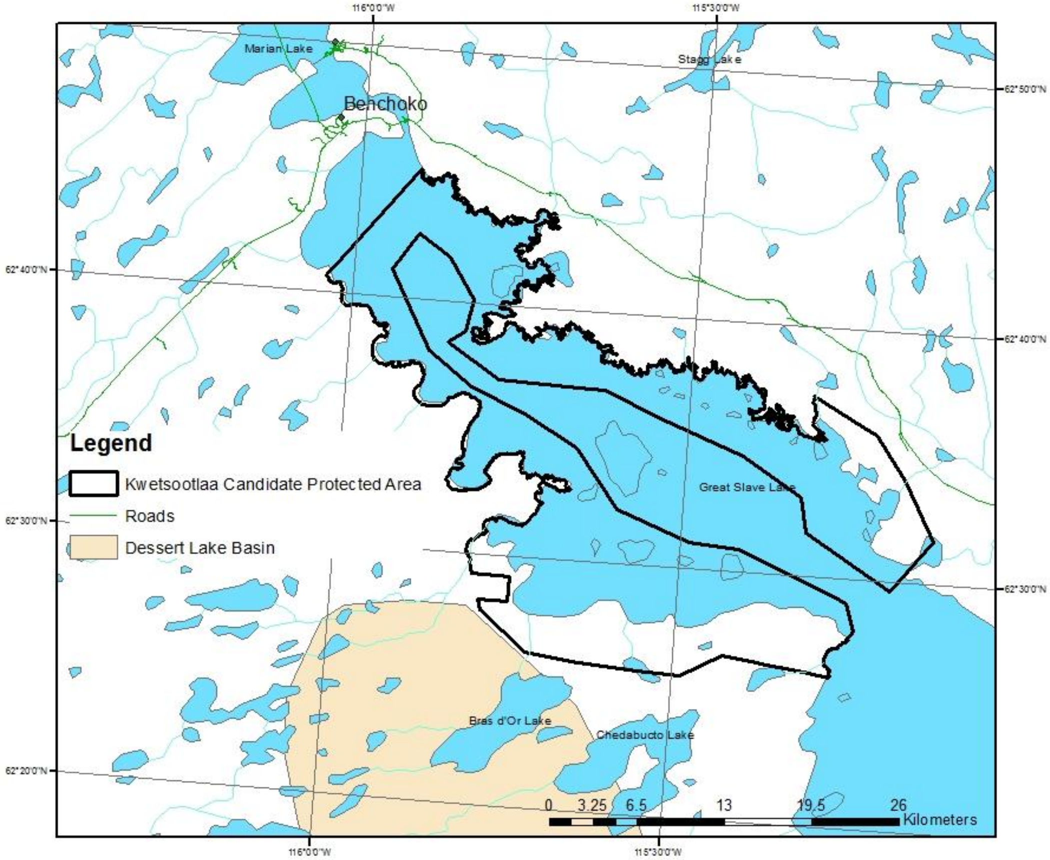


*Figure 10. Approximate extent of the Dessert Lake Basin.*

Giant Quartz Veins

One example of a giant quartz vein was observed on the shore of North Arm. A second occurrence was sampled near near the summit of the ridge 2 km north of North Arm Park. The outcrop sampled (Figure.7, sample WA -10-25) was outside the boundary of the candidate protected area. Although the sampled material contained the highest values for zinc, zirconium, cerium and gold of all the samples collected, there was no visible mineralization. A second giant quartz vein was also visited on the shore of North Arm closer to the KCPA (Figure 7), sample WA-10-7), and was also not observed to carry visible mineralization. The potential for Giant quartz vein associated deposits is low.

The area where these veins occur is shown in Figure 11.

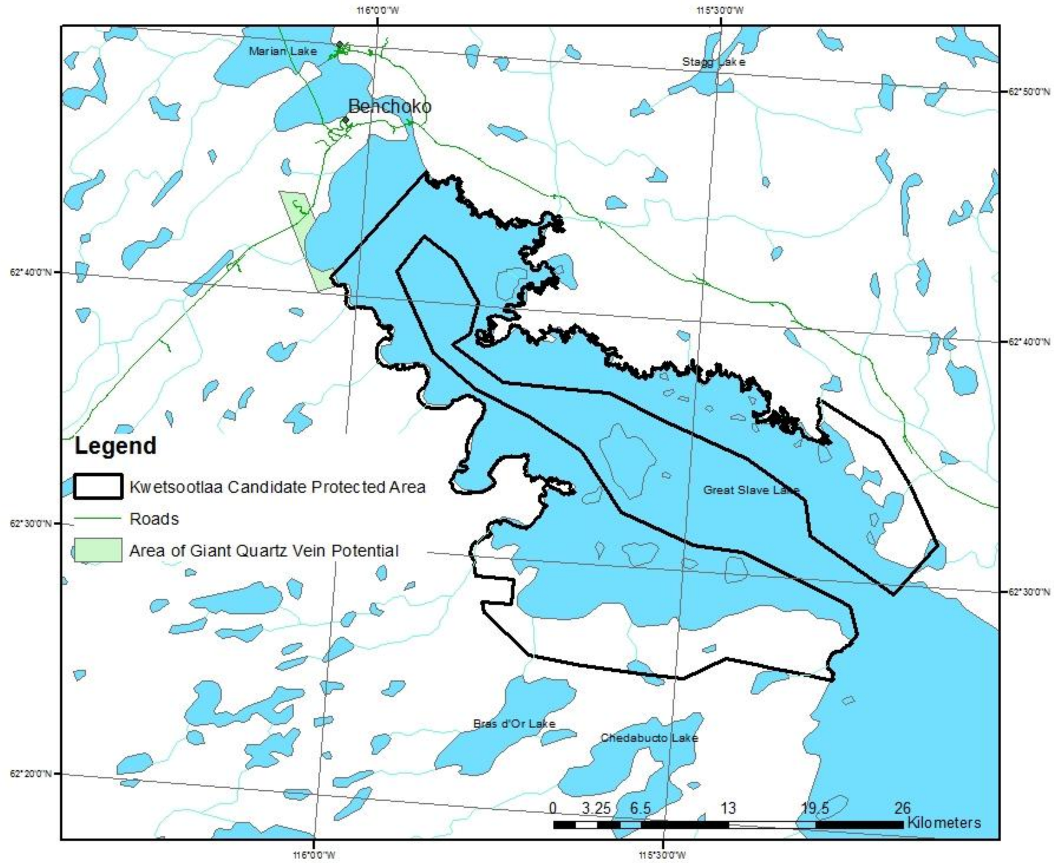


*Figure 11. Area with giant quartz veins.*

Dimension Stone

Granitic rocks suitable for dimension stone purposes are found on the eastern side of the study area. Samples polished at the NTGO show good colour and polishing properties (Figure 5). Outcrops were located that appear to be relatively free of joints and could produce large blocks of stone for the industry.  The Awry and Stagg granites are, however, large bodies extending outside the study area including areas closer to transportation. Although the potential for dimension stone resources being available within the study area (or the candidate protected area) is high, the likelihood of needing to develop these resources is very low. The area identified as having some potential for discovery of granite suitable for dimension stone production is shown in Figure 12.

