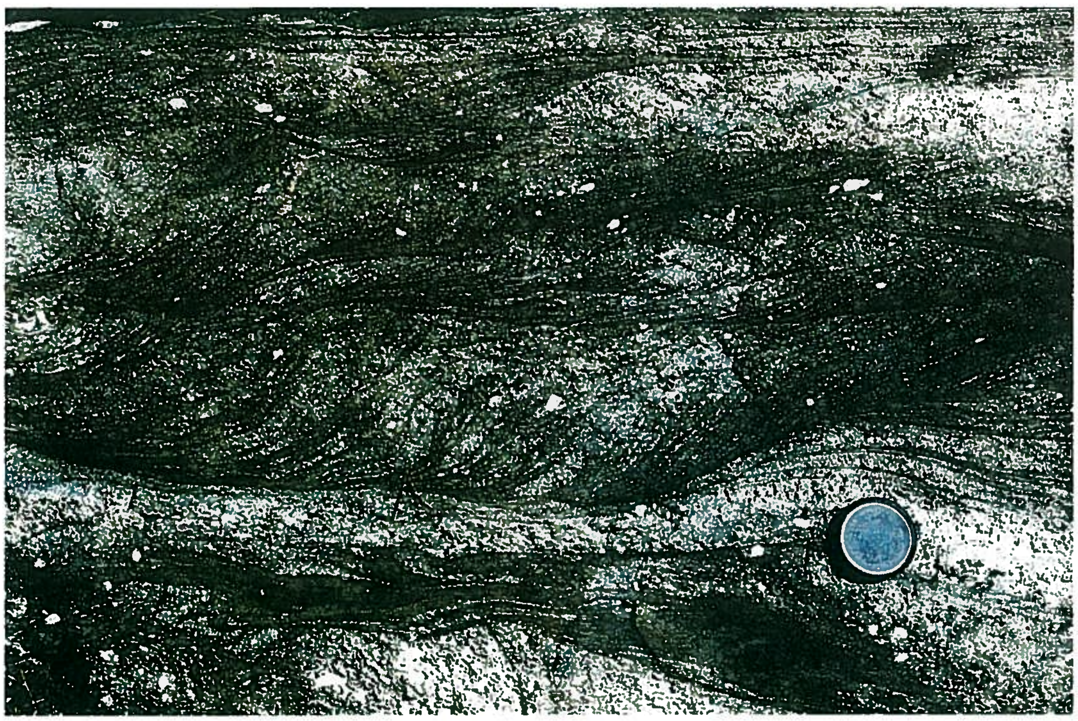
Bulletin No. 64

Metallic Mineral Occurrences of the Exposed Precambrian Shield in Northeastern Alberta

C. Willem Langenberg and
D. Roy Eccles



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Cover:
Trough cross-bedding (with over-steepened foreset beds) in the Sederholm Lake Formation of the Waugh Lake Group. Metasediments of the Waugh Lake Group contain shear-related gold showings in the Waugh Lake area (photo by T.R. Iannelli).

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Preface

Much of the potential for significant metallic mineral resources in Alberta has been only poorly defined, as most of the past economic activity in the province has been focused on petroleum exploration and development. The Canada-Alberta Partnership Agreement on Mineral Development (also known as the Canada-Alberta MDA) seeks to redress this deficiency and broaden Alberta's economic base. This publication forms part of a project, that was funded by the Canada-Alberta MDA. It documents presently known metallic mineral occurrences of the exposed Precambrian Shield of northeastern Alberta and shows the presence of gold and other base metals. It may serve as a starting point for future metallic mineral exploration on the exposed Precambrian Shield in Alberta.

Jan Boon, Executive Director
Alberta Geological Survey
March, 1996

Acknowledgements

The Canada-Alberta Partnership Agreement on Mineral Development and the Alberta Geological Survey provided funding for this project (M92-04-007). Administrative coordination of the project was under the directorship of Ms. Kathryn J. Wood, Alberta Department of Energy. The logistics support by Glen Wettlaufer (Andrew Lake Lodge) and Loon Air (Ft. Smith, NWT) are gratefully acknowledged. Mike McDonough is thanked for providing us with a preprint of a report on sulfide occurrences. Reg Olson, Robin Wyllie and Ron Burwash are thanked for reviewing an early draft of this publication. Dan Magee assisted with the graphics.

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Abstract

The description of 190 metallic mineral occurrences on the exposed Precambrian Shield of northeast Alberta provides models for mineral deposition, establishes exploration targets and gives insights into the economic potential of the mineral showings. Commodities include gold, uranium, base metals and rare earth elements. Among these occurrences, 20 have been investigated sufficiently and are of sufficient exploration importance to be classified as a mineral showing.

The most interesting result is the presence of gold and base metals, which were concentrated by shearing, in metasedimentary belts. Geochemical analyses of grab samples from deeply weathered sulfide horizons in shear zones of the Potts Lake, Waugh Lake, Doze Lake and Pythagoras Lake areas, contain up to 3.2 g/t gold. These results indicate the presence of shear-hosted Precambrian lode gold deposits. It is recommended that industry follow up on these gold showings. The Selwyn Lake area contains copper anomalies, which are associated with a stratiformal, but shear-related sulfide zone. Although no large amount of precious or base metals was found, the concentation of pyrite-pyrrhotite is important.

Quartz-tourmaline veins, which intrude granite and metasediments near Waugh Lake, contain gold, in association with anomalously high arsenic, molybdenum and tungsten contents, and may indicate that potential exists for Precambrian lode gold deposits.

Uranium showings account for nearly half of the mineral occurrences described in this report. The majority of the uranium mineralization is hosted in pegmatite and related granitoids. Their average grades are at present sub-economic. However, the uranium showing located at the West Arm of Andrew Lake has an associated anomalous molybdenum content. Some radioactive sites are associated with anomalously high contents of thorium and rare earth elements. Some iron-rich pegmatitic breccias contain 25 to 29 per cent iron, together with anomalously high vanadium contents.

Introduction

Much of the potential for significant metallic mineral resources in Alberta has been only poorly defined, as most of the past economic activity in the province focused on petroleum exploration and development. The Canada-Alberta Partnership Agreement on Mineral Development (also known as the Canada-Alberta MDA) seeks to redress this deficiency and broaden Alberta's economic base. This publication forms part of a project, that was funded by the Canada-Alberta MDA. Exploration companies taking part in the recent gold play in Phanerozoic rocks of the Ft. McMurray area have already benefitted from the Canada-Alberta MDA.

This bulletin documents presently known metallic mineral occurrences that exist in the exposed Precambrian Shield of northeastern Alberta and summarizes results published in various Alberta Geological Survey Open File Reports (Langenberg *et al.*, 1993 and 1994; Salat *et al.*, 1994; Olson *et al.*, 1994; Dufresne *et al.*, 1994; Iannelli *et al.*, 1995). Additional data on mineral occurrences were obtained from Godfrey (1986b) and McDonough (*in press*).

The exposed Precambrian Shield of Alberta is situated in NTS map areas 73E, 73L and 73M and is composed of Aphebian plutonic and metamorphic rocks, in addition to Helikian sedimentary rocks of the Athabasca Group (Figures 1 and 2). One showing hosted by Devonian carbonates (Stony Islands Copper Showing no. 190) is included because it occurs in a sedimentary outlier of the Elk Point Group on top of the Precambrian Shield and is genetically related to the Shield (Godfrey, 1973).

Previous Work

In 1957, the Alberta Research Council began systematic mapping of the Precambrian Shield in northeastern Alberta, and published district maps at a 1:31,680 scale (Godfrey, 1961, 1963, 1966, 1970, 1980a, 1980b, 1984, and 1987; Godfrey and Peikert, 1963 and 1964; Godfrey and Langenberg, 1986 and 1987). A 1:250,000 scale compilation summarizes the geology (Godfrey, 1986a). Geochronological studies have been published on those portions of the Shield initially mapped by the Alberta Research Council (Baadsgaard and Godfrey, 1967, 1972; Kuo, 1972; Day, 1975). Godfrey (1958) reported mineral showings in the Andrew, Waugh and Johnson lakes areas. All known mineral occurrences of northeastern Alberta were summarized later (Godfrey, 1986b). The structural geology of the area was put in a regional framework by Langenberg (1983).

Bostock (1982) published the geology of the Ft. Smith area, just north of the Alberta-NWT boundary. Watanabe (1961 and 1965) described metasediments of the Waugh Lake area and cataclastic rocks of the Charles Lake area.

Langenberg and Nielsen (1982) prepared a detailed account of the metamorphic history and Langenberg (1983) discussed the polyphase deformation of the area. Nielsen *et al.* (1981) put the crustal evolution of the area into a regional framework. Sprenke *et al.* (1986) presented the geophysical expression of the area and Goff *et al.* (1986) reported on the petrology and geochemistry. Bostock and van Breemen (1994) summarized age dating in an area of the Northwest Territories that borders the Alberta Shield.

The present Canada-Alberta MDA program resulted in many publications. Mineral occurrences of the Andrew Lake, Charles Lake, and Leland Lakes areas were reported by Langenberg *et al.* (1993 and 1994). The geology of the Waugh Lake area was discussed by Salat *et al.* (1994) and Iannelli *et al.* (1995). Olson *et al.* (1994) made a regional metallogenic evaluation of Alberta and Dufresne *et al.* (1994) discussed the mineral deposits potential of the Marguerite River area. The Geological Survey of Canada issued several 1:50,000 scale open file maps of the geology of northeastern Alberta, which were summarized by McDonough *et al.* (1995). Age dating of the Waugh Lake Group was reported by McNicoll and McDonough (1995). Structural controls on sulfide enriched zones are presented by McDonough (*in press*).

Analytical methods

During the 1992 program, a differentiating spectrometer (URTEC UG-135 model) was used for the study of radioactive occurrences.

Samples collected during 1992-1994 were taken from surface outcrops and analyzed by Loring Laboratories of Calgary. The Inductively Coupled Plasma spectrophotometry method of analysis (ICP) was used to determine the content of certain base metals and other pathfinder elements. Fire assay was used to determine the gold content, using a 20 gram aliquot.

Samples taken from radioactive sites (outcrops with readings of more than 2000 counts per second on the total count channel of an URTEC — UG 35 differentiating spectrometer) were split and a portion was sent to the SLOWPOKE Reactor Facility at the University of Alberta. Here, Instrumental Neutron Activation Analysis (INAA) was performed to determine heavy rare earth elements and major elements such as Na, K and Fe.

In addition, several samples from the Alberta Geological Survey's sample collection were analyzed by Loring Laboratories. These samples were collected by Dr. J.D. Godfrey in the 1950's and 1960's and are prefixed by JG.

The main results of these analyses are discussed in this report. A complete listing of all the results can be obtained from the authors. Some discrepancies between the ICP and INAA results can be explained by the different splits sent for analysis. It is recommended that a split from homogenized samples should be obtained for INAA in future work.

General geology

The Precambrian Shield of northeastern Alberta consists of massive to foliated granitoids, basement gneiss and metasediments (Figure 1). This Shield forms part of the Churchill Structural Province and was designated as Athabasca Mobile Belt by Burwash and Culbert (1976). The study area forms part of the Rae Craton and Taltson Magmatic Arc domains (Ross *et al.*, 1991). The work by Hanmer *et al.* (1994) indicates that the Snowbird Tectonic Zone between the Rae and Hearne structural provinces is an Archean structure and, consequently, they can collectively be referred to as Churchill Structural Province. The geological history of this part of the Churchill Structural Province involves sedimentation, deformation, metamorphism and ultrametamorphism, accompanied by remobilization, anatexis and intrusion. The latter processes were especially active in the Taltson Magmatic Arc. All of these processes have operated during different orogenic periods, resulting in the formation of complex polymetamorphic rocks. The granitoids of the Taltson Magmatic Arc represent basement, remobilized during Aphebian continental collision (Nielsen *et al.*, 1981). McDonough *et al.* (1995) provide an updated model for this collision.

Geochronological studies of rocks from the area (Baadsgaard and Godfrey, 1967, 1972; McDonough *et al.*, 1995; McNicoll and McDonough, 1995) provide further evidence of multiple orogenic cycles in northeastern Alberta. The migmatitic Granite Gneisses mapped by Godfrey (1986a) show poorly constrained ages of 3.20 to 2.14 Ga (McDonough *et al.*, 1995), form the basement of the Taltson Magmatic Arc and are referred to as Basement Gneiss. The High-grade Metasediments of Godfrey (1986a) might have a depositional age of 2.13-2.08 Ga, based on the dating of similar rocks in the Northwest Territories by Bostock and van Breemen (1994). Consequently, they might represent a cover sequence on top of the Basement Gneiss. The Basement Gneiss and the High-grade Metasediments (paragneiss) form the basement that was remobilized during continental collision.

Field contact relationships and bulk compositions suggest that the migmatitic gneiss and high-grade metasediments were parent materials for several of the granitoid rocks during the process of partial melting (Goff *et al.*, 1986). High initial $^{87}Sr/^{86}Sr$ ratios of, for example, Colin Lake and Slave Granitoids indicate S-type granitoids and derivation of these rocks by anatexis of pre-existing sedimentary rocks (Baadsgaard and Godfrey, 1972; Nielsen *et al.*, 1981). These granitoids have radiometric ages of between 1.97 and 1.92 Ga (McDonough *et al.*, 1995). It is possible that the younger ages (for the Slave and Arch Lake granitoids) date the main continental collision and that the older Colin Lake, Wylie Lake and Andrew Lake granitoids predate the collision (McDonough *et al.*, 1995).

Granitoid rocks, which are exposed in the Marguerite River area south of Lake Athabasca, may represent phases of the Wylie Lake pluton as suggested by Wilson (1986). The southerly outcrops in the Marguerite River area expose mylonites (Godfrey, 1970), whose parent material might include basement gneiss and metasediments, besides granitoids.

Low-grade metasediments and metavolcanics in the Waugh Lake area show primary sedimentary structures and belong to the Waugh Lake Group. The strata of the Waugh Lake Group were deposited in a composite back-arc/strike-slip rift basin and comprise distinct lithofacies assemblages that can be arranged into a coherent stratigraphic framework. The newly defined formations, in chronological order, comprise (Iannelli *et al.*, 1995):

(1) The basal **Martyn Lake Formation** consists of a rhythmically layered metasedimentary assemblage, at least 137 m thick, and is dominated by quartzitic sandstone, siltstone and mudstone (which is now phyllite) that contains turbiditic beds.

(2) The **Doze Lake Formation** is the lower metasedimentary and metavolcanic assemblage, 200 m to approximately 330 m thick, and is dominated by pebble to boulder conglomerate, sublitharenite to subarkose (lower member) and felsic volcanic flows and tuffs (upper member).

(3) The **Sederholm Lake Formation** is a distinctive green, brown-green to black weathered assemblage, and is dominated by mafic-rich sandstone and pebbly sandstone, 7 to 91 m thick. The formation varies considerably in thickness across the area.

(4) The **Johnson Lake Formation** is the upper metasedimentary and metavolcanic assemblage, 238 to 452 m thick, and is dominated by sublitharenite, subarkose and conglomerate in the lower half (lower member), and by felsic tuff, lapilli tuff and felsic to intermediate volcanic flows in the upper half (upper member).

(5) The **Niggli Lake Formation** is the uppermost formation and consists of a metavolcanic assemblage dominated by mafic volcanic flows and pyroclastic breccia.

The basal assemblage (the Martyn Lake Formation) is distinctly different from the overlying siliciclastic lithofacies units. The metasedimentary rocks of this formation are much more compositionally mature and generally thinner bedded than those of succeeding formations. The overlying rocks consist of two megacycles of metasediments grading into metavolcanics. The lower megacycle consists of the Doze Lake Formation and the upper megacycle is comprised of the Sederholm Lake and Johnson Lake formations.

The metasedimentary and metavolcanic rocks of the Waugh Lake Group contain relict primary sedimentary structures over much of northeast Alberta. Locally, where the rocks are only weakly deformed and sheared, primary sedimentary structures and textures have been well preserved. This is particularly true for outcrops of the Sederholm Lake and Johnson Lake formations where excellent examples of trough cross-beds, graded beds, load structures and scours have been observed (see photograph on the front cover of this bulletin). The interpretation of the depositional history of the siliciclastic and volcanic rocks of the Waugh Lake Group are based primarily on the examination of weakly deformed outcrops.

The base of the Waugh Lake Group was not observed within the map area, and consequently its basement is unknown. It is assumed that the Taltson basement is also the basement of the Waugh Lake Group. An unconformity is assumed to exist at the base of the succession because of the prolonged period of uplift and erosion that must have followed basement formation. McNicoll and McDonough (1995) show that the deposition of Waugh Lake sediments happened between 2.01 and 1.97 Ga ago. This is based on detrital zircons from quartz-feldspar pebbles in a conglomerate with ages between 2.70 and 2.01 Ga, and a 1.97 Ga age for a Colin Lake quartz-diorite, which intrudes the Waugh Lake metasediments.

The low-grade metasediments of the Burntwood Group, which are exposed along the north shore of Lake Athabasca (Godfrey, 1986a), are probably equivalents of the Waugh Lake Group.

Two distinct cycles of metamorphism can be recognized (Langenberg and Nielsen, 1982). The first cycle shows high-pressure granulite facies conditions (P=750 MPa, T=900°C). Based on the recent age-dating, the age of this cycle might be Aphebian, and not Archean as postulated by Langenberg and Nielsen (1982). The second cycle shows a three-stage cooling sequence from moderate-pressure granulite facies (P=500 MPa, T=740°C), through low-pressure amphibolite facies (P=300 MPa, T=555°C), to greenschist facies (P=200 MPa, T=260°C) conditions. This second cycle can be dated to have taken place between 1.97 and 1.68 Ga (Plint and McDonough, 1995)

Major faults affect most of the rock units and are younger than the macroscopic fold structures in the granitoids. These faults are expressed as shear zones characterized by mylonites (Watanabe, 1965). Retrograde greenschist facies minerals in the mylonitic zones indicate a late Aphebian age for this large-scale faulting, although it cannot be excluded that the ductile deformation started under higher grade conditions (McDonough *et al.*, 1995). Extensive brecciation along most faults indicates still younger brittle fault movements at higher crustal levels.

The unmetamorphosed Helikian Athabasca Group is mainly preserved south of Lake Athabasca, but its erosional edge approximately coincides with the north shore of Lake Athabasca and minor exposures are present close to the lake shore (Godfrey, 1986a). Concentrations of angular sandstone rubble and erratics, which appear close to their source, indicate that other sand and overburden covered areas north of Lake Athabasca might be underlain by the Athabasca Group

Glacial scouring during the Pleistocene has left numerous fresh outcrops, which greatly facilitate geologic studies in this area.

Mineral occurrences

A total of 190 metallic mineral occurrences are documented in this bulletin (Figure 1, 2 and 3 and the Appendix), which were compiled from many different sources. These sources include Langenberg *et al.*, 1993; Langenberg et al, 1994; Salat *et al.*, 1994; Iannelli *et al.*, 1995; Godfrey, 1970; Godfrey, 1986b; Price *et al.*, 1991; Olson *et al.*, 1994; Dufresne *et al.*, 1994 and McDonough (*in press*).

During the 1960's and 1970's, most efforts were directed toward uranium exploration. Consequently, uranium and associated commodities represent a large percentage of the known mineral occurrences. Relatively little attention, until recently, was given to gold or base metals. The widespread gossanous belts of metasediments have received relatively little exploration and the potential for shear-related gold deposits has been insufficiently investigated.

The majority of mineral occurrences and showings are located in the Aphebian rocks north of Lake Athabasca, but a few occur in Aphebian rocks of the Marguerite River area (Figure 2). The Helikian Athabasca Group contains some radioactive sites, which are mainly related to radioactive boulders, but economic deposits have not yet been found (Wilson, 1985). The Stony Island Copper Showing, which is hosted by Devonian carbonates, is also included because the Devonian forms an erosional remnant on top of the Precambrian Shield at this locality.

It should be noted that additional occurrences from Godfrey (1970 and 1986b) are shown with a commodity symbol on Figures 1 to 3. However, because little is known about these occurrences, they do not have a number and are not listed in the Appendix.

The mineral occurrences include both confirmed, as well as previously reported mineral occurrences that could not be relocated. Although ground investigation failed to relocate some reported occurrences, these particular occurrences still have been given a Mineral Occurrence Number, thus indicating that the location and immediate area has been prospected and geological observations have been made. Failure to relocate a mineral occurrence does not invalidate the existence of the occurrence; future more detailed work might relocate it. A note is made in the Appendix that the commodities previously reported were not found.

