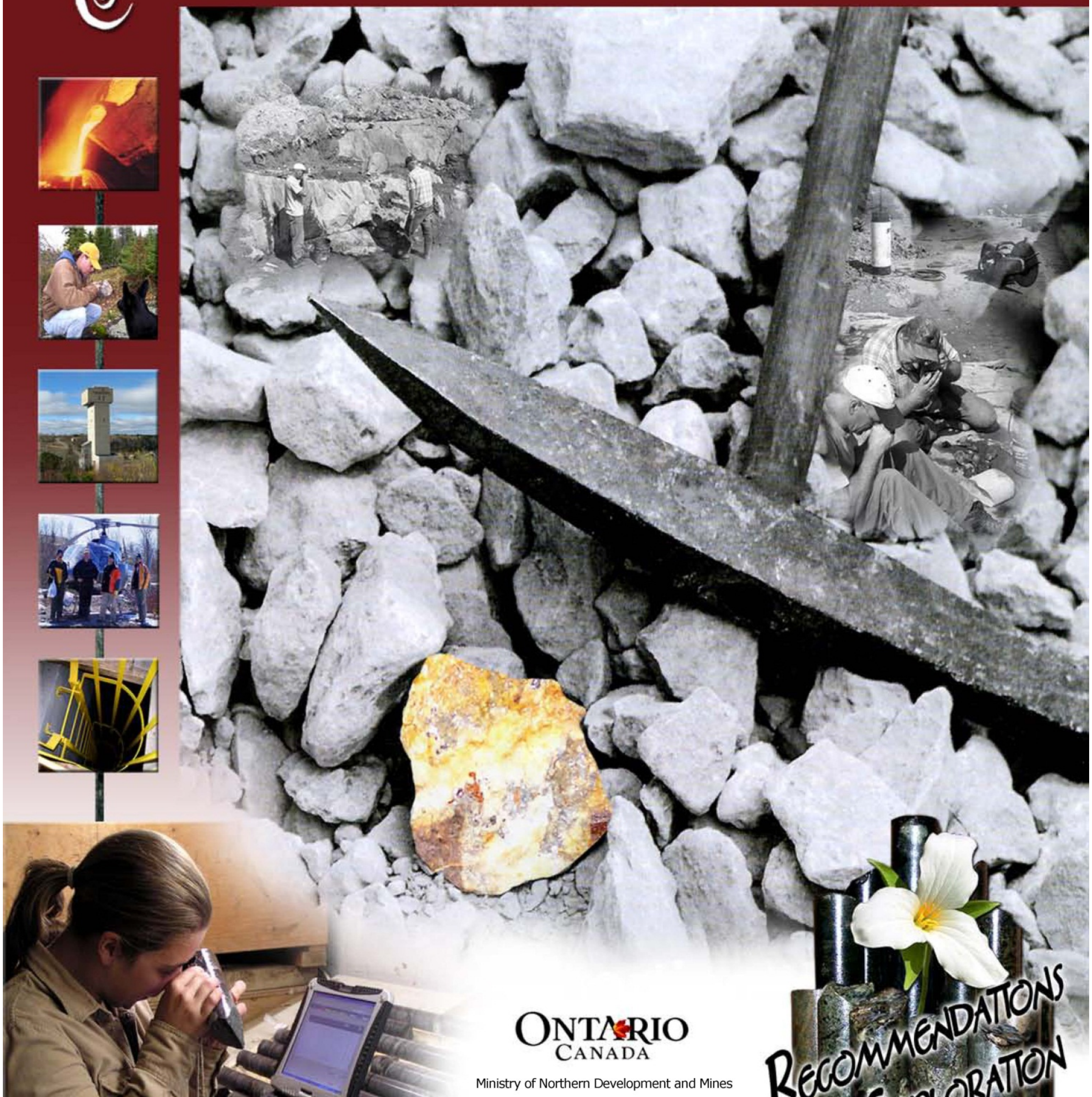
Explore the Opportunities...



ONTARIO
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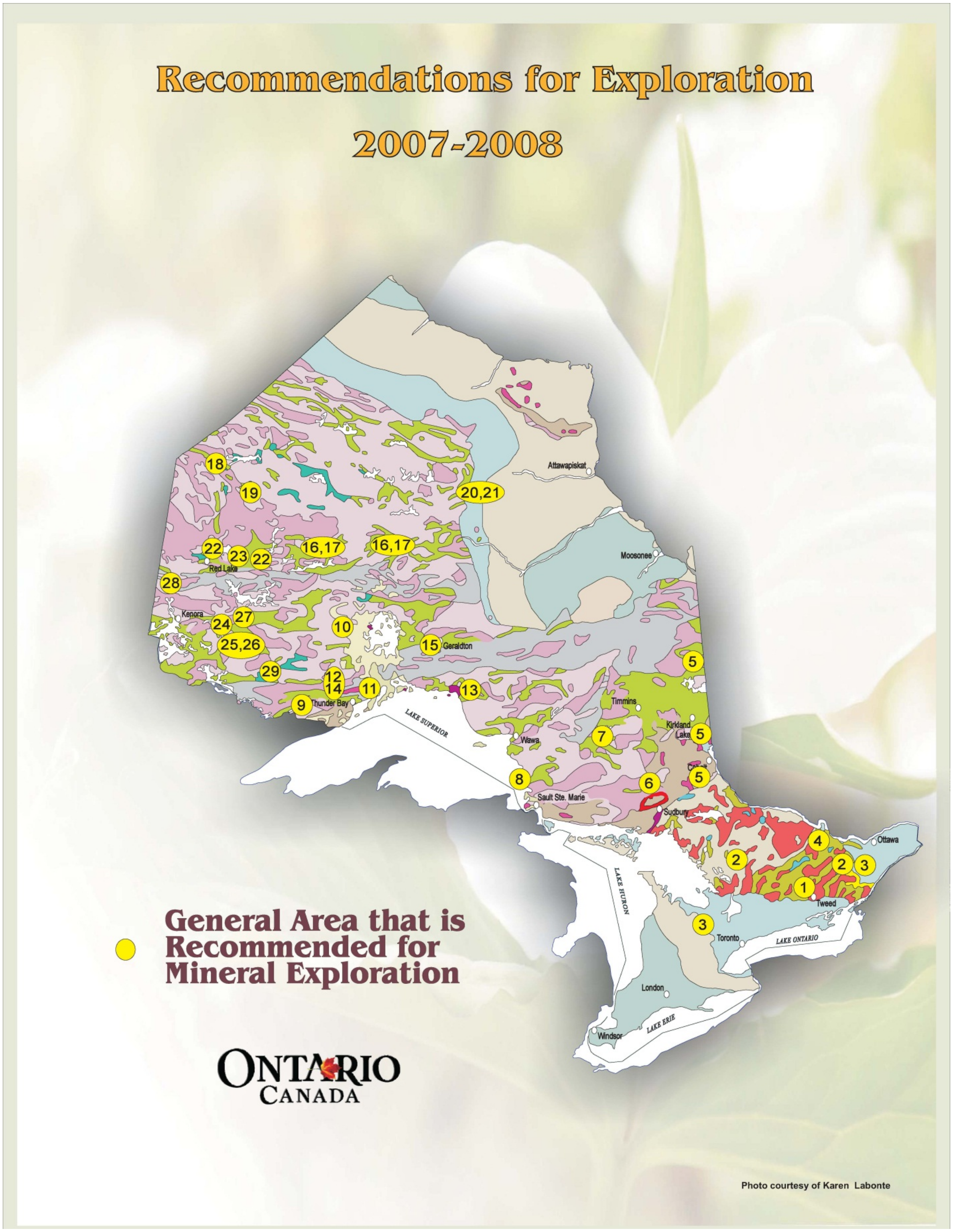
Ministry of Northern Development and Mines

Ontario Geological Survey

Resident Geologist Program

Recommendations for Exploration 2007 - 2008


Recommendations for Exploration
2007-2008
Attawapiskat
Moosonee
Red Lake
Kenora
Geraldton
Thunder Bay
LAKE SUPERIOR
Timmins
Kirkland Lake
Cobalt
Wawa
Sault Ste. Marie
Sudbury
Ottawa
Tweed
LAKE HURON
Toronto
LAKE ONTARIO
London
Windsor
LAKE ERIE
General Area that is Recommended for Mineral Exploration
ONTARIO
CANADA
Photo courtesy of Karen Labonte

The Ontario Resident Geologist's Program Recommendations for Mineral Exploration 2007-2008

The role of the Ontario Geological Survey's Resident Geologist Program is to monitor, stimulate and facilitate mineral exploration and support the sustainable development and stewardship of Ontario's mineral resources. The program is provincial in scope, forms the primary client service component of the Ontario Geological Survey and operates with a staff complement of 40 through a network of 10 field offices strategically located across the province. Six Regional Resident Geologists, supported by 8 District Geologists, 7 District Support Geologists and 3 GIS/Data Specialists provide a variety of services to mineral industry clients as well as functions internal to government that support the mineral resource sector. The Program's Land Use Policy and Planning Coordinator and 2 Regional Land Use Geologists provide input into land use planning issues in support of the mineral exploration industry. A First Nations Minerals Information officer, based in Thunder Bay, provides education, information, advice and expertise regarding geology, mineral exploration and mining to First Nation Communities throughout Ontario generally, and northern Ontario particularly.

Program services and functions are grouped into the following 7 key areas:

- **Provide expert geological consultation and advisory services to promote and stimulate mineral exploration and support the development and stewardship of Ontario's mineral resources in an environmentally responsible manner**
- **Generate and transfer new geoscientific data and ideas**
- **Maintain and provide public access to geoscience databases/other resource materials**
- **Monitor and report on mineral exploration and development activity**
- **Provide input into land use planning issues and initiatives to support the stewardship of Ontario's mineral resources**
- **Foster relationships amongst government, the mineral sector and Aboriginal communities**
- **Participate in marketing forums to promote Ontario's mineral endowment and attract mineral resource investment to the province**

The Resident Geologist Program also provides support to MNDM's Mining Lands Section front-counter client services.

The Senior Manager for the Resident Geologist Program is John Mason, who is resident in Thunder Bay.

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For additional information on the Resident Geologist Program and the Ontario Geological Survey please visit the Ministry of Northern Development and Mines' *Mines and Minerals website.*

NB: The various references to mineral reserves/resources in this document may be based on data before National Instrument 43-101 went into effect. These reserve/resource calculations may not meet criteria for National Instrument 43-101.

This document was originally published in December 2007.

It has been reformatted from the original to meet AODA compliance requirements.

1. Iron oxide-Copper-Gold Potential of the Deloro Granite Southeastern Ontario

Highlights

- **Deloro granite is enriched in REE, F**
- **Au-arsenopyrite deposits along its margin**
- **+200 000 oz Au**
- **resource in satellite granite stock**
- **wollastonite and low-Ti magnetite skarns including Ni, Co, Sb, U**
- **iron oxide, gold, and copper deposits, associated with structural controls**
- **trace element enrichment (REE, F, Co, U)**
- **widespread Na alteration, and local sericite alteration**

The Deloro Granite in Madoc and Marmora townships is associated with a range of mineralization types and minor element enrichment which has characteristics similar to those of iron oxide-copper-gold deposits.

The Deloro Granite is part of the Methuen suite of alaskitic, anorogenic granites emplaced between 1250 Ma and 1240 Ma in the Central Metasedimentary Belt of the Grenville Province (Easton, 1992). It includes syenitic and gabbroic phases, is relatively enriched in REE and F, and exhibits evidence of postmagmatic, hydrothermal albitization (Abdel-Raman and Martin, 1987). Both syenite and granite contain inclusions of gabbro, diabase, metavolcanics, and metasedimentary rocks. Deposits of gold, iron, and copper are associated with the Deloro Granite and smaller satellite bodies of granite, syenite and diorite.

Several gold-arsenopyrite deposits along the western margin of the Deloro Granite were mined prior to the early 1900s, producing 30 000 tonnes of ore averaging 10 g/t Au. Mineralization is confined to quartz veins within NNE-trending shear or fracture zones within highly altered granite, syenite and diorite. Feldspars are extensively altered to a fine-grained mass of pale green sericite, leaving the quartz grains intact with the appearance of quartz-eye porphyry. Concentrations of magnetite close to the gold mineralization are common.

Iron oxide-Copper-Gold Potential of the Deloro Granite Southeastern Ontario...cont'd.

In the 1980s, gold was discovered in a granite body about 800 m north of the Deloro Granite (the Dingman prospect, LeBaron 1991). Resource estimates range from 8.5 million tonnes @ 1.48 g/t Au (B. King, 1998, unpublished report for Noranda Exploration Company Limited), to 12.6 million tonnes @ 0.7 g/t Au (Barnes Engineering Services, 1998, unpublished report for Deloro Minerals Ltd.) indicate that the prospect contains significantly more gold than the total of all past production in southeastern Ontario (200,000+ oz vs. 38,000 oz). Accessory minerals include pyrite, chalcopyrite, pyrrhotite, magnetite and fluorite. NNE- trending shear zones contain intense green sericite alteration. Wollastonite and magnetite occur in skarn zones within the surrounding marble, and large blocks of granite occur within a footwall breccia.

A small zone of similar alteration and Au mineralization, also discovered in the 1980s, occurs within the western margin of the Deloro Granite. The Deloro North occurrence includes granite-diorite breccia, xenoliths of calcareous and siliceous metasediments, up to 15% magnetite in marble at the contact with syenite of the Deloro complex, and green sericite alteration in NNE-trending shear zones, several of which border linear topographic lows with coincident magnetic highs within the granite (LeBaron, 1990).

Several small magnetite and hematite deposits within metasediments in contact with the Deloro Granite were mined in the late 1800s to early 1900s. All are low- Ti, magnetite skarn type deposits, locally altered to hematite near the Precambrian– Paleozoic unconformity. References to mineralogy that suggest enrichment in IOCG-related elements include: smaltite at the Dominion Iron Mine; native Sb at the Dufferin Iron Mine; a secondary uranium mineral described as "uranochre", lining fissures at the Seymour Iron Mine; and reports of pyrite and chalcopyrite at most of the iron deposits bordering the Deloro Granite. The largest concentration of magnetite, the Marmoraton Iron Mine (produced 25 million tonnes grading 43% Fe) is situated at the contact between a diorite/syenite body and interlayered carbonate and siliceous metasediments, about 3.5 km southwest of the Deloro Granite. Pyrite and traces of chalcopyrite constituted up to 5% of the ore, occurring as fracture fillings introduced after deposition of the magnetite. Easton (1989) suggests that the diorite/syenite may be connected at depth to the Deloro complex.

The Eldorado Copper Mine, located about 1.5 km east of the Deloro Granite, consisted of a sulphide lens at the contact between a small granite body and dolomitic marble. The upper 25 m was oxidized to hematite, below which sulphides (chalcopyrite, pyrite, and chalcocite), averaging about 7% Cu, 9 g/t Ag, and 1 g/t Au, were mined to a depth of 100 m. At the eastern end of the same granite body is the site of Ontario's first gold discovery, the Richardson Mine. This deposit, mined in 1866, consisted of native gold associated with brannerite, a black, titaneferous uranium oxide.

Iron oxide-Copper-Gold Potential of the Deloro Granite Southeastern Ontario...cont'd.

The presence of iron oxide, gold, and copper mineralization, in association with structural controls, trace element enrichment (REE, F, Co, U), widespread Na alteration, and local sericite alteration, suggests that the mineralization system as a whole is similar to that of IOCG deposits. Little intensive exploration has been done in the area since the discovery of gold and iron deposits in the late 1800s. In particular, the syenite/diorite body at the Marmoraton Iron deposit, a magnetite (epidote-garnet) skarn, should be considered as a target for gold mineralization, based upon the association of small magnetite occurrences with gold deposits of the Deloro area. A much larger hydrothermal system such as that required to create a 25 million tonne iron ore body may also have produced significant alteration and mineralization within the Marmoraton intrusion. The KY-3 deposit of Solomon Resources in western Mongolia is a magnetite (epidote-garnet) skarn averaging 36% iron, in which "probable endoskarn mineralization assaying up to 2.615 g/t Au and 1.57% Cu has been noted within the dioritic intrusive rocks" (Solomon Resources Limited, news release, Sept. 7, 2006).

A number of other granites of the Methuen suite should be considered as targets for IOCG mineralization. These include the Coe Hill and Bessemer granites, both of which are associated with skarn magnetite deposits, and the Methuen granite, all within the Belmont Domain (Elzevir Terrane); the Cheddar and Cardiff granites and granitic rocks rimming the Burleigh- Anstruther gneiss domes in the Harvey-Cardiff Arch, Elzevir Terrane; the Addington granite, Mazinaw Terrane; and the Barbers Lake granite, Sharbot Lake Terrane. The Cheddar and Barbers Lake granites have a similar U, F, and oxygen isotope signature to that of the Deloro Granite (Easton, 1989).

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2. Grenville Province Ni-Cu (Co-PGE) Potential

Highlights

- **very little recent work on known Ni-Cu deposits**
- **two magmatic sulphide bodies at the Macassa deposit; in excess of 4M tons sulphide mineralization**
- **Ni-Cu-Co-PGE in anorthosite, gabbro, diorite ultramafic units at Ellerington wollastonite and low-Ti magnetite skarns including Ni, Co, Sb, U**
- **ghanite in stream sediments may vector to magmatic sulphide deposits**

Several nickel-copper prospects that were discovered in southeastern Ontario prior to 1965 have seen little additional exploration work since that time, with the exception of some activity in the 1990s that was directed primarily at exploration for platinum group metals.

The following table lists the nickel-copper occurrences in southeastern Ontario that are associated with mafic intrusions. More complete details are available in the Mineral Deposits Inventory database.