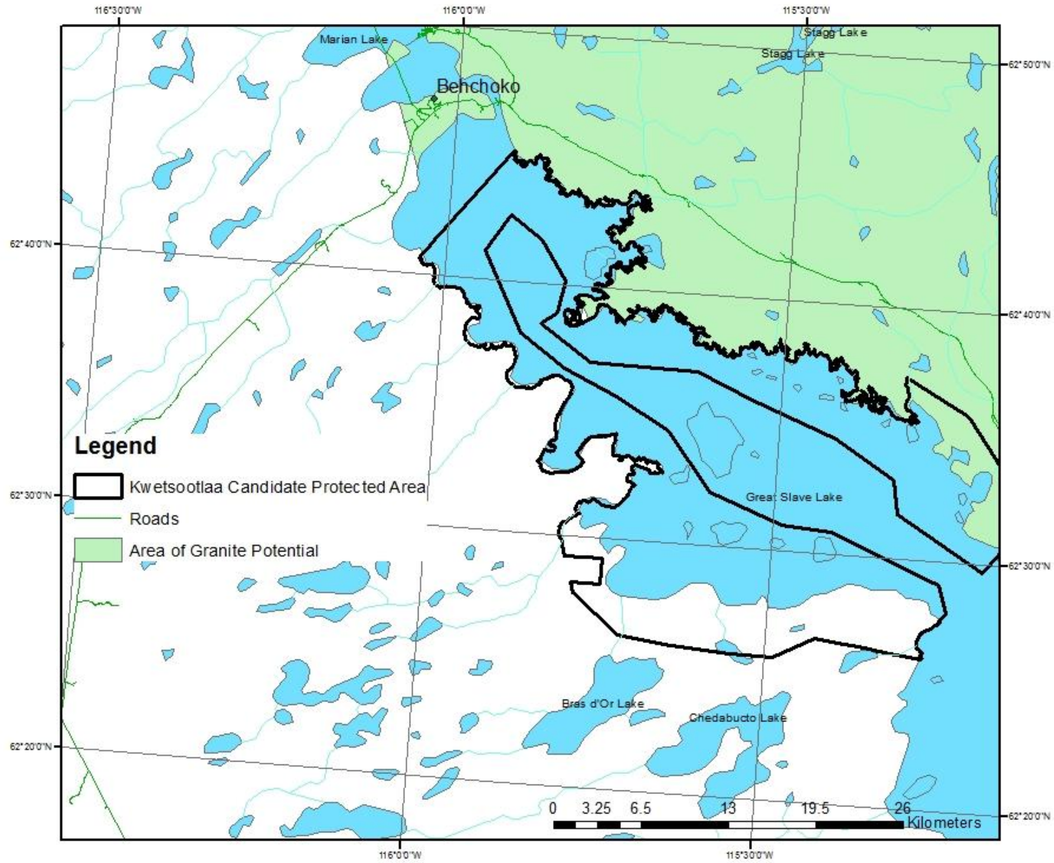


*Figure 12. Area with potential for granite (dimension stone) deposits.*

Clay Minerals

Clay has been dug from the bottom of North Arm in the past and used for various purposes (local pottery, spa etc.) by local artisans. The scale of these operations has been small, but could probably be made larger. The area used for obtaining this mud is outside the candidate protected area but the deposit extends to the south through most of the North Arm. The potential for further clay deposits in the study area is high although the probability of expansion of the use to require extraction from within the CPA is low.

The area with potential for development of a clay resource is shown in figure 13.

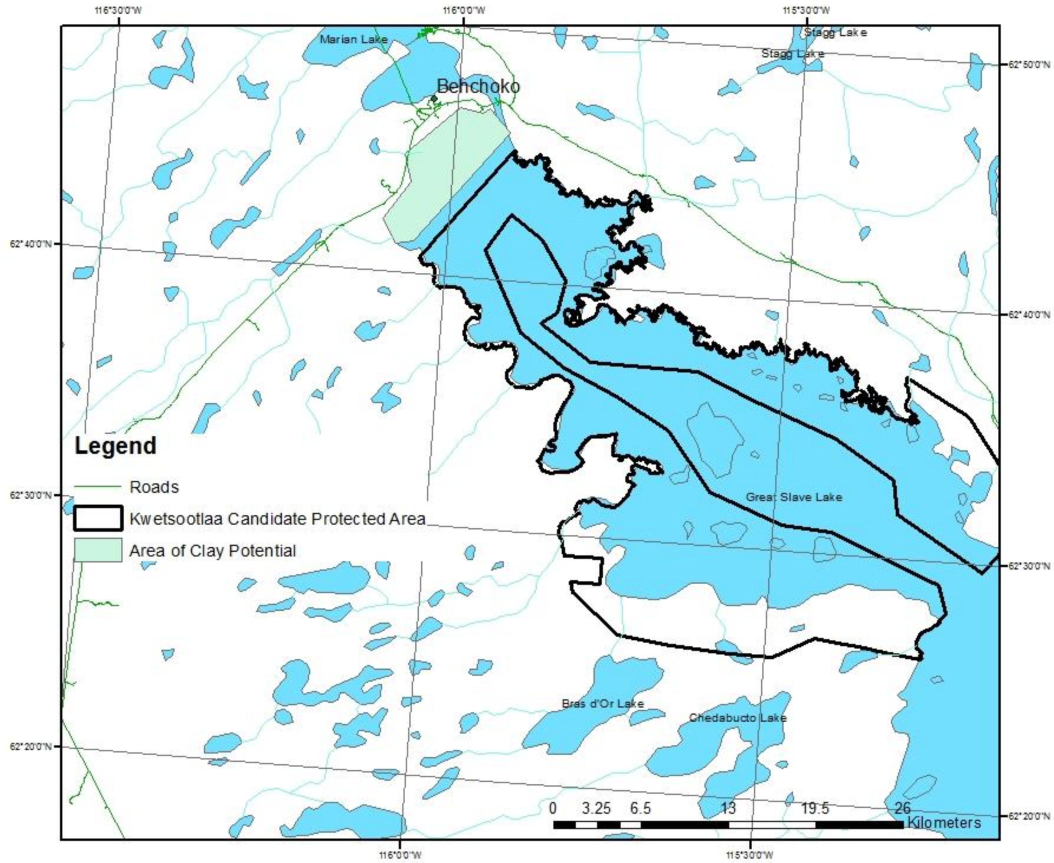


*Figure 13. Area with potential for clay deposits.*

Silica Sand

Silica rich sand occurs in the vicinity of Whitesand Point, straddling the southern limit of the KCPA. No testing has been done to assess the chemical and engineering properties of the sand, but visual examination of samples would indicate high silica sand with properties similar to those required by several industries (frac sand, glass manufacture etc.). The exact nature of the occurrence (outcrop, re-worked, glaciofluvial etc.) has not been investigated. These occurrences are discussed in NWT Open File 2012-06, Identification of Potential Silica Sand Deposits in the Northwest Territories (Levson et al, 2012). The area has a high potential for silica sand deposits.

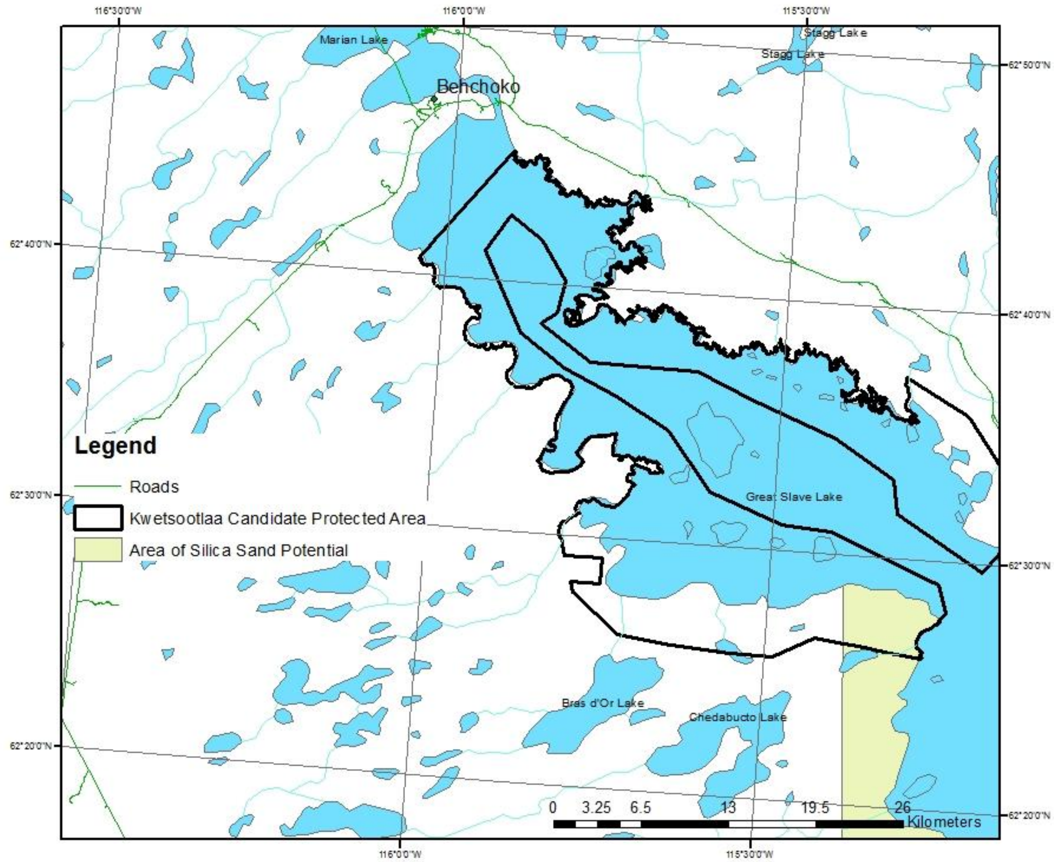


*Figure 14. Area with potential for silica (frac) sand deposits.*

**Diamonds**

The geophysics survey of the North Arm has identified some anomalies with signatures similar to Kimberlite. These anomalies are all either outside the KCPA or under the waters of North Arm. A complete discussion of the geophysics program and the results is given in Appendix B. No work is known to have been done to evaluate these anomalies as Kimberlite. The potential for Kimberlite deposits is rated as low. The locations of possible Kimberlite anomalies are shown in Appendix B, Figure 7.