Mineral occurrences are classified based on commodity: i.e. gold, uranium, rare earth elements, molybdenum, copper, lead, zinc, nickel, chromium, and iron. They are further subdivided according to mineral deposit models, which are based on geological setting and which largely follows a classification proposed by Olson *et al.* (1994).

For map representation, uranium and rare earth element occurrences, together with allanite and radioactive sites with unknown commodities, are grouped as radioactive sites. Molybdenum, copper, lead, zinc, nickel and chromium occur as sulfides and are grouped with other sulfide occurrences as sulfides. In addition, graphite and tourmaline/quartz vein sites are shown on Figures 1 to 3.

Showings

A mineral occurrence implies the presence of a mineral at a particular place. The Bureau of Mines (1968) defines a "showing" as the surface occurrence of a particular mineral and a "prospect" as a non-producing mining property under development. Therefore, there is no difference between showing and occurrence. However, it is proposed that a distinction be made, whereby a showing implies an occurrence of some merit, but which has not yet a sufficient in-ground resource to have become a prospect.

Therefore, in this bulletin, a metallic mineral occurrence is elevated to a showing if it meets one of the following two criteria:

(1) the occurrence contains significant concentrations of base metals (greater than about one volume per cent) or precious metals (greater than 100 parts per billion).

(2) the occurrence shows a radioactivity level above a threshold of 2,000 total counts per second as measured with a spectrometer or scintillometer over an area of at least a few square metres.

Similar showings in a relatively small area are grouped as one showing. Showings are considered "similar" when they have a comparable geological and structural setting or an identical mineral association.

Based on these criteria, 20 mineral showings were identified and described. The description contains information on geology, the mineralized zone and exploration work performed at each showing. The showings are discussed in chapters on gold, copper, uranium, rare earth elements and iron. They are given informal names referring to their general location. Their description provides a list of the various mineral occurrences included in the specific showing.

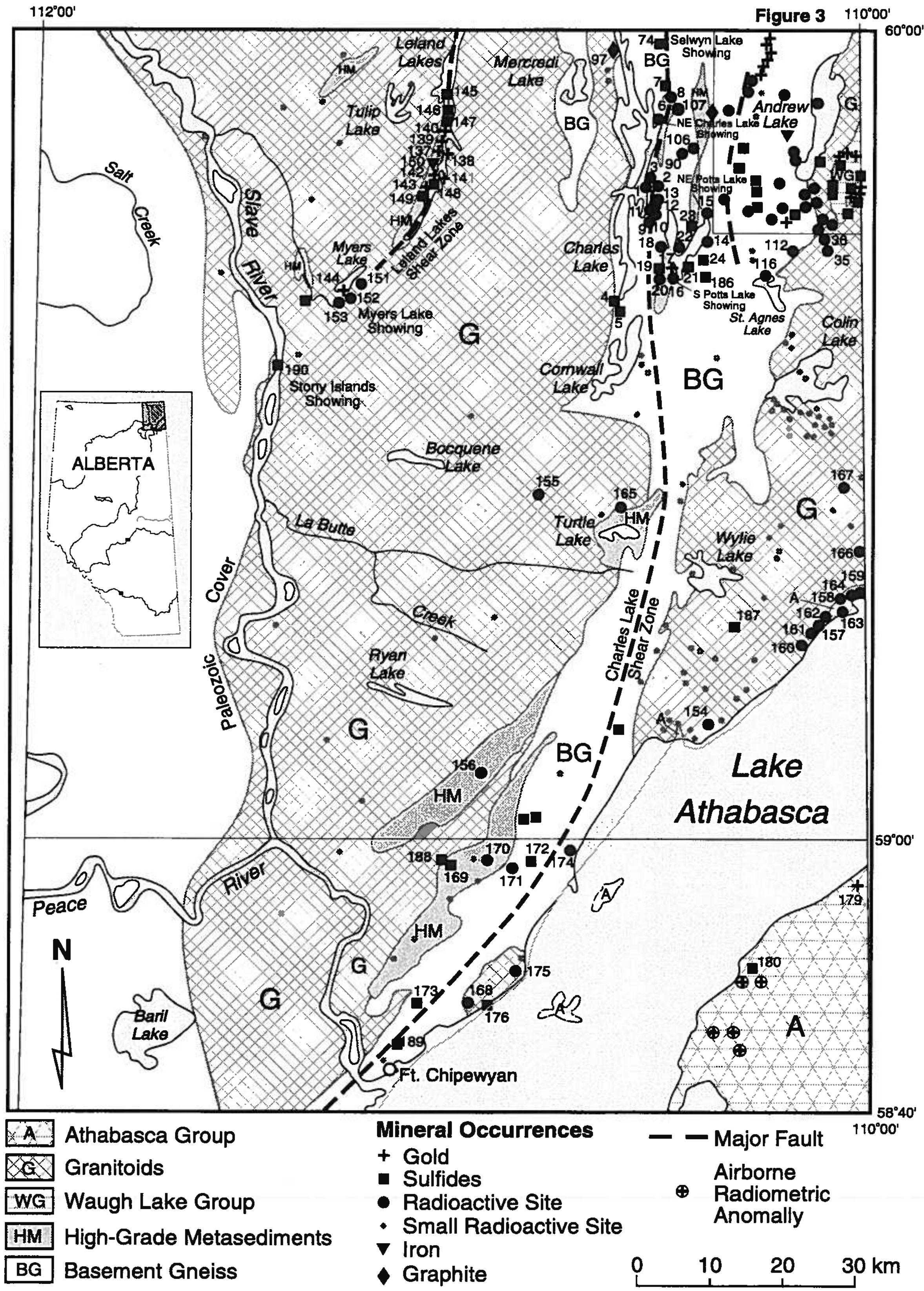

Figure 1. Metallic mineral occurrences north of Lake Athabasca. The geology is simplified from Godfrey (1986a).

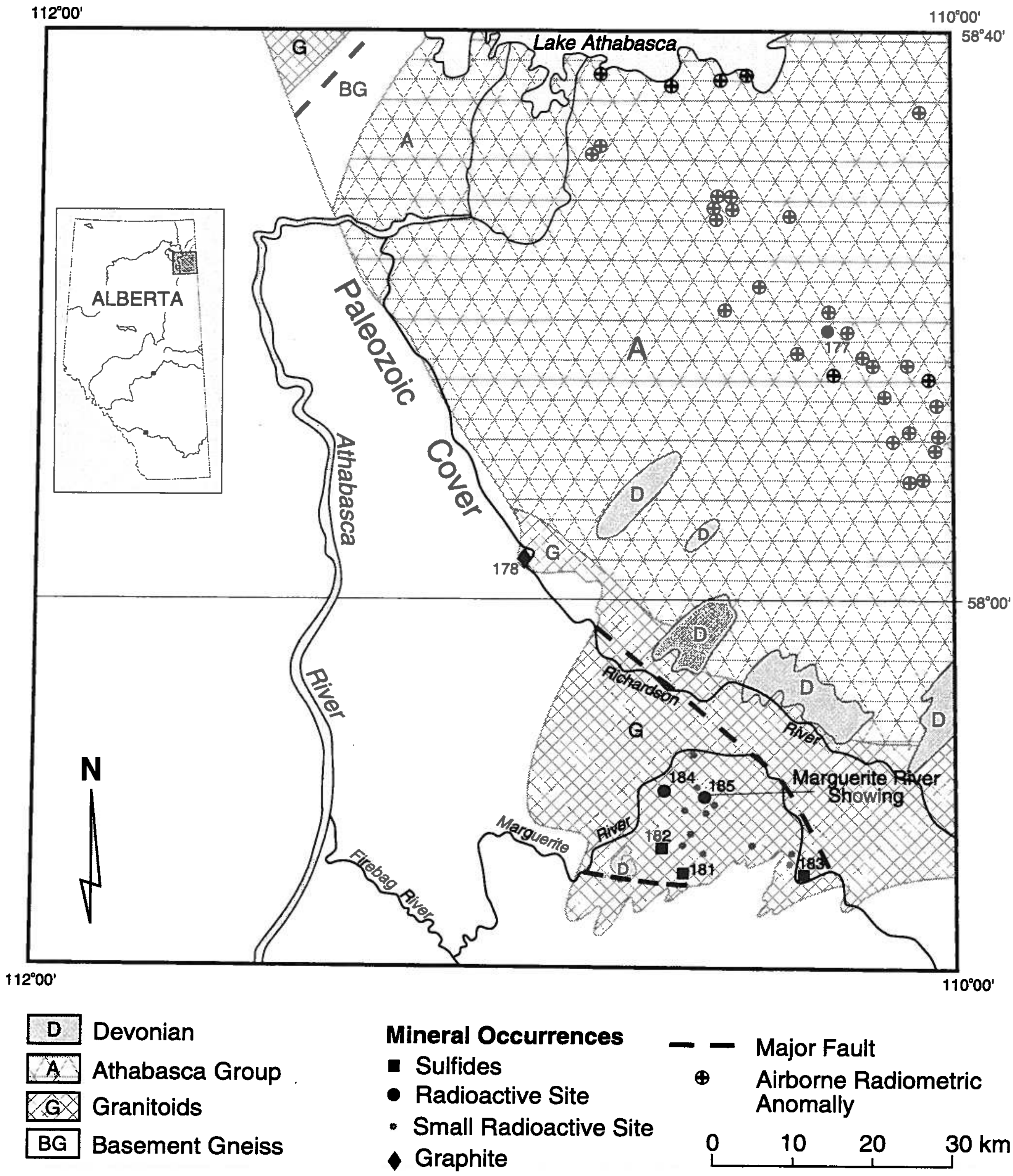

Figure 2. Metallic mineral occurrences south of Lake Athabasca. The geology is based on Godfrey (1970) and Wilson (1986). The airborne radiometric anomalies are from Godfrey and Plouffe (1978).

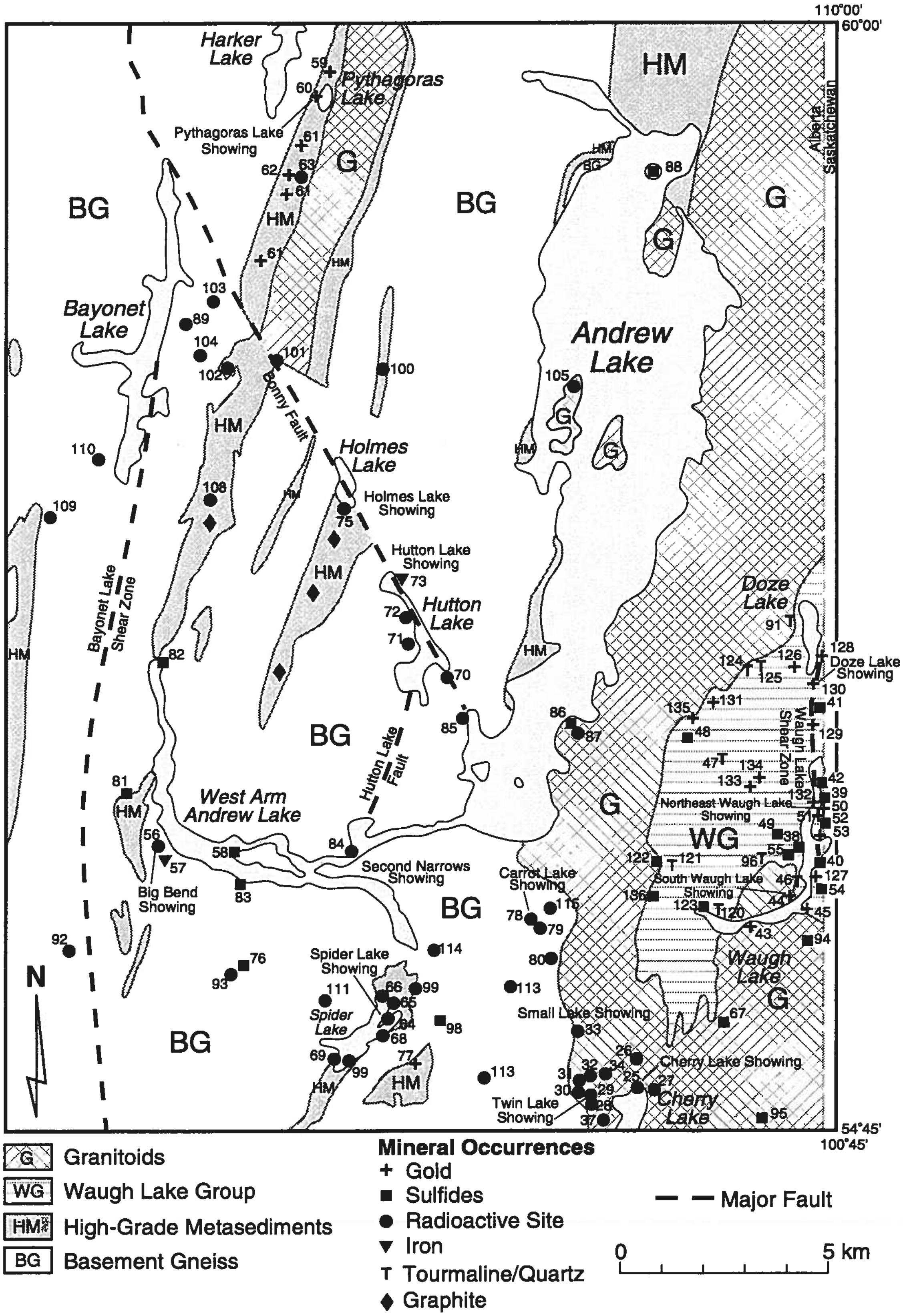

Figure 3. Metallic mineral occurrences of the Andrew Lake area. The geology is simplified from Godfrey (1986a).

Gold showings

South Potts Lake Gold Showing Mineral occurrence number (M.O. no.): 17

Located 300 m west of the southwest shore of Potts Lake (Figure 1; NTS 74M/09).

History of exploration

Godfrey (1966) reported massive arsenopyrite in a 3-foot wide zone within siliceous, chloritic metasediments at this location. In 1992, fairly recent red flagging in a grid pattern over the area and a shallow trench were observed, but no assessment report has been filed.

Geological setting

The area is underlain by high-grade metasediments consisting mainly of pure and impure quartzite and minor biotite-sericite schist (Figure 4). The metasediments, together with basement gneisses, form part of the basement complex (Godfrey, 1986a).

Approximately fifty per cent of the outcrops consist of rusty, folded quartz biotite schist and green chloritic schist. The remaining outcrops are composed of grey-pink biotite gneiss and porphyroblastic gneiss.

The metasediment layers are tightly folded and have a prominent foliation. Many small scale fractures run parallel to the foliation. A narrow linear gully, probably indicating a fault, cuts across the area and trends N25°E.

Mineralized zone

The zone is located in a low-lying outcrop of intermixed gneiss and rusty metasediment bands. The main showing consists of a 50 cm wide breccia zone composed of white quartz-feldspar material that encloses angular fragments of chloritic schist, and is in contact to the west with a 35 cm wide ferruginous chlorite schist. On both sides of this zone, the metasediments show a strong Fe-enrichment over 2 m.

Arsenopyrite and pyrite (up to a centimetre in width) occur along quartz-chlorite shears within the breccia zone, where they can constitute locally 2 to 3 per cent of the rock. Outside the breccia zone and over a 20 by 25 m area, minor pyrite and arsenopyrite (less than 1 per cent) are disseminated throughout the metasediments.

Silicification is visible on both sides of the breccia zone over a distance of 1 m. Some secondary chlorite appears to be present in and near the breccia zone.

Geochemical data

Three grab samples were collected at and near the mineralized area. Sample WL-08-12-03 was taken in the breccia zone. Sample WL-08-12-02 was taken 25 m west of the breccia zone from sulfide-quartz-biotite schist. Sample WL-08-12-04 was taken 20 m south of the breccia zone in brecciated quartz feldspar

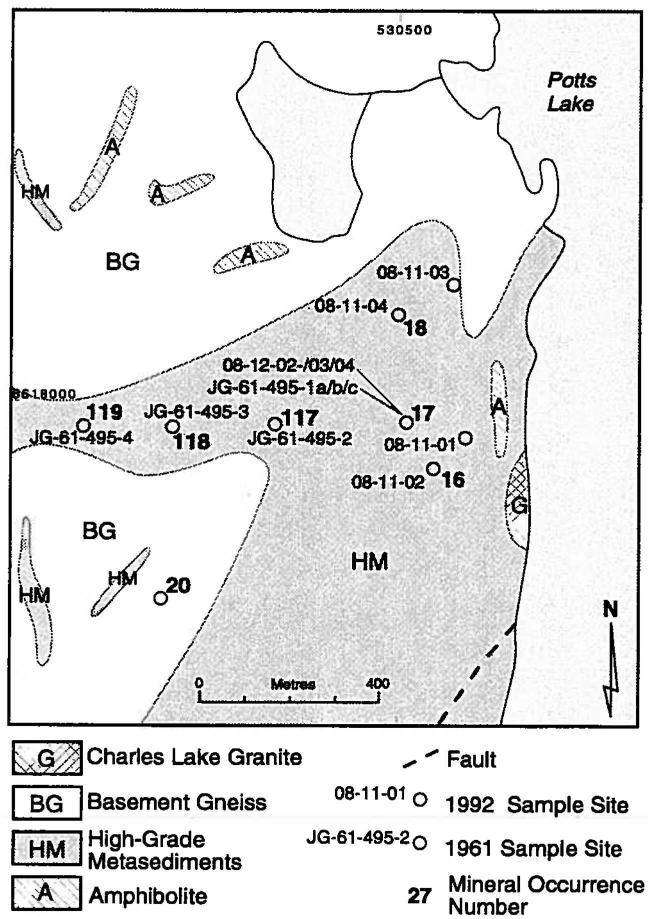

Figure 4. Geological map of the South Potts Lake Gold Showing. Geology after Godfrey (1966).

amphibolite. Sample WL-08-11-03, which was collected 250 m north of the mineralized zone from a band of pyritic feldspar-biotite schist, contains slightly anomalous nickel and gold. The most important geochemical results from the four samples are presented in Table 1.

Six samples which were collected in 1961 by Godfrey (1966) were retrieved from the Mineral Core Research Facility and analyzed. Three of them (JG-61-495-1a, b & c) contain abundant sulfides and their coordinates correspond to the location of the above mineral occurrence (see Figure 4). The other three samples were collected on a traverse extending to the west of the showing. Their elemental contents (Table 2) confirm the association Au-As-W-Bi.

Classification

Sulfides and geochemical association of Au, As, W and Bi indicate a shear-related lode gold deposit. Silicification, quartz gangue and breccia are common features of these deposits (Boyle, 1979).

Table 1. Selected results from geochemical analyses of 1992 samples, South Potts Lake Gold Showing.

Sample no	Au (ppb)	As (ppm)	W (ppm)	Bi (ppm)	Ba (ppm)	Cu (ppm)
WL-08-11-03*	10	–	–	–	279	–
WL-08-12-02	80	6943	2	126	–	116
WL-08-12-03	81	–	29	17	–	20
WL-08-12-04	20	4139	659	10	–	90

* sample WL-08-11-03 also contains 110 ppm Ni.

Table 2. Selected results of 1961 samples, South Potts Lake Gold Showing.

Sample no.	Description	Au (ppb)	As (ppm)	W (ppm)	Bi (ppm)	Ba (ppm)	Zn (ppm)
JG-61-495-1a	Quartzite and 5% arsenopyrite	85	28,461	5749	26	–	103
JG-61-495-1b	Quartz vein and 10-15% arsenopyrite	770	>10%	5948	205	–	–
JG-61-495-1c	Quartzite and quartz vein+5% arsenopyrite	62	41,772	6236	38	–	132
JG-61-495-2	Sheared quartzite	17	262	46	–	492	–
JG-61-495-3	Sheared quartzite	–	386	59	–	118	101
JG-61-495-4	Sheared quartzite	–	63	10	–	166	–

Northeast Waugh Lake Gold Showing M.O. numbers: 39, 50, 51, 52, 53

The mineralized zone occurs along a narrow north trending, 1 km long belt on the northeastern side of Waugh Lake (see Figure 3; NTS 74M/16).