Occurrence	Township	Significant Mineralization	Source of Information
Crowe River	Lake	Zone 53 m long, avg. 2.3% Cu over 2.1 m,	Alsof Mines, 1958)
Macassa	Limerick	3.5 Mt @ 0.8% Ni, 0.25% Cu, 0.05% Co	DDH, Lac Minerals, 1971
Simon	Lyndoch	S. zone amphibole gneiss, 230 000 t @ 1.09% Cu; N. zone gabbro, cp,po	DDH, Young-Davidson Mines, 1965)
Bonter	Marmora	0.45% Ni, 0.26% Cu over 54.0 m	DDH, Ontario Nickel, 1953
Ellerington	McClintock	1.36% Ni, 0.2% Cu, 0.0 98% Co over 4.5 m	DDH, Slocan Van Roi Mines, 1959
Ellerington	McClintock	1.12 g/t Pt	Orogrande Resources, 1997
Sharbot Lake	Olden	Sulphide zone 228 m long, 46 m wide; 0.3% Ni, 0.3% Cu, 0.14% Co over 5.5 m	DDH, Sharbot Lake Mines, 1957
Ameranium	Raglan	Surface sampling 0.5% Ni, 1957	None listed
Genricks Lake	Raglan	Surface sampling 0.5% Ni, 1957	None listed
Landolac	Raglan	Surface sampling 1.9% Cu, 0.85% Ni, 0.07% Co, 2 to 12 ppb Pd	Wilson, 1994
Raglan Hills	Raglan	0.25% Cu, 0.04% Ni over 1.37 m	DDH, Raglan Nickel Mines, 1956
Raglan Hills	Raglan	81 ppb Pt, 133 ppb Pd	McArthur Mills Expl., 1986
Lingham Lake	Tudor	0.9% Ni, 0.35% Cu	DDH, Louada Expl., 1969

One example of a magmatic nickel-copper deposit in the Grenville Province is the Renzy Lake Mine in western Québec, which produced about 1 million tons grading 1.5% Ni+Cu. The ore consisted of about 50% sulphides in cumulate-textured peridotite, which intruded paragneiss of the Central Gneiss Belt. Recent work has identified a new zone with grades of 0.9% Cu, 0.5% Ni, 0.04% Co, and 0.12 g/t Pt+Pd (Matamec Explorations Inc.).

Easton (1992) has identified 2 suites of gabbroic intrusions within the Central Metasedimentary Belt in Ontario: an older “Killer Creek” suite (older than 1270 Ma) and a younger “Lavant” suite (1250 to 1230 Ma). Although nickel-copper mineralization occurs in both suites, Easton suggests that nickel-copper magmatic sulphide deposits are more abundant in the members of the older suite. Examples of both, and of one occurrence in the Central Gneiss Belt, are described below.

Grenville Province Ni-Cu (Co-PGE) Potential…cont'd.

Central Metasedimentary Belt

Mineralization at the Macassa nickel-copper deposit consists of disseminated pyrrhotite, pentlandite, chalcopyrite, and pyrite in a band of metapyroxenite within the Thanet gabbro of the Lavant suite. The main zone, containing a drill-indicated resource of 3.5 Mt grading 0.8% Ni, 0.25% Cu, and 0.05% Co, is about 320 m long, averages 17 m in width, and has been drilled to a depth of 365 m. A second zone, about 1200 m to the south, contains a resource of 1.2 Mt grading 0.3% Ni (Carter, 1984). Limerick Mines Ltd. drilled 4 diamond-drill holes to confirm results of previous drilling and did ground magnetic surveys on other parts of the property in 2004.

The Raglan Hills gabbro, which is lithologically similar to the Killer Creek suite (Easton, 1992), is predominantly a gabbro- anorthosite intrusion with hornblendite at the margins and pyroxenite to olivine pyroxenite in the central part. The Raglan occurrence consists of a 155 m long, 90 m wide, 6 to 15 m thick lens of disseminated pyrrhotite, chalcopyrite, and pyrite hosted by anorthositic metagabbro (Carter, 1984). Work to date has focussed on 4 sulphide occurrences that were discovered in 1956. The presence of nickel-copper mineralization with anomalous platinum group element values (*see* Table) indicates that additional work is warranted in this large intrusive complex.

Central Gneiss Belt

Metagabbroic anorthosite bodies tens of metres wide and tens of kilometres long occur in the Fishog and McClintock domains of the Algonquin Terrane of the Central Gneiss Belt. Easton (1992) considers these to be layered anorthositic intrusions with a likely emplacement age of 1400-to 1300 Ma. Wilson (1994) describes a layered mafic intrusion in Sri Lanka that has been flattened to 5% of its original thickness and stretched to 20 times its original length during granulite- facies metamorphism. He further suggests that the thin, extensive mafic bodies in the Central Gneiss Belt have potential for nickel-copper mineralization.

In McClintock Township, Randsburg International Gold Corporation has intersected several nickel-copper-cobalt bearing sulphide zones with anomalous PGE values (*see* Table, Ellerington occurrence) within a 4 to 5 km wide band of anorthosite, gabbro, diorite, and ultramafic rocks flanked by paragneiss (Tweed Resident Geologists Program Office, MDI files). Although the occurrence was originally discovered in 1941, there has been very little exploration work in the surrounding area, and the geology has not been mapped in detail. This occurrence lies within an area shown by Lumbers and Vertolli (2003) as monzogranite, suggesting that the distribution of mafic rocks in the area may be more extensive than is indicated.

Grenville Province Ni-Cu (Co-PGE) Potential…cont'd.

Possible "Indicator Mineral" Occurrences

Most of southeastern Ontario nickel-copper occurrences are at, or near, the margins of intrusions, indicating that wall-rock assimilation may have induced sulphide saturation in the magma (Easton and Fyon, 1992). Eckstrand (1995) suggests that high zinc content in chromite associated with mafic to ultramafic intrusions may indicate assimilation of zinc-bearing sulphidic metasedimentary rocks. Similarly, green spinel, which may be iron rich (hercynite) or zinc rich (gahnite), may also be the product of sulphidic wall-rock assimilation. Green spinel has been reported in marginal phases of the Chenaux Gabbro (Wilson 1994), the Lavant–Oso Gabbro (Wolff, 1985) and in pyroxenites in several locations in the McClintock Township area (Adams and Barlow, 1910). A stream sediment anomaly consisting of 23 grains of gahnite from a sample taken within 500 m of the Killer Creek gabbro, and a second anomaly of 17 gahnite grains located about 24 km to the south (Felix, Reid and Easton, 2006) may be derived from the Killer Creek intrusion.

Summary

Southeastern Ontario nickel copper occurrences, in some cases with significant cobalt and anomalous platinum group metal values, are hosted by a variety of mafic to ultramafic intrusive rocks, locations of which are well-defined on geological maps within the central Metasedimentary Belt and less so within the central Gneiss Belt. In both areas, the intrusions should be examined in more detail for features such as evidence of magma mixing and wall-rock assimilation.

Based upon current high prices and projected continuing high demand for nickel, copper, cobalt and platinum group metals, and upon a relatively low level of previous exploration for magmatic nickel-copper deposits in southeastern Ontario, additional exploration is recommended.

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3. Ontario Dimension Stone - New Technologies, New Potential

Highlights

- **new technologies in thin stone veneer and resin- stone**
- **SE Ontario rock types well suited to new techniques**
- **samples on display in Tweed Resident's Office**

Southern Ontario has long been a major producer of stone and stone products. Recent trends in the residential construction market toward the use of resin-stone composites and thin stone veneer, which do not require large quarry blocks for production, have increased the economic potential of southern Ontario's wide variety of limestones, dolostones, sandstones, granites, gneisses, and marbles. Although the following recommendation refers specifically to previous investigations of dimension stone potential in Southeastern Ontario, recently developed technology in thin stone veneer and composite stone surfaces has increased potential for new dimension stone industries across the province.

Thin stone veneer (TSV) is natural, split-face stone cut to a thickness of 2 to 4 cm that gives the appearance of rough cut stone at a much lower cost and weight than standard 10 to 15 cm thick ashlar. It can be applied to an existing wall by using a standard mortar mix over a metal mesh backing, and does not require extra footings and wall ties that are required by conventional, full-thickness veneer products. Thin stone veneer is the fastest-growing sales product of stone suppliers in the United States (Penn, 2006), particularly in the residential market where it is used on exterior and interior walls, flooring, fireplaces, driveways, patios, and steps. K2 Stone Quarries Inc., of Nanaimo, BC, expects to triple production in the coming year, having seen sales of TSV grow from 25% of total sales in 2005 to 50% in 2006 (Penn, 2006).

The ideal stone for TSV fabrication is 4 to 8 cm thick with 2 split faces. The slab is fed into a veneer saw and sliced into 2 pieces, each 2 to 4 cm thick with a sawn back and split face. Limestone, dolostone, sandstone, slate, and granitic gneiss, all of which have been quarried in southern Ontario, are well suited to the production of TSV. Exploration of the following areas is recommended

- In southeastern Ontario, sandstone of the Nepean Formation is exposed above the Paleozoic–Precambrian unconformity along the margins of the Frontenac Arch near Gananoque and from Brockville to Ottawa.

Ontario Dimension Stone - New Technologies, New Potential…cont'd.

- In south-central Ontario, the Whirlpool and Grimsby sandstones outcrop near the base of the Niagara Escarpment from Niagara Falls to Collingwood

The most productive limestone and dolostone strata, with respect to building stone and flagstone in southeastern Ontario, are the Gull River and Bobcaygeon formations, which are most frequently exposed along the northern margin of the Western St. Lawrence Platform from Kingston to Midland. Several past and current producers are described in LeBaron and Williams (1990). In south-central Ontario, building stone is quarried almost exclusively from dolostones of the Amabel Formation on the Bruce Peninsula. Derry Michener Booth and Wahl and OGS (1989) describe the geology and quarries of the area.

Gneissic rocks in the Parry Sound–Muskoka area are quarried in several locations for flagstone. Fouts and Marmont (1989) describe the quarries and the potential of the area for flagstone production. Easton and Fyon (1992) suggests that domain and terrane boundaries in the Central Gneiss Belt and the Central Metasedimentary Belt Boundary Zone are primary target areas for flagstone deposits.

Many deposits of limestone, dolostone, sandstone and gneiss that are considered to be unsuitable for dimension stone production, based upon low potential for large quarry block extraction, may be suitable for the production of thin stone veneer. Such deposits, including granites, should also be re-examined as sources of stone for cultured marble and granite, which may contain 80% stone particles in a polyester resin matrix. LeBaron et al. (1990) documents 71 sites in southeastern Ontario that were examined for building stone potential–predominantly marbles and granites with a wide range of colours and textures. Polished samples from 51 of the sites can be viewed at the Resident Geologist's Office in Tweed.

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Photo. Thin stone veneer, Brady quarry, Parkin Township

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4. Non-sulphide Zinc Potential in the Central Metasedimentary Belt

Highlights

- **zinc oxide deposits in Grenville marbles**
- **new extraction methods environmentally acceptable**
- **zinc oxide minerals frequently mis-identified in the past**

In 2006, Ontario produced approximately 108 000 tonnes of zinc worth $380 million. Although the value of zinc produced increased by over 200%, the volume produced decreased by almost 10%. The sole remaining zinc producer in Ontario is the Kidd Creek Mine, a deposit near Timmins.

The price of zinc has almost tripled in the past few years from $US0.35 per pound in 2003 to $US1.22 per pound in the 4th Quarter 2007. The London Metals Exchange reported an average price per tonne of zinc of over $3100 for the period January to November 2006. There is a growing demand for zinc due in part to the increasing industrialization of East Asian nations.

Difficulties in metallurgical beneficiation of non-sulphide zinc ores experienced in the nineteenth and early twentieth centuries led to a lack interest in development of these deposits. Recent new extraction and electrowinning technologies have renewed interest in non-sulphide zinc as a potential major source of zinc metal. It is possible that these new technologies will allow for the production of zinc from non-sulphide deposits at lower costs than production from conventional sulphide ores (Hitzman et al., 2003). Increasing environmental restrictions may also favour the development of non-sulphide zinc deposits relative to sulphide ores.

Prolonged lack of economic interest has contributed to a lack of research into and understanding of these deposits (Sangster, 2003). The world's largest hypogene non-sulphide zinc deposits are Franklin and Sterling Hill in New Jersey. These deposits are hosted by Mesoproterozoic Grenville Province marbles exposed in Appalachian uplifted terranes.

Non-sulphide Zinc Potential in the Central Metasedimentary Belt…cont'd.

Gauthier and Larivière (2005) have suggested that the zinc oxide mineral potential of carbonate rocks along the Central Metasedimentary Belt Boundary Zone may be underestimated, as the zinc oxide willemite will weather to serpentine and, consequently, might be misidentified as altered forsterite or chondrodite. Studies conducted in Quebec using "zinc zap" have identified several areas of previously unknown zinc oxide mineralization. Grenville Supergroup marbles of the Central Metasedimentary Belt (CMB) present the same characteristics as those in New Jersey.

Non-sulphide zinc occurrences have been located in the (CMB) in the area of Bryson, Québec, 60 km west of Ottawa. The Cadieux deposit, a SEDEX-type zinc sulphide deposit is hosted in the same marble belt 30 km to the south, near Renfrew. Gauthier and Larivière (2005) identify the Bryson–Renfrew region as a transition between conventional sulphide deposits with unconventional non- sulphide zinc deposits in a SEDEX environment.

Marble-rich carbonate units of Renfrew County, are known to host zinc sulphide mineralization. There is potential for previously unrecognized zinc oxide mineralization in this part of the Central Metasedimentary Belt.

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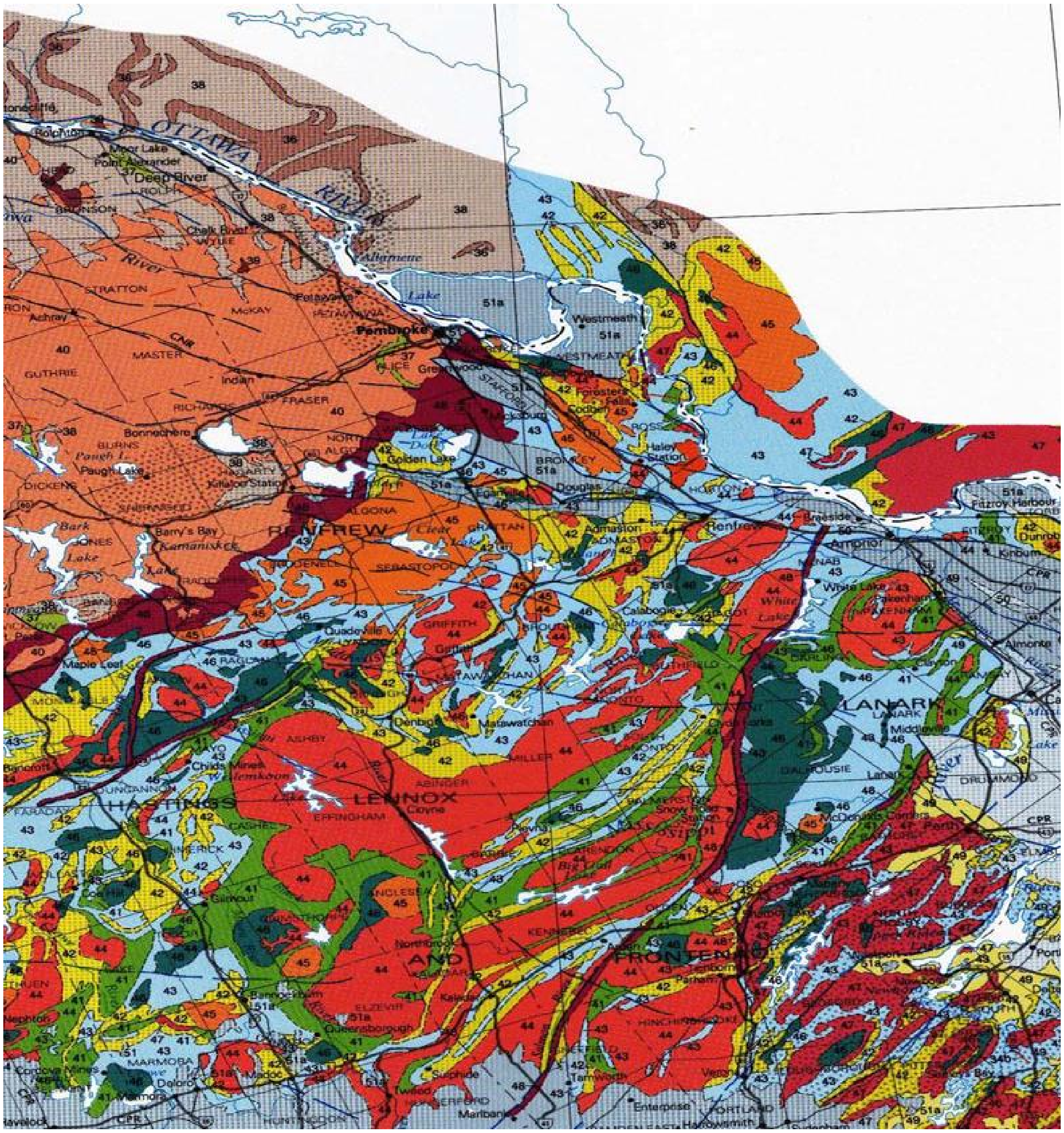
Non-sulphide Zinc Potential in the Central Metasedimentary Belt…cont'd.

Figure: Geology of the northern Central Metasedimentary Belt.



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5. Resurgence of interest In Iron Ore – Kirkland Lake

Highlights

- **dramatic increase in price of iron ore**
- **two past producers with reserves**
- **numerous iron formations remain undeveloped**
- **significantly improved access**

Worldwide price increases of 70% in 2005 and approximately 20% in 2006 (Jorgenson, 2007) have created a resurgence in the interest for Archean iron formations as a source of iron ore. Kirkland Lake Resident Geologist District hosts 2 past producing mines: the Adams Mine south of Kirkland Lake and the Sherman Mine north of Temagami.

The mines were developed in Algoma type, oxide facies iron formation. The Adams Mine began production in 1964, and was followed by the Sherman Mine in 1968. Both mines closed in 1990 due to the high cost of production, not to a depletion of ore reserves. It is reported that the Sherman Mine may have had about 3-5 years of reserves (Northern Daily News, March 7, 1989); and the Adams Mine approximately 14 years of open pit reserves at closure (Meyer et al., 1990). At the Adams Mine, ore was still being extracted from 4 pits; 4 other orebodies were undeveloped at the time of closure. Additional deposits are known to exist to the west of the mine. In 2004 the Ontario Government passed an act known as "The Adams Mine Lake Act". This Act does not eliminate mining as a use for the property.

Many iron deposits are described in "Iron Deposits of Ontario" (Shklanka, 1968). Many of the deposits in the region were discovered following regional airborne magnetic surveys, which were flown after World War II. More recent, higher detail, airborne magnetic surveys exist for most of the greenstone areas of the District. Manipulation of the digital magnetic data allows for ease of identification of most of the deposits identified in the publication mentioned above.

Essentially only reconnaissance work has been performed over the known deposits; many have only been tested by a few drill holes. Road access has improved greatly since the 1960's when they were first prospected. The Iron Lake prospect in Newman Township was traced by geophysics for a strike length of 3.5 km. Iron formation was intersected along a core length of 54 m. Other unexploited deposits can be found in all parts of the district.

Increased access, the continued demand for iron and the associated price increase, could now make some of these deposits viable.