*Summary*

Potential for various types of deposits within the study area range from low to high. Geology is favourable for the occurrence of IOCG, unconformity type uranium, giant quartz vein and Kimberlite (diamond) deposits; however exploration efforts to date have failed to find mineralization in economic amounts. Silica sand is observed along the shores of North Arm while clay from the bottom of the lake has been used locally in the past. Both commodities need further evaluation, but fall largely outside the proposed protected area. The granites to the west of the proposed protected area hold some promise as sources of dimension stone but again fall just outside the protected area. The overall potential for finding mineral resources within the Candidate protected area may be summarized as low.

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# Appendix A : Chemical Analyses

ACME ANALYTICAL LABORATORIES LTD. Final Report

| | |
|---|---|
| Client: | NWT Geoscience Office |
| File Created: | 16-Mar-11 |
| Job Number: | VAN11000972 |
| Number of Samples: | 9 |
| Project: | Kakisa |
| Shipment ID: | |
| P.O. Number: | |
| Received: | 7-Mar-11 |

| | Method | WGHT | 4A | 4A | 4A | 4A | 4A |
|---|---|---|---|---|---|---|---|
| | Analyte | Wgt | SiO2 | Al2O3 | Fe2O3 | MgO | CaO |
| | Unit | KG | % | % | % | % | % |
| | MDL | 0.01 | 0.01 | 0.01 | 0.04 | 0.01 | 0.01 |
| Sample | Type | | | | | | |
| WA-10-1 | Rock | 0.35 | 8.82 | 0.95 | 2.2 | 18.07 | 27.03 |
| WA-10-02 | Rock | 0.34 | 2.46 | 0.51 | 0.25 | 0.6 | 52.99 |
| WA-10-04 | Rock | 0.88 | 84.57 | 8.03 | 0.36 | 0.07 | 0.16 |
| WA-10-05 | Rock | 0.62 | 96.03 | 1.83 | 0.38 | 0.01 | 0.08 |
| WA-10-8B | Rock | 0.35 | 58.14 | 17.9 | 8.59 | 3 | 4.79 |
| WA-10-11 | Rock | 0.39 | 73.24 | 13.76 | 0.93 | 0.11 | 0.07 |
| WA-10-12 | Rock | 0.6 | 83.5 | 8.5 | 1.09 | 0.69 | 0.1 |
| WA-10-25 | Rock | 0.49 | 63.59 | 15.67 | 4.76 | 5.3 | 0.4 |
| WA-10-100 | Rock Chip | 0.02 | 53.19 | 7.11 | 16.09 | 3.44 | 5.81 |
| Pulp Duplicates | | | | | | | |
| WA-10-1 | Rock | 0.35 | 8.82 | 0.95 | 2.2 | 18.07 | 27.03 |
| WA-10-1 | REP | | 8.79 | 0.95 | 2.21 | 17.97 | 27.15 |
| Reference Materials | | | | | | | |
| STD CSC | STD | | | | | | |
| STD OREAS76A | STD | | | | | | |
| STD SO-18 | STD | | 58.21 | 13.98 | 7.62 | 3.38 | 6.32 |
| STD SO-18 | STD | | 58.21 | 13.96 | 7.6 | 3.36 | 6.35 |
| BLK | BLK | | | | | | |
| BLK | BLK | | <0.01 | <0.01 | <0.04 | <0.01 | <0.01 |
| Prep Wash | | | | | | | |
| G1 | Prep Blank | <0.01 | 67.42 | 15.98 | 3.32 | 1.1 | 3.49 |

ACME ANALYTICAL LABORATORIES LTD.

| | |
|---|---|
| Client: | NWT Geoscience Office |
| File Created: | 16-Mar-11 |
| Job Number: | VAN11000972 |
| Number of Samples: | 9 |
| Project: | Kakisa |
| Shipment ID: | |
| P.O. Number: | |
| Received: | 7-Mar-11 |

| | Method | 4A | 4A | 4A | 4A | 4A | 4A |
|---|---|---|---|---|---|---|---|
| | Analyte | TiO2 | P2O5 | MnO | Cr2O3 | Cu | Ba |
| | Unit | % | % | % | % | PPM | PPM |
| | MDL | 0.01 | 0.01 | 0.01 | 0.002 | 5 | 5 |
| Sample | Type | | | | | | |
| WA-10-1 | Rock | 0.05 | 0.06 | 0.07 | <0.002 | <5 | 64 |
| WA-10-02 | Rock | 0.03 | 0.03 | 0.03 | <0.002 | <5 | 42 |
| WA-10-04 | Rock | <0.01 | 0.11 | <0.01 | 0.004 | <5 | 408 |
| WA-10-05 | Rock | <0.01 | 0.04 | <0.01 | 0.007 | <5 | 47 |
| WA-10-8B | Rock | 0.79 | 0.25 | 0.08 | 0.003 | 21 | 555 |
| WA-10-11 | Rock | 0.1 | 0.1 | <0.01 | <0.002 | <5 | 305 |
| WA-10-12 | Rock | 0.05 | 0.06 | 0.01 | 0.002 | 15 | 573 |
| WA-10-25 | Rock | 0.89 | 0.32 | 0.06 | <0.002 | <5 | 178 |
| WA-10-100 | Rock Chip | 0.73 | 0.14 | 0.17 | 0.022 | 212 | 193 |
| Pulp Duplicates | | | | | | | |
| WA-10-1 | Rock | 0.05 | 0.06 | 0.07 | <0.002 | <5 | 64 |
| WA-10-1 | REP | 0.05 | 0.07 | 0.07 | 0.002 | <5 | 64 |
| Reference Materials | | | | | | | |
| STD CSC | STD | | | | | | |
| STD OREAS76A | STD | | | | | | |
| STD SO-18 | STD | 0.69 | 0.83 | 0.4 | 0.562 | 72 | 503 |
| STD SO-18 | STD | 0.69 | 0.83 | 0.4 | 0.561 | 74 | 503 |
| BLK | BLK | | | | | | |
| BLK | BLK | <0.01 | <0.01 | <0.01 | <0.002 | <5 | <5 |
| Prep Wash | | | | | | | |
| G1 | Prep Blank | 0.39 | 0.18 | 0.1 | <0.002 | <5 | 1011 |

ACME ANALYTICAL LABORATORIES LTD.
Client:
File Created:
Job Number:
Number of Samples:
Project:
Shipment ID:
P.O. Number:
Received:

| | 4A | 4A | 4A | 4A | 4A | 4A | 4A | 4A |
|---|---|---|---|---|---|---|---|---|
| | Zn | Sr | Zr | Ce | Y | Nb | Sc | LOI |
| | PPM | PPM | PPM | PPM | PPM | PPM | PPM | % |
| | 5 | 2 | 5 | 30 | 3 | 5 | 1 | -5.1 |
| Sample | | | | | | | | |
| WA-10-1 | <5 | 60 | <5 | <30 | 6 | <5 | 1 | 41.9 |
| WA-10-02 | 20 | 309 | <5 | <30 | 4 | <5 | <1 | 42.9 |
| WA-10-04 | <5 | 66 | <5 | <30 | <3 | <5 | <1 | 0.5 |
| WA-10-05 | <5 | 12 | <5 | <30 | <3 | <5 | <1 | 0.2 |
| WA-10-8B | 81 | 429 | 142 | 68 | 21 | 9 | 14 | 0.9 |
| WA-10-11 | 7 | 56 | <5 | <30 | 11 | 11 | 2 | 0.8 |
| WA-10-12 | 12 | 35 | 34 | <30 | 6 | <5 | 2 | 1.1 |
| WA-10-25 | 98 | 12 | 220 | 96 | 33 | 12 | 12 | 4.4 |
| WA-10-100 | 399 | 129 | 48 | 35 | 13 | <5 | 16 | 11.6 |
| Pulp Duplicates | | | | | | | | |
| WA-10-1 | <5 | 60 | <5 | <30 | 6 | <5 | 1 | 41.9 |
| WA-10-1 | <5 | 60 | <5 | <30 | 5 | <5 | 1 | 41.9 |
| Reference Materials | | | | | | | | |
| STD CSC | | | | | | | | |
| STD OREAS76A | | | | | | | | |
| STD SO-18 | 79 | 398 | 292 | 33 | 31 | 20 | 25 | 1.9 |
| STD SO-18 | 78 | 395 | 289 | 33 | 31 | 19 | 25 | 1.9 |
| BLK | | | | | | | | |
| BLK | <5 | <2 | <5 | <30 | <3 | <5 | <1 | 0 |
| Prep Wash | | | | | | | | |
| G1 | 50 | 752 | 145 | 57 | 17 | 22 | 5 | 0.4 |