History of exploration

Hudson's Bay Oil and Gas Limited flew a series of airborne geophysical surveys, one of which was a magnetic, electromagnetic and radiometric survey (Stamp, 1969). The electromagnetic survey recorded three conductors near the northern part of Waugh Lake, one of which was called "anomaly #1" and was selected as the best target for exploration. This anomaly includes arsenopyrite at locality #16 of Godfrey (1958). The discovery was followed-up by ground checking and trenching at four separate locations along the shear zone. Although some additional work was recommended, no further exploration was carried out.

Geological setting

The northeast Waugh Lake area sits on the eastern edge of the area underlain by the Aphebian Waugh Lake Group, which comprises low-grade metasediments and metavolcanics. The Waugh Lake Group is intruded by a variety of granitic rocks (Figure 5).

The Waugh Lake area represents both a sedimentary as well as a structural basin. A major syncline is outlined by the outcrop pattern of the stratigraphic units. A major shear zone follows the length of Waugh Lake and schistosity is very pronounced due to shearing and folding. At close examination, many small crenulations can be seen in the shear zone.

The strata also typically contain quartz veins and locally have extensive quartz stockworks. The latter feature is generally associated with fault or shear zones. Mafic dykes (less commonly sills) and hornblende-biotite diorite dykes are also present.

The mineral occurrences forming the northeast Waugh Lake and Doze Lake Gold showings are hosted in rocks ranging from schistose quartz arenite to biotite-sericite schist, which belong to the Martyn Lake Formation (Iannelli *et al.*, 1995). All these rocks are pyritic in places, but graphite is also present.

Mineralized zone

The mineral occurrence reported by Godfrey (1958) was confirmed by an airborne electromagnetic (AEM) survey (Stamp, 1969), which recorded a 6 km long north trending conductor extending from northern Waugh Lake along the Alberta-Saskatchewan border. Other smaller anomalies were located over Waugh Lake and to the northwest (Figure 6).

The long conductor (anomaly #1) was followed up by trenching and a series of ground electromagnetic and magnetic traverses. Unfortunately, the two types of surveys did not follow the same traverse lines and their results were not reported except for the traverses in the area of Trench no. 2. The conductor may be explained by graphitic material, although the conductor is only 20 m east of a magnetic zone containing large amounts of sulfides (Burgan, 1971). The magnetic anomaly 300 m south of Trench no. 4 deflects the compass.

The mineralized zones in the northeast Waugh Lake area consist of variable amounts of sulfides associated with quartz mica schists. Pyrite, pyrrhotite and arsenopyrite are relatively easily recognizable minerals, notwithstanding the deep weathering which has affected the exposed rock units. As a result large quantities of limonite and goethite are present. Rare specks of chalcopyrite are present. The sheared nature of the rocks in the sulfide enriched zones indicate that the enrichment is shear-related and that sulfides are remobilized throughout the shear zone (Iannelli *et al.*, 1995).

In the northern part of the mineralized belt, a cross-cutting dyke of microgranite has enhanced the concentratrion of sulfides over a one metre interval on both sides of the dyke. There, massive pyrite, pyrrhotite and arsenopyrite stringers, a few millimetres thick, run along the schist foliation. Gold contents of up to 416 ppb are present in samples from the stringer zone.

The best assays reported by Hudson's Bay Oil and Gas Limited came from a composite chip sample, which was collected along the length of Trench no. 2 (Figure 6). This sample contains 0.01 per cent copper and 0.01 per cent nickel. In Trench no. 1, a chip sample contained 0.017 per cent nickel, 20 g/t silver and 0.34 g/t gold (340 ppb Au).

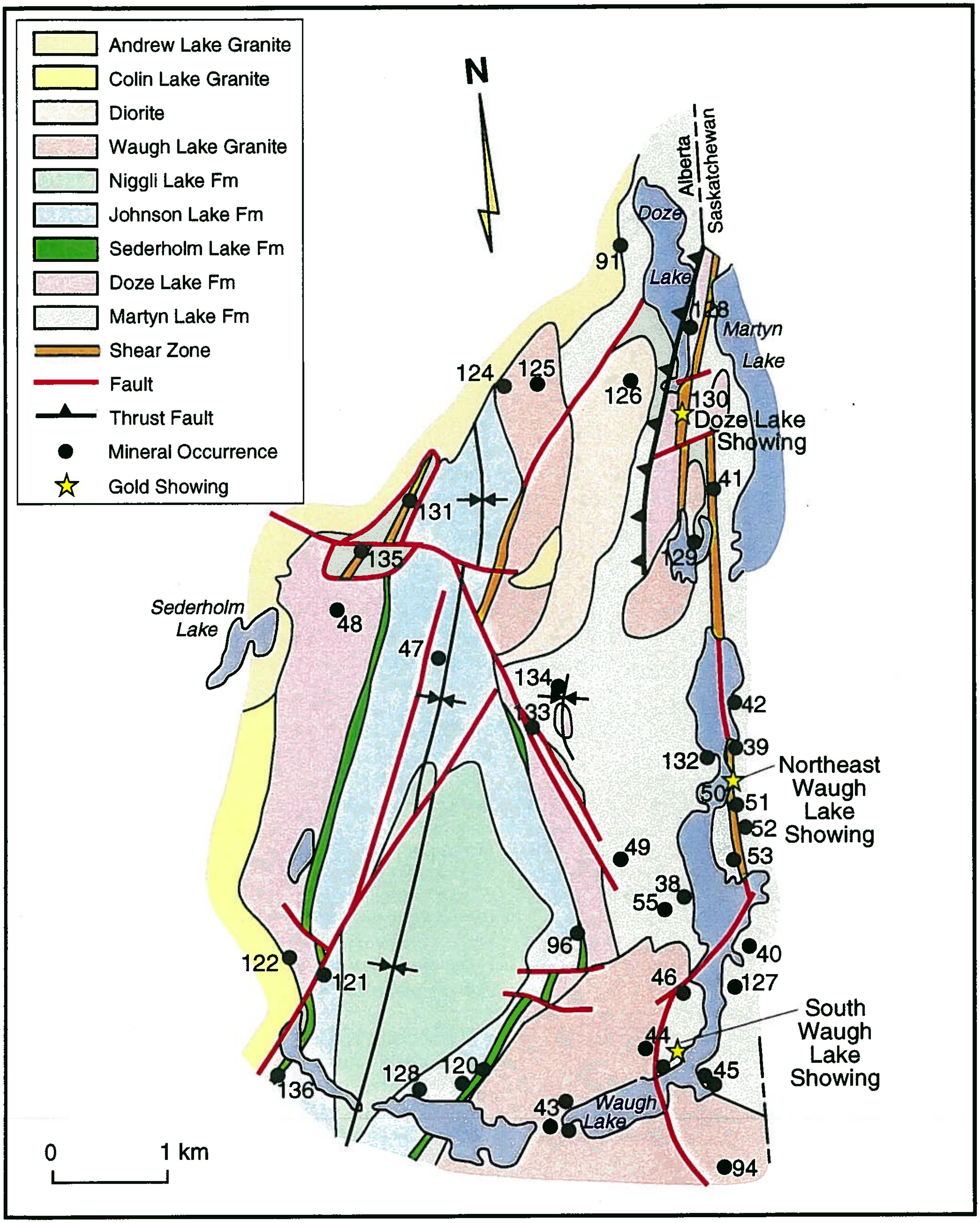

Figure 5. Geological map of the Waugh Lake area. The locations of the Doze Lake, Northeast Waugh Lake and South Waugh Lake Gold showings are indicated. Geology after Iannelli *et al.* (1995).

The deep weathering combined with the high amount of sulfides in the country rocks interferes with observation of superimposed host rock alteration. However, large masses of chlorite in quartz-rich graphitic schist in Trench no. 2 indicate some local magnesium enrichment.

Geochemical data

Five assay results of samples from the trenches were reported (Table 3). During 1992, the trenches were resampled. Another area (Mineral Occurrence number 53), situated 250 m south of Trench no. 4, was also sampled as it belongs to the same belt of mineralized rocks, and the main results are presented in Table 4. Results include up to 416 ppb gold (0.4 g/t Au).

Classification

The preferred location of sulfides in the shear zone indicates that the enrichment is shear-related and that (originally possibly stratiformal) sulfides are remobilized during the shearing process. Structural control of mineralization is also indicated by concentration of sulfides along mica crenulations in the schists. The mineralization (redistribution of sulfides and gold) is syn- to post-kinematic in relation to deformation under greenschist facies conditions and has affinities to shear-related lode gold deposits (Iannelli *et al.*, 1995).

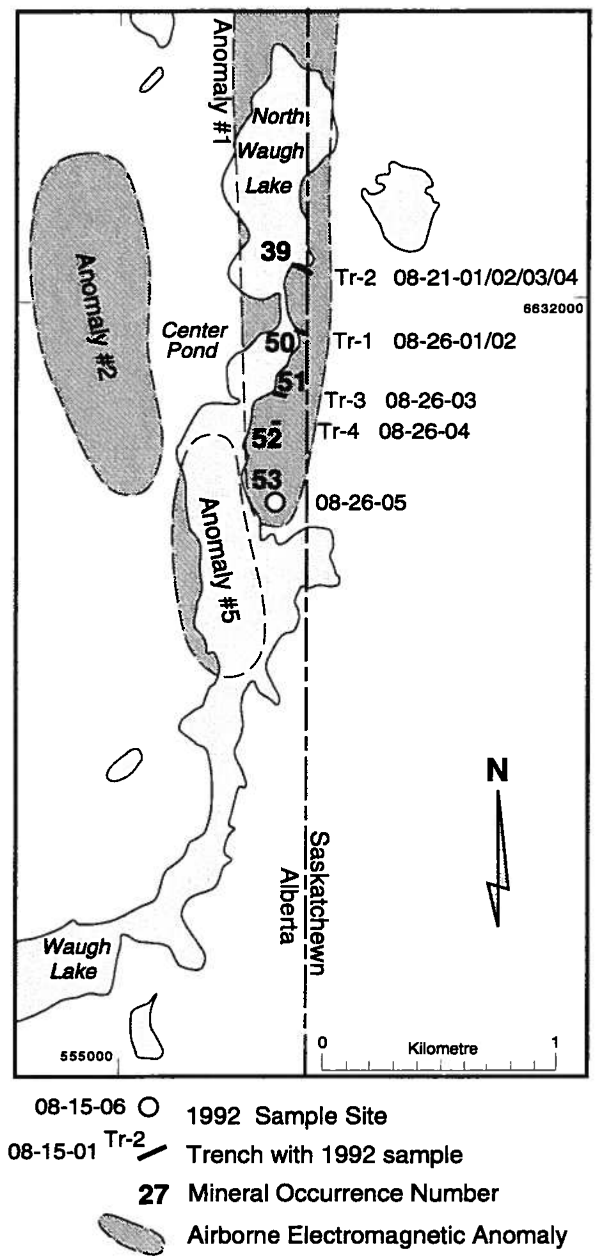

Figure 6. Geophysical map of the Northeast Waugh Lake Gold Showing.

Table 3. Results of chemical analyses of samples from trenches at Waugh Lake (from Burgan, 1971).

Sample no. (M.O. no.)	Location	Cu %	Ni %	Au g/T	Ag g/T
1516 (8) (**50**)	Trench no. 1	0.004	n.a.	n.d.	n.d.
1517 (9) (**50**)	Trench no. 1	0.002	0.017	0.34	20.4
1518 (10) (**50**)	Trench no. 1	0.005	n.a.	n.d.	n.d.
1521 (composite) (**39**)	Trench no. 2	0.010	0.010	n.d.	n.d.
1520 (6) (**52**)	Trench no. 4	0.004	n.a.	n.a.	n.a.

n.a. = not analysed for.
n.d. = not detected.

Table 4. Selected results of 1992 grab-samples (Northeast Waugh Lake Gold Showing).

Sample no. (M.O. no.)	Location — Description	Au ppb	As ppm	Cu ppm	Zn ppm	Ni ppm	Cr ppm
WL-08-21-01 (39)	Centre of Trench no.2 2%pyrite	11	–	–	–	–	196
WL-08-21-02 (39)	East end of Trench no.2 10%pyrite, arsenopyrite	17	–	55	141	–	–
WL-08-21-03 (39)	East end of Trench no.2 massive sulfide stringers	29	–	62	157	–	–
WL-08-21-04 (39)	Near west end of Trench no.2 quartz vein + pyrite	9	–	53	–	–	205
WL-08-26-01 (50)	East end of Trench no.1 Quartz vein + 2%pyrite, arsenopyrite	28	29	–	–	–	197
WL-08-26-02 (50)	West end of Trench no.1 10% arsenopyrite	416	14,596	–	–	–	–
WL-08-26-03 (51)	Trench no.3 5% pyrite, arsenopyrite	9	39	53	–	–	–
WL-08-26-04 (52)	Trench no.4 5% pyrite, arsenopyryte	–	18	–	158	61	211
WL-08-26-05 (53)	250m. S. of Trench no.4 10% pyrite, chalcopyrite	16	–	130	300	177	–

Doze Lake Gold Showing M.O. number: 130

Located 100 m south of the south end of Doze Lake (Figure 3; NTS 74M/16)

History of exploration

This occurrence was first reported by Salat *et al.* (1994).

Geological setting

The geological setting is identical to the nearby Northeast Waugh Lake gold showing.

Mineralized zone

Within a belt of rusty, iron-sulfide rich, well-layered and folded metasediments. As well, many small quartz veins are present.

Geochemical data

Two spots of rusty sediments have been chip sampled. Sample HS93-07-08-22 has a gold content of 3,212 ppb (3.2g/t Au) and sample HS93-07-08-23 contains 121 ppb Au. They are accompanied by elevated Mo contents of 99 and 27 ppm, respectively. No arsenic was detected in the samples. The high content of gold in the first sample was checked by re-analyzing the pulp (3278 ppb Au) and reject of the sample (2370 ppb Au)

Classification

This gold showing is geologically similar to the other gold occurrences, that occur in sulfide-rich metasediments along the Waugh Lake Shear Zone (such as mineral occurrences nos. 50, 51 and 53). It is a shear-related gold showing.

South Waugh Lake Gold Showing M.O. numbers: 43, 44, 45, 46

Occurrences are scattered along the shore of the southern part of Waugh Lake where it makes a large bend to the west (Figure 3; NTS 74M/16).

History of exploration

The area was first recognized for its potential by Godfrey (1963), who noted the extensive presence of tourmaline-quartz veins along the north shore near the elbow of Waugh Lake (Figure 5).

Geological setting

The south Waugh Lake Gold Showing is underlain by intrusive rocks, that intrude the Waugh Lake Group. Granitic rocks form cliffs along Waugh Lake. The Waugh Lake granites form part of the Colin Lake granitoids (Godfrey, 1986a), which intruded Waugh Lake sediments about 1.97 Ga ago (McNicoll and McDonough, 1995). To the east, low-grade metasediments of the Waugh Lake Group are probably in fault contact with the granites (Figure 5).

On the northern shore and to the west, the hills consist of a monotonous mass of grey, pinkish weathering, medium-grained biotite granite. The granites are generally weakly foliated. Sometimes the foliation is crenulated. This crenulation may be related to a strike-slip fault, which is assumed parallel to the straight shoreline.

The metasediments of the Martyn Lake Formation to the east, contain slaty cleavage. In this area, several faults are shown by Godfrey (1961). The faults are either parallel to the lake or intersect it at high angles.

Mineralized zone

The mineralized zones consist of veins of quartz and massive black tourmaline. The veins occur both in the granitic stocks and in the metasediments. They tend to be thin (1 to 10 cm), but long (10 to 15 m), fairly straight and multilayered in granitic host rocks. In contrast, in the metamorphic rocks tourmaline appears in massive contorted layers, 15 to 75 cm thick and quartz is often only present in minor amounts.

A granitic dyke, which cuts through metasediments (quartzite and quartz sericite schist), contains tourmaline in the ground mass and massive tourmaline/quartz selvages along its sides. Parts of tourmaline/quartz veins that cut across metasediments are injected along bedding into the metasediments. The vein looks like a giant centipede and the arms that penetrate the host rock form bleached halos along its sides, which are a few millimetres wide. Where tourmaline and quartz veins cut through the metasediments, they always contain a small amount of pyrite (1 to 2 per cent). The overall direction of the veins in the area ranges from N40°E to N90°E. There does not seem to be a difference in orientation between veins hosted by granite or metasediments.

Table 5. Selected results of 1992 grab samples at south Waugh Lake.

Mineral occurrence number	Sample no.	Au ppb	Mo ppm	As ppm	W ppm
43	WL-08-23-01	–	291	–	1119
43	WL-08-23-02	–	–	–	260
43	WL-08-23-03	8	455	–	93
44	WL-08-23-05*	77	–	–	–
44	WL-08-23-07	–	–	35	–
44	WL-08-23-08**	157	–	58	–
45	WL-08-23-09	10	–	11	–
45	WL-08-23-10	43	–	9	–
46	WL-08-23-11	–	–	–	–

* Pb = 122 ppm
** Cu = 132 ppm

Quartz-tourmaline veins are also found elsewhere in the Waugh Lake area, but nowhere with the abundance and size of veins which characterize the South Waugh Lake Showing. These veins are definitely late and related to faults, but they are also spatially related to the Waugh Lake granites. In one outcrop on the north side of the lake, a tourmaline quartz vein is cut by an even later fracture that trends N32°E. This fracture is filled with barren quartz.

Geochemical data

A few of the tourmaline quartz veins were sampled and the more significant results from the geochemical analyses are presented in Table 5. Most noticeable is an association through the whole area of gold, arsenic, molybdenum and tungsten, with tourmaline and quartz. Tungsten and molybdenum show a negative correlation with respect to arsenic. This association is reminiscent of the mineral paragenesis found in typical Archean lode gold deposits of the Abitibi belt in Quebec (Boyle, 1979).

Classification

The geochemical data and geological setting suggest that the gold in tourmaline/quartz veins is similar to the Precambrian lode gold occurrences which are hosted in quartz veins.

Pythagoras Lake Gold Showing M.O. numbers: 59, 60, 61, 62

The mineralized zone is found along a band of outcrops exposed on the western side of a chain of lakes that extend in a SSW direction from Pythagoras Lake (Figure 3; NTS 74M/16).

History of exploration

Gossans near Pythagoras Lake contain massive arsenopyrite, pyrite and smaller amounts of other sulfides in a band of feldspathic quartzite and biotite schist (Godfrey, 1958). One grab sample was reported to contain 0.39 per cent nickel, 10 g/t silver and an undetermined amount of gold. Exploration on these occurrences has not been reported, but remains of an old camp and broken-up outcrops on the west shore of Pythagoras Lake indicate that at least some prior exploration has been done.

Geological setting

The chain of lakes and associated muskegs, which extend SSW from Pythagoras Lake, occupies a 500 m wide belt underlain by high-grade metasediments. The belt is bordered in the west by basement gneiss and in the east by an elongated stock of biotite granite, that forms a series of prominent hills. The contact between metasediments and granites has been interpreted by McDonough *et al.* (1995) as a folded thrust fault, forming a tectonic window.

Table 6. Selected results of 1992 samples, Pythagoras Lake Gold Showing.

M.O. no.	Sample no.	Description	Au (ppb)	As (ppm)	Zn (ppm)
59	WL-08-29-01	0.1 mx 1 m quartzite +2% pyrite, arsenopyrite	131	3113	–
59	WL-08-29-02	0.5 mx 5 m quartzite +1%pyrite, arsenopyrite	–	433	105
60	WL-08-29-03	5 m x 25 m gossan in biotite quartzite	116	3611	–
60	WL-08-29-04	garnet quartzite +2%pyrite, arsenopyrite	603	883	–
61	WL-08-29-05	garnet-graphite quartzite	21	16	105
62	WL-08-29-06	contact granite-metasediment	8	8	–
61	WL-08-29-07	garnet-graphite schist	26	146	–
61	WL-08-29-08	rusty quartzite	31	672	107

Widely scattered outcrops, which are exposed in the middle of the low-lying metasedimentary belt, consist mostly of competent biotite quartzite. Many interlayers, 1 to 10 cm wide, of biotite schist are preserved along with the quartzite. Some granitic material is often irregularly injected within the more quartzitic layers. Both quartzite and schist contain abundant garnets and are often graphite-rich. Near the western shore of Pythagoras Lake, biotite quartzite is interlayered with sheared bands of quartz and feldspar material giving a gneissic texture.