References

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6. Ni-Cu-PGE in Sudbury Offset Dykes

Highlights

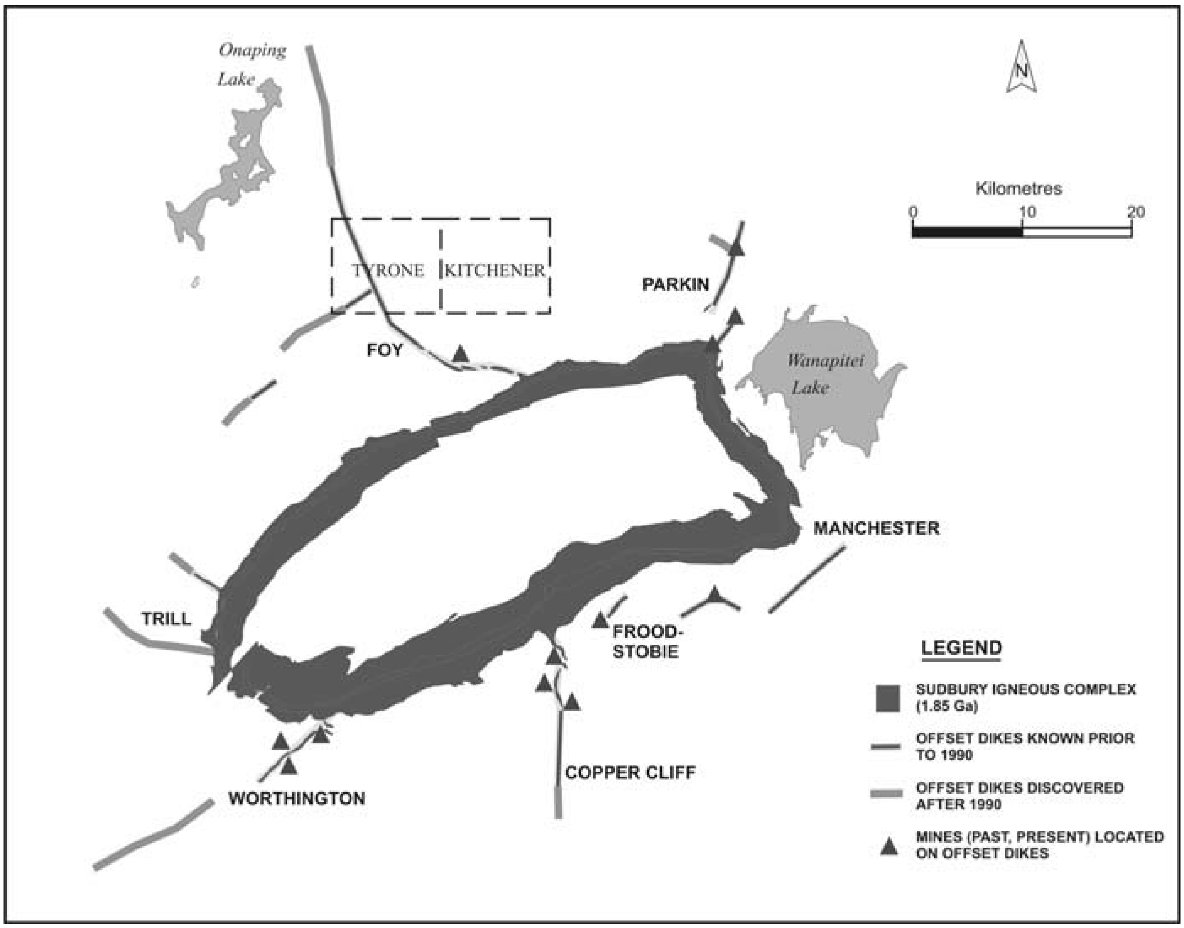
- **significant past and current Ni- Cu-PGE production from Offset Dykes**
- **Offset Dykes are associated with Sudbury Breccia**
- **Sudbury Breccia found 80 km from Sudbury Basin and remains open for staking**

Several producing mines in the Sudbury camp have exploited economic base metal mineralization in offset dykes, which are essentially Sublayer intrusive rocks penetrating the footwall of the Sudbury Igneous Complex (SIC). Accordingly, these dykes have been popular exploration targets since the earliest days of mining in Sudbury. Offset dykes either radiate outward from the base of the SIC or occur in footwall rocks parallel to the SIC contact.

Sudbury Breccia, a pseudotachylite of varying composition, occurs around the Sudbury Basin in both radial and concentric patterns as well, and has been identified as far as 80 km from the basin in the northeast. Many offset dykes are associated with Sudbury Breccia. Radial offsets project outward from embayments along fractures which are often filled with Sudbury Breccia; the Frood-Stobie offset is entirely within Sudbury Breccia.

In the highly-staked ground surrounding the Sudbury Basin, one of the last areas affording unstaked Crown Land is found in the granites and gneisses of Kitchener and Tyrone townships, northeast of the basin. Proximal to the prolific Foy offset, this area contains little-documented occurrences of Sudbury Breccia which warrant further examination for possible offset dykes of both radial and concentric nature.

Figure. Location of Tyrone and Kitchener townships.



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7. Graphite versus Ironstone in the search for VMS

Highlights

- **both ironstone and graphitic sediments can vector to VMS**
- **varying geophysical response from contrasting environments**
- **Swayze area hosts prospective ironstone and chloritized felsic rocks**

As a result of extensive exploration for volcanogenic massive sulphide (VMS) deposits in the Timmins area subsequent to the discovery of the Kidd Creek Mine (former Texasgulf), recent emphasis has been focused on developing techniques and insights into the chemistry of graphitic conductors that mask, mimic or vector to potential sulphide ore bodies (e.g., Barrie, 2004).

It is notable that many of the electromagnetic conductors in the Kidd Munro assemblage around and north of the Kidd Creek Mine have proven to be barren pyrite hosted by graphitic argillite. In the vicinity of the Kamiskotia volcanogenic massive sulphide deposits (Hathway, Hudak and Hamilton, 2005) and at the Kidd Creek Mine (Bleeker 1999), similar graphitic argillites are intimately associated with base metal mineralization. In contrast, around the Shaw dome south of Timmins, the sediments consist predominantly of chert and ironstone. Similarly, in the southern Swayze greenstone belt, the Woman River Iron Formation is composed of chert and magnetite ±sulphides which is distinct from nearby graphitic argillaceous sediments.

While sulphide precipitation can and does occur in both ironstone exhalative environments and graphitic argillaceous seafloor conditions, the concentration of VMS in either setting may ultimately be the response to chemical conditions suitable for the deposition and preservation of economic sulphide deposits. The significantly different magnetic pattern expressed by these two contrasting VMS environments is important to their identification. Specifically, graphitic argillite rocks will have a strong positive electromagnetic signature with little or no magnetic response, in contrast to ironstone that can easily be recognized by its very strong magnetic response, with or without a coincident electromagnetic signature.

In the search for VMS mineralization in an ironstone environment such as that of the southern Swayze area, one should anticipate a reduction in the magnetic intensity of the ironstone where sulphide mineralization is present. The intense chlorite alteration associated with felsic volcanic rocks in the area augurs well for discovery of VMS deposits.

References

Barrie, C. T. 2004. Geochemistry of Exhalites and Graphitic Argillites near VMS and Gold Deposits; an Ontario Mineral Exploration Technologies (OMET); Ontario Geological Survey, Miscellaneous Release – Data 173.

Bleeker, W. 1999. Structure, Stratigraphy and Primary Setting of the Kidd Creek Volcanogenic Massive Sulfide Deposit A Semiquantitative Reconstruction; *in* Hannington, M.D. and Barrie, C.T (eds.), Economic Geology Monograph 10, The Giant Kidd Creek Volcanogenic Massive Sulfide Deposit, Western Abitibi Subprovince, Canada, p.71-121.

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8. Keweenawan Felsic Rocks and their Implication for Base Metal Mineralization

Highlights

- **Kewenawan-aged Cu-Mo deposits related to Mid-Continent Rift**
- **breccia pipes and felsic porphyries host Cu-Mo mineralization**
- **known deposits in excess of 1M tons and >1% Cu**

Keweenawan-age felsic rocks have been identified as being dominantly intrusive or subvolcanic in nature. They were emplaced during the initial phase of formation of the Midcontinent Rift and make up a part of the Mamainse Point Formation, located approximately 80 km north of Sault Ste. Marie and east of Lake Superior within the townships of Ryan and Kincaid. They also appear as porphyritic plugs east of the Formation intruding Archean metavolcanics of the Batchewana greenstone belt.

Keweenawan Felsic Rocks and their Implication for Base Metal Mineralization…cont'd.

It is interpreted that the felsic rocks formed by partial melting of pre-existing crust under high a heat flow regime associated with rifting and mafic volcanism. The Keweenawan-aged felsic intrusive rocks may also have played a significant role as heat source for widespread copper mineralization in the area, and may be, at least spatially, linked to the past-producing Coppercorp and Tribag mines. A small Keweenawan stock, called the Jogran porphyry, intruded Archean volcanic rocks to the east of the basalt exposures at Mamainse Point. The mineralized Tribag breccias are located approximately 6 km to the east-northeast of the Jogran porphyry. Blecha (1965, 1969) described the Jogran porphyry as a fine-grained rock with abundant phenocrysts of quartz and feldspar, along with pyrite, chalcopyrite and minor molybdenite mineralization disseminated throughout the porphyry. Both these porphyries may be genetically related to the same source as the felsic rocks of the Mamainse Point Formation.

Based on fluid inclusion and stable isotope work, Richards (1985) identified the Jogran porphyry as a possible source for mineralizing fluids for the Coppercorp deposit. He concluded the mineralization formed as a result of interaction between hot magmatic fluids and lower temperature meteoric fluids, or possibly hydrothermal-metamorphic fluids (Richards, 1985). Blecha (1974) inferred that the Tribag breccias were formed as a result of a collapse of rocks caused by the withdrawal of a deep-seated pulsating magma of felsic composition. Evidence for this style of intrusion is provided by the high proportion of felsic fragments within each of the breccia pipes, along with subsequent diamond drilling that encountered a highly altered feldspar porphyry intrusion under the breccias. Continued exploration and mapping in the area may be able to provide more insight on the timing and emplacement along with the linkage that occurs between the felsic intrusive rocks and copper mineralization (*see* figure below).

Copper Deposits in the Mamainse/Batchewana Area (all non-NI43-101 compliant)

- Coppercorp: Quartz-Carbonate Vein : 1.02M tons @1.16% Cu
- Tribag: Breccia Pipes: 1.1M tons @ 1.65% Cu
- Jogran Porphyry: 18M tonnes @.019% Cu and 0.05% MoS_2

References

Blecha, M. 1965. Geology of the Tribag Mine; Canadian Institute of Mining and Metallurgy, Bulletin, v.58, no. 642, p.1077-1082.

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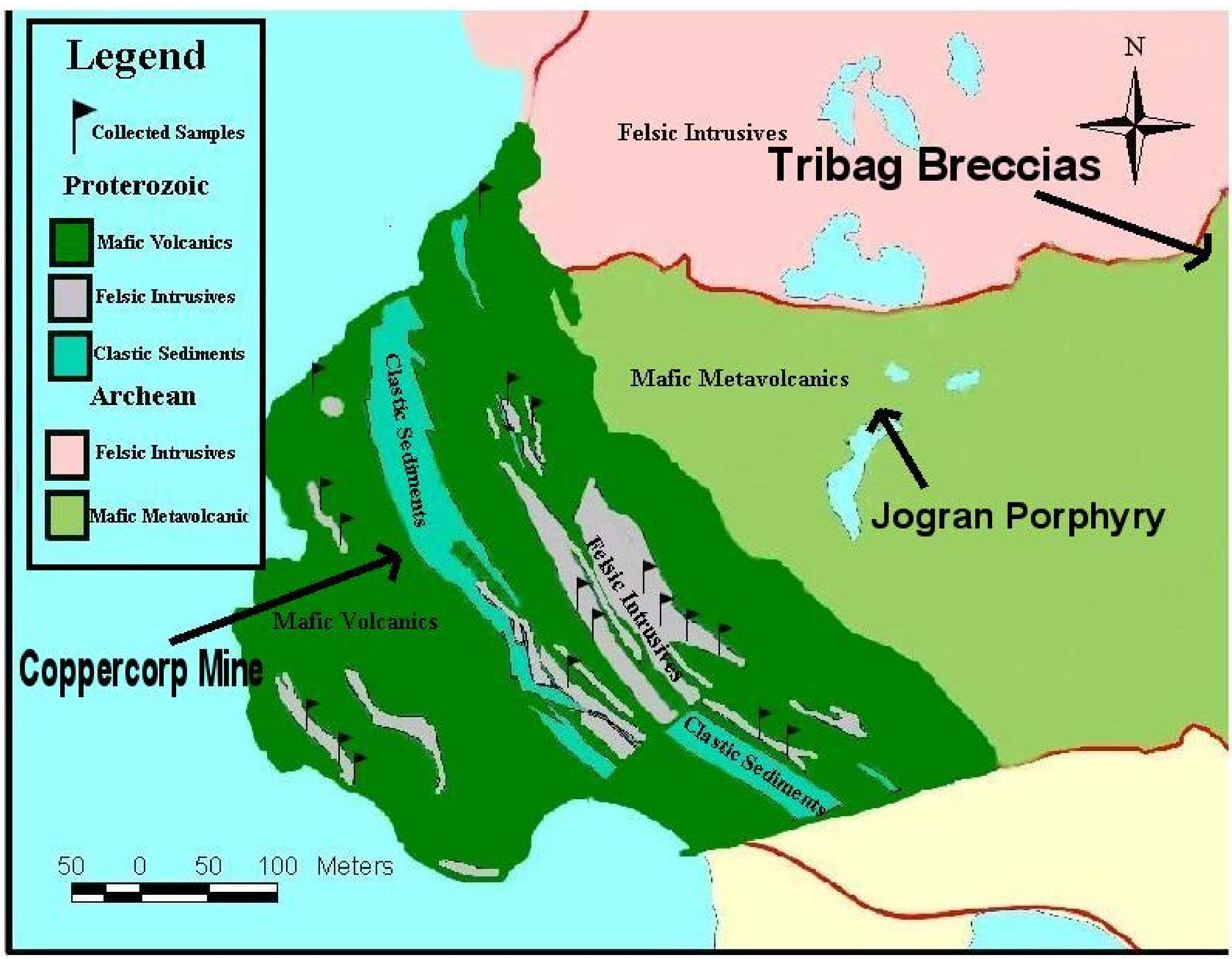
Keweenawan Felsic Rocks and their Implication for Base Metal Mineralization…cont'd.

Massey, N.W.D. 1980. The geochemistry of some Keweenawan metabasites from Mamainse Point, Ontario; unpublished PhD thesis, McMaster Univeristy, Hamilton , Ontario, 353p.

Richards, J.P. 1985. A fluid inclusion and stable isotope study of Keweenawan fissure vein hosted copper sulphide mineralization, Mamainse Point, Ontario; Unpublished MSc thesis, University of Toronto, Toronto, Ontario, 290p.

Figure: Mamainse Point Formation and the eastern domain of the Batchewana Greenstone Belt



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9. Thunder Bay South District General Recommendations

Highlights

- **Thunder Bay South hosts considerable and varied mineral endowment**
- **OGS & GSC reports available digitally on-line**
- **unexplained geochemical anomalies over prospective bedrock geology**

With the sharp rise in global prices for gold, silver, platinum, uranium, nickel, zinc, copper and iron, mineral exploration has increased considerably in the Thunder Bay South District. Archean and Proterozoic geological environments in the Thunder Bay South District are actively being explored for various deposit types that include; copper-zinc VMS, copper-nickel-PGM, gold, unconformity uranium, Olympic Dam (IOCG), copper-molybdenum, diamonds, amethyst, stone and peat.

The Ontario Geological Survey and the Geological Survey of Canada have released numerous geoscience surveys and reports with lake bottom sediment & lake water geochemistry, till geochemistry, kimberlite indicator mineral data, geophysics and geology. This data is available in digital and hard copy paper maps and much of this data is available online through *Geology Ontario at the Mines and Minerals website*

With the use of the geological, geochemical and geophysical datasets; prospective areas can be further defined. Regional and detailed geophysical surveys indicate magnetic high and/or low anomalies coupled with electromagnetic anomalies support potential VMS and magmatic Cu-Ni-PGM targets.

The regional geochemical data has shown an excellent correlation of the geochemistry of known deposits or occurrences, as well as indicating several unexplained geochemical anomalies requiring further research over prospective bedrock geology. Two examples are (NAD83, Zone 16 UTM coordinates):

- Northern Lights Lake. (227500E/5355000N): Au, Cu-Ni-Co anomaly over unknown bedrock geology
- White River (636000E/5383100N): U anomaly over U-bearing granite

Additionally, a careful review of Rogers (1995) reveals a gabbroic contact zone associated with the batholith situated in southern Duckworth Township. A strong Ni-Cr-Co-chromite anomaly present in the area deserves exploration (Bajc 2000). Till sampling and prospecting has been recommended by Bajc (2000) for this area to fully evaluate the source of this anomaly. Road access to this area is good.

References

Bajc, A. F. (2000) Results of regional till sampling in the western part of the Shebandowan greenstone belt, northwestern Ontario; Ontario Geological Survey, Open File Report 6012, 74 p

Rogers, M. C. (1995) Precambrian geology, Duckworth Township, Ontario Geological Survey Map 2621, scale 1:20 000

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10. Obonga Greenstone Belt: Ni-Cu- PGE and VMS Potential

Highlights

- **unexplored multi- phased layered intrusion**
- **known Ni-bearing phase**
- **Obonga belt also hosts numerous VMS-style occurrences**
- **unexplored coincident EM/Mag anomalies in prospective felsic rocks**

Operation Treasure Hunt airborne magnetometer/electromagnetic surveys have revealed a possible multi-pulsed layered intrusion. While the layers appear stacked, there is a degree of folding present as evidenced by the hook shapes in the magnetic survey. The area was mapped in the mid-1960s and was interpreted to be underlain by peridotites, serpentinites and gabbro (Thurston, 1967; Kustra, 1966). Kustra (1966) further describes the unit as a “dioritic rock, partly serpentinized” and contains “phases of gabbro, peridotite, pyroxenite and dunite”. Kustra (1966) also reports that the serpentinized portions of this unit are magnetic and nickeliferous.

The following figures illustrate the general geology and magnetic signature of the Obonga Lake metavolcanic belt.