ACME ANALYTICAL LABORATORIES LTD.
Client:
File Created:
Job Number:
Number of Samples:
Project:
Shipment ID:
P.O. Number:
Received:

| | 2A Leco | 2A Leco |
|---|---|---|
| | TOT/C | TOT/S |
| | % | % |
| | 0.02 | 0.02 |
| Sample | | |
| WA-10-1 | 11.1 | 0.29 |
| WA-10-02 | 11.77 | 0.04 |
| WA-10-04 | 0.07 | <0.02 |
| WA-10-05 | 0.07 | <0.02 |
| WA-10-8B | <0.02 | 0.12 |
| WA-10-11 | <0.02 | 0.17 |
| WA-10-12 | 0.07 | <0.02 |
| WA-10-25 | <0.02 | <0.02 |
| WA-10-100 | 2.49 | 4.05 |
| Pulp Duplicates | | |
| WA-10-1 | 11.1 | 0.29 |
| WA-10-1 | | |
| Reference Materials | | |
| STD CSC | 3.01 | 4.25 |
| STD OREAS76A | 0.17 | 17.49 |
| STD SO-18 | | |
| STD SO-18 | | |
| BLK | <0.02 | <0.02 |
| BLK | | |
| Prep Wash | | |
| G1 | <0.02 | <0.02 |

# Appendix B : Geophysics Interpretation

# A PRELIMINARY INTERPRETATION OF AEROMAGNETIC DATA

# ON

# THE KWETS'OOTLÁÁ PROPOSED PROTECTED AREA,

**NORTH ARM OF GREAT SLAVE LAKE, NORTHWEST TERRITORIES**

**prepared for:**

**Indian and Northern Affairs Canada**

**January 30, 2012**


Report prepared by:

Aurora Geosciences Ltd.

Franz Dziuba, B.Sc., P.Geoph.

Approximately 5,035 line-kilometres of digitally recorded high sensitivity aeromagnetic data were acquired in the North Arm area, Northwest Territories (portions of NTS sheet 85J, 85K) during November to December 2010. The survey, conducted by EON Geosciences Inc. was flown on behalf of the Government of the Northwest Territories through Indian and Northern Affairs Canada (INAC) and the Northwest Territories Protected Areas Strategy.
The survey area comprises Archean Slave Province and supracrustal Paleozoic Interior platform rocks as well as the North Arm of Great Slave Lake. Magnetic anomalies and lineaments were interpreted in terms of the types of likely geological rock types and structures to help determine the mineral potential of the area.

## INTRODUCTION

The NWT Protected Areas Strategy (PAS) outlines a process to establish protected areas in the NWT. A key step in the process includes gathering and examining scientific knowledge about the proposed area for protection. Since the proposed protected area, Kwets'ootl'àà, covers the northern portion of the North Arm of Great Slave Lake the North Arm aeromagnetic survey was required in order to provide geological information about the area underlying the lake to help determine whether economic mineral potential may exist in the area.

Lake water is of negligible magnetic susceptibility and therefore virtually transparent to magnetic fields and the magnetic responses caused by the distribution of magnetic minerals as determined by the underlying geology. A qualitative interpretation of aeromagnetic data can then aid geological mapping of areas underneath lake water or under superficial non-magnetic cover that would be invisible to a mapping geologist.

The aeromagnetic survey was funded by the Northwest Territories Geoscience Office (NTGO) through Indian and Northern Affairs Canada (INAC) funding for the Northwest Territories Protected Areas Strategy.

## GEOLOGY

The geology of the area is described by Henderson (1985) and Stubley (2005). Further geological information was taken from mineral exploration assessment reports (Ostensoe, 1995; Dessert Lake, Gerle Gold, Williams et al, 2001; Great Bear Project, BHP Billiton - Far West Mining) describing programs performed along the southern portion of the area. Drill hole locations are indicated on figure 1 along with generalized geology.

The aeromagnetic survey was centered on the North Arm of the Great Slave Lake located between Archean aged granitic rocks of the southern Slave Province to the northeast and Paleozoic aged carbonate and clastic sedimentary rocks of the Interior Platform to the southwest. The sedimentary rocks thicken to the west covering a basement comprising metasedimentary and plutonic rocks of the southern Slave and/or Bear Provinces with the north trending Wopmay fault zone regarded as defining the west side of the Slave craton. Early to mid- Proterozoic dykes cut all major lithologies of the Slave Province.

BHP / Far West Mining drilled several holes as part of their Great Bear Project within, and proximal to, the southwest corner of the survey area (01B1 through 01B5).

Lithology intercepted by drilling was described as approximately 120 to 140 m of Paleozoic cover over a basement generally comprising moderately to steeply dipping

meta-volcano-sedimentary sequences, thinly bedded magnetite banded iron formation, mafic to intermediate tuffs and a sequence of calc-silicate rocks.

Further to the east-southeast Gerle Gold Ltd. and Monopros Ltd. accomplished a drill program on their Dessert Lake area claims. Three drill holes (GGL_DE95-01, 05, 06) located near the southeast corner of the survey area passed through approximately 100 metres of sedimentary rocks before intersecting granite / granodiorite. Another drill hole (GGL_DE95-02b) located immediately to the south and central to the survey area encountered 127 metres of sedimentary cover rocks before entering granite then a greenstone formation.

No other drilling is known to have occurred within the aeromagnetic survey extents.

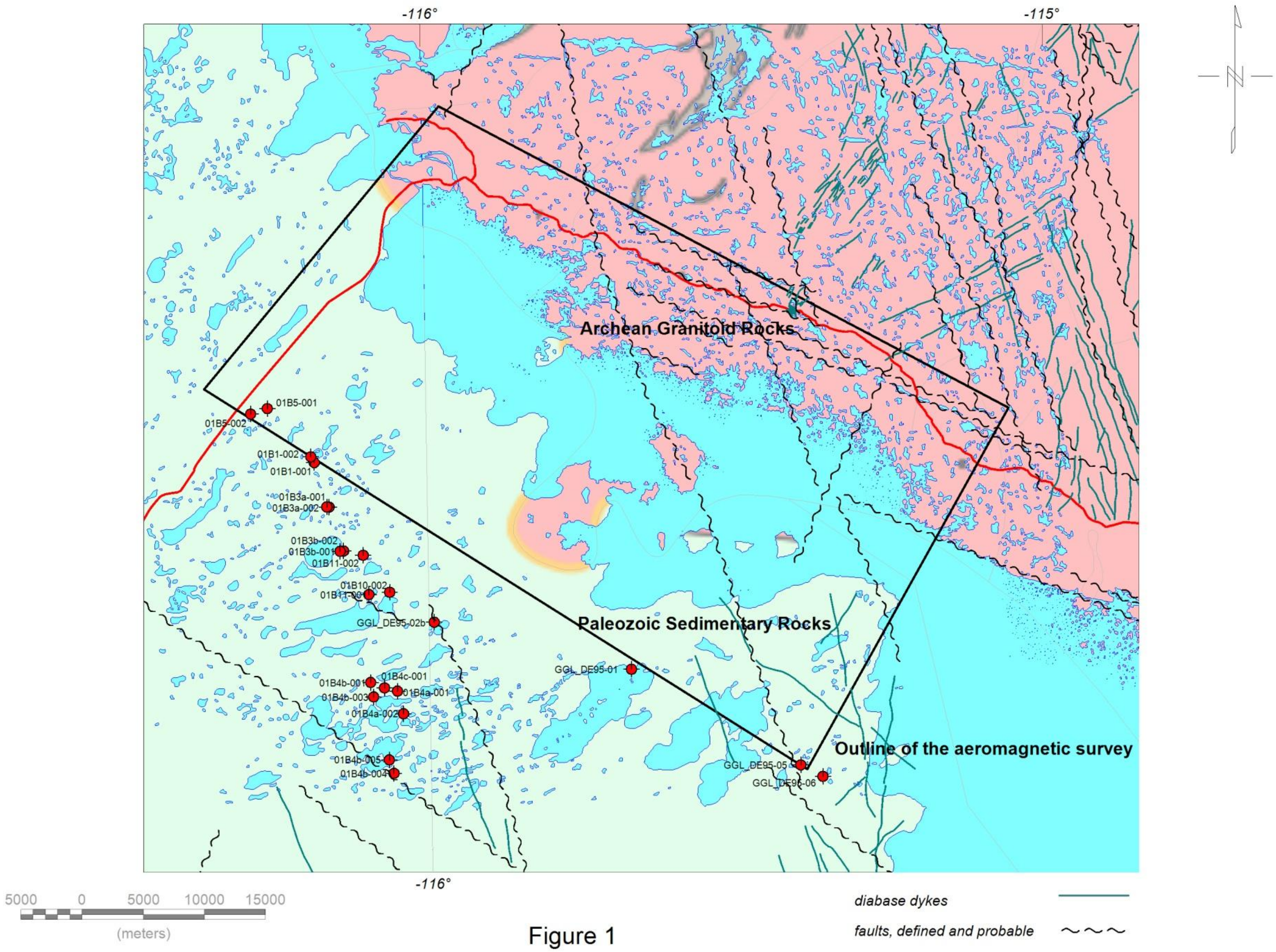


Figure 1

*General Geology of the North Arm Survey Area (modified from Stubley, 2005)*
*showing the North Arm of Great Slave Lake, the aeromagnetic survey extents and historical drill hole locations*

## MAGNETIC DATA ACQUISITION and PROCESSING

A summary of the data acquisition and processing procedures is provided here and the final survey report can be found in NWT Open File 2011-04.