Mineralized zone

Almost all of the outcrops of this metasedimentary belt are rusty and contain some limonite or pyrite. Many of the less recessive quartzite and associated biotite schist outcrops are gossanous and include millimetre thick stringers of pyrite, pyrrhotite and arsenopyrite. Sulfides are concentrated along the schistosity and were remobilized during deformation under greenschist facies conditions. Pyrite may cut across greenschist grade minerals, indicating that mineralization outlasted deformation.

Geochemical data

A total of eight samples were collected from the rusty outcrops. The most significant data are presented in Table 6. Of particular interest is an assay showing 603 ppb gold (0.6 g/t Au) and high arsenic contents (up to 3611 ppm). It is important to note that most outcrops along the belt of metasediments contain anomalously high gold contents.

Classification

Widespread anomalous gold contents within metasediments suggests that the gold-bearing zones may originally be of stratiformal nature. Faulting resulted in concentration of the gold along shear zones (see also McDonough, *in press*), indicating that this showing represents shear-related lode gold deposition.

Myers Lake Gold Showing M.O. number: 144

Mineralized zones occur near the outlet of the Dog River on Myers Lake (Figure 1; NTS 74M/11).

History of exploration

Vestor Explorations Ltd. explored some permits in the Myers Lake area southwest of the Leland Lakes in the early 1970s. Disseminated pyrite and pyrrhotite were reported in one of the assessment reports (Williams, 1970a).

Geological setting

The occurrence is situated in Mylonitic Slave Granite along the Leland Lakes Shear Zone as mapped by Godfrey and Langenberg (1987).

Mineralized zone

Mineralized zones exist in pyritic amphibolite within sheared Slave Granitoids. The amphibolites are between 1 and 15 m wide and extend for tens of metres along strike.

A thin section shows mainly hornblende, plagioclase and opaques (pyrite). The texture of the rock is relatively equigranular, without a pronounced foliation. If the rock was mylonitized at any stage, it has subsequently been completely recrystallized.

Geochemical data

One grab sample (WL3-07-18-03), containing 200 ppb gold and 60 ppm copper, defines the Myers Lake Gold Showing at present (Langenberg *et al.*, 1994).

Classification

Gold and sulfides may be related to an originally basic igneous intrusion. They were probably remobilized during movements along the Leland Lakes Shear Zone.

Copper showings

Selwyn Lake Copper Showing M.O. number: 74

Located 150 m west of the northern tip of Selwyn Lake (Figure 1; NTS 74M/16).

History of exploration

The Selwyn Lake mineral occurrence was first reported in an assessment report by James (1970), who was contracted by Rio Alto Exploration Ltd. to do ground checking of radiometric anomalies and who noted several old trenches. There is no record of this older exploration work. Two samples were collected from the trenches and one contains 0.1 per cent Cu. Langenberg *et al.* (1994) mapped the showing in detail and took selected grab samples of the sulfide zone. The results are summarized below.

Geological setting

The Selwyn Lake mineralized zone occurs along or near the western edge of the easternmost branch of the Charles Lake Shear Zone, of which Selwyn Lake is a topographic expression (Figures 1 and 7). The shear zone is expressed by a belt of mylonite that cuts basement gneiss, which crops out along the first ledge west of the lake shore. On the slope and towards the top of the main north-south trending hill, large and continuous bands of brown-red weathered (gossanous) amphibolites are interlayered with rusty high-grade metasediments. The metasediments include biotite quartzite and schists, which are in places garnet bearing. The enclosing country rock is pink to red basement gneiss.

Although not situated in the main mylonite zone, the amphibolite and metasediments show a mylonitic texture in thin section (McDonough, *in press*). The mineralized zone is located within the band of massive gossanous amphibolite (Figure 7).

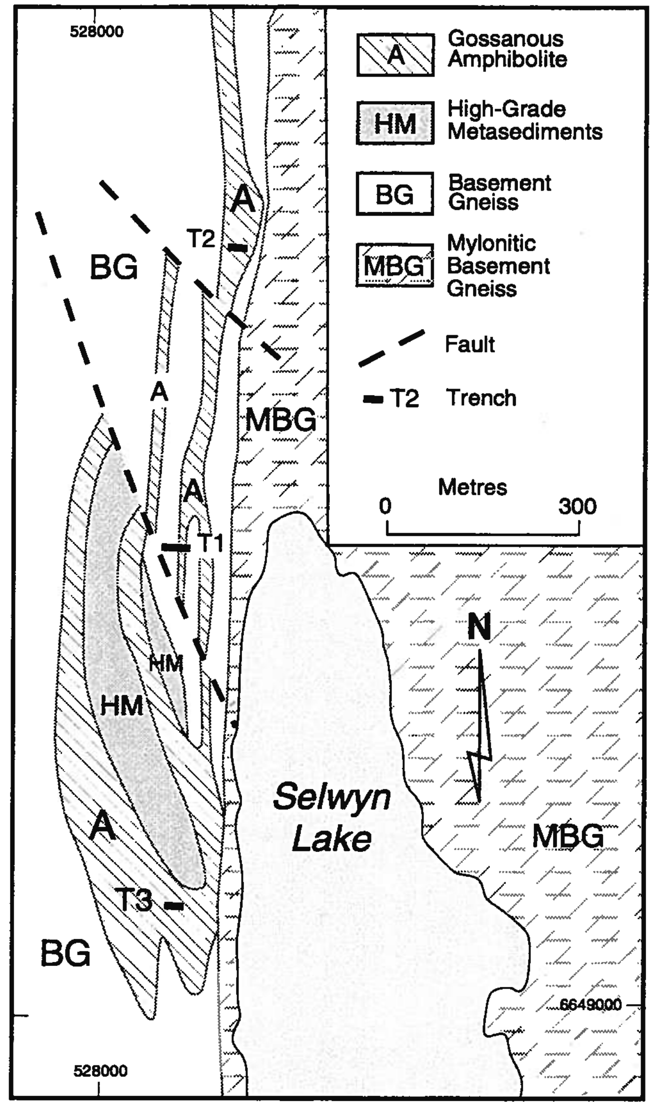

Figure 7. Geological map of the Selwyn Lake Copper Showing (mineral occurrence no. 74). Geology from Langenberg *et al.* (1994).

Mineralized zone

The sulfides comprise pyrite, pyrrhotite and minor amounts of chalcopyrite (Langenberg *et al.*, 1994). The main concentration of sulfides is found in bands of massive gossanous amphibolite near the contact with metasediments, where the amphibolite is interlayered with garnet-rich quartzite and meta-arkose. The surface expression of the mineralization consists of two to three layers, 1 to 5 m wide, that occur in brown-red weathered (gossanous) amphibolite and deep green biotite-hornblende quartzite. The layers are continuous over more than 2 km in a north-south direction. The amphibolite could represent a metamorphosed mafic intrusive or volcanic rock.

The mineralized zone is well exposed in three exploration trenches, which in places are up to 3 metres deep (T1, T2 and T3 on Figure 7). Massive pyrrhotite and pyrite exist at the bottom of Trench T1, away from the weathered surface. Some layers are well laminated, contain 15 to 40 per cent sulfides, and have a breccia-like texture. The sulfides occur mainly in amphibolite. The sulfide rich horizons have an exposed thickness of 3 metres in the trench. Pyrrhotite has grown parallel to the annealed greenschist grade mylonite fabric, enclosing relic pull aparts of epidote, zoisite and deformed quartz (McDonough, *in press*). Up to several per cent of chalcopyrite exist locally in Trench T3, although copper contents only reach 0.1 per cent.

Two types of alteration affect amphibolite and metasediments. The main alteration is pervasive silicification of the high-grade metasediments, whereas secondary chloritic alteration occurs in green quartzite and amphibolite.

Geochemical data

The assessment report by James (1970) does not provide much information on the geochemistry of the area and its minerals. Only two samples were analyzed for copper, nickel and zinc, and one of the samples contains 0.1 per cent Cu

The most significant results of sampling performed by Langenberg *et al.* (1993 and 1994) are listed in Table 7. They confirm copper contents of up to 0.1 per cent.

Classification

The preferred location of sulfides in amphibolite might indicate that the occurrence is related to basic intrusives. However, based on textural evidence it is clear that the sulfides were remobilized and concentrated by shearing. As such, this showing represents another shear-zone hosted occurrence.

Table 7. Selected geochemical analyses from the Selwyn Lake Copper Showing.

Sample no	Location	Cu ppm	Zn ppm	Ni ppm	Co ppm	Au ppb
WL2-09-02-02	Trench T1; Quartzite +50%pyrite, pyrrhotite	209	2	41	35	20
WL2-09-02-03	Trench T1; Amphibolite +50%pyrite, pyrrhotite	294	25	43	35	7
HS93-08-12-06	Amphibolite band +10%pyrite, pyrrhotite 250 m North of Trench 1	453	35	39	42	–
HS93-08-14-02 A	10 m. E. of Trench 3; amphibolite + pyrite, pyrrhotite	438	12	65	57	12
HS93-08-14-02 C	Trench 3; amphib. + quartzite, chlorite layers + 10%pyrite, pyrrhotite	895	16	46	41	15

ppm = parts per million.

ppb = parts per billion.

Stony Islands Copper Showing M.O. number: 190

Stony Islands refers to a group of four islands in the Slave River, located about 7 km north of Hay Camp (74M/11). The showing is located on the largest, western island.

History of exploration

Copper occurrences on the Stony Islands were first reported by Godfrey (1973) and subsequently by Godfrey and Langenberg (1987). No additional work has been recorded.

Geological setting

Middle Devonian carbonates lie unconformably on Precambrian granitoid rocks and form sedimentary outliers on top of the Precambrian Shield (Godfrey and Langenberg, 1987). The Slave Granitoids below the unconformity are generally heavily oxidized (weathered). The unconformity is overlain by a conglomeratic, sandy granite wash of the La Loche Formation (Norris, 1963). The granite wash is overlain by poorly-bedded sandy dolomites, which grade into well bedded dolomites and limestone of the Fitzgerald Formation (Norris, 1963). The Fitzgerald Formation equivalent in the nearby subsurface is the Ernestina Lake Formation of the Elk Point Group (Meijer Drees, 1994).

Mineralized zone

Copper (chalcopyrite) occurs mainly in the carbonates overlying the granite wash. Copper bloom (malachite) and minor chalcopyrite occurs as well in the granite wash in one location. Marcasite nodules up to 15 mm in diameter are locally associated with the copper mineralization. The main copper zone is stratabound and is largely restricted to a 25 cm thick dolomite bed of the Fitzgerald Formation, about 3 m above the unconformity. However, it is also present at several locations above this layer. Copper is low-grade and dispersed, It probably averages less than 0.3 per cent over a selected bed thickness of 10 cm (Godfrey, 1973). The copper was probably sourced from the Precambrian, but the timing and conditions of concentration are uncertain.

Geochemical data

A grab sample with a visible thin seam of sulfides contains 1.08 per cent copper (Godfrey, 1973).

Classification

This is a sediment hosted strata-bound copper showing.

Uranium showings

Cherry Lake Uranium Showing M.O. numbers: 25, 26, 27

From the northern shore of Cherry Lake the anomalously radioactive zone extends 750 m to the north and 400 m to the east (Figures 3 and 8).

History of exploration

The radioactivity in the area was first reported by Godfrey (1963) in mapping the southern portion of the Andrew Lake district. In 1967, Astrabrun Mines Ltd. acquired exploration permit number 6 from the Alberta Government and subsequently transferred it to New Senator-Rouyn Ltd. That same year, New Senator-Rouyn Ltd. carried out geological reconnaissance, including blasting of a limited number of trenches (Hart, 1967). In 1968, McIntyre Porcupine Mines Ltd. optioned the permit and followed up with a helicopter scintillometer survey, rock trenching (11 trenches up to 1.5 m wide by 0.9 m deep) and 6 diamond drill holes totalling 575 m (Thorpe, 1969).

Geological setting

North Cherry Lake is located within slightly porphyritic biotite granite, which is a major phase of the Aphebian Colin Lake Granitoids (Godfrey, 1963).

The main rock unit consists of a light grey to pinkish, foliated biotite hornblende granite; mostly medium-grained and equigranular, but locally porphyritic. The granite is fairly uniform in the central and eastern part of the area, but tends to be more mafic to the west. It also includes several slivers of highly deformed metasediments (Figure 8). Several mylonite zones are well exposed, especially near radioactive zones, they generally trend northerly and in places they are offset by later faults.

Mineralized zone

New Senator-Rouyn Ltd., exploring in the area with a Geiger counter, did not report their results. McIntyre Porcupine Mines Ltd. carried out a systematic scintillometer survey over a grid (Thorpe, 1969) and found six small anomalies with readings above 1000 counts per second (Figure 8).

Zone 1 (Mineral Occurrence No. 25) is on the northern shore of Cherry Lake, where extensive yellow uranium staining is associated with well-banded mylonite zones in equigranular biotite granite. The highest radioactivity reading was recorded in an old trench next to the lake shore. Prior channel sampling by New Senator-Rouyn Ltd. showed 0.79 per cent U_3O_8 over 1.2 m, which was confirmed by a 1992 grab sample (WL-08-15-01) containing 0.31 per cent U_3O_8. Two diamond drill-holes by McIntyre Porcupine Mines Ltd., which were 136 and 50 m long and in opposite directions, gave negative results. The surficial secondary yellow uranium staining is thought to be autunite, while some of the black material in highly radioactive fractures is probably pitchblende. Veinlets filled with barren quartz are restricted to the west margin of the mylonite zone. They vary in orientation from N135°E close to the mineralized zone, to N145°E farther away. Spot readings of up to 18,000 counts per second (Total Counts) were recorded with a spectrometer in 1992 over the zone 1 trench.

A second mineralized area, Zone 2 (Mineral Occurrence No. 26) is situated 600 m north of Zone 1, in a strongly foliated granite with bands or layers of hornblende porphyritic granite. Much yellow uranium staining is scattered over a 20 m long trench, where McIntyre Porcupine Mines Ltd. reported the highest grade of 0.10 per cent U_3O_8 in a pegmatite. The two diamond drill holes did not intersect any mineralized zones.

Northeast of Cherry Lake, 120 m from shore, a third high radioactive area, Zone 3 (Mineral Occurrence No. 27), was investigated by a 2 m long trench and a 60 m inclined drill-hole. Only low uranium contents were found in brecciated pegmatite. The best result was 0.03 per cent uranium across 1.5 m.

A swampy area, which is about a third of the way between Zones 1 and 2, shows high uranium contents. The black swamp material, probably humus rich soil or peat, contains between 0.67 per cent and 1.76 per cent U_3O_8. However, a 139 m long hole (DDH 68-3) drilled by McIntyre Porcupine Mines Ltd. under the swamp failed to detect significant amounts of uranium. The reason for the highly uraniferous swamp material is uncertain, but may be due to meteroric waters leaching U-rich granites, followed by precipitation and concentration of the uranyl ions from the surface waters by organic matter.

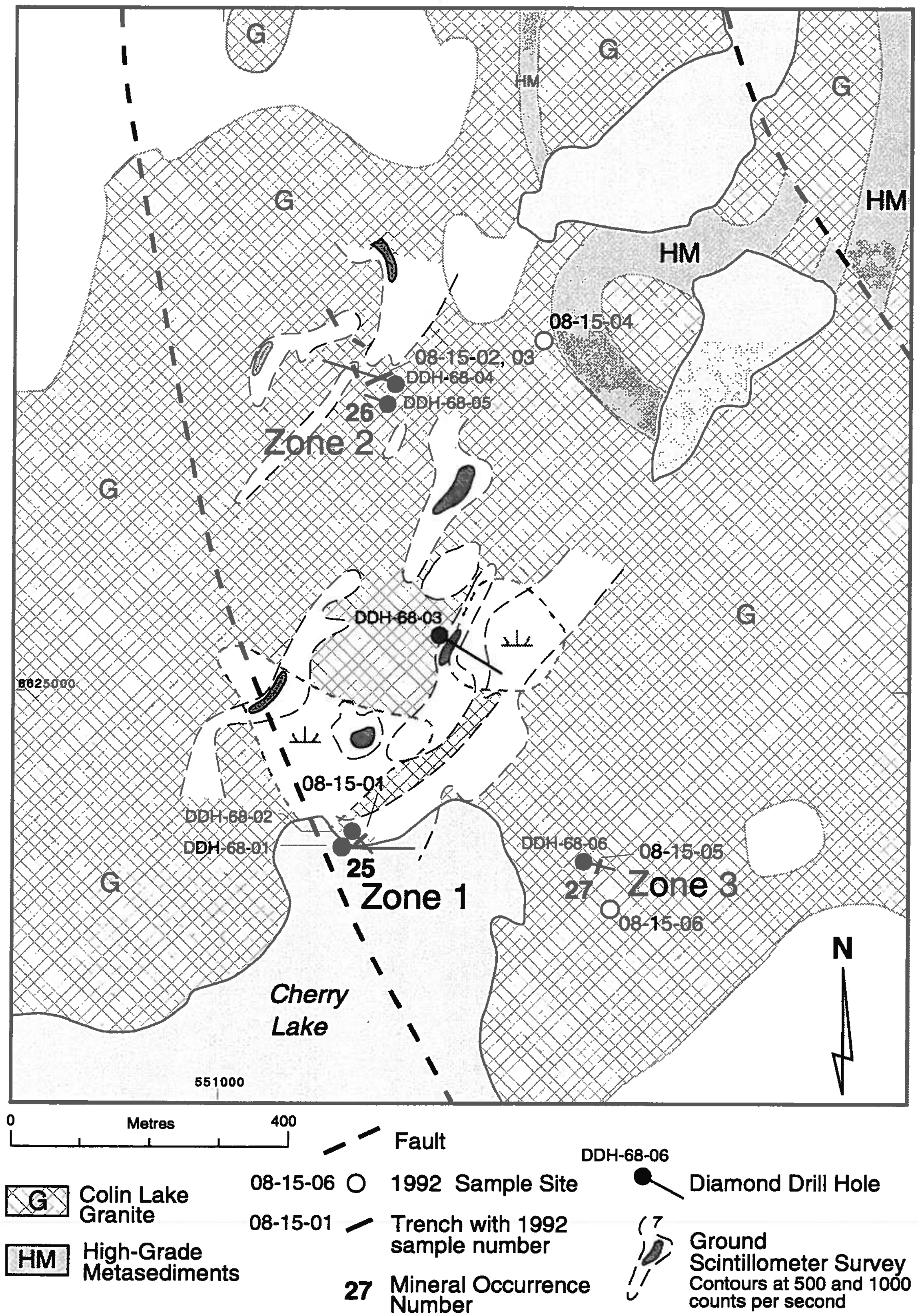

Figure 8. Geological map of the Cherry Lake Uranium Showing. Geology after Godfrey (1963). Exploration data from Thorpe (1969).

The main alteration around the mylonitic zone is silification. It pervades the host rocks over several metres and is manifested by quartz veining. In the northern showing, pyrite occurs in biotite layers, which show elevated radioactivity.

Geochemical data

Data reported by the different companies which have worked in the area are probably incomplete. Selected data are reproduced in Table 8. The samples collected in 1992 by the AGS show some anomalous metal contents, which are presented in Table 9.

Classification

The uranium zones are hosted by granite-pegmatite and have been later concentrated by fracturing and mylonitization. The uranium concentrations in the swamp area represent surficial enrichment resulting from absorption of uranium by organic matter (peat).

Table 8. Selected geochemical analyses from trench on the north shore of Cherry Lake (from Thorpe, 1969)

Sample number	Location	Width	% U_3O_8
9920	W. end of trench	0.6 m.	0.14
9921	E. end of trench	0.6 m.	0.01
9922	E. end of trench	0.6 m.	Tr.

Table 9. Selected results from geochemical analyses of 1992 samples (Cherry Lake Uranium Showing).

Sample no. / (M.O. no.)	Location. — Description.	U ppm	Th ppm	Au ppb	Cu ppm	Pb ppm	Zn ppm
WL-08-15-01 (25)	Zone 1 — Trench — sheared granite + joints with yellow stains	2565	12	21	–	97	–
WL-08-15-02 (26)	Zone 2 — Trench — rusty biotite granite	125	114	5	32	232	122
WL-08-15-03 (26)	Zone 2 — Trench — yellow stains	485	56	12	–	–	–
WL-08-15-04 (26)	Zone 2 — rusty metasediment	–	18	9	57	–	–
WL-08-15-05 (27)	Zone 3 — Trench — sheared syenite + hematite	–	38	10	–	–	150
WL-08-15-06 (27)	Zone 3 — granodiorite	400	26	7	–	59	90

Notice 1 ppm U=1.179 ppm U_3O_8

Twin Lakes Uranium Showing M.O. numbers: 28, 29, 30, 31, 32, 34

The radioactive area is located 500 m west of the northwestern bay on Cherry Lake and extends 900 m in a northerly direction (Figure 3; NTS 74M/16).