Figure 1. General Geology and mineral occurrences of the Obonga Lake greenstone belt

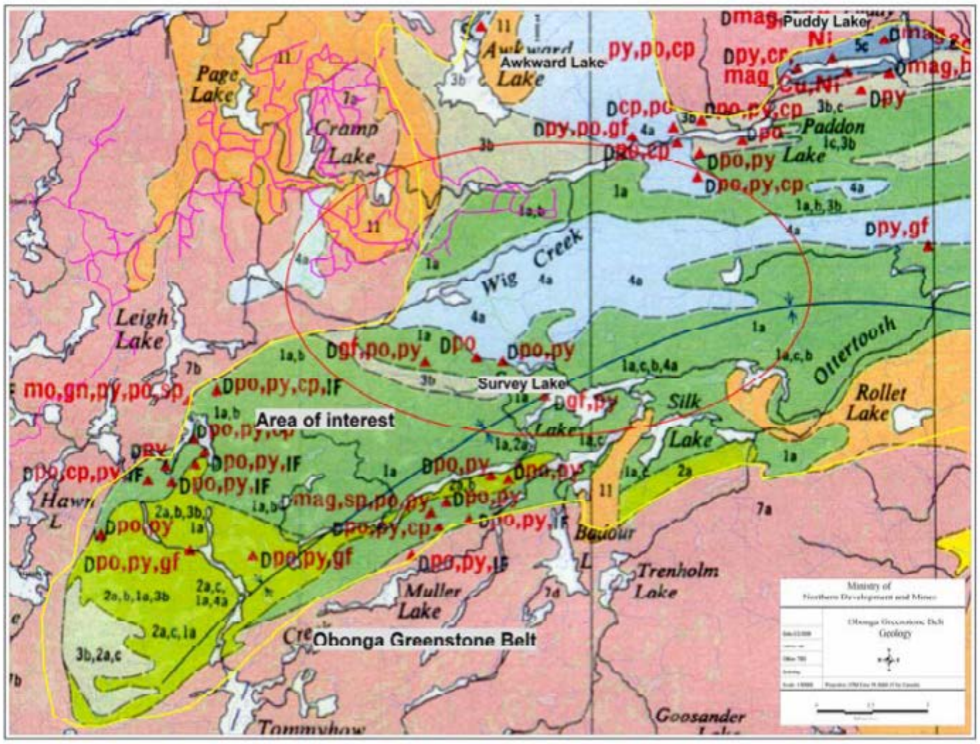
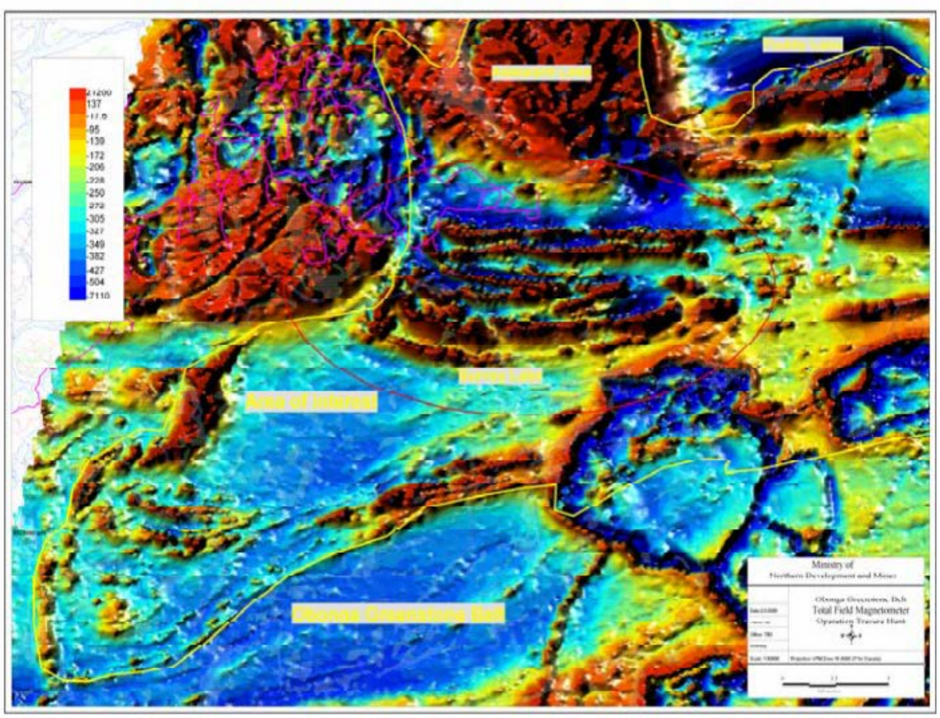


Figure 2. Total field magnetic signature, Obonga greenstone belt



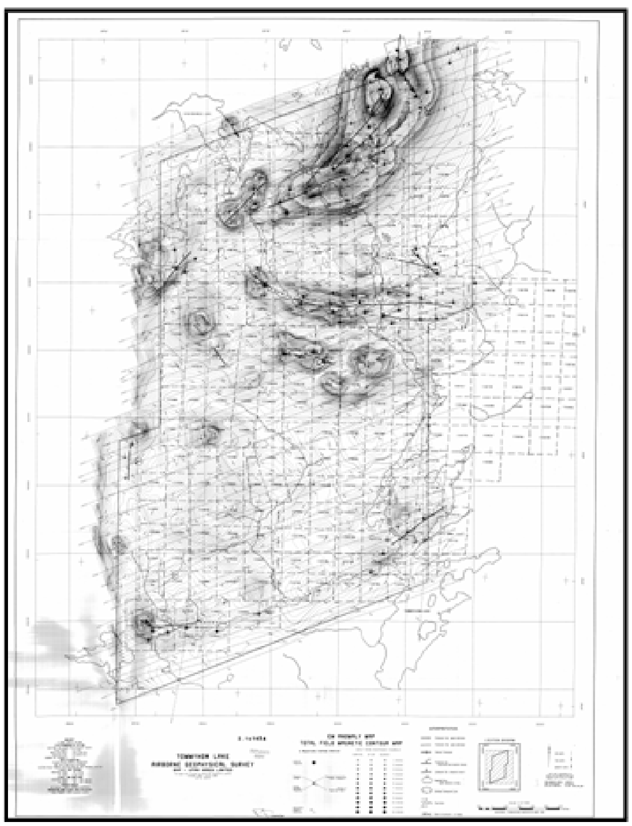
Obonga Greenstone Belt: Ni-Cu- PGE and VMS Potential…cont'd.

The southwestern end of the Obonga metavolcanic belt is underlain by felsic volcanic rocks that have been explored for VMS-style deposits in the past. This area contains numerous coincident EM and Magnetic anomalies that should be explored for base metals.

Many of the anomalies are outlined in the recent Obonga-Garden Operation Treasure Hunt geophysical release, as well as assessment work done by various mineral exploration companies that have worked in the area.

Following is a magnetometer and electromagnetic survey map of the western part of the Obonga Lake area prepared for BHP Utah Mines Ltd. by Questor Surveys Limited in 1991. This map is filed in the Thunder Bay South District assessment files.

Figure 3. Airborne Mag/EM survey of the western portion of the Obonga greenstone belt



References

Thurston, P.C. (1968) Obonga-Leigh Lakes Area, Awkward lake Sheet, District of Thunder Bay; Ontario Department of Mines Preliminary Geological Map P457, scale 1:15 840

Kustra, C. R. (1967) Obonga Lake Area, Ontario Department of Mines Preliminary Map P416, scale 1:15 840

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11. Ni-Cu-PGE Potential of Proterozoic Intrusive Rocks

Highlights

- **newly discovered Cu-Ni-PGM occurrence**
- **other peridotites and mafic-UM intrusions are known in the area**

With the discovery of copper-nickel-PGM mineralization in peridotite by Magma Metals (www.magmametals.com.au/) in the Current Lake area (UTM zone 16, NAD27, 357291E 5402943N), other magnetic anomalies in the region as well as other mafic to ultramafic intrusive bodies should be explored. A careful examination of available aeromagnetic maps should delineate some of these anomalies. Mapping by Scott and Sequin (1990a, 1990b) has outlined a few discrete amphibolite–pyroxenite intrusions in the MacGregor Township area. New logging roads have made access to these intrusions easier.

Scott and Seguin (1990a, 1990b) mapped a massive to porphyritic gabbro in the eastern portion of MacGregor Township; Morehouse (1960) describes a “massive, fine-grained biotite andesite or trap” that has a “lamprophyric aspect” in the same general vicinity. The unit is exposed in a rock cut on top of the hill between Highway 587 and Nelson Road. The rock is a very dark green metagabbro with coarse pyroxene metacrysts. Finer grained lamprophyric rocks crop out just north of the Nelson Road Highway 11/17 intersection.

Numerous other small amphibolitic and or pyroxenites have been mapped in MacGregor Township by Scott and Seguin (1990a, 1990b) and deserve to be investigated. Many have a weak magnetic anomaly associated with them.

References

Scott, J.F. and Seguin, J.N. (1990a) Precambrian Geology, MacGregor Township, West Half; Ontario Geological Survey Preliminary Map P2984 (revised), scale 1:15 840

Scott, J.F., and Seguin, J.N. (1990b) Precambrian Geology, MacGregor Township, East Half, Ontario Geological Survey Preliminary Map P 2985 (revised), scale 1:15 840.

Moorhouse, W.W. (1960) Gunflint Iron Range in the vicinity of Port Arthur, Ontario Department of Mines 1960, v 69, pt.7, p 1-40

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12. Potential for Cu-Zn VMS in the Eastern Shebandowan Belt

Highlights

- **discovery of Zn- rich float by OGS**
- **known sulphide lenses in felsic rocks**
- **Cu-Zn occurrences in felsic rocks along >50 km trend**

The area around Mokomon should be explored for Au and VMS. An OGS field crew discovered sulfide float that assayed over 5% Zn in a gravel pit (Bajc, 2000). Schnieders et al. (2005) suggest a possible source in the following description (see also map, following page):

> Bajc (2000) discovered a large sulphide boulder in a gravel pit in Conmee Township (Location 2). Subsequent assays of parts of this boulder by staff of the Regional Resident Geologist Program yielded up to 5.13% zinc with anomalous values in gold. One possible source area for this boulder lies to the northeast of the gravel pit in the vicinity of Mokomon, where in 1917, the Nichols Chemical Company conducted extensive trenching and drilling in the search for pyrite. Pyrite lenses have been mapped to be at least 27 feet wide (Assessment Files, Thunder Bay South District) (Location 3).

One sample collected by staff of the Regional Resident Geologist Program yielded 0.06 ounce per ton gold. At Location 4, 2.3 km to the northeast from Location 3, two north trending trenches plus a small blast pit have exposed brecciated oxide and sulphide facies iron formation. Sampling reported by Brown (1995) yielded up to 153 ppb gold, although no assays for base metals were undertaken. At Location 5, on Highway 102 at Mud Lake, a VMS-style sulphide zone is exposed on the north side of the highway in fragmental felsic volcanic rocks. Grab samples from this site returned assays of up to 0.85% zinc and 0.25% copper. Further to the east and still within the felsic volcanic belt at Location 6, samples taken from fragmental volcanic rocks in Gorham Township in the bed of the Current River, yielded assay results of up to 1.12% zinc, 0.27% copper, and 0.81 ounce per ton gold (District Geologist Files, Thunder Bay South District). Untested VLF airborne conductors in MacGregor Township associated with this felsic package at Location 7 should be further explored for VMS-style sulphide mineralization (Assessment Files, Thunder Bay South District).

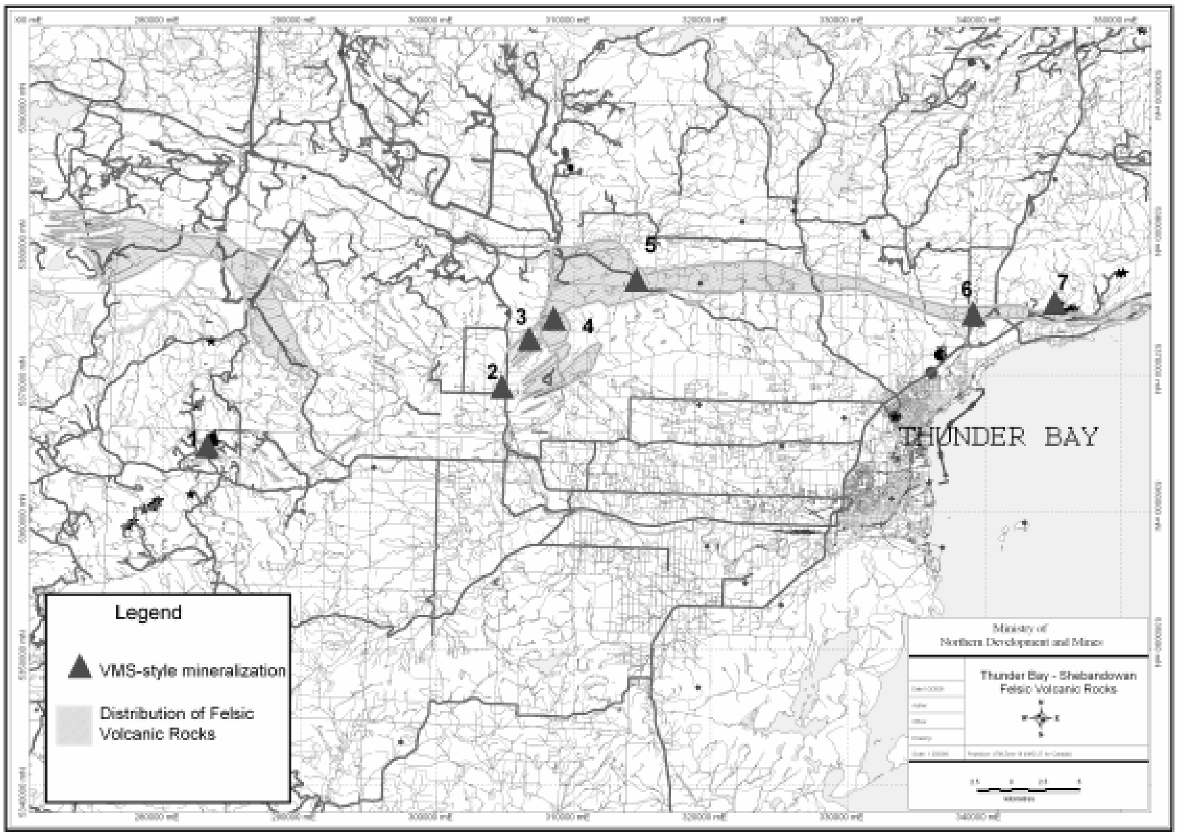
This entire felsic volcanic package should be explored for base metal mineralization, especially in areas adjacent to known showings. The Mokomon area should receive special attention because of the presence of known sulphide mineralization that happens to be up ice from a large sphalerite-rich boulder found by Bajc (1999).

References

Bajc, A. F. (2000). Results of regional till sampling in the western part of the Shebandowan greenstone belt, northwestern Ontario; Ontario Geological Survey, Open File Report 6012, 74 p

Schnieders, B.R., Scott, J.F., Magee, M.A., Muir, T.L., and Komar, C. 2005 Report of Activities, 2004, Resident Geologist Program, Thunder Bay South Regional Resident Geologist's Report; Thunder Bay South District; Ontario Geological Survey, Open File Report 6148, 46 p.

Figure. Distribution of felsic volcanic rocks in the eastern Shebandowan greenstone belt and location of VMS-style occurrences.



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13. VMS Potential of the Marathon- Hemlo Greenstone Belt

Highlights

- **recent base metal discoveries**
- **assessment file research reveals historical drill holes with Zn-rich intersections**

Although, most of the high mineral potential areas in the Hemlo-Marathon area are currently staked, local prospectors have mining claims available for option. An area east of the Port Coldwell Complex on the Pic River merits attention as it is underlain by felsic metavolcanic rocks and new occurrences of copper-zinc have been recently discovered. The area was mapped by Thompson (1931) and Milne (1967) as well reported on by Schnieders and Smyk (1994). Schnieders and Smyk (1994) described the geology on a traverse along the powerline from Page Lake southwesterly to the Pic River and from east to west, encountered magnesium tholeiitic basalts, iron formation, turbidites, and felsic volcanic rocks including rhyolite, rhyolite breccias and debris flows.

A review of the Kerr Addison Mines Ltd. 1971 drill logs in the Thunder Bay assessment files showed that Hole KP-71-4 had 20 foot intersection, from 15 feet to 35 feet down-hole, that averaged 1.15% Zn; in hole KP-71-6 there was a 0.5 foot intersection at 27 feet that assayed 1.84% Zn and a 2.5 foot intersection from 35 feet to 37.5 feet that assayed 1.76% Zn. This area should be explored again in light of the high mineral potential as well as the evolving VMS model which was, at that time (1971), in its infancy. The current knowledge base with respect to VMS deposits would certainly aid in the proper exploration for Cu-Zn massive sulfides in this area.