EON Geosciences Inc. conducted the North Arm aeromagnetic survey between the period November 29 to December 29, 2010. Data were acquired using a Geometrics Cesium G822A magnetometer mounted in a tail stinger aboard a Piper Navajo fixed wing aircraft. The survey area is outlined on figure 1 and is defined by the following UTM coordinates (NAD83 UTM zone 11N).

| Corner | Easting | Northing |
|---|---|---|
| 1 | 533177 | 6944807 |
| 2 | 552342 | 6967929 |
| 3 | 598957 | 6943323 |
| 4 | 582512 | 6913771 |

Traverse lines were oriented east - west (90°) at an average separation of 500 m for a total 4,161 line kilometres. Tie lines were flown north - south and spaced approximately 2,500 m apart for a total 874 line kilometres. The survey area terrain was described as easy with topography ranging from 153 m to 214 m. Flight altitude was a nominal terrain clearance of 125 m following a drape surface computed using SRTM digital elevation data. Real time navigation was provided by a Novatel ProPak-V3 CDGPS system which was also used to record the flight path. Post processing of the collected data using GPS base station improved flight path positioning precision to the order of 1 metre.

Compensation for aircraft and directional magnetic signals were applied real - time to the magnetic data. Post data acquisition processing steps included the removal of high frequency noise, shifts and jump corrections, an IGRF altitude correction to account for deviations from the intended flight altitude, a Taylor series correction factor for height variations, and tie line leveling corrections.

All final accepted data were within the noise and diurnal specifications as described in EON's report and were delivered to the GSC's scientific authority for subsequent gridding and imaging. To allow the comparison of results of the current survey with other aeromagnetic surveys held by the National Aeromagnetic Data Base, residual magnetic field values were generated from the tie- leveled data by removal of the appropriate calculated international geomagnetic reference field (IGRF). The processed data were used to produce 1:100,000-scale colour and contour interval maps of the total magnetic field and 1:100,000-scale shaded colour interval magnetic first vertical derivative maps with annotated Keating coefficients (NWT Open File 2011-04).

The processed grid of aeromagnetic data showing the distribution of magnetic minerals over the survey area is shown in figure 2. In order to facilitate the geological interpretation of these data the following visualization and filtering options were generated to help define the physical properties of the source structures causing the observed distribution of magnetic minerals.

| | |
|---|---|
| Shaded relief | illuminates linear magnetic trends |
| Vertical derivative | enhances shallow source responses, suppresses deeper source responses and provide better resolution of closely spaced sources |
| Upward continuation | separates deeper source responses from the total response |
| Tilt derivative | aids in determining the shape and edge detection of magnetic sources. |

The resulting images are shown in figures 3 through 6.

Keating coefficients, which are used to highlight magnetic anomalies that may be caused by kimberlite pipes, were calculated and supplied with the data set. The coefficients are a measure of correlation between a vertical cylinder model anomaly and the gridded residual total field magnetic data (Keating 1996). The following cylinder model parameters were employed for the North Arm aeromagnetic survey.

| | |
|---|---|
| cylinder diameter | 200 metres, infinite length |
| depth | 10 metres |
| magnetic inclination | 81° N |
| magnetic declination | 20° E |
| window size | 1000 m X 1000 m |

Coefficients showing greater than 75% correlation are displayed on figure 6 as proportionally sized circular symbols indicating the location of the anomaly. Solutions range from 75.1% to 83.7%, and relative errors from 11% to 17%. The symbols overlay an image of the reduced to the pole tilt derivative of the total magnetic field.