History of exploration

The radioactivity in the area was first reported by Godfrey (1963). In 1967, Astrabrun Mines Ltd. acquired an exploration permit and subsequently transferred it to New Senator-Rouyn Ltd. That same year, New Senator-Rouyn Ltd. carried out geological reconnaissance and blasted a limited number of small trenches (Hart, 1967). In 1968, McIntyre Porcupine Mines Ltd. optioned the permit and followed up with a helicopter scintillometer survey (assessment report by Trigg *et al.*, 1968). Two trenches were blasted on the south shore of Twin Lakes with disappointing results. Subsequently, a ground scintillometer survey was carried out, followed by blasting of nine trenches. Four diamond drill holes, DDH 68-7, 68-8, 68-9 and 68-10, for a total of 465 m, were drilled below the most radioactive sections, without encountering anything of economic interest (Thorpe, 1969).

In 1976 the area was investigated by a consortium of companies, including Tachyon Venture Management Ltd., Sacksville Oils & Minerals Ltd. and Conventures Ltd. (Allan, 1976). In 1977, the trenches previously dug by McIntyre were re-investigated and an additional three trenches were blasted (north of McIntyre's DDH 68-7, see Figure 9). The results were not encouraging (Allan, 1977).

Geological setting

The area surrounding the northern part of Cherry Lake is underlain by rock units which belong to the Aphebian Colin Lake Granitoids, consisting of foliated leucocratic porphyritic biotite-granite (Figure 9). Biotite may form layers, resulting in a gneissic texture. The granite units are injected with numerous bands of white muscovite pegmatite, locally containing wispy and discontinuous biotite-rich layers. The pegmatitic bodies are most frequently parallel to foliation. In the trenches, tight folding of the biotite layers has been observed. Some brittle fracturing is evident .

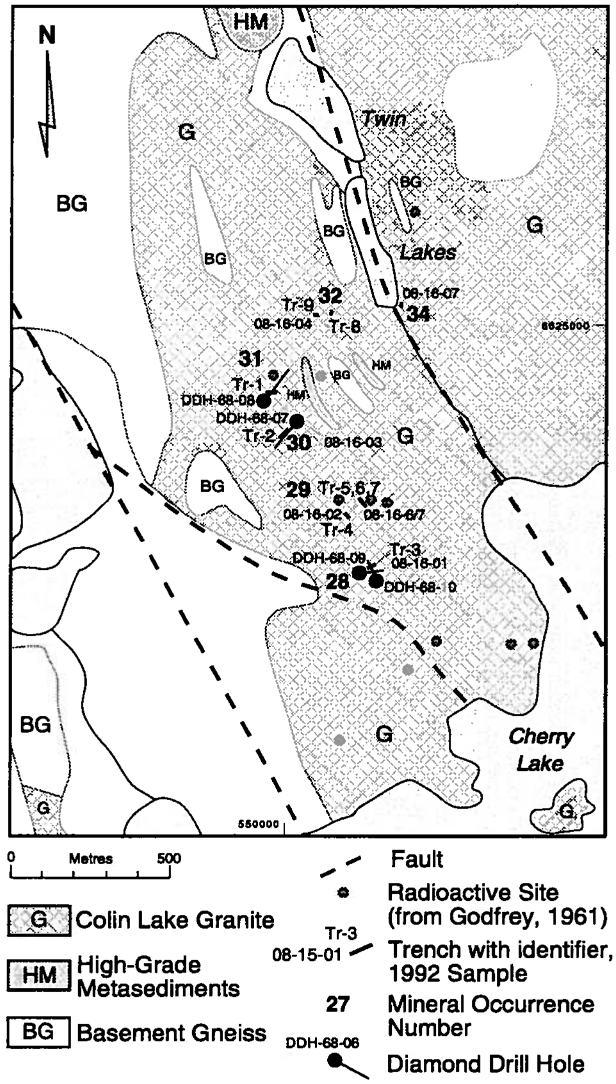

Figure 9. Geological map of the Twin Lakes Uranium Showing. Geology after Godfrey (1963).

Mineralized zone

A helicopter scintillometer survey was flown over the area in 1968 (Trigg *et al.*, 1968). Ten radioactive anomalies were selected and investigated by ground scintillometry. Four long linear radiometric anomalies were outlined, as well as five more local anomalies. These anomalies have recorded readings above 2500 total counts per second. In 1976, another helicopter scintillometer survey was carried out (Allan, 1976) and six anomalies were detected to the west of Twin Lakes.

The mineralized zone is indicated by yellow uranium stains and hematitization scattered over the entire area. High radioactivity is associated with pegmatite, often showing a breccia-like texture. In the past, the most anomalously high radioactive areas have been trenched and drilled. Yellow uranium staining and hematite are found in the radiactive pegmatites which also contain many red feldspars. The best results have been reported from the south end of Twin Lakes with grab samples containing up to 0.14 per cent U_3O_8 (Hart, 1967) At Trench no. 2 (Thorpe, 1969, M.O. no. 30) a 13 m long channel sample contained 0.016 per cent U_3O_8. The same range of values have been encountered in drilling and are considered uneconomic. Areas in the trenches with spot readings of over 2500 total counts per second were confirmed by spectrometer in 1992.

Silica flooding is widespread in the vicinity of radioactive zones and affects pegmatite as well as granite. The centers of the pegmatites are often altered into massive quartz. In many parts of the district, hematitization of the feldspars in pegmatite is common. Spots of massive hematite occur also in medium grained granite and are associated with elevated radioactivity.

Geochemical data

Uranium contents in the trenches are presented by Thorpe (1969) and summarized in Table 10.

The investigation conducted by AGS in the summer of 1992 confirmed the previous results. In addition, the analyses indicated some low, but possibly anomalous contents of other metals (Table 11).

Classification

Uranium associated with pegmatite.

Table 10. 1968 Geochemical results at Twin Lakes (from Thorpe, 1969).

Location	sample type	$\%U_3O_8$
Trench no. 1	3 m channel	0.03
Trench no. 1	Grab	0.11
Trench no. 2	3 x1.5 m channel	0.04
Trench no. 3	Grab	0.11
Trench no. 4	1.5 m channel	0.05
Trench no. 6	1.5 m channel	0.04
Trench no. 9	2.4 m channel	0.03

Table 11. Selected results of 1992 samples from the Twin Lakes Uranium Showing.

M.O. no.	Sample no.	Location	U ppm	Th ppm	Mo ppm	Pb ppm	Zn ppm	Au ppb
28	WL-08-16-01	Trench no. 3	75	–	29	41	–	9
29	WL-08-16-02	Trench no. 4	320	–	57	95	126	9
30	WL-08-16-03	Trench no. 2	260	38	59	98	101	5
32	WL-08-16-04	Trench no. 9	195	79	23	106	–	11
34	WL-08-16-07	1967 Trench	130	182	118	59	–	6

Small Lake Uranium Showing
M.O. number: 33

The mineralized area is located on the northern shore of a "small lake" situated 1.8 km to the northwest of the northern end of Cherry Lake (Figure 3; NTS 74M/16).

History of exploration

The radioactivity in the area was first reported by Godfrey (1963). In 1967, Astrabrun Mines Ltd. acquired a permit and subsequently transferred it to New Senator-Rouyn Ltd. After confirming uranium near and around Cherry Lake (Hart, 1967), New Senator-Rouyn Ltd. optioned their permit to McIntyre Porcupine Mines Ltd. A helicopter survey (Trigg *et al.*, 1968) re-discovered the radioactive zone located on the shore of "Small Lake." After a ground scintillometer survey, ten trenches were blasted in the areas of greatest radioactivity. However, four diamond drill holes with a total length of 521 m failed to intersect any significant uranium zones (Thorpe, 1969) and exploration stopped.

Geological setting

The area is underlain by biotite granite, biotite gneiss and high-grade metasediments, near the boundary between the Basement Complex to the west and the Aphebian Colin Lake Granitoids to the east (Figure 10). In the trenches, high-grade metasedimentary gneisses and schists, which are intruded by pegmatites, are exposed. In addition, many small scale folds exist.

Mineralized zone

Two radioactive anomalies, which were identified by the helicopter scintillometer survey (Trigg *et al.*, 1968), were followed up by ground scintillometry. Two strong anomalies were outlined with readings above 2000 cps (Figure 10). These anomalies were confirmed in 1992 by spectrometer, which recorded localized readings of up to 12,000 total counts per second.

Some high radioactivity is locally associated with yellow uranium stains on the surface of biotite granite. However, the best mineralized zones occur within biotite quartz-rich pegmatite with a breccia-like texture. The best results were obtained in Trench no. 4, which showed contents of 0.50 per cent U_3O_8 over 1.5 m.

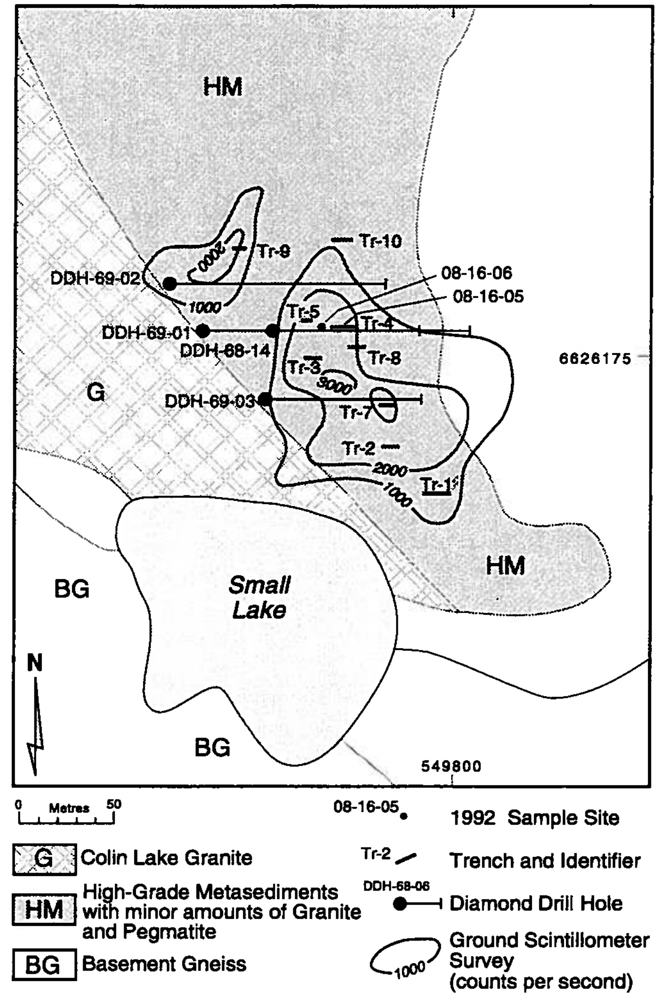

Figure 10. Geology and geophysics of the Small Lake Uranium Showing (mineral occurrence no. 33). Geology after Thorpe (1969).

Molybdenite contents of up to 0.28 per cent MoS_2 exist in Trench no. 7. Drill core showed similar contents; the best intersection was found in drill hole DDH 68-14 with a content of 0.05 per cent U_3O_8 over 4.5 m. In drill hole DDH 69-1, a 2.25 m interval in a biotite-rich layer within pegmatite contains 0.05 per cent U_3O_8 and 0.05 per cent MoS_2 (Thorpe, 1969).

Pyrite is associated with biotite-rich layers. In Trench no. 4, the contact of such a layer with pegmatite is highly radioactive and a grab sample of that layer contains 0.69 per cent U_3O_8 and 0.08 per cent MoS_2. In the trenches, silicification is very prevalent in all type of rock units.

Geochemical data

From the ten trenches blasted, only Trenches no. 4 and no. 7 have significantly anomalous uranium contents (Table 12).

Two grab samples collected in 1992 confirm the amount of uranium. They also indicate some anomalous contents of other metals (Table 13).

Classification

Uranium is associated with molybdenum in pegmatite within metasediments.

Table 12. Results of samples from trenches at Small Lake (from Thorpe, 1969).

Location	Width	%U_3O_8	%ThO_2	%MoS_2
Trench no. 3	1.5 m	0.06	–	–
Trench no. 4 — W. end — 0 to1.5m	1.5 m	0.50	0.15	–
Trench no. 4 — from 1.5 to 3.0m	1.5 m	0.04	Tr.	–
Trench no. 4 — W. end — 0.6 m depth	0.3 m	0.08	0.04	0.08
Trench no. 4 — from 0.3 to 0.6 m — 0.6m depth	0.3 m	0.04	0.03	0.06
Trench no. 4 — from 0.6 to 0.9 m — 0.6 m depth	0.3 m	0.08	0.07	0.08
Trench no. 4 — from 0.9 to 1.2 m — 0.6 m depth	0.3 m	0.05	0.03	0.07
Trench no. 4 — from 1.2 to 1.5 m — 0.6 m depth	0.3 m	0.04	Tr.	0.02
Trench no. 4 — W. end — 0.6 m depth	0.3 m	0.49	0.16	0.16
Trench no. 4 — W. end — 1.2 m depth	0.3 m	0.07	0.02	0.02
Trench no. 4 — E. end — 1.2 m depth	0.3 m	0.16	0.11	0.18
Trench no. 4 — from 0.3 to 0.9 m — 1.2 m depth	0.6 m	0.03	0.02	0.07
Trench no. 4 — from 0.9 to 1.5 m — 1.2 m depth	0.6 m	0.05	Tr.	0.06
Trench no. 4 — grab / high radioactivity	–	1.06	0.24	0.23
Trench no. 5 — W. end	1.5 m	0.04	0.01	–
Trench no. 7 — W. end	0.3 m	0.11	0.09	0.20
Trench no. 7 — E. end	0.6 m	0.19	0.11	0.28
Trench no. 9 — E. end	1.5 m	0.03	Tr.	–
Trench no. 9 — Grab	–	0.08	0.01	–
Trench no. 10 — E. end	1.8 m	0.03	0.03	–

Table 13. Selected results of 1992 samples from Small Lake Uranium Showing.

Sample no	Location/descript.	U ppm	Th ppm	V ppm	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Au ppb
WL-08-16-05	West end Trench 4 at pegmatite-schist contact	5865	1054	121	489	13	1144	124	12
WL-08-16-06	1 m. West of Trench 4 pyritic schist	120	55	103	14	122	89	77	8

Big Bend Uranium Showing (west arm Andrew Lake) M.O. number: 56

The showing is located 400 m west from the shore of the large bend, where the east trending west arm of Andrew Lake shifts to a north trending direction (Figure 3; NTS 74M/16).

History of exploration

Radioactivity in the area was first reported by Godfrey (1958), but never received much attention. It is interesting to note that the mineralized zone was never observed by airborne geophysical surveys. This may be because of its location at the base of a major hill and due to the thick forest cover. Three grab samples taken by Godfrey (1958), which have extremely high uranium and molybdenum contents, were incorrectly reported to be from Spider Lake. Rapid River Resources Ltd. acquired six mineral claims covering the area from the showing eastward. After ground prospecting, they drilled four holes totalling 530 m, to test the surface radioactive anomalies. The best intersection is 0.22 per cent U (0.26 per cent U_3O_8) over 1 m. A second hole drilled beneath that intersection, yielded only weak radioactivity over 30 cm (Geiger, 1971). In view of these results, the claims were allowed to lapse.

Geological setting

The area is underlain by basement gneiss and a few bands of metasediments (Godfrey, 1966, and Figure 11). The mineralized zone consists of tightly folded biotite schist and quartz feldspar biotite schist, which grade toward the east into basement gneiss. In the west there is a sheared contact with pink to white leucogranite. The shear zone is 20 to 50 cm wide and contains lenses of pegmatite. The leucogranite varies in texture from fine- to coarse grained and is much less foliated to the south, where it is in contact with basement gneiss on its western margin. The leucogranite contains inclusions of metasediments about one metre in size. The metasediments display a well-developed foliation, which is slightly discordant with the shear zone.

Mineralized zone

Molybdenite and yellow uranium stains are concentrated in a band of biotite schist (Godfrey, 1958). The band can be followed over a distance of 33 m before being covered by glacial drift. Godfrey (1958) reported high uranium and molybdenum contents in three grab samples from the radioactive zone (Table 14).

Although the area has been flown by various radiometric airborne surveys, no important anomalies were identified. Using a ground scintillometer, Rapid River Resources found 300 scattered radiometric highs, which are aligned along two north-trending zones (Figure 11). The western zone contains the mineralized area described by Godfrey (1958). This zone was drilled and a 1 m core interval containing 0.22 per cent U (0.26 per cent U_3O_8) exists. The mineralized interval occurs at a vertical depth of 20 m in a brecciated band of biotite schist (Geiger, 1971).

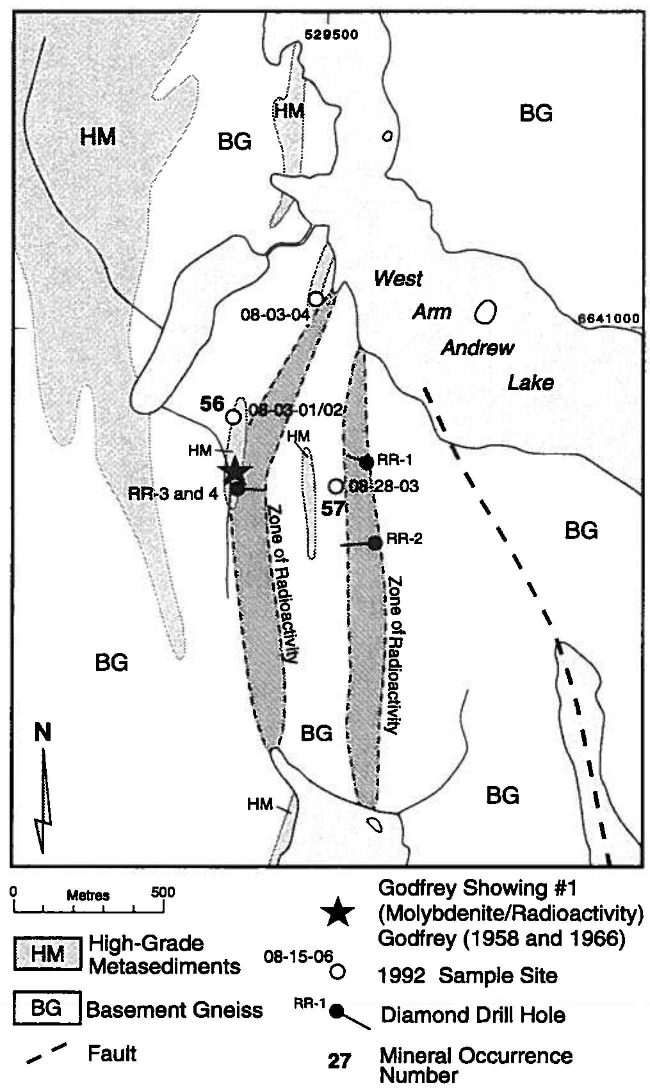

Figure 11. Geological map of the Big Bend Uranium Showing. Geology after Godfrey (1966).

The mineralized zone is confined to a biotite- and quartz-rich band within the shear zone. The schistose band is continuous over 10 m with a maximum width of 0.5 m, contains much limonite and is highly radioactive. In 1992, readings in access of 20,000 total counts per second were recorded by spectrometer over the 10 by 0.5 m wide shear zone. Molybdenite flakes ranging from 1 to 3 mm in size constitute locally up to 1 per cent of the rock unit. In addition, galena, pyrite and possibly pitchblende occur. To the south, the schistose shear zone widens to 1 m and contains quartz and pegmatite lenses. Molybdenite and pyrite are concentrated in the pegmatites, but the radioactivity is lower. It should be noted that the mineralized zone occurs at a location about 200 m north of the one reported by Godfrey (1958). It is possible that Godfrey plotted this outcrop at the wrong location.

Silicification in the biotite-rich shear zone results in quartz lenses.