References

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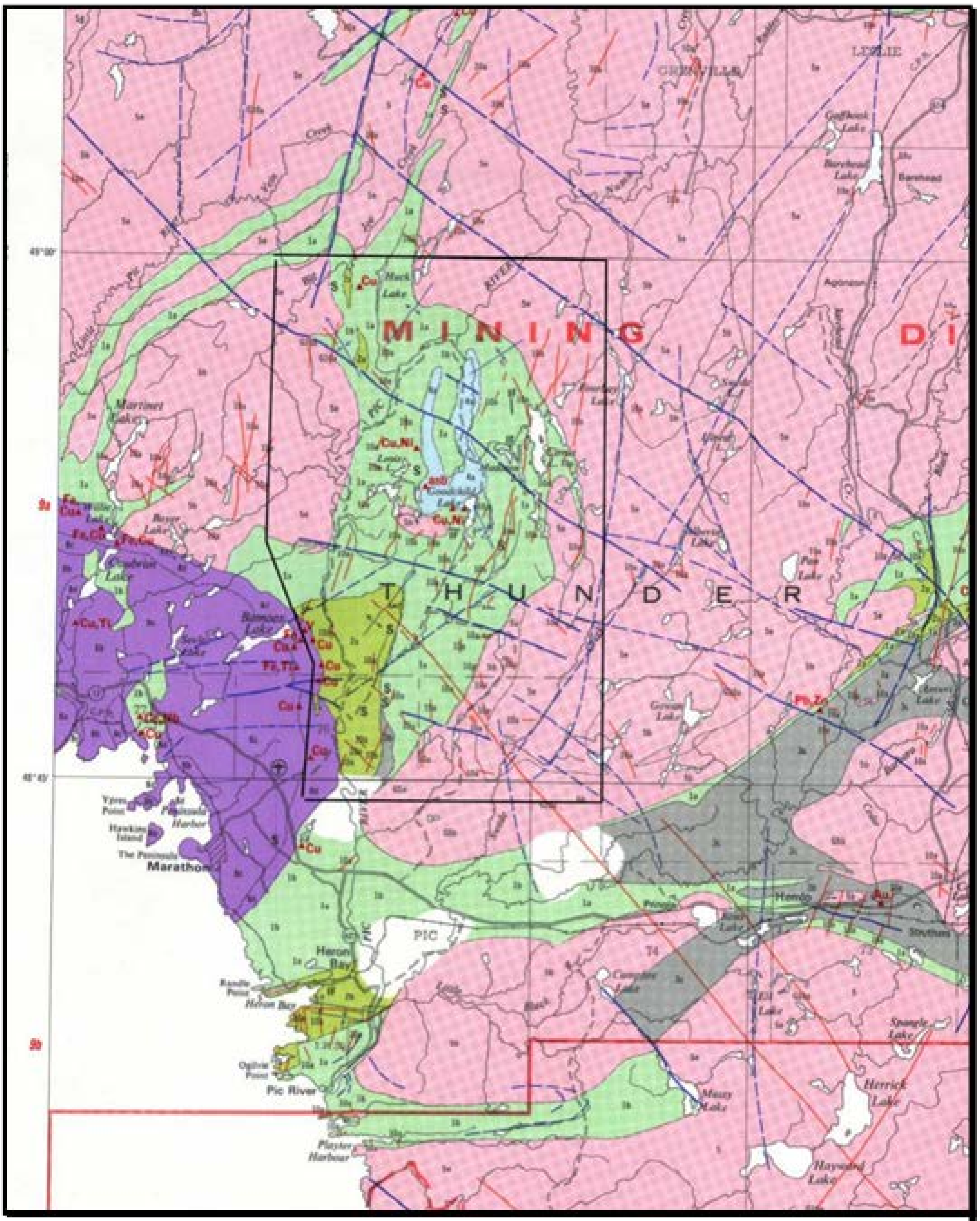
Schnieders, B.R. and Smyk, M. C. (1994) Schreiber-Hemlo Resident Geologist's District; *in* Summary of Field Work and other Activities 1994; Ontario Geological Survey Miscellaneous Paper, p. 130-135.

Thompson, J. E. (1931) Geology of the Heron Bay area, Ontario Department of Mines Annual Report, 1931, v.40, pt.2. p.21-39.

Figure. Western portion of the Marathon-Hemlo Greenstone Belt.



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14. Gold in the eastern Shebandowan and Atikokan Areas

Highlights

- **favourable lithology, structure and alteration for both high-grade veins and low- grade large tonnage deposits**

Eastern-Shebandowan Metavolcanic Belt (Beaverlodge Lake Area)

A narrow, but prominent, band of metavolcanic rocks trends from Hazelwood Lake to Kingfisher Lake. This volcanic area contains quartz stock vein systems south of Beaverlodge Lake. Old blast pits in a sulphide-rich iron formation were noted south of Beaverlodge Lake. A new logging road system makes this area accessible. Based on the presence of stockwork quartz vein systems, faulting and carbonate alteration, the area should be prospected for gold. MacDonald mapped the area, the results of which were published as part of the Gorham Township and vicinity report (MacDonald 1941).

Atikokan - Marmion Lake Area

In the Atikokan area, gold is associated with large shear structures and porphyry systems. Examples of these would be the Hammond Reef and Sawbill occurrences. Gold is disseminated in a large tonnage-low grade deposit or concentrated in high- grade quartz veins, such as the Fern Elizabeth Mine. While the geochemistry and geophysical tools help in the discovery, structure must not be overlooked. Recent mapping by D. Stone et al. (1995a, 1995b) has delineated many of these large structures in the Atikokan area. Several properties with gold occurrences along strike of the Hammond Reef, staked by local prospectors, are available for option. Additionally, there are several gold occurrences open for staking in the Atikokan area.

References

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——— 1995b. Precambrian geology, Sapawe area; Ontario Geological Survey, Preliminary Map P.3350, scale 1:50 000.

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15. VMS Potential along the southern Margin of the Onaman Batholith

Highlights

- **polymetallic quartz veins**
- **magmatic Cu-Ni in composite intrusion**
- **Cu and Zn-Ag-Pb-Cu ± W in felsic rocks**
- **recent discovery of Zn-Cu VMS**

Renewed interest in gold and base metal deposits in both the Beardmore–Geraldton and Onaman–Tashota greenstone belts has prompted a re-evaluation of local mineral deposits and styles of mineralization. Recent mapping, geochronology and a geological synthesis completed by Stott et al. (2002) provides a tectonostratigraphic framework on which to base observations and recommendations.

The area in question lies along the southern margin of the Onaman batholith, northeast of Jellicoe and west of Geraldton. It comprises a variety of metavolcanic and metasedimentary rocks of the southern part of the Onaman–Tashota belt where it is in fault-bounded contact with dominantly mafic metavolcanic rocks and clastic metasedimentary rocks of the Beardmore–Geraldton belt. The metavolcanic rocks are ascribed to the ca. 2740 Ma Elmhirst–Rickaby assemblage and the ca. 2770– 2780 Ma Onaman assemblage (Stott et al., 2002). Mapping by Beakhouse (1989) west of Geraldton labelled the eastern parts of the Onaman and Elmhirst–Rickaby assemblages “the Kirby Lake and Dionne Lake metavolcanics [sic], respectively”.

Three main metallic mineral deposit types were identified by Parker (1996) in Elmhirst and Rickaby townships: 1) polymetallic quartz veins and chlorite replacement veins; 2) magmatic copper-nickel mineralization in a composite mafic–ultramafic intrusion; and 3) disseminated copper and zinc-silver-lead-copper ± tungsten mineralization, largely associated with felsic metavolcanic rocks. Mackasey and Wallace (1978) had suggested that this mineralization may have been syngenetic-volcanogenic.

Beakhouse (1989) described a number of iron sulphide occurrences associated with a banded iron formation (BIF) in the Kirby Lake metavolcanic unit. Sulphides are mostly hosted by iron formation or chert, but may also occur in graphitic schists in adjacent metavolcanic rocks. Chalcopyrite, sphalerite, galena and arsenopyrite were also noted. Minor felsic metavolcanic rocks occur near mineralized zones. Recent work by prospector T. Johansen on his Kirby Lake property has led to the discovery of zinc- and copper-rich, semi-massive sulphides (Resident Geologist's Files, Thunder Bay North District, Thunder Bay) associated with a persistent recrystallized chert unit and rhyolite. Garnet and aluminosilicate minerals reportedly occur in the rhyolitic rocks (T. Johansen, Prospector, personal communication, 2006). Sampling of a quartz-sericite schist by Mason and White (1986) returned 1.89% Zn, 5000 ppm Pb and 0.91 ounce per ton Ag.

A sulphide occurrence in chert-magnetite banded iron formation at the eastern end of Dionne Lake, and a sulphide-mineralized felsic pyroclastic breccia nearby were described by Beakhouse (1989). It was suggested that they could perhaps be attributed to volcanogenic massive sulphide (VMS) mineralization processes. Felsic metavolcanic rocks in the Dionne Lake area are poorly exposed and may be more extensive than previously mapped (Beakhouse 1989). Many local base metal occurrences also host mineralized quartz veins (e.g., Kirby Lake; Pichette; Dubrex) and may represent remobilized synvolcanic sulphide deposits. This area should be investigated for its VMS base metal potential.

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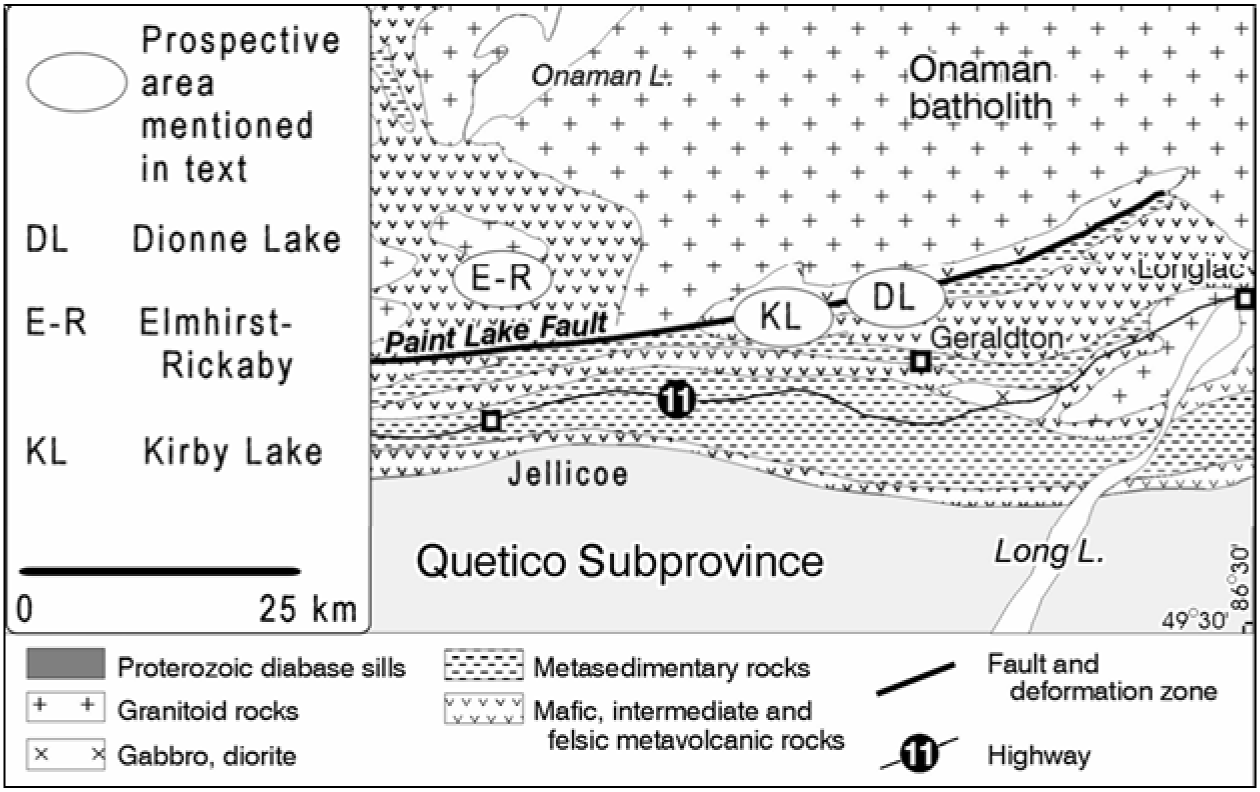
Figure. Southern margin of the Onaman batholith.



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16. VMS Potential in the Miminiska– Fort Hope and Pickle Lake Belts

Highlights

- **Cu-Fe enriched, Na-Ca depleted 100 m wide footwall alteration zone to base metal occurrences**
- **favourable lithologies bracket age of formation of major VMS deposits**

Although base metal occurrences have not been identified in many locations in the Miminiska–Fort Hope greenstone belt, a number of interesting occurrences of disseminated base metal sulphides, perhaps related to volcanogenic massive sulphide (VMS)-style mineralization, have been identified in the Petawanga Lake area (Boylen occurrences). The rocks of this area are assigned to the St. Joseph assemblage (2715 Ma). All known, major Archean VMS deposits in Ontario are hosted in metavolcanic sequences younger than 2750 Ma (Rogers et al. 1995). The Boylen occurrences are associated with a metavolcanic sequence that includes felsic fragmental and mafic metavolcanic rocks. Metamorphosed equivalents of possible footwall alteration zones were recognized in the vicinity of the occurrences as chlorite-garnet, chlorite-amphibole-garnet and staurolite-garnet assemblages (Edwards, 1991). These alteration zones exhibit strong iron enrichment, sodium and calcium depletion, and were generally copper enriched. A 100 m wide, copper-enriched alteration zone was drilled by Falconbridge Limited and was hypothesized by Edwards (1991) to possibly represent a hydrothermal alteration pipe. Edwards (1991) also suggested that the known mineralized zones occur within the core of a southwest-plunging syncline. Therefore, further exploration for VMS-type mineralization is warranted in the area to the southwest of the Boylen occurrences. Mapping by Wallace (1981) also revealed VMS- favourable lithologies, including a mixture of mafic and felsic to intermediate metavolcanic rocks to the southwest, separated from the Boylen occurrences by a north-northeast-striking shear and/or fault zone.

Two interesting base metal occurrences have been documented in the Pickle Lake greenstone belt. One of these occurrences (Dona Lake #1), southeast of the past- producing Dona Lake mine (246 500 ounces of gold produced between 1989 and 1994; Resident Geologist's Files, Thunder Bay North District, Thunder Bay), returned anomalous copper and zinc values. This occurrence is located within felsic metavolcanic rocks of the Woman assemblage that were recently reclassified by Young (2003) and Young et al. (2006) as being part of the approximately 2740 million year old Confederation assemblage. This is the lithotectonic assemblage that hosted the only economic VMS deposit found to date in the Uchi Subprovince (the past-producing South Bay Mine). Therefore, further evaluation of the VMS potential of the Confederation assemblage rocks of the Pickle Lake area is warranted. These favourable rocks form the southeast margin of the belt and also extend west, south of the Ochig Lake pluton.

The McCullagh Creek zinc prospect is approximately 25 km northeast of Pickle Lake in 2836 million year old rocks of the Kaminiskag assemblage (formerly Woman assemblage (Young et al., 2006)). It is interesting to note that the rocks that host this occurrence are of a similar age to those that host the Arseno Lake and North Caribou River base ± precious metal occurrences in the North Caribou Lake greenstone belt (2827 to 2852 Ma; Breaks, Osmani and deKemp 2001). A number of other base ± precious metal occurrences (Seim, 1993) are hosted by Kaminiskag assemblage rocks of the Meen–Dempster greenstone belt.

These observations indicate the possibility of a significant base metal mineralization event(s) that predates 2750 Ma. Therefore, older rock sequences such as the Kaminiskag assemblage should not be ignored when exploring for base metal deposits (cf. Galley, Hannington and Jonasson, 2006).

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17. Gold Potential in the Miminiska– Fort Hope and Pickle Lake Belts

Highlights

- **North Caribou–Totogan lakes shear zone and splays control numerous gold prospects and deposits**
- **NW structures may also have localized sanukitoid intrusions and related gold mineralization**

The collision between the North Caribou and Winnipeg River terranes that is interpreted to have occurred between 2720 and 2700 Ma (Percival and Easton 2007) resulted in the development of a number of significant fault/shear zones, as well as the emplacement of numerous late to post-tectonic intrusions in the Miminiska-Fort Hope and Pickle Lake greenstone belts. Economic lode gold mineralization is closely associated with the major deformation zones, and may have a genetic relationship to some of the late-tectonic intrusions, based on the Archean lode gold model of Beakhouse (2007). Therefore, exploration in the vicinity of these major deformation zones and intrusions is considered to have significant potential for the discovery of new gold deposits. Some of the most interesting of these prospective features are discussed below.

The majority of the major deformation zones in the Miminiska-Fort Hope and Pickle Lake greenstone belts, strike either in a general northwest or northeast orientation. The most notable northwest-striking feature is the North Caribou- Totogan Lakes shear zone (Osmani and Stott 1988). The southeast end of the North Caribou-Totogan Lakes shear zone is located in the vicinity of Eabamet Lake in the central portion of the Miminiska-Fort Hope greenstone belt. It extends in a northwest direction, passing to the northeast of Keezhik Lake, where it approximately coincides with the greenstone-granite boundary. Numerous gold occurrences in the Keezhik Lake area are interpreted to be associated with structures (e.g., splay faults) related to this fault zone. Gold mineralization further to the northwest at the Musselwhite Mine in the North Caribou greenstone belt is also considered to be related to this structure.

Other notable approximately northwest-striking deformation zones have been mapped in the Pickle Lake greenstone belt. These include the Central Patricia fault of Pye (1975), which is located in close proximity to the Central Patricia No. 1 Mine, and a major northwest-striking zone of shearing mapped by Stott et al. (1989) on the Dona Lake Mine property.

In addition to the northwest-striking structures discussed above, a close spatial association has been noted between shear zone-hosted mineralization and a number of major northeast-striking deformation zones (Puumala and Madon 2006 and Smyk et al. 2007). These include several parallel structures in the Pickle Lake area that include the Pickle Crow (associated with the past-producing Pickle Crow and Central Patricia No. 2 Mines) and Cohen-MacArthur faults, and several northeast- striking structures in the Miminiska-Opikeigen Lakes area of the Miminiska-Fort Hope greenstone belt.

Gold mineralization in these areas typically occurs in quartz veins and sulphidized iron formation. The most significant gold occurrences generally appear to be found in subsidiary structures (e.g., splays, fracture zones in competent lithologies) that are likely to be related to the major deformation zones.

It is interesting to note that the four Pickle Lake area past-producing mines (Pickle Crow, Central Patricia Nos. 1 and 2, and Dona Lake) are located in close proximity to a major northwest-striking Proterozoic diabase dike. The diabase clearly post-dates the gold mineralization, which Young et al. (2006) suggest occurred at some point in the time interval 2716-2697 Ma (i.e., close to the time of emplacement of the Hooker-Burkoski stock). However, its presence in this area, combined with the close spatial association between the Archean Webb Lake, Hooker-Burkoski and Kibler Lake stocks and the dike, suggests the possibility of the earlier existence of an unexposed deep-crustal northwest-striking structure that had an influence on the emplacement of intrusions and the localization of significant gold mineralization in the Pickle Lake area.

Gold Potential in the Miminiska– Fort Hope and Pickle Lake Belts…contd.

Finally, the Kibler Lake stock, located at the northern margin of the Pickle Lake greenstone belt, is a notable intrusion that may have a genetic relationship to the gold mineralization. Recent diamond drilling data collected from this largely unexposed intermediate to felsic intrusion (LeCouteur 2000) indicates characteristics (e.g., magnetite-rich phases) that suggest that it may be of the sanukitoid suite. Beakhouse (2007) has suggested that sanukitoid magmatism may be related to the same tectonic events responsible for Archean lode gold mineralization. Lamprophyre intrusions, which Beakhouse (2007) notes may be genetically related to sanukitoid intrusions, are also common in the Pickle Lake area.