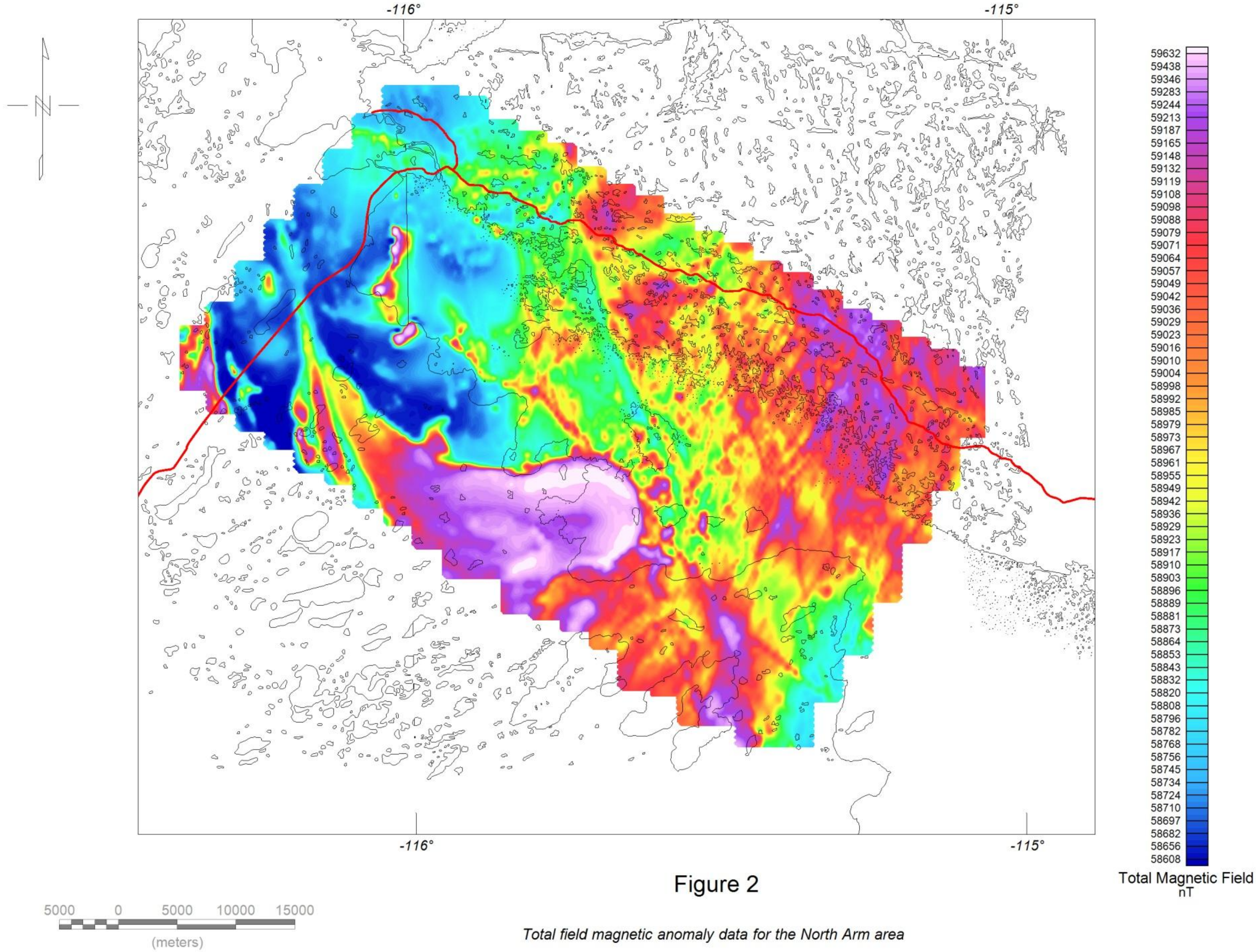


Figure 2

*Total field magnetic anomaly data for the North Arm area*

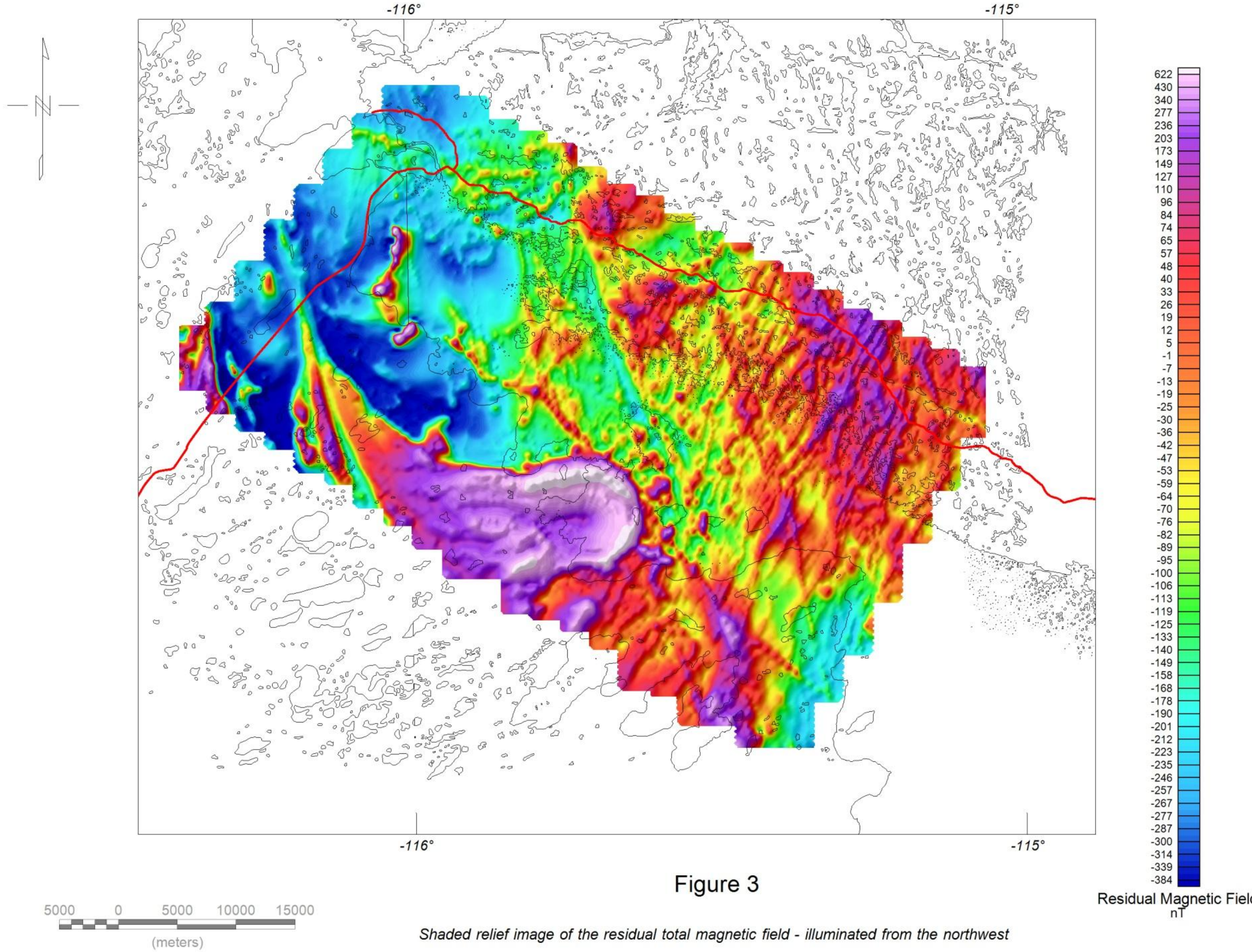


Figure 3

*Shaded relief image of the residual total magnetic field - illuminated from the northwest*