Geochemical data

Two grab samples were taken from the mineralized zone (Figure 11). The sample from the highly radioactive zone contains 0.29 per cent U_3O_8 and 0.25 per cent MoS_2 (Table 15).

Classification

Uranium and molybdenum associated with shearing at the contact of granite and metasediment.

Table 14. Results from Big Bend Uranium Showing reported by Godfrey (1958)

Sample No	U_3O_8 %	Mo %
JG-58-44-1A	1.03	0.69
JG-58-44-1B	3.93	1.03
JG-58-44-1C	3.29	1.40

Table 15. Selected results of 1992 samples, Big Bend Uranium Showing.

Sample no	Description/Remarks	Mo ppm	Pb ppm	U ppm	Th ppm	V ppm	Ba ppm
WL-08-28-01*	Sheared biotite-schists High radioactivity	1508	1100	2430	460	142	652
WL-08-28-02	Wide shear zone +pegmatite	619	342	645	128	–	213

* WL-08-28-01 contains 1333 ppm Mn. Notice: 1 ppm Mo=1.669 MoS_2

Spider Lake Uranium Showing M.O. numbers: 64, 65, 66

The mineralized zone occurs on a peninsula in Spider Lake and on a string of small islands extending to the southwest (Figure 3; NTS 74M/16).

History of exploration

The radioactivity in the area was first reported by Godfrey (1963). In 1967, Astrabrun Mines Ltd. acquired exploration permit numbers 6 and 7 from the Alberta Government and subsequently transferred them to New Senator-Rouyn Ltd. After confirming uranium mineralization near Cherry Lake and Holmes Lake (Hart, 1967), New Senator-Rouyn Ltd. optioned their permits to McIntyre Porcupine Mines Ltd. A helicopter scintillometer survey confirmed the presence of radioactive anomalies on the north shore of Spider Lake (Trigg *et al.*, 1968). McIntyre Porcupine Mines Ltd. blasted a series of trenches across the radioactive belt at M.O. nos. 64 and 65. Subsequently, they drilled a diamond drill hole at both showings. No intersection of economic interest was encountered in the trenches or in the two holes (Thorpe, 1969).

Geological setting

Spider Lake is located within a northeast trending belt of high-grade metasediments. The belt is enclosed between basement gneiss and is intruded by pink medium-grained foliated granite. A major northeast fault cuts through the northeast corner of Spider Lake. The metasediments are composed of massive feldspathic quartzite and rusty biotite graphite schist, with minor foliated granite. At the contacts with basement gneiss, the metasediments are frequently intruded by muscovite bearing pegmatite. Mesoscopic folds are common in the metasediments, while shear bands are common in granite.

Mineralized zone

Three main radioactive zones were detected by the airborne survey (Trigg *et al.*, 1968) near the contact of metasediments and basement gneiss: Mineral Occurrences nos. 64, 65 and 66 (Figure 12). This confirmed the radioactive sites of Godfrey (1963). Minor radioactivity is also encountered in the trenches on the small islands. High radioactivity is concentrated along the contacts between quartzite and biotite schist. However, the uranium content is low and ranges from 0.01 to 0.17 per cent U_3O_8. No pitchblende has been found, although yellow-green uranium stains are present. Sulfides may occur in rusty metasediments and can account for 1 to 3 per cent of the rock; molybdenite is often present. In 1992, spot readings of over 10,000 total counts per second were recorded in the trenches by spectrometer.

Silicification is generally pervasive in the area of radioactivity. It affects all rock types, but more specifically the biotite schist and biotite gneiss. Hematitization is expressed by reddening of feldspars in pegmatites in the areas of high radioactivity.

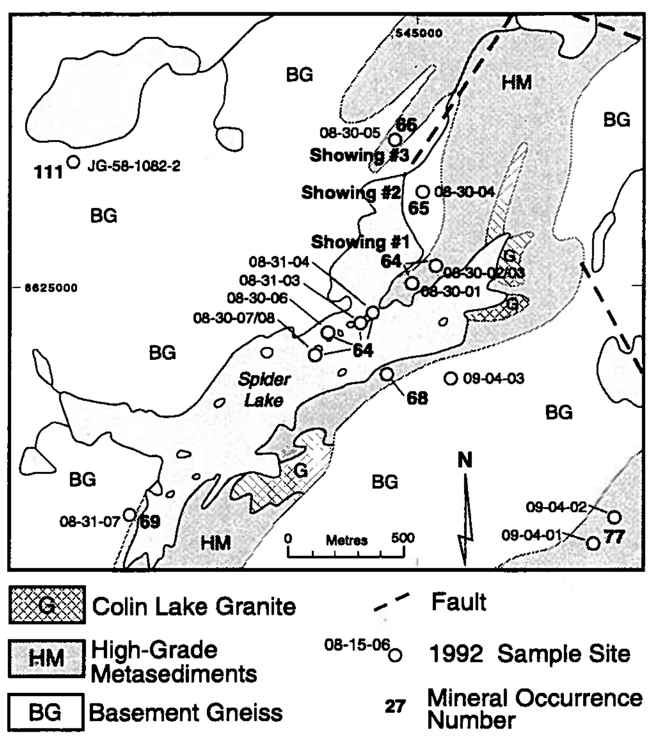

Figure 12. Geological map of the Spider Lake Uranium Showing. Geology after Godfrey (1963).

Geochemical data

McIntyre Porcupine Mines Ltd. reported U_3O_8 contents of up to 0.17 per cent (Thorpe, 1969). The anomalous uranium contents were confirmed by sampling in 1992 (Table 16).

Classification

The mineralized zones consist of uranium (with or without molybdenum) associated with pegmatite layers intruding metasediments.

Table 16. Selected results of 1992 samples at Spider Lake.

Sample no (M.O. no.)	**Location / Description**	**U** ppm	**Th** ppm	**Mo** ppm	**Pb** ppm	**Zn** ppm	**Au** ppb
WL-08-30-01 **(64)**	"Showing no. 1" — S.W. trench. silicified paragneiss + molybdenite	130	–	37	–	–	–
WL-08-30-02 **(64)**	"Showing no. 1" — N.E. trench. pegmatite in schist + pyrite	530	–	87	257	–	–
WL-08-30-03 **(64)**	"Showing no. 1" — 1m. E. of N.E. trench rusty quartz biotite schist + 3%pyrite	150	–	–	–	–	–
WL-08-30-04 **(65)**	"Showing no. 2" — central trench pegmatitic hematized paragneiss.	430	132	28	–	–	–
WL-08-30-05 **(66)**	"Showing no. 3" — central pit yellow stains at contact pegmatite (molybdenite bearing) with paragneiss.	575	99	185	191	–	–
WL-08-30-06 **(64)**	Station "C" — trench rusty schist+pyrite, graphite	–	–	–	104	92	–
WL-08-30-07 **(64)**	Station "B" — trench yellow stains in pegmatite +pyrite, pyrrhotite, molybdenite	1345	154	60	391	–	6
WL-08-30-08 **(64)**	Station "B" — W. end of trench rusty biotite schist	–	–	–	–	–	–
WL-08-31-03 **(64)**	Station "D" — S.end of trench rusty garnet quartzite+pyrite,pyrrhotite	–	–	–	–	–	–
WL-08-31-04 **(64)**	Station "E" — trench contact biotite schist with pegmatite	145	–	–	87	118	–

Station "B", "C" etc. refers to locations shown in Godfrey (1958).

"Showing no.1,2" etc. refers to McIntyre Porcupine Mines Ltd.'s designation of the mineral occurrences (see Figure 12).

Holmes Lake Uranium Showing M.O. number: 75

The mineralized area is found near the shore of a little bay at the southern tip of Holmes Lake (Figure 3; NTS 74M/16).

History of exploration

The radioactivity in the area was first reported by Godfrey (1963). In 1967, Astrabrun Mines Ltd. acquired exploration permit number 7 from the Alberta Government and subsequently transferred them to New Senator-Rouyn Ltd. After confirming uranium in the southwest corner of Holmes Lake (a sample contained 0.14 per cent U_3O_8), New Senator-Rouyn Ltd. optioned their permit to McIntyre Porcupine Mines Ltd. A helicopter scintillometer survey recorded five radioactive anomalies in the area (Trigg *et al.*, 1968). One anomaly was tested by seven small trenches and a diamond drill hole (Figure 13). A uraniferous zone was found from the collar to 50 m, but was judged to be uneconomical. Another anomaly is situated 800 m to the southwest and was also sampled (Thorpe, 1969).

Geological setting

Holmes Lake area occupies the northern part of a high-grade metasedimentary belt, which is cut off by the prominent northwest trending Bonny Fault. The metasediments are bordered on all sides by basement gneiss (Figure 3).

The main rock type in the trenches is white silicified pegmatite, locally containing wispy bands of foliated biotite-rich feldspathic quartzite. The quartzites are often interlayered with hematitized gneiss, that is rich in feldspar porphyroblasts. The pegmatite layers are aligned along the foliation. To the west, biotite schist and quartzite (high-grade metasediments) are the dominant rock types.

Mineralized zone

Five radioactive anomalies were found in the area by an airborne survey (Trigg *et al.*, 1968). All the radioactive zones are in white pegmatite. No uranium or thorium minerals can be recognized, except for some yellow uranium stains in Trenches 2-A and 2-B. The channel samples of the trenches contain up to 0.07 per cent U_3O_8 (Thorpe, 1969). Total counts per second measured by spectrometer exceed 1000 cps in the trenches and between Trench 2B and 3A.

The drill hole intersected three weakly uraniferous zones in pegmatite with contents of up to 0.03 per cent U_3O_8. The radioactive may extend 800 m to the southwest as indicated by a grab sample containing 0.14 per cent U_3O_8 (Thorpe, 1969). Quartzite and biotite gneiss in the trenches also contain minor sulfides (mainly pyrite).

Hematitization is the most widespread alteration product in the Holmes Lake area. It affects the gneiss as well as the pegmatite. Silicification is mainly restricted to the pegmatite.

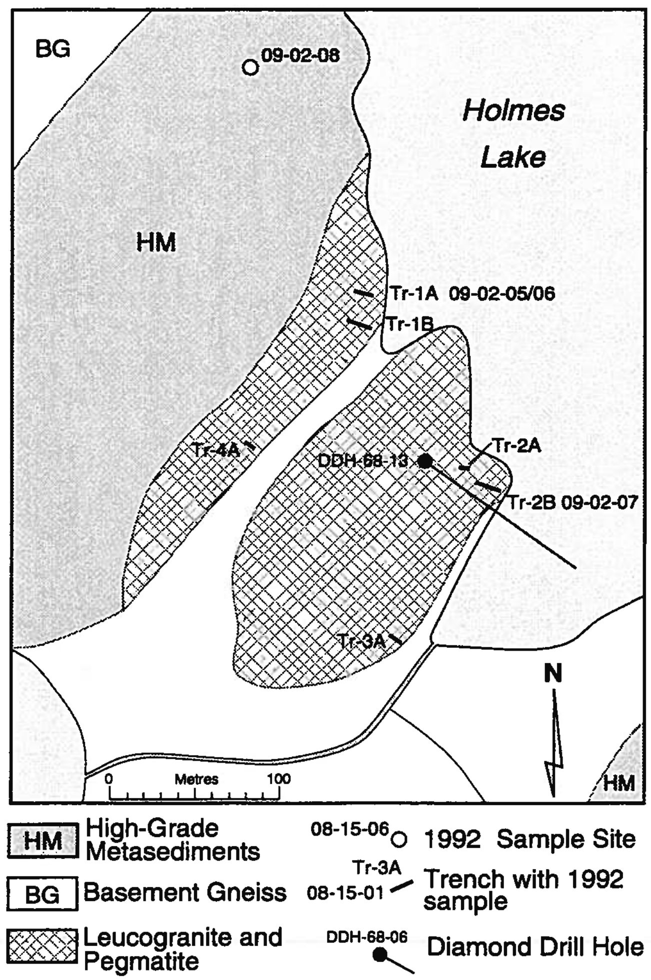

Figure 13. Geological map of the Holmes Lake Uranium Showing (mineral occurrence no. 75). Geology after Thorpe (1969).

Geochemical data

Grab samples collected in 1992 confirm the generally low level of anomalous uranium content. However, they reveal some anomalously high base metal contents in pyrite rich quartzite and amphibolite (Table 17).

Classification

Pegmatite hosted uranium mineralized zones.

Table 17. Selected results of 1992 samples from Holmes Lake.

Sample no	Location-Description.	U ppm	V ppm	Pb ppm	Zn ppm	Ni ppm	Ba ppm	Au ppb
WL-09-02-05	Trench 1A — radioactive pegmatite	120	102	258	208	–	283	–
WL-09-02-06*	10 m N. of Trench 1A — pyrite quartzite	–	–	–	–	–	138	33
WL-09-02-07	Trench 2A — pyritic gneiss	100	139	48	86	159	–	–
WL-09-02-08	150 m N of trenched area — amphibolite	–	121	–	–	106	–	–

* Sample WL-09-02-06 contains 1942 ppm Mn.

Carrot Lake Uranium Showing M.O. numbers: 78, 79, 80

Carrot Lake is the unofficial name given to a small lake, which is located 2.5 km straight south from Andrew Lake (Figures 3 and 14; NTS 74M/16).

History of exploration

The Carrot Lake radioactive zone was discovered by Hudson's Bay Oil and Gas Company Ltd. during routine ground follow-up of airborne radiometric anomalies. A ground radiometric survey, detailed geological mapping and trenching were performed. A total of 33 trenches and pits were excavated and 43 chip samples were taken from 17 trenches. Although no economic deposit was discovered, drilling and additional work were recommended, but no further exploration was carried out (Thorpe, 1969; Burgan, 1971).

The area was explored again in 1976 and 1977. No additional zones were discovered and the mineralized zones were found to be narrower and more erratic in grade than previously reported (Allan, 1977).

Geological setting

The predominant rock types are basement gneiss and pink granite with lesser amounts of pegmatite, metasediments and amphibolite (Figure 14).

Basement gneiss with minor biotite granite underlies the western part of the Carrot Lake zone, which is bordered to the east by foliated to gneissic Colin Lake granites with locally abundant pegmatite and inclusions of metasediments. Tight folding, small shear zones and jointing are common features throughout the area.

Mineralized zone

Two bedrock anomalies were recorded in the Carrot Lake area by airborne geophysical surveys and the mineralized zone was outlined by ground follow-up (Stamp, 1969; Burgan, 1971). Anomalous radioactivity is present along a 1.6 km long zone and is controlled by fractures and shear zones, which cut across lithological contacts. The Carrot Lake Showing is subdivided into a North and South Zone.

The North Zone includes Mineral Occurrences Nos. 78 and 79 and is underlain by basement gneiss (including migmatized schists and quartzite) and minor granite

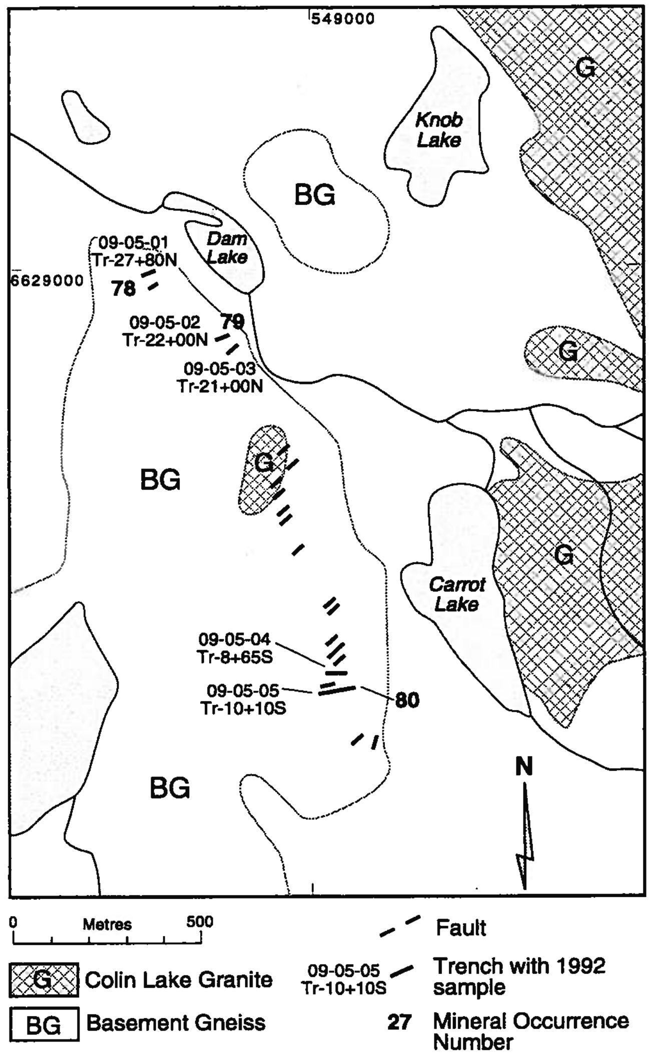

Figure 14. Geological map of the Carrot Lake Uranium Showing. Geology after Godfrey (1963).

(Figure 14). The uraniferous zone consists of small veins and pods of possible pitchblende and thucholite (a mixture of uraninite and carbonaceous matter) along fractures. Yellow uranium stains are seen in many trenches in this zone. At the west end of Trench 27+80N, a chip sample contains 0.18 per cent U_3O_8. In Trench 21+00N a chip sample from a 1 m interval shows 0.16 per cent U_3O_8. In Trench 22+00N, two successive 0.6 m chip samples have values of 0.14 per cent U_3O_8.

The South Zone (Mineral Occurrence No. 80) is underlain by foliated biotite granite and gneiss, injected by quartz-rich pegmatites. The pegmatite contains abundant red-pink hematitized feldspar, and graphite occurs in contacts with granite. Radioactivity is mainly found in biotite pegmatite and in coarse porphyroblastic quartz biotite gneiss. No uranium mineral has been identified and uranium contents are in the 0.03 to 0.04 per cent range (Burgan, 1971). In 1992, spot high readings of over 10,000 total counts per second were recorded by spectrometer in the trenches of the north zone (Mineral Occurrences nos. 78 and 79). In the south zone (Mineral Occurrence no. 80) a couple of spot readings were over 5000 total counts per second. In the South zone, silicification in the form of quartz enrichment may be present, along with hematitization of the feldspars.

In 1976, Tachyon Venture Management Ltd. and its partners carried out a helicopter spectrometer survey. Follow-up ground surveys did not delineate any significantly anomalous radioactive zones. In addition, the sandy plain was surveyed with an emanometer to detect any radon gas. However, the amounts of radon measured are generally low.

Geochemical data

Channel samples from the trenches have uranium contents of up to 0.04 per cent U_3O_8 in the South Zone and up to 0.18 per cent U_3O_8 in the North Zone (Burgan, 1971).

In the 1976/1977 program, a total of 2000 soil samples were collected in an area between Carrot Lake and Andrew Lake. Eleven anomalous zones ranging from 20 to 30 ppm U were found and these are generally downstream from the previously discovered mineralized areas. About 84 overburden holes were drilled in the area between Andrew Lake and Carrot Lake, and the basal till sampled. The highest content is 43 ppm U, which is only slightly anomalous (Allan, 1976, 1977).

In 1992, a number of samples were taken from radioactive areas and from sulfide rich horizons. The results of the geochemical analyses are shown in Table 18. Sample 09-05-01 with about 2 per cent U_3O_8 stands out. This sample also has anomalously high contents of silver and copper. No anomalous thorium contents were found.

Classification

The anomalous uranium content of the north zone is associated with fractures and shear zones in granite and gneiss. In the south zone, uranium contents are lower and are found in graphite-rich biotite pegmatite and porphyroblastic gneiss.

Table 18. Selected results of 1992 samples (Carrot Lake Uranium Showing).

Sample no. (**M.O. no.**)	**Location — Description.**	**U** ppm	**V** ppm	**Mo** ppm	**Cu** ppm	**Pb** ppm	**Zn** ppm	**Ag** ppm
WL-09-05-01 (**78**)	North Zone — Tr. 27+80N East end — fault zone	17957	86	29	103	382	–	5.7
WL-09-05-02 (**79**)	North Zone — Tr. 22+00N yellow stain in schist	767	103	–	–	65	117	2.9
WL-09-05-03 (**79**)	North Zone — Tr. 21+00N yellow stain in rusty schist	1636	–	–	–	217	85	2.2
WL-09-05-04 (**80**)	South Zone — Tr. 8+65S rusty gneiss + 2%pyrite	68	65	–	189	–	–	–
WL-09-05-05 (**80**)	South Zone — Tr. 10+10S gneiss + 2%pyrite	21	86	–	139	–	–	–

Second Narrows Uranium Showing (west arm Andrew Lake) M.O. number: 84

Situated 2.8 km west of the main lake along the west arm of Andrew Lake (Figure 3; NTS 74M/16).