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18. Polymetallic Mineralization near the Bear Head Fault Zone

Highlights

- **numerous Ag-Au- base metal vein occurrences and one producer**
- **polymetallic and Cu-Au mineralization associated with sanukitoid intrusion**
- **shear zone hosted Au and porphyry- type Cu-Mo**

The Favourable Lake/Setting Net Lake and North Spirit Lake greenstone belts are the location of numerous occurrences of silver-gold-base metal vein mineralization and porphyry-type molybdenum-copper-gold mineralization. These greenstone belts are all located marginal to the regional dextral transcurrent Bear Head fault zone (Osmani and Stott 1988), which may have played a role in the localization of the magmatic/ hydrothermal systems responsible for their deposition. Subsidiary geological structures within the greenstone belts that are related to the Bear Head fault, and late- to post-tectonic intrusions within and marginal to the greenstone belts are considered to be prospective for these types of mineralization.

Polymetallic Mineralization near the Bear Head Fault Zone…cont'd.

Significant examples of polymetallic vein mineralization include the past- producing Berens River Mine in the Setting Net Lake greenstone belt, and the Borland Lake deposit (502 412 tons grading 8.09 opt Ag and 0.02 opt Au) in the Favourable Lake greenstone belt. The most significant example of porphyry-type mineralization is the Setting Net Lake deposit (100 000 000 tons of 0.09% MoS2) in the Setting Net Lake greenstone belt. Examples of interesting mineralization in areas of the Setting Net Lake and North Spirit Lake belts that are largely unstaked at the present time are provided below.

Several copper-gold and polymetallic occurrences are clustered around the margins of the Bijou Point intrusion on North Spirit Lake, which was mapped by Wood (1977), and classified by Stone (1998) as an intermediate to mafic intrusion of the sanukitoid suite. These occurrences are hosted both within the intrusion and in the adjacent supracrustal rocks. Intrusion-hosted occurrences, and occurrences found in the supracrustal rocks immediately adjacent to the intrusion typically consist of narrow arsenopyrite- and/or chalcopyrite-rich (sometimes massive sulphide) veins that commonly return significant gold values. A polymetallic occurrence hosted within supracrustal rocks farther from the intrusive contact consists of mineralized shears or quartz veins containing pyrite, pyrrhotite, chalcopyrite, and galena. The reported range of mineralization styles in the Bijou Point area suggests that these occurrences are of the porphyry-type, and may be examples of the copper-gold deposit subtype of Sinclair (2006). Beakhouse (2007) has also suggested that sanukitoid magmatism may be related to the same tectonic events responsible for Archean lode gold mineralization.

During a 1988 diamond drilling program, Noramco Explorations reported anomalous gold, silver and base metal mineralization in several diamond drill holes that were advanced to test geophysical anomalies in the Crazy Lake area, at the western end of the Setting Net Lake greenstone belt. The reported mineralization included shear zone-hosted gold and porphyry-type copper- molybdenum-gold. One of the most interesting drill holes was NBW-88-08 (Chute 1988), which was reported to have intersected a narrow unit of interbedded tuff and wacke underlain by a granodiorite (in places porphyritic) intrusion. Strong silicification was reported throughout the borehole, with potassic alteration also noted throughout the granodiorite. Mineralization consisting of disseminated pyrrhotite and pyrite was reported throughout the borehole, with chalcopyrite and molybdenite occurring toward the bottom of the hole. Anomalous gold assays of greater than 100 ppb were reported throughout the drill hole from samples of all lithologies, with a maximum reported value of 1977 ppb over 1.5 m from chalcopyrite-bearing granodiorite.

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19. Base metal and gold potential of the North Spirit Lake belt

Highlights

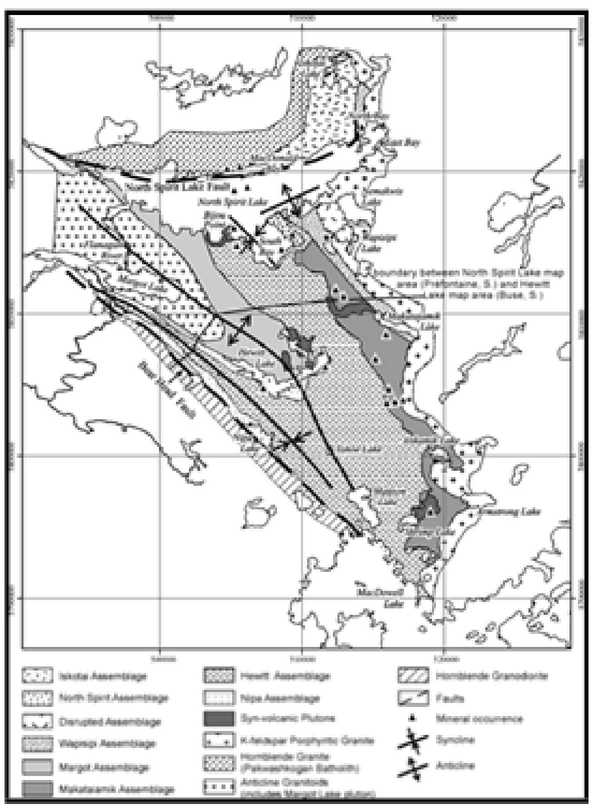
- **Au-As-Ag-Cu mineralization in the Bijou Point intrusion**
- **Prospective Ni-Cr- PGE in ultramafic rocks**
- **New VMS alteration mapped in the southern portion of the belt**

The North Spirit Lake greenstone belt is under-explored but represents an area with potential for base metal and gold mineralization. There are about 50 historic mineral occurrences within the belt and new mapping by the Ontario Geological Survey has revealed important VMS alteration patterns in the southern portion of the belt.

In the northern portion of the belt the most interesting area is the Bijou Point intrusion, which is a synvolcanic intrusion, coeval with a younger volcanic package (Hewitt assemblage), and hosts veins of massive arsenopyrite and massive chalcopyrite. This mineralization is accompanied by tourmaline and sericite alteration. Various Au, As, Ag and Cu values have been reported from occurrences in and around the intrusion. Further exploration in the northern part of the belt should focus on Ni, Cr, and PGE potential in an extensive sequence of ultramafic rocks in the Wapisipi assemblage. The ultramafic rocks are tentatively interpreted to be both intrusive and extrusive (komatiite flows) with spinifex textures.

The southern portion of the belt is dominated by metavolcanic rocks of the Hewitt assemblage hosting VMS-style synvolcanic alteration that has been newly mapped. Stratabound amphibole and amphibole-garnet alteration is found near Hewitt Lake and becomes pervasive in the Tahoe Lake area. In the southern portion of the belt proximal aluminosilicate alteration was recorded in both the Hewitt and the Makataiamik assemblages. This alteration is possibly related to the synvolcanic Shrimp Lake pluton. Pyrrhotite is found in many of the rocks within the Hewitt assemblage and a new massive sulphide outcrop containing chalcopyrite, pyrite, pyrrhotite and sphalerite was found near Shrimp Lake.

Figure. General geology of the North Spirit Lake greenstone belt.



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20. Sachigo Subprovince: Emergence of a new Metallogenic District?

Highlights

- **new Cu-Zn VMS discoveries under Phanerozoic cover**
- **current and past gold production**
- **Sachigo will be Ontario`s next treasure trove**

Ontario is well endowed with a wide variety of metallic mineral commodities that have given rise to important mining districts. Namely, the Abitibi, Hemlo, Uchi (Red Lake/Pickle Lake) and Sudbury districts comprise much of the mining wealth generated in Ontario. Except for Sudbury, these districts are within the boundaries of Archean-aged, greenstone belt-dominated subprovinces. Despite remarkable similarities in lithology, structure, age, chemistry, tectonic history and setting of Ontario's volcanic dominated subprovinces, the above mentioned ones by far dominate the mine production of the province.

The Sachigo Subprovince spans the breadth of northern Ontario and continues eastward beneath the Phanerozoic cover rocks of the Hudson Bay and James Bay lowlands. New and recent discoveries in the Sachigo subprovince are noteworthy. For instance, the De Beers Canada Inc., Spider Resources Inc. and KWG Resources Inc. discovery of volcanogenic massive sulphide mineralization at McFaulds Lake in 2003, followed by Noront Exploration Inc. nickel discovery (September 2007) in the same area are interesting exploration successes. Farther afield in the Sachigo subprovince, Goldcorp Inc. continues to operate the Musselwhite Mine, an iron formation hosted lode gold deposit. Other gold deposits e.g. Lingman Lake and Sachigo River Mine hold promise. At High Bank Lake, Northern Shield Resources Inc. is pursuing platinum group element mineralization in a large layered gabbroic intrusive complex. Individually, the recent discoveries in the Sachigo subprovince are significant, some (e.g. Musselwhite Mine, Sachigo River Mine) have proven viable, others are still in the infancy of exploration. Collectively, the broad base of deposits being identified and discovered in the Sachigo subprovince suggest it may well be Ontario's last great mineral frontier with a metallogenic endowment as attractive as the Uchi or Abitibi subprovince. The limited exploration of the Sachigo subprovince to date, compared to the initial high success rate of discovery suggests the Sachigo subprovince may well prove to be Ontario's next mineral treasure trove.

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21. Massive Cu-Ni-PGE Discovery near McFauld's Lake Raises Prospects for Similar Deposits Nearby

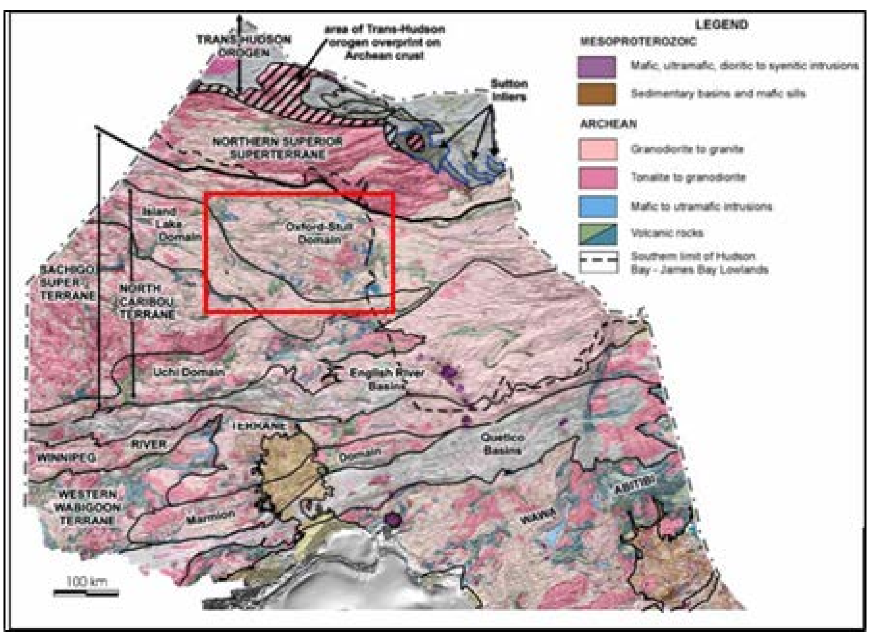
Highlights

- **Highly prospective linear chains of mafic to ultramafic intrusions with Ni-Cu-PGE prospects**
- **Currently a focus of intense exploration activity near a very significant Ni-Cu- PGE discovery in 2007 west of the James Bay Lowland**
- **Similar intrusions may yet be discovered in this region**
- **Several intrusions are known to be Cr-PGE-bearing outside of the new discovery**

With the recent important discovery of massive sulphide zones of Ni-Cu-PGE by Noront Resources Ltd. on their Double Eagle project in the far north of Ontario (Figures 1 and 2), there has been considerable excitement generated in that region. There are a number of mafic-ultramafic intrusions in this part of Ontario that warrant further consideration in light of this discovery. Some of these intrusions appear to form a chain extending from a Cr-PGE-bearing mafic to ultramafic layered intrusion at Big Trout Lake to another layered intrusion at Highbank Lake at the edge of the James Bay Lowland. These intrusions occur along the southern margin of the Oxford-Stull domain and several are currently being explored. The southern margin of the Neoarchean Oxford-Stull domain is traced by the major, transcurrent Stull-Wunnummin fault that splays into northeast-trending branching faults at the east end of the Wunnummin belt. The Double Eagle discovery is within one of a set of mafic to ultramafic intrusions around the eastern margin of a major circular plutonic complex, west of the McFauld's Lake greenstone belt.

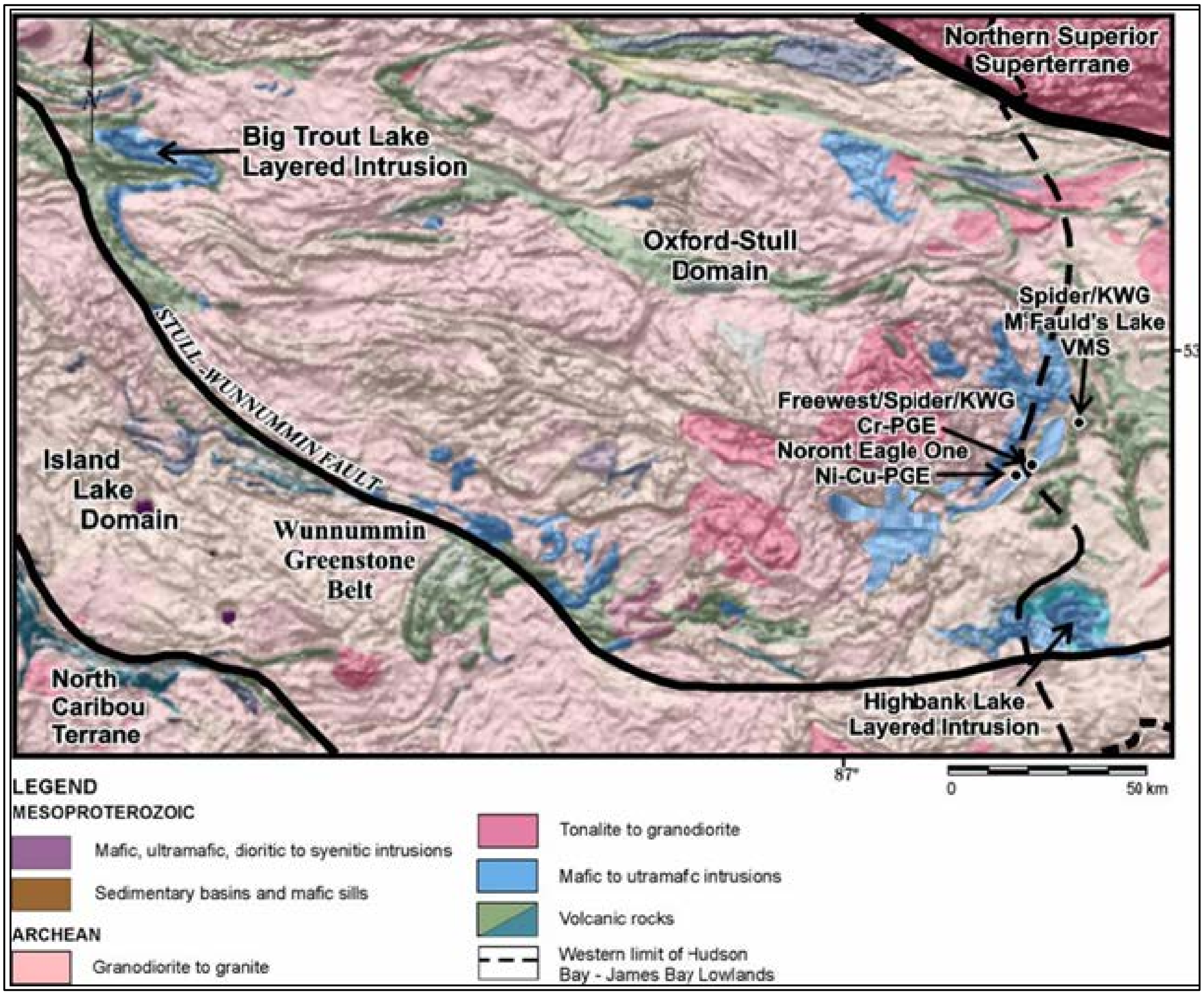
The relationship amongst these intrusions within the Oxford-Stull domain is unknown. One interpretation to be tested is that they are coeval, mantle-derived, crustal-contaminated magmatic emplacements that invaded along a terrane boundary and plutonic contacts during a late Neoarchean convergence of the North Caribou terrane towards the Northern Superior superterrane. If they are tectonically related, it opens up a much wider area of comparable exploration opportunities beyond the immediate vicinity of the Double Eagle discovery.

Figure 1. General geology and terranes of the Superior Province of Ontario showing location of Map in Figure 2.



Massive Cu-Ni-PGE Discovery near McFauld's Lake Raises Prospects …cont'd.

Figure 2. Mafic to ultramafic intrusions (blue) occur along the southern margin of the Oxford-Stull domain and around the west side of the McFauld's Lake greenstone belt.



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22. Gold Potential in Old and New Environments–Red Lake Belt

Highlights

- **continued discoveries of gold deposits in central Red Lake**
- **extensive prospective gold- bearing horizon extends over 100 km**
- **gold occurrences along Subprovince boundary are analogous to other major gold deposits being actively explored**

Recent significant gold discoveries in the heart of the Red Lake camp by Sabina Silver Corporation and Wolfden Resources Inc. (now held by Premier Gold Mines Limited) and Southern Star/Exall Resources (the Bruce Channel discovery, now held by Gold Eagle Mines Ltd.) are interpreted to occur immediately adjacent to the Neoarchean–Mesoarchean unconformity. Exploration along the unconformity's 105 km length within the Red Lake greenstone belt is highly recommended.

Gold occurrences have been documented along portions of the Lake St. Joseph- Sydney Lake Fault that are within a few kilometres of the Papaonga Lake quartz- diorite stock. The fault represents the subprovince boundary between the Uchi volcanic terrane to the north, and the English River metasedimentary gneisses to the south. At least six gold showings are known between Curie and Papaonga lakes; they are hosted by sheared, silicified, sericitized +/-tourmalinized tuffs and sediments, which are cut by quartz-tourmaline-arsenopyrite veins. At the PL-1a zone, of the Papaonga Lake occurrence (MDI#52K16NW00005), sulphide- bearing, graphitic greywacke hosts a 1.7 km long zone of contorted quartz- tourmaline veining. Channel samples as high as 0.33 ounce per ton gold over 1.5 m were reported from the North Showing of the Currie Lake occurrence (MDI#52K16NE00003) during the last exploration work performed in mid-1980.