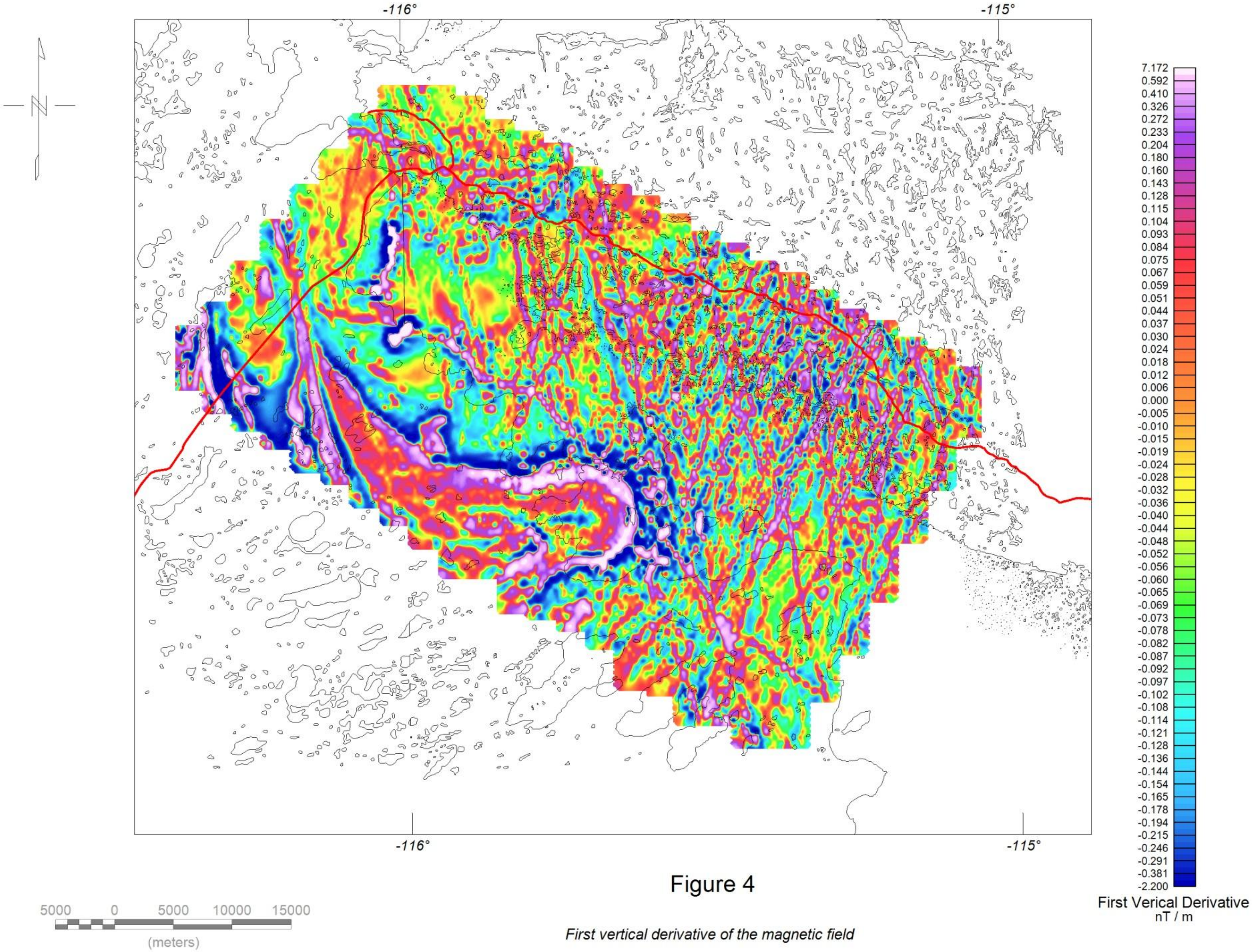


Figure 4

*First vertical derivative of the magnetic field*

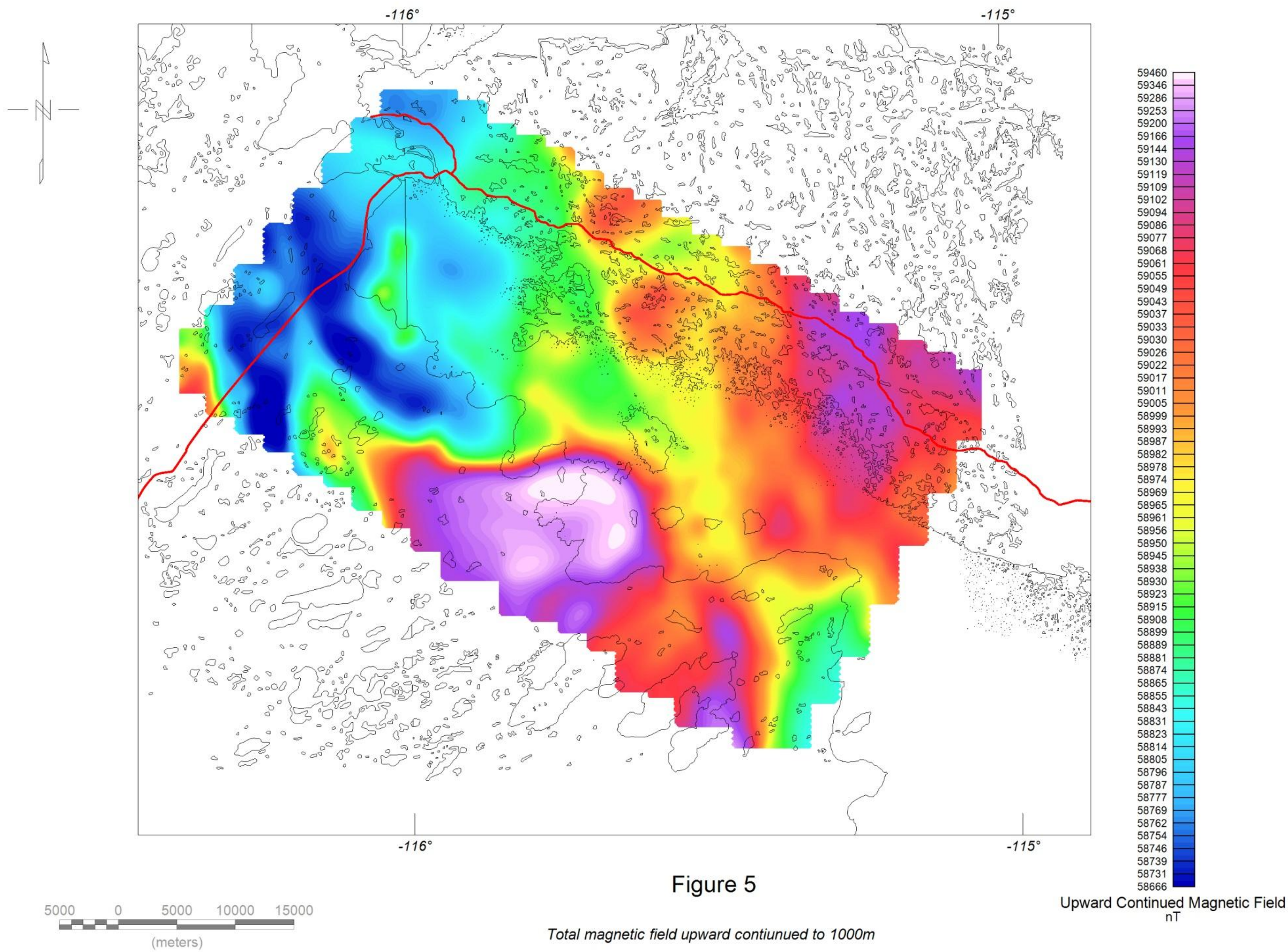


Figure 5

*Total magnetic field upward contiunued to 1000m*

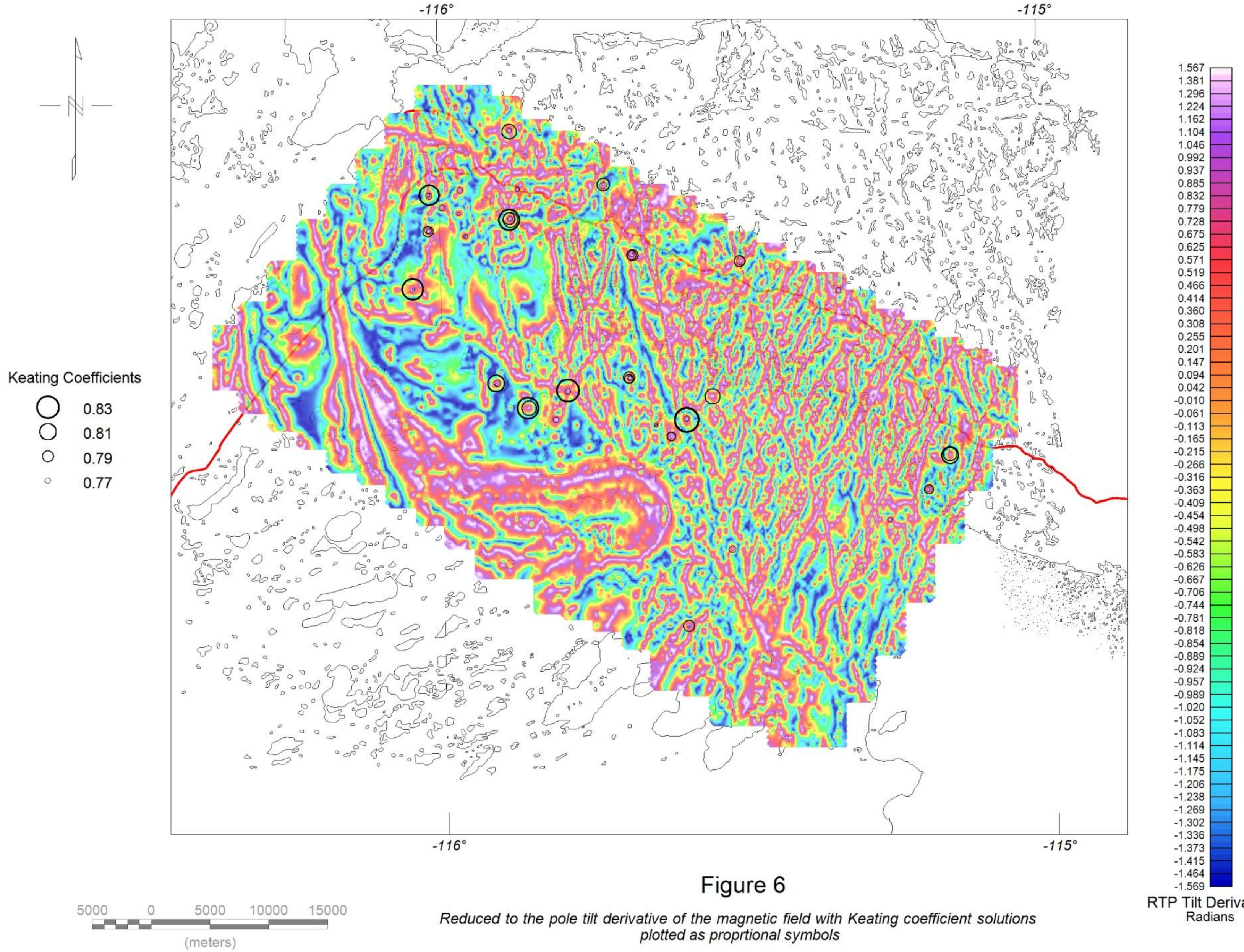


Figure 6

*Reduced to the pole tilt derivative of the magnetic field with Keating coefficient solutions plotted as proprtional symbols*

## DISCUSSION OF RESULTS

Regions exhibiting magnetic intensities forming characteristic patterns or textures that appear to correlate with known geology were visually identified and are described below. The interpretation is annotated on figure 7.

The northeast portion of the survey over an area mapped as Awry and Stagg Plutonic Suite granite and granitoid rocks (Henderson 1985) is characterized by a predominantly north-northeast and northwest trending pattern of linear and relatively narrow positive magnetic highs. These features are particularly noticeable on the magnetic derivative images (figure 4, 6). The magnetic amplitudes exhibited by the lineaments range as high as 200 nT implying magnetic sources. These sources are most likely shallow as indicated by the narrow response profiles. These observations suggest that the responses are caused by mafic dykes. The north-northeast and northwest trend directions relate the linears to Indin dyke swarms. The east-northeast trending Dogrib dyke swarms suggest a less mafic composition.

The characteristic magnetic fabric observed over the Awry and Stagg granitic rocks ranges to the southern limits of the survey area. This fabric indicates that the Plutonic suite rocks likely extend to the south under the lake water and Paleozoic cover. The interpretation is corroborated by results from drill holes GGL_DE95-05 and GGL_DE95-06 collared near the southeast corner of the survey describing approximately 90 metres of non-magnetic sedimentary cover rock overlying weakly magnetic granite / granodiorite rocks.

The total magnetic field image over the Plutonic Suites is dominated by the responses of the interpreted shallow source dyke swarms. Upward continuation filtering of magnetic field data can be used to separate causative sources from various depths (Jacobsen, 1987). This method was applied in order to extract deeper source responses (figure 5).The resulting image shows magnetic field variations across the pluton and demonstrates that compositional variations likely exist in the Awry and Stagg Plutonic suite granites. Alternatively one could speculate that these variations may be indicating inclusions of Anton Complex or Yellowknife rocks. Further petrographic and geochemical analyses would be required to determine the exact cause of the magnetic variations.

Several moderate west-northwest striking narrow magnetic lows truncate and / or offset the north-northeast trend of positive magnetic lineaments and as such are interpreted to represent postdating faults. A prominent linear magnetic low matching the trace of a defined fault strikes northwest through Waite Island and forms a sharp contact with granitic rocks exhibiting differing magnetic susceptibilities. This indicates the fault structure may be controlling the distribution of magnetite through these parts of the pluton.