History of exploration

The area was investigated by McIntyre Porcupine Mines Ltd. using a helicopter scintillometer. One of the anomalies was followed up by the blasting of six small trenches, located 1.4 km west of Mineral Occurrence no. 84, but no uraniferous zone was found (Thorpe, 1969). In 1974, Aquarius Mines Ltd. of Edmonton carried out a ground prospecting program, following up on the radioactive sites reported on Godfrey's (1963) map along the western shores of Hutton Lake. These occurrences were correlated with the south-trending Hutton Lake Fault, which extends to the west arm of Andrew Lake (Figure 3). A radioactive zone was traced along the fault. Two small trenches were blasted at the south end of this zone, in which a low grade uranium zone was found (Sullivan, 1974). These trenches constitute the Second Narrows Uranium Showing (M.O. no. 84).

In 1976, the Aquarius permits were optioned to Tachyon Venture Management Ltd. and an airborne radiometric survey was performed. This survey indicated previously undetected, twice-background anomalies along the western margin of the Hutton Lake Fault, which were subsequently investigated on the ground with a detailed exploration program (Allan, 1976). However, no work was done near the trenches on the north shore of the second narrows. The exploration program failed to encounter any significant uranium content.

Geological setting

The area is underlain by pink to red basement gneiss containing pegmatite veins. The pegmatites are generally parallel to foliation in the gneisses, which in places is mylonitic. Minor slivers of high-grade metasediments are present (Godfrey, 1963). A fault cuts through the area and extends to Hutton Lake. The fault is a splay of the Bonny Fault (Figure 3).

Mineralized zone

The area was investigated by McIntyre Porcupine Mines Ltd. using an airborne scintillometer and several anomalies were outlined (Thorpe, 1969). Aquarius Mines followed up with ground surveys using scintillometers. Readings of 4500 to 5000 counts per second were reported and these sites were trenched. Elsewhere, scattered readings of 1000 to 2000 counts per second were recorded (Sullivan, 1974).

In 1976, Tachyon Venture Management Ltd. carried out a helicopter spectrometer survey. A continuous belt of anomalies was detected over a distance of 2.5 km on the western flank of the Hutton Lake Fault Zone. However, this airborne survey failed to detect anomalous radioactivity near the trenches. Ground follow-up of the anomalies was performed. The discontinuous distribution of the radioactive zones discouraged further exploration.

The radioactivite zone in the northern trench is associated with a 50 cm wide zone of brecciated and hematitized basement gneiss. No identifiable uranium mineral was observed, but greenish yellow uranium stains and limonite is common in fractures (Sullivan, 1974). In 1992, spot high readings over 8000 total counts per second were recorded in the brecciated gneiss of the northern trench by spectrometer.

The southern trench which is over 10 m long, shows moderate radioactivity throughout, but no identifiable uranium minerals are present. The gneiss is strongly hematitized. About 2 m north of the trench, 1 to 2 per cent pyrite occurs in a quartz vein. A grab sample from the vein did not contain any elevated uranium or metal contents.

Widespread hematitization is the main alteration product. Feldspar is the most easily hematitized mineral. In the northern trench, hematite is altered to limonite along fractures. Besides hematitization, chloritization of mafic minerals is common.

Geochemical data

A grab sample from the brecciated zone in the northern trench contains 0.15 per cent U_3O_8 (Sullivan, 1974). Tachyon Venture Management Ltd. collected 114 soil samples along the Hutton Lake Fault. Only two samples contained more than 100 ppm Uranium (Allan, 1976).

The grab sample collected in 1992 from the northern trench confirms the (low grade) uranium content (Table 19).

Classification

Uranium is hosted by pegmatitic basement gneiss and occurring along brittle fractures.

Table 19. Selected results of 1992 samples from Second Narrows Uranium Showing.

Sample no	Location / description	U ppm	Th ppm	Mo ppm	Pb ppm	Ba ppm
WL-09-08-01	North trench / hematitic brecciated granite gneiss	755	186	43	193	277
WL-09-08-02	2 m N. of southern trench / quartz vein + 1-2% pyrite	–	99	–	40	–

Rare earth elements showings

Northeast Charles Lake Rare Earth Elements Showing M.O. number: 6

The showing is situated east of Charles Lake at the entrance of a narrow channel to the northeast extension of the lake (Figure 1; NTS 74M/16).

History of exploration

Godfrey (1966, map 65-6A) recorded anomalous radioactivity at this locality.

Geological setting

The area of the showing is underlain by high-grade metasediments (Godfrey, 1966), which are in contact with mylonitic gneiss of the Charles Lake Shear Zone. Thin bands of tightly folded rusty schists and quartzite are intruded by white leucogranite and pegmatite (Figure 15).

Mineralized zone

The highest radioactivity of about 25 times background (up to 2500 total counts per second) was recorded in fractures in granite filled with pink K-feldspar. White pegmatite interbedded with leucogranite show radioactivity of 5 to 10 times background. No radioactive minerals could be identified.

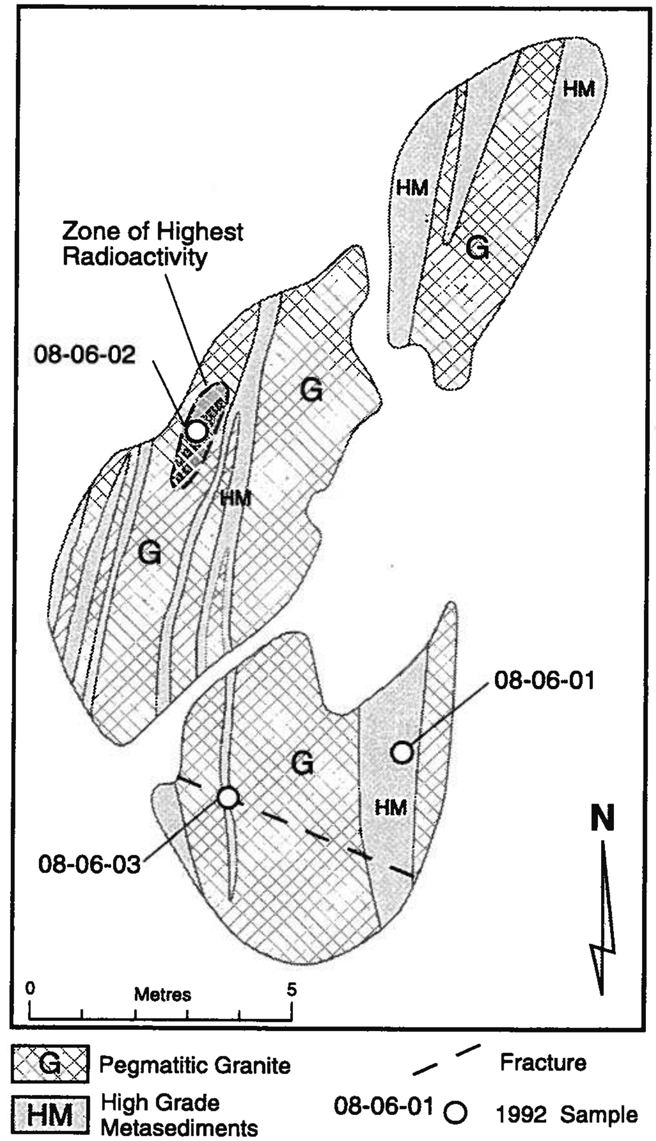

Figure 15. Geological map of the Northeast Charles Lake Rare Earth Elements Showing, Mineral Occurrence no. 6.

Geochemical data

One grab sample (WL-08-06-01) was taken from the rusty metasediments while the two others (WL-08-06-02 and 03) were collected from the radioactive pegmatitic layers. The main anomalous contents are listed in Table 20.

Classification

The rare earth element (La) zone has a thorium association and is hosted by leucogranitic pegmatite.

Table 20. Selected results of 1992 samples from northeast Charles Lake.

Sample number	Mo ppm	Pb ppm	Zn ppm	Th ppm	La ppm	Ba ppm
WL-08-06-01	–	–	146	–	–	–
WL-08-06-02	68	–	–	220	–	–
WL-08-06-03	72	107	–	1051	704	362

North Potts Lake Rare Earth Elements Showing
M.O. number: 15

Situated 250 m from the northern tip of Potts Lake, eastern Arm (Figure 1; NTS 74M/16).

History of exploration

Godfrey (1966, map 65-6C) recorded anomalous radioactivity at this locality.

Geological setting

The bedrock around the northern end of Potts Lake consists of basement gneiss with minor bands of high-grade graphite and garnet schists. These metasediments are intermixed with granite and pegmatite. The mineral occurrence is located in a fractured pegmatite within metasediments.

Mineralized zone

The highly radioactive area (2 m wide and 25 m long) is underlain by fractured quartz-rich pegmatite, forming a breccia. The fracture system is parallel to foliation and trends north. The fractures are a few millimetres wide and filled with black sooty material (pitchblende?). The radioactive pegmatite shows up to 3500 total counts per second with a spectrometer.

Geochemical data

Sample WL2-08-10-03, collected from the radioactive pegmatite, contains 269 ppm Th and 201 ppm La. Sample WL2-08-10-04, which was collected 15 m to the southeast from a 50 cm wide band of rusty graphitic metasediment, contains 98 ppm Cu and 7 ppb Au.

Classification

The showing represents a rare earth elements-thorium association in pegmatite.

South Potts Lake Rare Earth Elements Showing
M.O. number: 16

Situated 250 m west of the southwest shore of Potts Lake (NTS 74M/09).

History of exploration

This showing was discovered during examination of the South Potts Lake Gold Showing (Mineral Occurrence No. 17). Strong radioactivity led to sampling the outcrop.

Geological setting

The area is underlain by high-grade metasediments consisting mainly of pure and impure quartzite and minor biotite-sericite schist (Figure 4). The metasediments form part of the Basement Complex. The mineral occurrence is located in biotite gneiss interlayered with numerous whitish to pinkish pegmatites. A shear band in the gneiss trends north. In the mineralized pegmatite, numerous vertical fractures are present.

Mineralized zone

The radioactive zone is located in a pink fractured pegmatite interlayered with biotite gneiss. The fractured zone extends over an area of 1 by 10 m and shows readings of over 3500 total counts per second on the spectrometer. A grab sample contains 1.06 per cent total rare earth elements and up to 0.27 per cent thorium content .

Geochemical data

One grab sample (WL2-08-11-02) was collected from the radioactive zone. This sample was split in two, where one portion was analyzed using the Instrumental Neutron Activation Analysis (INAA) method, which determines the contents of several rare earth elements, and the other by ICP. Results from both methods are presented in Table 21. The discrepancies between the results of the two methods are possibly caused by hand splitting of the heterogenous megacrystic rock.

Classification

The rare earth elements are hosted by a pegmatite.

Table 21. Selected results of sample WL-08-11-02 at south Potts Lake.

	U ppm	**Th** ppm	**La** ppm	**Ce** ppm	**Nd** ppm	**Sm** ppm	**P** %	**Pb** ppm	**Sr** ppm	**Ba** ppm	**Au** ppb
ICP/AA	5	2756	2624	na	na	na	0.23	115	149	151	8
INAA	49	83	2210	5630	2550	202	na	na	384	1410	<5

na = not analyzed.

Marguerite River Rare Earth Elements Showing M.O. Number: 185

Situated about 6 km south of the Marguerite River (Figure 2) and 1 km south of a small lake (unofficially named Lake Nine on the map of Godfrey, 1970).

History of exploration

Godfrey (1970) shows an area with rock alteration and some shear zones. This alteration was investigated by Dufresne *et al.* (1994), who found a radioactive anomaly with rare earth elements.

Geological setting

The area is underlain by megacrystic granites according to Godfrey (1970), which may be related to the Wylie Lake Granitoids occurring north of Lake Athabasca (Wilson, 1986).

Mineralized zone

Radioactive zones in megacrystic granite were grab sampled and analyzed by Dufresne *et al.* (1994). At this locality, spot high readings of up to 3000 counts per second were measured by a scintillometer survey. Secondary uranium oxide staining and/or hematitization exist at these occurrences. A grab sample (MD93082704) contains 103 ppm Pb, 175 ppm Zn, 11 ppm Bi, 10 ppm Mo, 1900 ppm Th, 300 ppm U, 3300 ppm Ce, 4.5 ppm Eu, 110 ppm Hf, 1900 ppm La, 1200 ppm Nd, 200 ppm Sm, and 15 ppm Tb. Hematitization represents the main alteration.

Classification

Rare earth elements associated with megacrystic granite.

Iron showing

Hutton Lake Iron-Vanadium Showing M.O. number: 73

Situated 125 m northeast of the north end of Hutton Lake (Figure 3; NTS 74M/16).

History of exploration

On geological map 58-3A, Godfrey (1961) shows an arsenopyrite occurrence associated with a sliver of metasediments at this location. Extensive and careful search of the area during the 1992 AGS investigation failed to relocate the arsenopyrite occurrence. During this search outcrops of magnetite-hematite rich rocks were discovered.

Geological setting

The northern end of Hutton Lake is underlain by basement gneiss, which include gneiss, leucogranite and pegmatite. The straight eastern edge of Hutton Lake is a topographic expression of the northwest-trending Bonny Fault (Figure 3).

Mineralized zone

Pegmatite veins are generally parallel to the north-trending foliation and are composed of feldspars, magnetite and hematite. Where they form swells, the center is often enriched in quartz and the feldspars are cracked, corroded and shattered. The matrix of the breccia consists of magnetite and hematite and locally presents up to 50 per cent of the rock. Epidote is common in some fractures. Patches of epidote are found within the magnetite rich pematite layers.

A ten kilogram sample was collected, which shows a content of 25.1 per cent iron and 274 ppm vanadium. The vanadium content is interesting because vanadium-iron ore deposits are generally associated with mafic to ultramafic rocks and not with felsic rocks, such as pegmatite.

Quartz in pegmatite breccias appears to be late and hence could represent silicification. Epidote is present in late fractures and in pegmatitic breccia, but the relation to magnetite-hematite is not clear.

Geochemical data

Sample WL-09-01-02 contains 25.1 per cent Fe and 274 ppm V.

Classification

The mineralized zone at Hutton Lake is a pegmatite hosted iron-vanadium occurrence.

Other significant mineral occurrences

Besides the showings discussed thus far, several other mineral occurrences listed in the Appendix should be noticed because after additional exploration they could become showings (and potentially deposits) in the future. Mineral occurrences in rusty metasediments are worth additional investigation and are highlighted in Table 22. The anomalous geochemical contents of some metallic commodities at these sites are significant, considering that weathering generally removed most of the sulfides near surface, as shown in the 2 m deep trench at Selwyn Lake (M.O. no. 74).

Sulfides and gold

Other sulfide occurrences that should be noted are the ones along the Leland Lakes Shear Zone, which have varying contents of metallic commodities (M.O. nos 137 to 149, from Langenberg *et al.*, 1994) and the ones reported by McDonough (*in press*) at Whaleback Lake (M.O. 186), Florence Lake (M.O. 187), Flett Lake (M.O. 188) and Dore Lake (M.O. 189).

Sulfide occurrences based on assessment reports submitted to the Alberta Government include no. 169 (Turner, 1969), no. 172 (Turner, 1969), no. 173 (Ellison, 1969), no. 176 (Brown and Slack, 1980), and no. 179 with 2.7 g/t gold in a core interval of a hole that intersected the regolith below the Athabasca Sandstone (Nelson, 1978).

Radioactive sites

Additional radioactive sites can be divided into Aphebian and Helikian occurrences.

Aphebian rocks

Geochemical analyses of samples from some radioactive sites have shown that the radioactivity did not originate from uranium, but from thorium. Several of these sites are anomalously high in both Th and La contents. The mineralized zone is either associated with white pegmatite intruding metasediments or within red to pink non-foliated granite. One exception is Mineral Occurrence no. 85 which consists of quartz material in fractured rocks with hematite along the Bonny Fault, west of Andrew Lake. These data are summarized in Table 23.

Other potentially interesting radioactive sites based on assessment reports submitted to the Alberta Government include mineral occurrences no. 152 (Babcock and Hartley (1971), no. 154 (Hale, 1970), no. 155 (Anderson, 1970), no. 156 (Williams, 1970b), no. 165 (C & E Exploration, 1976), no. 167 (Allan, 1978), no. 168 (Hale, 1970), no. 170 (Turner, 1969), and no. 171 (Turner, 1969).

Helikian rocks

The Helikian Athabasca Group in Alberta has been explored for uranium, after many economically important uranium deposits were found spatially associated with this group in Saskatchewan. Economic deposits have not yet been found in Alberta (Wilson, 1985), but past exploration has led to a number of mineral occurrences (Olson *et al.*, 1994). For example, numerous uraniferous boulders exist at and near mineral occurrence no. 158, which is located in an area underlain by Athabasca sandstone near Greywillow Point. This locale was drilled by Uranerz Exploration and Mining Ltd., but no uraniferous zones were encountered (Lehnert-Thiel and Kretchmar, 1976). The other occurrences are all related to uraniferous boulders, which might be close to outcrop, and include no. 157 (Lehnert-Thiel and Kretchmar, 1976), no. 159 (Lehnert-Thiel and Kretchmar, 1976), nos. 160 to 164 (Lehnert-Thiel *et al.*, 1978), no. 166 (Kilby and Walker, 1979), nos. 174 and 175 (MacMahon, 1977), and no. 177 (McWilliams and Sawyer, 1976).

Godfrey and Plouffe (1978) defined several radiometric anomalies in the Athabasca Group based on airborne geophysical surveys, which are shown on Figures 1 and 2.

Iron

Another mineral occurrence (no. 57), similar to the Hutton Lake Iron Showing, was discovered during 1992 near the west arm of Andrew Lake (Figure 3). It consists of magnetite and hematite forming the matrix of a brecciated pegmatite within foliated leucogranite. Geochemical analyses indicates iron with a vanadium association (Table 24).

Graphite

A geophysical anomaly was drilled by Norcen and encountered graphitic schists. This site defines mineral occurrence no. 178 (McWilliams *et al.*, 1979).

Table 22. Geochemical results from some additional mineral occurrences.

M.O. no. Sample no.	Location	Host rock	Anomalous geochemical contents
07	NE of Charles Lake	rusty meta-sediment	
WL-08-06-05			245 ppm Cu
WL-08-06-06			144 ppm Cu — 79 ppb Au
23	E. shore of Potts Lake	rusty paragneiss	
WL-08-13-03			196 ppm Cu — 188 ppm Zn — 27 ppb Au
24	E. shore of Potts Lake	rusty meta-sediment	
WL-08-13-06			154 ppm Cu — 13 ppb Au
WL-08-13-07			232 ppm Cu — 19 ppb Au
38	W. shore of Waugh Lake	rusty meta-sediment	
WL-08-20-03			290 ppm Zn — 20 ppb Au
40	E. of Waugh Lake	chloritized	
WL-08-21-09		metasediment	120 ppm Cu
55	W shore central	granodiorite	
WL-08-26-11	Waugh Lake		116 ppm Zn — 163 ppm Ni — 370 ppm Cr
WL-08-26-13			124 ppm Zn — 207 ppm Ni — 470 ppm Cr
WL-08-26-14			352 ppm Cr
77	SE of Spider Lake	rusty paragneiss	
WL-09-04-01			162 ppm Cu — 10 ppb Au
WL-09-04-02			109 ppm Cu — 24 ppb Au
86	E.shore Andrew Lake	rusty paragneiss	
WL-09-09-01			122 ppm Cu — 106 ppm Zn
WL-09-09-02			24 ppb Au
WL-09-09-05			270 ppm Pb
88	Island — N. Andrew Lake	amphibolite	
WL-09-09-07			190 ppm Cu — 213 ppm Cr

Table 23. Geochemical analyses from additional radioactive sites.