Curie and Papaonga lake mineralization has certain similarities with Roberto-style gold mineralization (being actively explored at Goldcorp Inc.'s Eleonore property in Québec): 1) the regional association of gold mineralization with a quartz-diorite stock, adjacent to a subprovince boundary; 2) the polydeformed nature of host sediments and tuffs; and 3) the association of gold with tourmaline-arsenopyrite- sulphide veins and disseminations

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23. Advanced Exploration Continues on VMS Targets in Confederation Lake Belt

Highlights

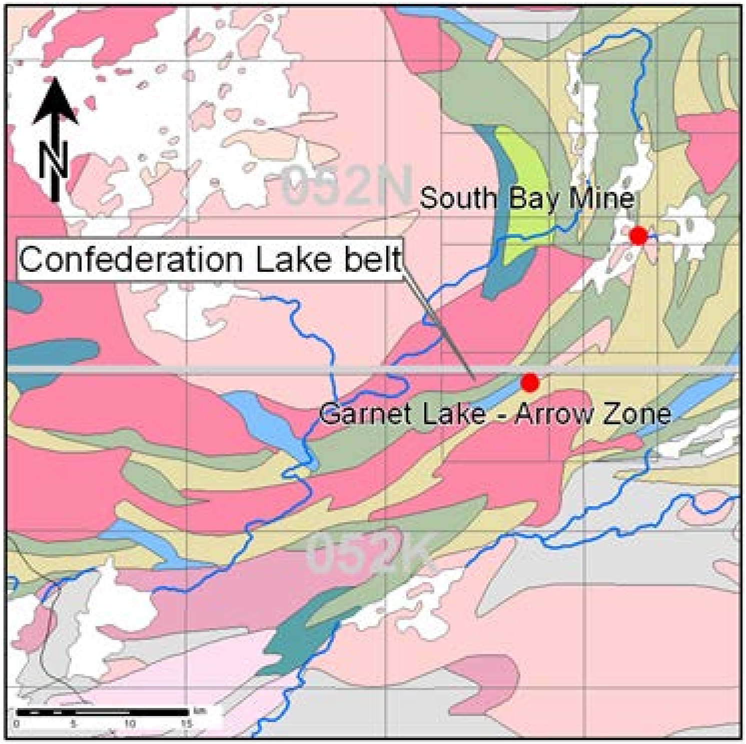
- **highly prospective band of altered volcanic rocks host numerous base metal prospects and one past-producer**
- **on-going advanced exploration on 2M tonne (NI43-101) Zn-Cu deposit**

Volcanogenic massive sulphide (VMS) deposits and prospects, and associated proximal chloritic and alumino-silicate alteration, have been documented in the Red Lake and Birch–Uchi greenstone belts, hosted in Confederation assemblage rocks.

FII-type and FIII-type rhyolites occur throughout a 100 km band extending east from Red Lake to the past-producing South Bay Mine (1.6 million tons grading 11.06% Zn, 1.8% Cu and 2.12 ounces Ag per ton; MDI#52N02SE00012). Tribute Minerals Inc. continues to build upon its success in tracking mineralized horizons with deep-penetrating Titan-24 magnetotelluric–induced polarization geophysical surveys. The company is in the first stages of permitting for a ramp to extract a bulk sample and perform underground delineation drilling on its Arrow Zone (indicated resource of 2.1 million tonnes at 5.92% Zn, 0.75% Cu, 0.58 g/t Au, 21.1 g/t Ag, with Indium and Gallium credits).

Numerous undifferentiated sulphide occurrences have been documented in many of the northern greenstone belts (e.g., Sandy Lake, North Spirit Lake, Stull Lake, Cherrington Lake). Geological compilation maps produced by the OGS and its predecessors indicate the locations of these occurrences, but little further is known about them. Some of these may warrant investigation as grassroots-type exploration targets

Figure. General geology of the southern Confederation Lake greenstone belt.



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24. Cu-Ni-PGE potential of the Mulcahy Lake Layered Intrusion

Highlights

- **>15 km wide layered mafic- ultramafic intrusion**
- **known anomalous PGE and Cu concentrations**
- **relatively untested sulphur-saturation zone**

The Mulcahy Lake Intrusion is located southwest of Dryden near Eagle Lake. The intrusion is a northeast trending, vertically-dipping layered mafic intrusive body. Studies of the intrusion have identified 4 zones (Sutcliffe et al., 1985):

- Marginal zone: 1 km thick, comprises layered gabbro and gabbro-norite rocks
- Lower zone: 1.5 km thick, comprises units similar to Marginal Zone
- Middle Zone: 3 km thick with units of norite, gabbro-norite and magnetite- bearing rocks
- Upper Zone: 1.5 km thick, comprises gabbro-norite to ultramafic rocks

The airborne total magnetic response (*see* Figure) provides a good illustration of the layering within the intrusion (Ontario Geological Survey, 1987).

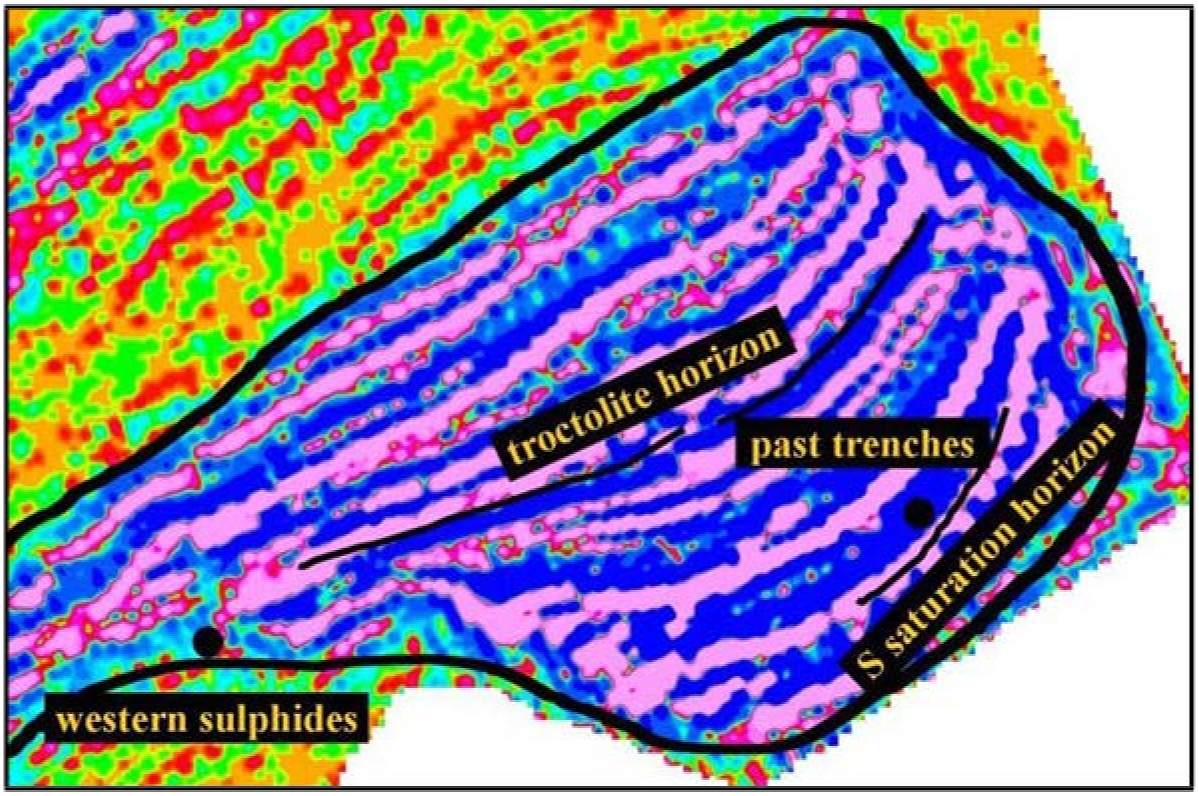
The intrusion has the potential to host "reef-type" copper-nickel and platinum group element (PGE) mineralized units. The frequency of lithogeochemical sampling of the stripped and trenched areas is higher than sampling in other parts of the intrusion, where it is reported to be 10 samples per square km. Based on this low density, a "reef-type" base metal-PGE environment could well be hidden in various parts of the intrusion.

The following areas are recommended for further examination (Kenora District Office, Atikwa Minerals Ltd., assessment file, 52F11SW S-6):

- A 20 m to 30 m wide Troctolite Horizon that extends along the central part of the Middle Zone (*see* Figure).
- Most exploration programs have occurred near the Marginal-Lower Zone boundary. Several stripping, trenching and sampling programs have targeted a complex layering of mafic-to-ultramafic rocks. Some of these layers contain sulphides and anomalous PGE values.
- Studies have identified that sulphur-saturation occurs near the Marginal-Lower transitional area. This sulphur-saturation zone is located about 200 m south of the trenches and has not been adequately explored.
- Samples of gabbroic rocks taken in the western part of the intrusion have returned up to 1.8% Cu. Reconnaissance sampling and only a few drill holes have tested this area.

Cu-Ni-PGE potential of the Mulcahy Lake Layered Intrusion…cont'd.

Figure. Airborne total magnetic response with areas recommended for exploration within the Mulcahy Lake Intrusion (*modified after* Ontario Geological Survey 1987). Field of view is 14 km east-west.



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25. Gold Potential of the Dinorwic Lake Area

Highlights

- **distal calcite, proximal iron-carbonate alteration zones vector to gold occurrences**
- **localized silicification and arsenopyrite closely related to gold deposition**

Mapping by the Ontario Geological Survey (Beakhouse, 2002) has delineated patterns of alteration and deformation that may have a positive bearing on the gold potential of the area. In particular, the Dinorwic Lake area is characterized by well-foliated, intensely altered rocks. This regional-scale area, which Beakhouse (2002) called the Dinorwic Lake structural domain (DLSD) extends for approximately 30 km, parallels Dinorwic Lake and can be interpreted as the northern extension of the Manitou Straits fault (*see* Map following page).

Fabric development and alteration in this domain is more intense than the surrounding rocks, but the overall strain is low. Areas of high strain are restricted to very narrow zones, with adjacent altered pillows showing little evidence of strain. This difference in degree of strain and lack of shear indicators may suggest the Dinorwic Lake structural domain is not the product of a shear event.

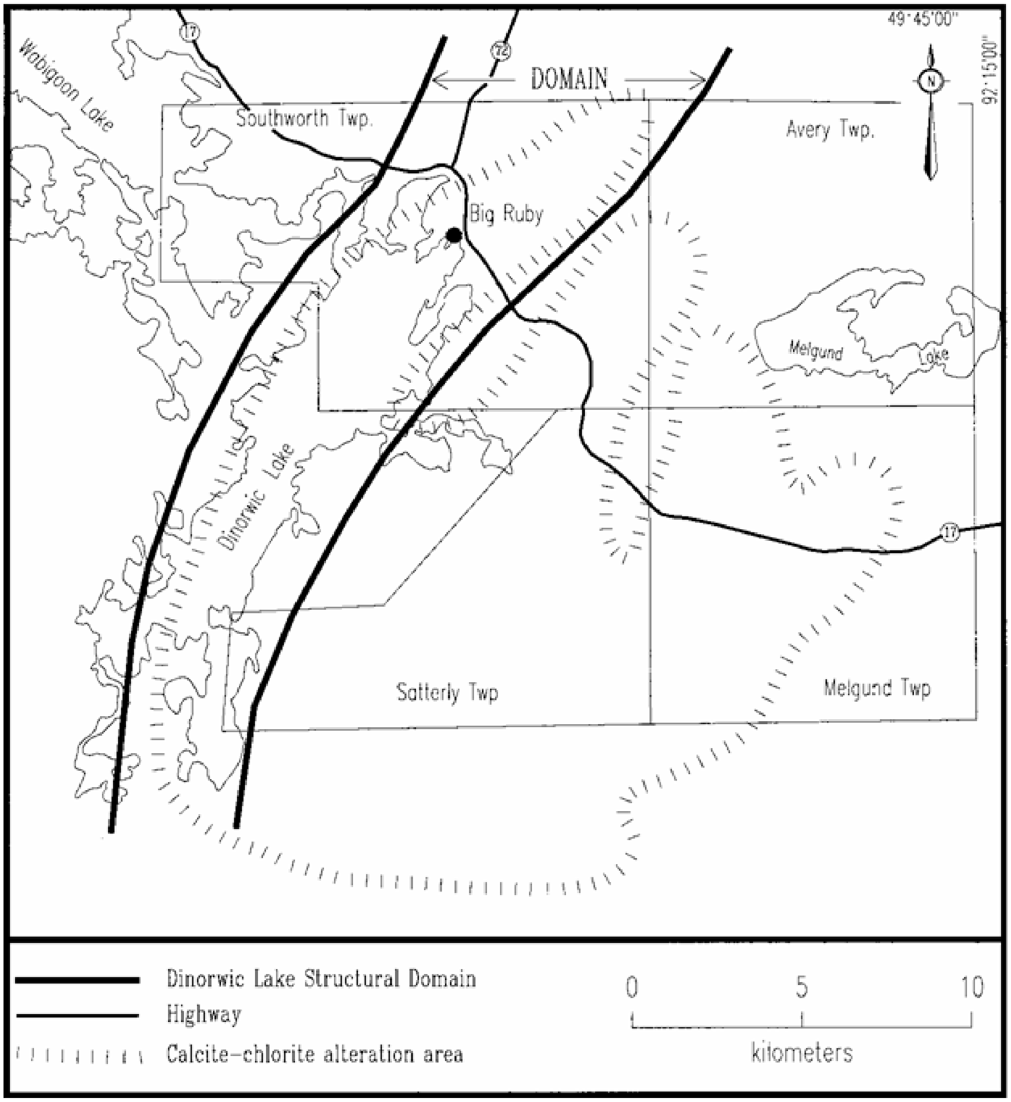
Weak pervasive calcite-chlorite alteration exists throughout a large area (Parker, 1989) centred on the DLSD. More intense alteration is characterized by iron- carbonate alteration within the domain. The iron-carbonate overprints calcite- chlorite alteration. Quartz veins parallel the strain fabric and contain fragments of iron-carbonate altered material, indicating the veining may postdate carbonate alteration.

The exposures created by Highway 17 construction near the north-end of Dinorwic Lake represent an area of high strain within the Domain. The rocks in this area have elevated arsenopyrite content. Grab samples of sheared mafic intrusive rocks from the HW 123 occurrence returned up to 1000 ppb Au and 7.5% As (Parker, 1989).

The Johnson-Whitewater Lake occurrence, located near the south-end of Dinorwic Lake, exhibits gold-bearing quartz veins within wide, intense, north-trending shear zones. Grab samples of a quartz vein from an open cut returned 2.27 g/t Au and 4.74 g/t Au (Parker, 1989).

Large-scale iron-carbonate altered zones, localized silicification and the presence of known gold-bearing quartz vein occurrences (i.e., Big Ruby) suggest the Dinorwic Lake structural domain is a prime target area for gold exploration.

Figure. Location of the Dinorwic Lake Structural Domain



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Parker, J.R. 1989. Geology, gold mineralization and property visits in the area investigated by the Dryden–Ignace Economic Geologist, 1984–1987; Ontario Geological Survey, Open File Report 5723, 306p

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26. Polymetallic Potential of Manitou Straits Fault

Highlights

- **multi-site and multi-element (As, Au, Cu, Sb, Mo,Cd, Ag, Zn) anomalous area near junction of regional faults and felsic intrusion**
- **base metal sulphides in drill holes**
- **open for staking**

The results from a high-density lake sediment geochemical survey over the Kakagi-Rowan Lakes greenstone (Dyer et al., 2006) include a strong poly-metallic anomalous area that occurs in an interesting geological and structural setting. Known as the Bretz Lake-James Lake anomaly, it is located ~50 km due south of Dryden, adjacent to the Manitou Straits.

This is a multi-site and multi-element (As, Au, Cu, Sb, Mo, Cd, Ag, Zn) anomalous area (designated as anomalous area #8 in OFR 6188) that occurs to the north of the Bretz Lake felsic intrusion and includes the highest Zn value of the survey (197 ppm) and an anomalous Au value of 11 ppb. Two lake sites returned strongly anomalous levels of Cu, Zn, Cd and As. Many other samples from sites within the area returned multi-element (two or more of As, Sb, Mo, Ag, Zn) anomalous levels.

The area is located south of the junction of the eastern trending Manitou Stretch– Pipestone Lake fault and the northeast trending Manitou Straits fault. OGS mapping by Berger and Jeffrey (1991) indicate the bedrock geology consists of metavolcanic, metasedimentary and felsic intrusive rocks and that several diamond drill holes intersected sulphides (including chalcopyrite and sphalerite). However, this area has seen relatively little exploration activity and as of November 2007, ground was still open for staking.

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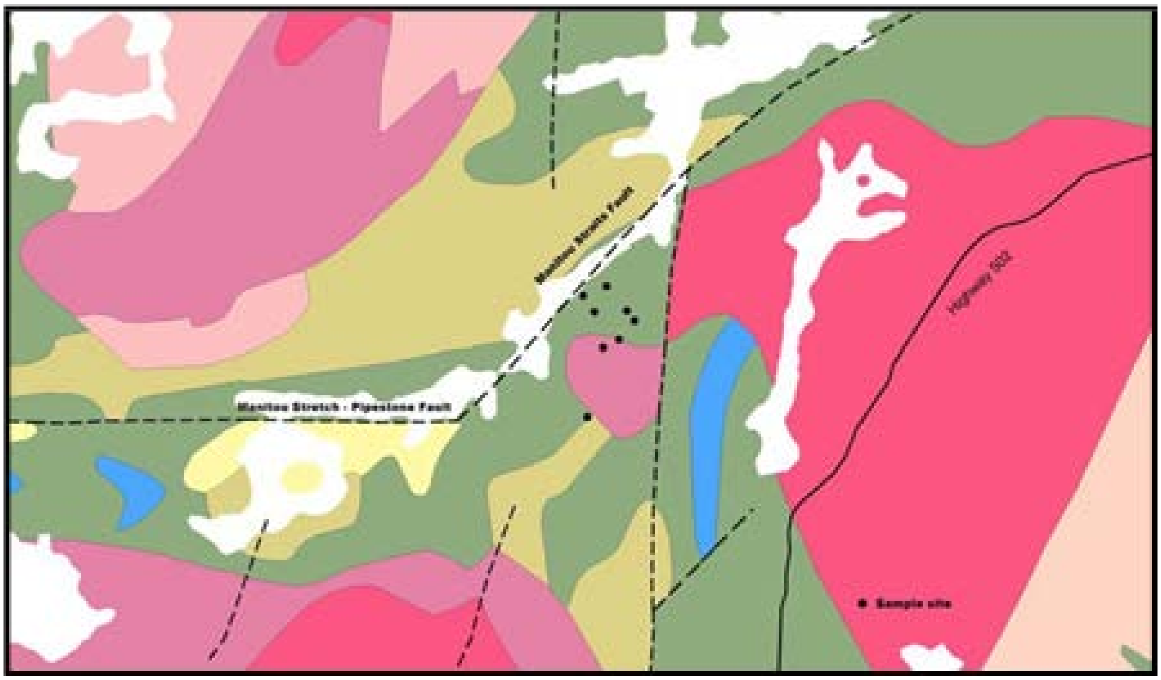
Berger, B.R. and Jeffrey, D.S. 1991. Precambrian geology, Manitou Stretch area; Ontario Geological Survey, Map 2561, scale 1:20000.