Further to the west an irregular contact sweeping from north-south to east-west forms a gradational boundary with a broad and smooth magnetic low. The low can be traced to the southwest corner of the survey extents. Here historical drilling encountered Paleozoic sedimentary rocks covering intercalated granodiorite and meta-sedimentary-volcanic rocks (Williams et al 2001). Average magnetic susceptibilities of sedimentary and metamorphic rocks are considered to be generally lower than those of igneous rocks (Telford et al, 1976). This implies that the magnetic low is mapping an area comprising mainly sedimentary and metasedimentary rocks.

A strongly positive, up to 1200 nT, magnetic anomaly stretches north-south for approximately 6 kilometres through the centre of the magnetic low area. The anomaly's high amplitude response is likely caused by an accumulation of magnetite as suggested by the anomaly's linear to sinuous surface trace in deformed iron formation rocks. This interpretation of the style of mineralization however is not definitive as the anomaly could also be explained by a stratabound massive magnetite-hematite deposit, for example. A similar but more subdued magnetic anomaly can be seen immediately to the southeast. Another magnetic feature located approximately 13 kilometres to the southwest was tested by drill holes 01B5-001 and 01B5-002 which confirmed the presence of magnetite bearing iron formation rocks located at a depth of approximately 240m.

The south central portion of the residual total magnetic field image is dominated by a large curvilinear magnetic anomaly measuring approximately 8 kilometres by 14 kilometres. The feature straddles the interpreted contact between granitic and meta-sedimentary-volcanic rocks. The eastern portion of the anomaly corresponds to lake covered areas while the northern edge of the anomaly traverses Pte du Lac where generally Paleozoic sedimentary rocks have been mapped along with inliers of Awry Plutonic suite ganitoid rocks (Henderson, 1985). Outcrops of magnetite bearing porphyritic rhyodacite were reportedly noted in the area (Klein, 1991). A distinct magnetic high with values up to 800 nT rims the northern, eastern and southern edges of the anomaly while the centre of the anomaly shows a more moderate response of up to 200 nT. The elevated magnetic values, concentric shape, and broad extents demonstrated by the anomaly can be interpreted to be the responses of a large scale mafic intrusion. One could further suppose that the raised magnetic field values encircling more subdued ones are mapping roughly contemporaneous igneous rocks differing in phase and form. This feature could also indicate the presence of ring dykes however a conclusive interpretation is impossible based on the aeromagnetic data alone.

The western edge of the anomaly is unclear as it lacks a distinct magnetic rim. The magnetic field values remain greater than 100nT over a broad area until being truncated by a northwest trending linear magnetic low. Considering its location and trend angle the magnetic low is likely tracing a structure associated with the regionally extensive Wopmay Fault zone. A pair of linear magnetic high anomalies ranging roughly from 150 to 250 nT parallel the feature to the west. BHP / Far West Mining drill tested the most westerly of these anomalies, reporting approximately 130 metres of Paleozoic cover rocks overlying metasedimentary and granodiorite rocks. These rocks contain varying amounts of disseminated sulphide mineralization including pyrrhotite which could explain the increased magnetic field readings.

Kimberlite pipes, a source for diamonds have been explored for in the Slave Craton due to its thick Archean crust. These roughly cylindrical ultramafic intrusions give rise to circular magnetic anomalies noticeable on aeromagnetic data and are targeted using automated pattern recognition techniques. The methodology was applied to the North Arm aeromagnetic data to generate Keating coefficients which indicate how well the observed magnetic field data matched theoretical data produced by a model similar to the dimensions shared by known Slave Craton kimberlites. Aeromagnetic data does not contain any information regarding diamondiferous potential nor will the technique generate targets for pipes that do not correspond to the model dimensions. The exercise does show that several magnetic anomalies formed by possible kimberlite pipes exist on the survey area (Figure 6). Lacking any other geological criteria, the more prospective of these targets would be those located along structures related to dyke swarms. This spatial association between kimberlite pipes and dykes in the Lac de Gras area has been demonstrated (Wilkinson et al, 2001).

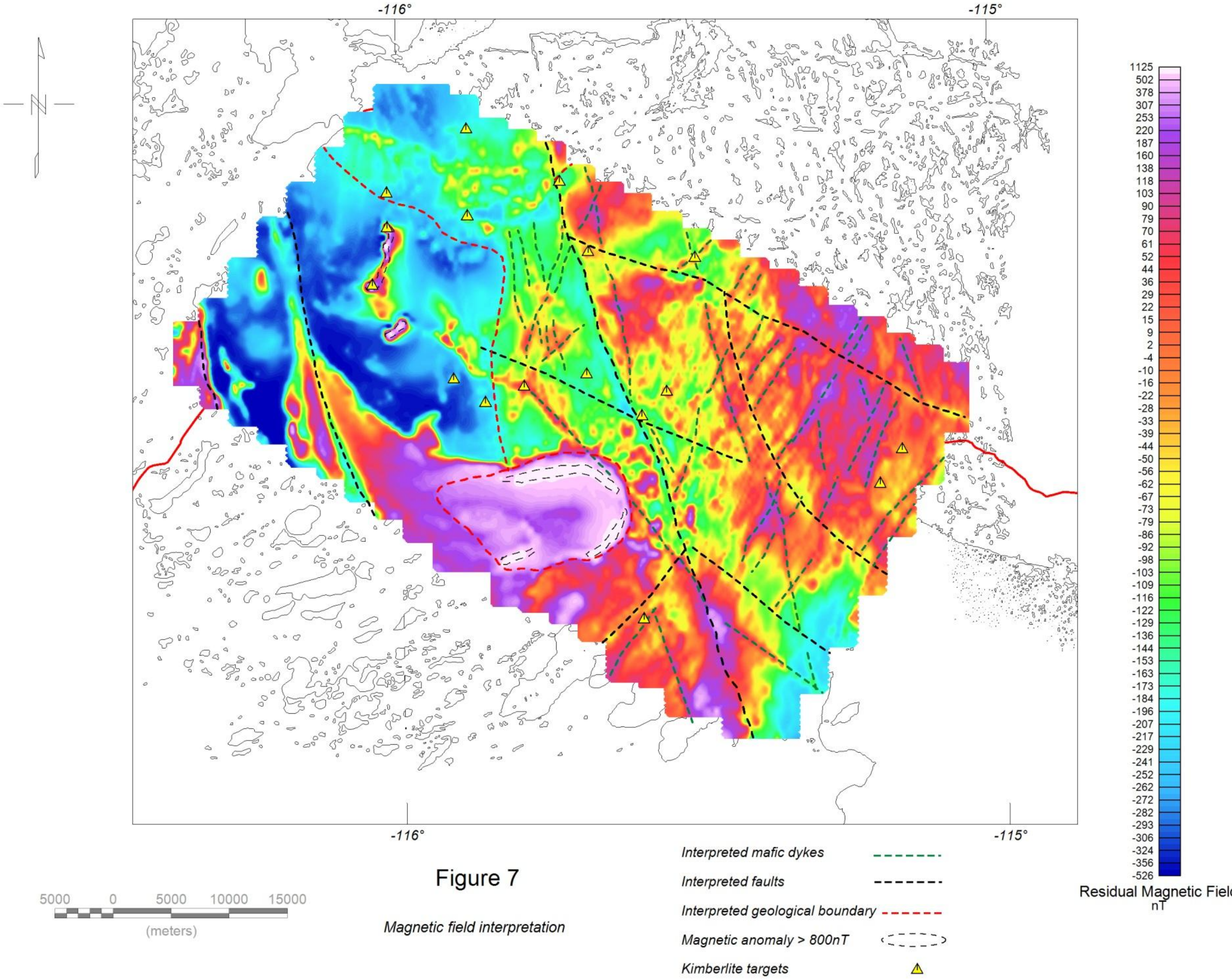


Figure 7

*Magnetic field interpretation*

**SUMMARY AND CONCLUSIONS**

The aeromagnetic survey covering the proposed protected area Kwets'ootl'àà was undertaken to gain insight into the geology underlying the lake covered portions of the region. The high resolution magnetic field data outlined known geological units and structures and was able to trace their extensions under the lake and younger cover rocks. Additional features that were previously unknown were also recognized.

Aeromagnetic data alone cannot distinguish economic mineralization from accumulations of magnetite mineralization. The data however does indicate that the area may be hosting features which would represent potential targets for additional mineralization. These include major northwest trending faults, possible oxide-facies iron formation rocks, and evidence of an igneous complex. Additionally, magnetic signatures characteristic of kimberlite pipes were identified from the data.

Respectfully submitted,

January 30, 2012, 2011

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