Dyer, R.D., Ravnaas, C., Felix, V.E. and Russell, D.F. 2006. Kakagi Lake area lake sediment geochemical survey, northwestern Ontario; Ontario Geological Survey, Open File report 6188, 68p.

Figure. Geology and faults in area with anomalous lake sediment sample sites.
Field of view is 30 km east-west



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27. Gold and VMS Potential of the Warclub Assemblage

Highlights

- **Au-enriched VMS mineralization in Warclub sediments on Plomp Farm property**
- **>3M ton resource at Thunder Lake gold deposit**
- **Warclub Assemblage has a prospective 250 km strike**

The Warclub assemblage is a package of metasedimentary rocks with intercalated metavolcanic and felsic intrusive rocks, extending approximately 250 km from the eastern Lake of the Woods to Minnitaki Lake. The assemblage contains areas of altered rocks indicative of hydrothermal events associated with gold deposition and volcanogenic massive sulphide (VMS) environments. Anomalous zinc and copper values are documented at various locations within this assemblage.

Gold potential of a quartz-phyric sericite schist unit in the Warclub assemblage has been the target of exploration programs in the Dryden area. Significant historical and current exploration programs were centred on the Thunder Lake gold deposit (where an underground program of bulk sampling recovered 428 oz Au and 1161oz Ag from 2365 tonnes) and the Plomp Farm gold-base metal prospect. Mineralization and alteration typical of a VMS environment is encountered on the Plomp Farm property.

The Plomp Farm property sequence, interpreted from drilling, includes a basal metasedimentary unit, overlain by a package of metavolcanic and metasedimentary rocks of the Warclub Assemblage that are capped by 25-30 m of pyrrhotite-pyrite- bearing graphitic sediment. The graphitic sediment is interpreted as representing the last stage of VMS-type hydrothermal activity. Active exploration by Champion Bear Resources Ltd. at the Plomp Farm property continues to discover additional hydrothermally altered rocks and gold-base metal mineralized zones (Champion Bear Resources Ltd., news release, August 1, 2007).

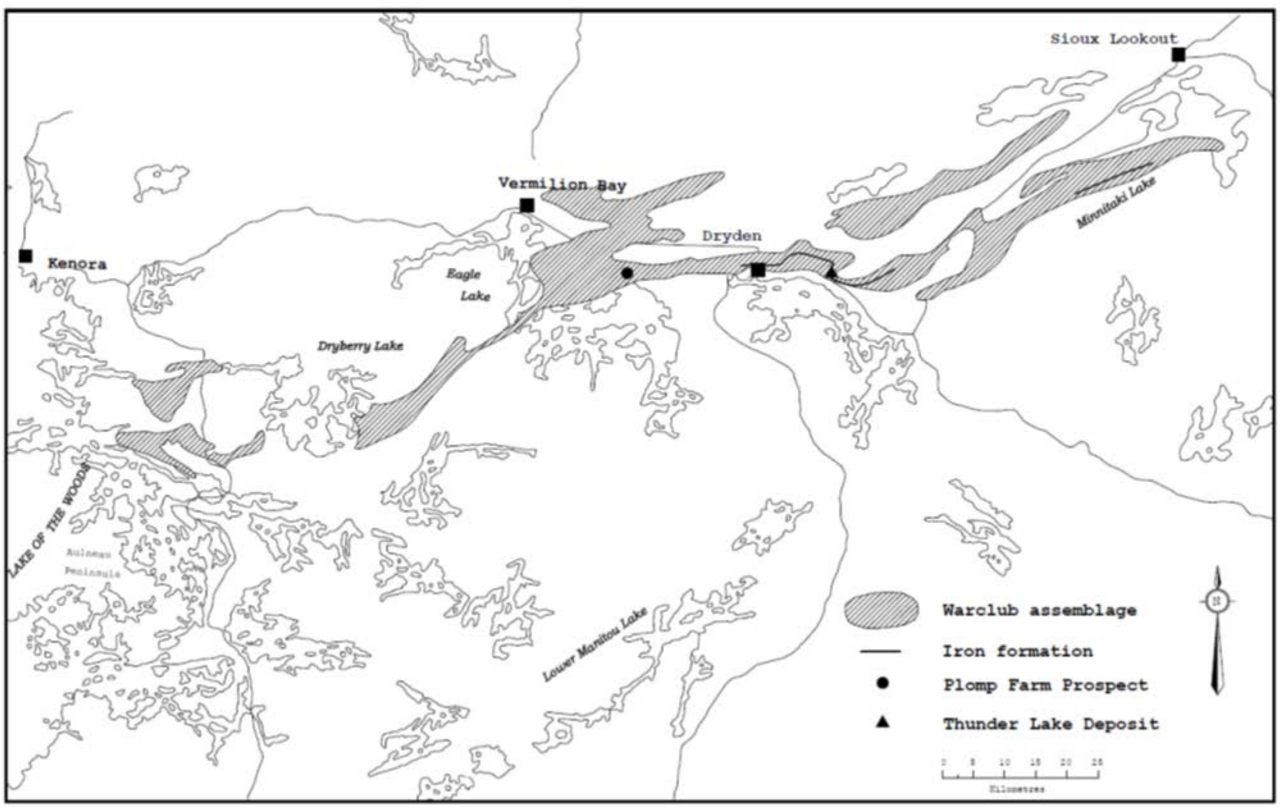
In the Thunder Lake area, structural features in the quartz porphyritic felsic volcanic rocks include a well-developed early (D1) fabric with concordant quartz veins (070°), which are locally deformed into Z-asymmetric folds. A weakly developed second (D2) fabric is evident, with concordant quartz veins (050°) approximately parallel to the axial surfaces of the folds. The second generation of quartz veins postdates the gold mineralization and usually have poor gold values (Beakhouse, 2002).

Gold and VMS Potential of the Warclub Assemblage…cont'd.

Renewed interest in the Thunder Lake area is anticipated as a result of Laramide Resources Ltd. announcement of the purchase of the property hosting the Thunder Lake Deposit (Laramide Resources Ltd., news release, September 24, 2007). The deposit hosts a non-NI 43-101 compliant resource of 3.0 million tonnes grading 6.5 g/t Au.

In summary, the Warclub assemblage is a package of metavolcanic and metasedimentary rocks with proven gold and base metal potential. Only limited exploration has been carried out over the assemblage's 250 km extent: areas underlain by prospective rock types, hosting alteration and mineralization typical of gold and VMS environments are likely to be discovered.

Figure. Location of the Warclub assemblage, Thunder Lake and Plomp Farm properties (*modified after* Blackburn 1978).



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Blackburn, C.E. 1978. Geological compilation, Kenora–Fort Frances; Ontario Geological Survey, Map 2243, scale 1:253 440.

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28. Cu-Ni-Co-Cr-PGE Potential of the English River Subprovince

Highlights

- **past production and current resources of Cu-Ni-Co-PGE**
- **numerous untested occurrences along Werner-Rex Fault and splays**
- **other mafic intrusions in English River Subprovince untested**

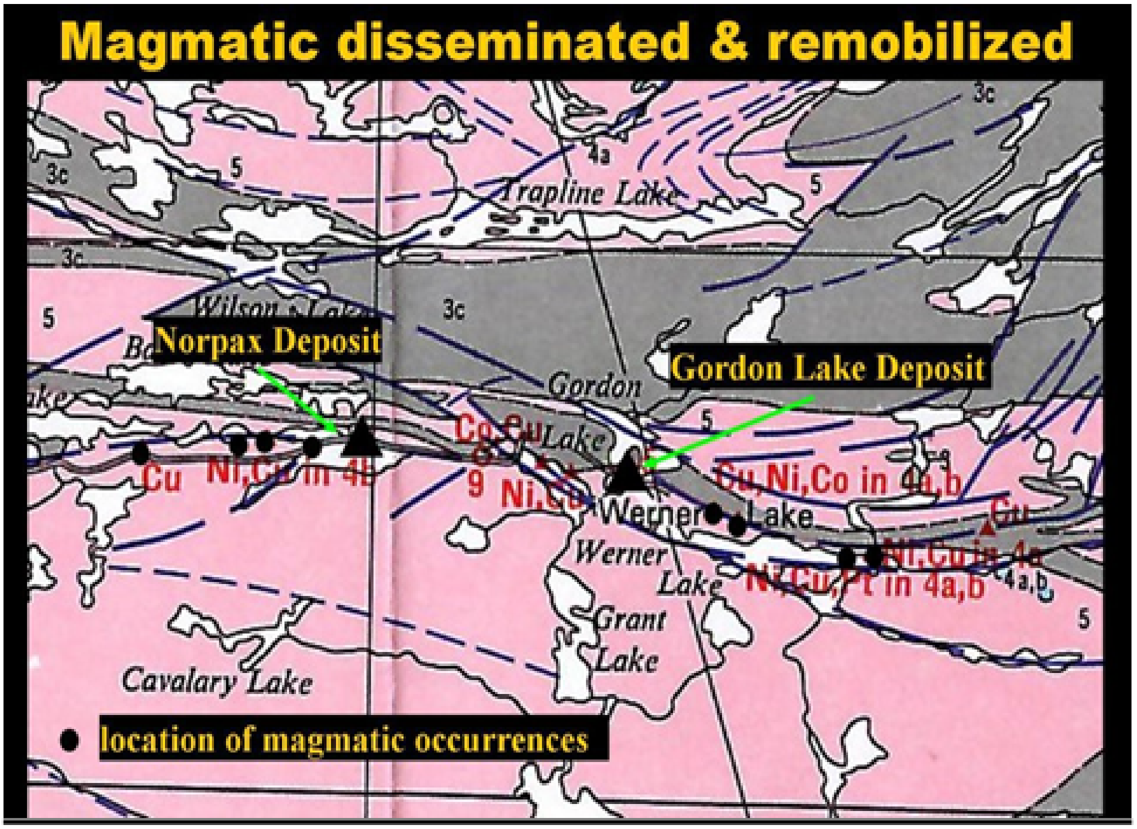
Numerous Cu-Ni-Co-Cr-PGE occurrences are known in the Werner–Rex Lakes area. The following is summarized from Parker's (1989) evaluation of the mineral potential of the area. Mineralization is hosted within a number of mafic intrusive pods associated with the regional Werner–Rex fault system. The ultramafic-mafic rocks, that are host to mineralization, were part of a syn-tectonic stratiform intrusion that was deformed after emplacement. The present pods of mafic intrusive rocks are interpreted to be tectonic fragments of this once stratiform intrusive body.

Mineralization is associated with 3 deposit-model types:

- Magmatic mineralization: disseminated and remobilized Ni-Cu sulphides containing Cr and PGE (Norpax and Gordon Lake deposits);
- Cobalt-copper skarnoid mineral deposits (Werner Lake Cobalt Deposit).
- Remobilized sulphide mineralization in migmatite, pegmatite and sedimentary gneisses (Rex–Lower Fortune occurrences)

There are approximately 37 known occurrences in the immediate Werner–Rex Lakes area (*see* Figure). The presence of additional mineralized mafic intrusive bodies has not been adequately tested along the 30 km length of the Werner–Rex fault system and in splays to the north and south. In addition, some ultramafic– mafic intrusive rocks found within the extensive English River Subprovince are, at least spatially, associated with extensive fault systems within metasedimentary assemblages. These intrusive bodies should be examined for Cu-Ni-Co-Cr-PGE mineralization.

Figure. Geology and location of mineral occurrence in the Werner – Rex lakes area.
Field of view is 20 km east- west.



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Parker, J.R. 1998. Geology of nickel-copper-chromite deposits and cobalt-copper deposits at Werner–Rex–Bug lakes, English River Subprovince, northwestern Ontario; Ontario Geological Survey, Open File Report 5975, 178p

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29. Gold, Copper-Nickel and PGE in an old iron-mining camp

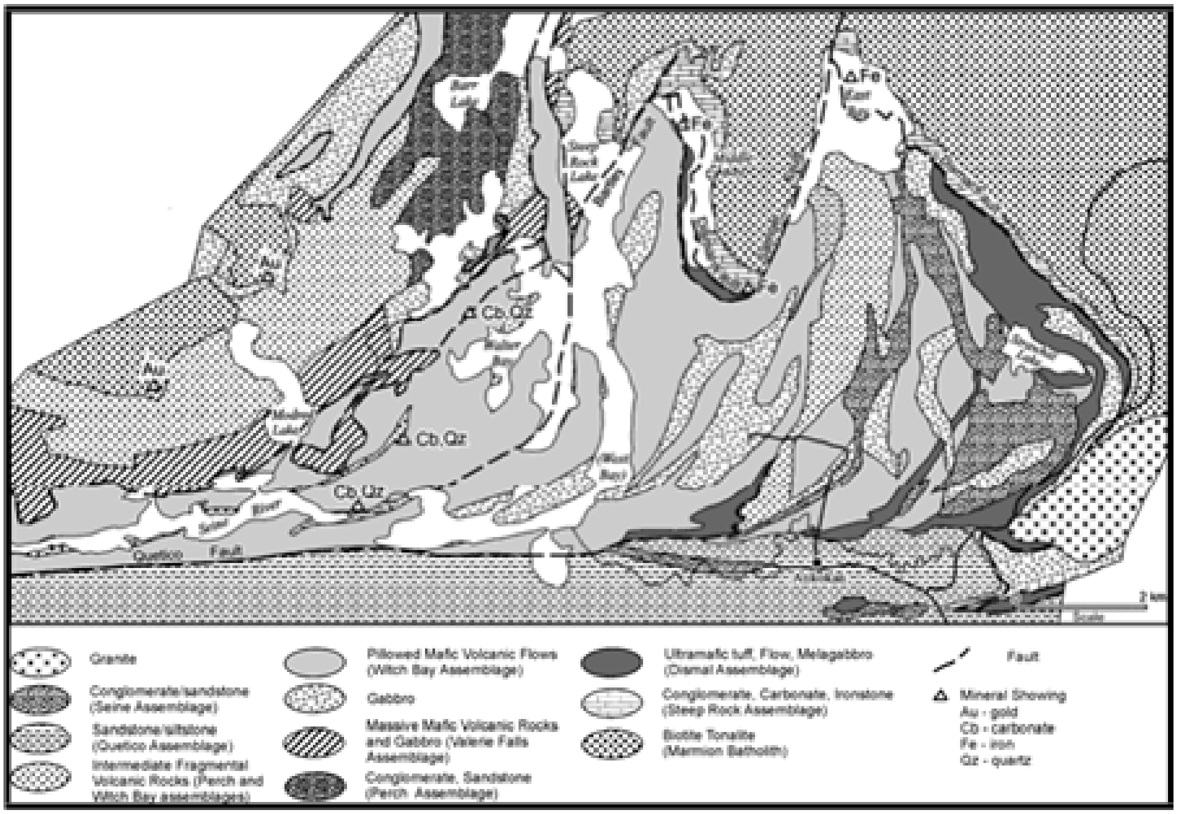
Highlights

- **new mapping defined several new targets for Au and Cu-Ni and PGE mineralization in the Steep Rock Lake area**
- **extensive zones of carbonate alteration and quartz+carbonate veining associated with anomalous gold values have been recognized within broad fault zones in the western part of the Steep Rock belt**
- **mafic to ultramafic rocks of the newly defined Dismal assemblage attain a width of 1.5 km in the eastern Steep Rock belt and represent a largely unexplored target for Cu-Ni and PGE**

The Steep Rock Lake area is well known for the historic production of iron and for gold occurrences such as the Harold and Elizabeth properties. The latest mapping in this old mining camp has defined several new targets for gold and copper-nickel and platinum-group metal mineralization. Extensive zones of carbonate alteration and quartz+carbonate veining are associated with splays of the Quetico and Bartley faults as well as thin units of tonalite and sedimentary rocks and extend from the Seine River through the Walter Bay and Barr Lake areas (see map). Samples of quartz+carbonate vein material from these zones yielded up to 190 ppb gold and point to significant gold potential within broad fault zones in the western part of the Steep Rock belt.

The newly defined Dismal Assemblage includes the ultramafic ashrock, high-iron basalts and gabbro in the eastern Steep Rock belt and deformed mafic to ultramafic rocks extending east along the Quetico-Wabigoon Subprovince boundary to Sapawe. The Dismal Assemblage includes the Ni-Co bearing Atikokan River occurrences and the iron deposits (Atikokan Iron Mine) at Sapawe. Mafic to ultramafic rocks of the Dismal Assemblage attain a width of 1.5 km in the eastern Steep Rock belt (see map) and represent a largely unexplored target for copper- nickel and platinum group metals.

Figure. General Geology of the Steep Rock Lake area



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30. Structurally-Controlled, Magmatic Hydrothermal Gold Deposits

Highlights

- **Spatial, temporal and genetic association of gold mineralization with late mantle- derived plutons**
- **Gold mineralization hosted in favourably oriented segments of regional faults and/or upright domes/anticlines**

Recent work (Beakhouse, 2007a, b) suggests that magmatic hydrothermal processes related to a distinctive suite of mantle-derived plutons emplaced as the terminal stage of Archean juvenile crust formation play a role in the genesis of Archean lode gold deposits. Mineralization is localized in tectonic structures developing concomitantly with emplacement of these late plutons. Consequently, recognition of these late mantle-derived plutons (LMDPs) and the structures that developed at the same time as their emplacement may be vectors to areas favourable for gold mineralization.

LMDPs include both sanukitoid and alkalic plutons that are distinguished by their dual primitive (elevated Ni, Cr, Mg#) / evolved (elevated LILE and HFSE) geochemical character, transitional to distinctly alkalic character and a number of other characteristics. Mineralization may occur within or marginal to these intrusions but in many cases is hosted in structures distant (up to 10 km) from the pluton. Structures developing synchronously with emplacement of these plutons are varied and include generally east-trending regional faults and deformation zones as well as upright folds that deform the dominant regional deformational fabric defined by near-peak metamorphic mineral assemblages. Segments or splays of the regional faults that depart from the regional strike of these zones by 20° to 40° as well as upright anticlines or domes related to the folding are especially favourable structures.

References

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