M.O. no.	Sample no.	Location	Host rock	Thorium-Lanthanum contents
08	WL-08-06-07	500 m E of North extension Charles Lake	red granite.	192 ppm Th — 333 ppm La.
11	WL-08-07-02	E. of central Charles Lake	white pegmatite	355 ppm Th — 363 ppm La
12	WL-08-07-05	E. of central Charles Lake	white pegmatite	310 ppm Th — 503 ppm La
14	WL-08-09-01 WL-08-09-02	E. shore of Potts Lake	pink granite	453 ppm Th — 376 ppm La 318 ppm Th — 413 ppm La
85	WL-09-08-03	W. shore of Andrew Lake	red cataclasite	751 ppm La

Table 24. Geochemical results of an iron rich outcrop near the big bend of the west arm of Andrew Lake.

M.O. no.	Sample no.	Location	Host rock	Geochemical results
57	WL-08-28-03	SW of big bend of west arm of Andrew Lake	sheared pegmatite breccia	29.2% Fe — 381 ppm V

Conclusions

The description and classification of metallic mineral occurrences provide models for mineral deposition and insights into the economic potential of the mineral showings.

The most interesting result is the presence of gold and base metals, which were concentrated by shearing, in metasedimentary belts. Airborne electromagnetic (EM) techniques, which have good depth penetration, could be used to detect blind mineralized zones. Depth penetration is necessary to look through the weathered zones, which are extensive and deep in recessive and sheared metasediments

Gold

Systematic sampling showed that two geological settings were favorable for gold enrichment. The first one is illustrated by the showings of South Potts Lake (up to 770 ppb Au), Pythagoras Lake (up to 603 ppb Au), Northeast Waugh Lake (up to 416 ppb Au), and Doze Lake (3200 ppb Au), where these gold contents are found in rusty metasediments associated with arsenopyrite. Brecciation and silicification are well-developed at South Potts Lake, whereas shearing played an important role at Northeast Waugh Lake, Doze Lake and Pythagoras Lake. Microgranitic intrusions at northeast Waugh Lake might also have contributed to the mineralized zones. Elemental association varies greatly, but gold-arsenic associations appear to be present. In these occurrences, variable amounts of base metals occur in association with gold. South Potts Lake shows a similar association, in addition to anomalous contents of tungsten, bismuth and barium. Further study is needed to determine the reasons for such differences in geochemistry and to relate them to the geological setting. Additional arsenopyrite occurrences are potential sites of gold-bearing zones and are worth further exploration.

The preferred location of sulfides in shear zones indicates that the enrichment is shear-related and that sulfides are remobilized during the shearing process. Structural control of mineralization is also indicated by concentration of sulfides along mica crenulations in the schists. The mineralization (redistribution of sulfides and gold) is syn- to post-kinematic in relation to deformation under greenschist facies conditions and has affinities to shear-related Precambrian lode gold deposits (Olson *et al.*, 1994). Geologically similar belts such as in the Ashton Lake, Potts Lake, Alexander Lake, Split Lake and Swinnerton Lake areas should be further investigated.

The second geological setting consists of quartz-tourmaline veins intruding granite and metasediments (South Waugh Lake Showing no. 44). In this showing, tungsten along with minor amounts of molybdenum are found in association with gold contents of up to 157 ppb. Geochemical data and geological setting indicate that the gold in tourmaline/quartz veins is similar to Precambrian lode gold deposition hosted in quartz veins (Boyle, 1979).

Base metals

The Selwyn Lake Showing is anomalous in copper and associated with sulfide zones. Although no large amount of precious or base metals was found in the sulfide zones, the concentation of pyrite-pyrrhotite is important. The amphibolites, which show a mylonitic texture, are well layered to massive and are interbedded with metasediments. This showing represents a shear-zone hosted copper occurrence. The Stony Islands showing represents sediment-hosted strata-bound copper deposition.

Besides these showings, several other mineral occurrences have shown anomalous levels of base metals. These occurrences can be divided into two groups. One group, which contains a copper-lead-zinc (and often minor gold) association, is located in metasedimentary-metavolcanic assemblages with a felsic bulk composition and is related to Precambrian lode gold occurrences (Mineral Occurrences nos. 7, 23, 24, 38, 77 and 86). The other group is located in rocks of more basic composition (diorite, amphibolite) and shows high nickel-chromium contents (Mineral Occurrences nos. 55 and 88). In addition, many of the gold showings show anomalously high base metals contents.

Uranium

Fifty per cent of all mineral occurrences in this part of Northeast Alberta are related to uranium. However, all of them are of relatively low grade with typical contents of less than 0.1 per cent U_3O_8. The large number of uranium occurrences in the area reflect the focus of past exploration. Most of the uranium is hosted by pegmatite and pegmatitic phases of granitoids in basement gneiss or metasediments. Under present market conditions, it is unlikely that the pegmatite hosted uranium showings in the area hold much economic potential. Uranium is often concentrated along shear zones and fractures. However, exploration showed that the uranium concentration is very erratic and at present uneconomic. This type of uranium deposit contains very little thorium.

A second type of uranium occurrence is in pegmatite at the contact with metasediments and is often associated with strong shearing. This type is characterized by the presence of molybdenum and accessory lead, some of which may be radiogenic, and a significant amount of thorium. Molybdenum content can reach 1.40 per cent (Godfrey, 1958). The mineralized zones at Small Lake, the West Arm of Andrew Lake (Big Bend) and Spider Lake (on shore) fall in the molybdenum-enriched category and appear to have the best continuity and overall grades. However, trenching and drilling have shown the grades to be sub-economic.

The best prospect for important uranium deposits in northeast Alberta is a deposit associated with the unconformity below sediments of the Athabasca Group. Market conditions will determine when exploration for this type of deposit will resume.

Rare Earth Elements

The amount of Rare Earth Elements at the South Potts Lake Showing (no. 16) is a good indication for a potential deposit. The content of elements like cerium and samarium should be noted. The pegmatitic environment is favorable for a sizeable deposit and systematic detailed sampling is required. These occurrences may warrant further exploration. Geological settings similar to these occurrences are common in northeast Alberta, hence additional deposits might be present.

Molybdenum

Eleven occurrences, which are reported on geological maps of the area, could not be relocated. Godfrey (1958) warned about the possibility of mis-identification of graphite, which is a very common mineral in the area. These occurrences could be examples of this phenomenon, although tiny flakes of molybdenite can be easily missed. In one case (Mineral Occurrence no. 43), molybdenite was not observed but the geochemical analysis indicates the presence of molybdenum (455 ppm). In another case (Mineral Occurrence no. 48), there is a difference between the location of the molybdenum occurrence on the maps and the description in the written reports (Godfrey, 1958, 1963).

However, molybdenum deposits remain a possibility in high-grade gneissic to granitic terrain. It could represent the end member of a mineralization trend, which starts with a uranium-thorium association and continues with a uranium-thorium-molybdenum association. Mineable disseminated molybdenite deposits do exist in high-grade gneissic to granitic terrain and some have been exploited at the Lacorne and Moss mines in Quebec (Lang *et al.*, 1968).

Iron-Vanadium

The two magnetite-hematite occurrences, hosted in pegmatitic breccia within granitic country rock, show a distinct Fe-V association which is unusual in a granitic environment. Fe-V minerals characterize iron deposits in mafic to ultramafic rocks. It is too early to draw conclusion from only two examples, but these results warrant further survey, considering that the area has a high magnetic signature on regional magnetic maps (Sprenke *et al.*, 1986).

General

The documentation of metallic mineral ocurrences presented in this bulletin may serve as a starting point for future metallic mineral exploration on the exposed Precambrian Shield in Alberta. It is recommended that industry follow up on the showings identified in this report.

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Appendix. Inventory of mineral occurrences

Mineral Occurrence Number: 1
Central Charles Lake
Northing: 6630350
Easting: 526310
Minerals: Pyrite
Commodities: ?
Host rock: Amphibolite within Basement Gneiss
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 2
East central Charles Lake
AGS Field-check: 1992
Northing: 6630550
Easting: **527160**
Commodities: U?, Radioactive site, but was **not found** in 1992
Host rock: Metasediments with quartz veins
Reference: Godfrey, 1966

Mineral Occurrence Number: 3
East central Charles Lake
AGS Field-check: 1992
Northing: 6630590
Easting: 526780
Commodities: U?, Radioactive site, but was **not found** in 1992
Host rock: Rusty metasediments within Basement Gneiss
Reference: Godfrey, 1966

Mineral Occurrence Number: 4
Southwest Charles Lake
AGS Field-check: 1992
Northing: 6615080
Easting: 522890
Minerals: Pyrite
Commodities: Cu and Mo (Godfrey, 1966), but were **not found** in 1992
Host rock: Metasediments
Reference: Godfrey, 1966

Mineral Occurrence Number: 5
South of Charles Lake
AGS Field-check: 1992
Northing: 6612960
Easting: 523150
Commodities: Ni, Cr and Zn (Godfrey, 1966), but were **not found** in 1992
Host rock: Mafic Basement Gneiss
Reference: Godfrey, 1966

Mineral Occurrence Number: 6
Northeast of Charles Lake
AGS Field-check: 1992
Northing: 6639750
Easting: 528300
Minerals: yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite within Metasediments
Reference: Godfrey, 1966

Mineral Occurrence Number: 7
Northeast of Charles Lake
AGS Field-check: 1992
Northing: 6643850
Easting: 529200
Minerals: Pyrite and Chalcopyrite
Commodities: Cu
Host rock: Metasediments
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 8
North of Charles Lake
AGS Field-check: 1992
Northing: 6642200
Easting: 529130
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Granite in Metasediments
Reference: Godfrey, 1966

Mineral Occurrence Number: 9
South central Charles Lake
AGS Field-check: 1992
Northing: 6625700
Easting: 527400
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite within Metasediments
Reference: Godfrey, 1966

Mineral Occurrence Number: 10
East central Charles Lake
AGS Field-check: 1992
Northing: 6626000
Easting: 527680
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite within Metasediments
Reference: Godfrey, 1966

Mineral Occurrence Number: 11
East central Charles Lake
AGS Field-check: 1992
Northing: 6626400
Easting: 527725
Commodities: Rare Earth Elements
Host rock: Pegmatite within Metasediments
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 12
East central Charles Lake
AGS Field-check: 1992
Northing: 6627415
Easting: 527975
Commodities: Rare Earth Elements
Host rock: Pegmatite within Metasediments
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 13
East central charles Lake
AGS Field-check: 1992
Northing: 6627500
Easting: 528100
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite within Metasediments
Reference: Godfrey, 1966

Mineral Occurrence Number: 14
Northeast Potts Lake
AGS Field-check: 1992
Northing: 6622600
Easting: 534775
Commodities: Mo, but was **not found** in 1992
Host rock: Basement Gneiss
Reference: Godfrey, 1966

Mineral Occurrence Number: 15
North Potts lake
AGS Field-check: 1992
Northing: 6626525
Easting: 534800
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite within Metasediments
Reference: Godfrey, 1966

Mineral Occurrence Number: 16
Southwest of Potts Lake
AGS Field-check: 1992
Northing: 6617850
Easting: 530575
Commodities: Rare Earth Elements
Host rock: Pegmatite within Basement Gneiss
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 17
Southwest of Potts Lake
AGS Field-check: 1992
Northing: 6617950
Easting: 530500
Minerals: Pyrite and arsenopyrite
Commodities: Gold associated with sulfides
Host rock: Metasediments
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 18
Southwest of Potts Lake
AGS Field-check: 1992
Northing: 6618190
Easting: 530500
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite within Metasediments
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 19
Southwest of Potts Lake
AGS Field-check: 1992
Northing: 6618875
Easting: 528600
Commodities: Mo, but **not found** in 1992
Host rock: Basement Gneiss
Reference: Godfrey, 1966

Mineral Occurrence Number: 20
Southwest of Potts Lake
AGS Field-check: 1992
Northing: 6617575
Easting: 530000
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite within Basement Gneiss
Reference: Godfrey, 1966

Mineral Occurrence Number: 21
Southeast of Potts Lake
AGS Field-check: 1992
Northing: 6619490
Easting: 532280
Minerals: Pyrite (Molybdenite reported by Godfrey was **not found)**
Commodities: Ni and Cr
Host rock: Metasediments
Reference: Godfrey, 1966

Mineral Occurrence Number: 22
Central Potts Lake
AGS Field-check: 1992
Northing: 6621110
Easting: 530940
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite within Metasediments
Reference: Godfrey, 1966

Mineral Occurrence Number: 23
North central Potts Lake
AGS Field-check: 1992
Northing: 6624980
Easting: 532800
Minerals: Pyrite
Commodities: ?
Host rock: Metasediments
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 24
East central Potts Lake
AGS Field-check: 1992
Northing: 6620520
Easting: 534350
Commodities: Base metals (Cu)
Host rock: Paragneiss within Basement Gneiss
Reference: Gossan shown by Godfrey (1966)

Mineral Occurrence Number: 25
(Olson *et al.*, 1994: **74M-M1**)
North Cherry Lake
AGS Field-check: 1992
Northing: 6624800
Easting: 551200
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Colin Lake Granite
Reference: Trenched and Drilled by McIntyre Porcupine Mines Ltd. in 1968 (Thorpe, 1969).

Mineral Occurrence Number: 26
North Cherry Lake
AGS Field-check: 1992
Northing: 6625500
Easting: 551170
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Colin Lake Granite
Reference: Trenched and Drilled by McIntyre Porcupine Mines Ltd. in 1968 (Thorpe, 1969).

Mineral Occurrence Number: 27
North Cherry Lake
AGS Field-check: 1992
Northing: 6624710
Easting: 551660
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Colin Lake Granite
Reference: Trenched and Drilled by McIntyre Porcupine Mines Ltd. in 1968 (Thorpe, 1969).

Mineral Occurrence Number: 28
Twin Lakes
AGS Field-check: 1992
Northing: 6624400
Easting: 550100
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Colin Lake Granite
Reference: Trenched and Drilled by McIntyre Porcupine Mines Ltd. in 1968 (Thorpe, 1969).

Mineral Occurrence Number: 29
Twin Lakes
AGS Field-check: 1992
Northing: 6624630
Easting: 550030
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Colin Lake Granite
Reference: Trenched by McIntyre Porcupine Mines Ltd. in 1968 (Thorpe, 1969).

Mineral Occurrence Number: 30
Twin Lakes
AGS Field-check: 1992
Northing: 6624810
Easting: 549880
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in gneissic Colin Lake Granite
Reference: Trenched by McIntyre Porcupine Mines Ltd. in 1968 (Thorpe, 1969).

Mineral Occurrence Number: 31
Twin Lakes
AGS Field-check: 1992
Northing: 6624950
Easting: 549790
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in gneissic Colin Lake Granite
Reference: Trenched and Drilled by McIntyre Porcupine Mines Ltd. in 1968 (Thorpe, 1969).

Mineral Occurrence Number: 32
Twin Lakes
AGS Field-check: 1992
Northing: 6625000
Easting: 549925
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: gneissic Colin Lake Granite
Reference: Trenched by McIntyre Porcupine Mines Ltd. in 1968 (Thorpe, 1969).

Mineral Occurrence Number: 33
(Olson *et al.*, 1994: **74M-M12**)
Small Lake
AGS Field-check: 1992
Northing: 6626200
Easting: 549675
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Metasediments
Reference: Trenched by McIntyre Porcupine Mines Ltd. in 1968 (Thorpe, 1969).

Mineral Occurrence Number: 34
Twin Lakes
AGS Field-check: 1992
Northing: 6625075
Easting: 550360
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in gneissic Colin Lake Granite
Reference: Trenched by McIntyre Porcupine Mines Ltd. in 1968 (Thorpe, 1969).

Mineral Occurrence Number: 35
East Cherry Lake
AGS Field-check: 1992
Northing: 6622160
Easting: 551125
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Colin Lake Granite
Reference: Radioactive occurrence from Map 62-1A (Godfrey and Peikert, 1963) and Map EM-182 (Godfrey, 1986b).

Mineral Occurrence Number: 36
Island in Cherry Lake
AGS Field-check: 1992
Northing: 6623000
Easting: 550740
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Colin Lake Granite
Reference: Radioactive occurrences indicated on Maps 58-4 (Godfrey, 1958) and EM-182 (Godfrey, 1986b).

Mineral Occurrence Number: 37
North Cherry Lake
AGS Field-check: 1992
Northing: 6623980
Easting: 550350
Minerals: Yellow Uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Colin Lake Granite
Reference: Radioactive occurrences indicated on Map 61-2A (Godfrey, 1963).

Mineral Occurrence Number: 38
West of Waugh Lake
AGS Field-check: 1992
Northing: 6630750
Easting: 555250
Minerals: Pyrite
Commodities: Base metals (Zn and Cr)
Host rock: Waugh Lake Group
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 39
(Olson *et al.*, 1994: **74M-M6)**
Northeast of Waugh Lake
AGS Field-check: 1992
Northing: 6632060
Easting: 555720
Minerals: Pyrite, Chalcopyrite and Pyrrhotite
Commodities: Base metals (Cu, Zn and Cr)
Host rock: sheared Waugh Lake Group
Reference: Trenched by Hudsons Bay Oil and Gas Co. Ltd. (Burgan, 1971).

Mineral Occurrence Number: 40
East of Waugh Lake
AGS Field-check: 1992
Northing: 6630410
Easting: 555725
Minerals: trace pyrite (pyrrhotite reported by Godfrey **not found**)
Commodities: Base metals (Cr and Cu)
Host rock: sheared Waugh Lake Group
Reference: From Map 58-4 (Godfrey, 1958).

Mineral Occurrence Number: 41
North of Waugh Lake
AGS Field-check: 1992
Northing: 6634360
Easting: 555700
Minerals: trace pyrite/chalcopyrite (arsenopyrite reported by Godfrey **not found**).
Commodities: Base metals (Cu-Zn)
Host rock: sheared Waugh Lake Group
Reference: Map 61-2A (Godfrey, 1963).

Mineral Occurrence Number: 42
East of Waugh Lake
AGS Field-check: 1992
Northing: 6632425
Easting: 555750
Minerals: Arsenopyrite
Commodities: ?
Host rock: sheared Waugh Lake Group
Reference: Showing on Map 58-4 (Godfrey, 1958).

Mineral Occurrence Number: 43
Southwest of Waugh Lake
AGS Field-check: 1992
Northing: 6628925 6629140 6628825
Easting: 554000 554150 554140
Minerals: Tourmaline
Commodities: Mo and W (Au potential)
Host rock: Tourmaline-quartz veins in Waugh Lake Granite
Reference: From Godfrey (1963 and 1986b).

Mineral Occurrence Number: 44
West of Waugh Lake
AGS Field-check: 1992
Northing: 6629520
Easting: 555100
Minerals: Tourmaline
Commodites: Au, Pb and Cu
Host rock: Tourmaline-quartz veins in Waugh Lake Group
Reference: From Godfrey (1963 and 1986b).

Mineral Occurrence Number: 45
Southeast of Waugh Lake
AGS Field-check: 1992
Northing: 6629250
Easting: 555420
Minerals: Tour
Commodities: Au
Host rock: Tourmaline-quartz veins in Waugh Lake Group
Reference: From Godfrey (1963 and 1986b)

Mineral Occurrence Number: 46
West of Waugh Lake
AGS Field-check: 1992
Northing: 6630010
Easting: 555180
Minerals: Tourmaline
Commodities: ?
Host rock: Tourmaline-quartz veins in Waugh Lake Group
Reference: From Godfrey (1963 and 1986b)

Mineral Occurrence Number: 47
Northwest of Waugh Lake
AGS Field-check: 1992
Northing: 6633050
Easting: 553350
Minerals: Tourmaline
Commodities: ?
Host rock: Tourmaline-quartz veins in Waugh Lake Group
Reference: From Godfrey (1963 and 1986b)

Mineral Occurrence Number: 48
Northwest of Waugh Lake
AGS Field-check: 1992
Northing: 6633500
Easting: 552500
Minerals: Molybdenite reported by Godfrey (1963) **not found**
Commodities: Mo?
Host rock: Pegmatite in Waugh Lake Group
Reference: From Godfrey (1963 and 1986b)

Mineral Occurrence Number: 49
West of Waugh Lake
AGS Field-check: 1992
Northing: 6631150
Easting: 554750
Minerals: Galena showing of Godfrey (1958) **not found** in 1992
Commodities: Pb?
Host rock: Waugh Lake Group
Reference: From Godfrey (1958)

Mineral Occurrence Number: 50
(Olson *et al.*, 1994: **74M-M6**)
Northeast of Waugh Lake
AGS Field-check: 1992
Northing: 6631760
Easting: 555770
Minerals: Arsenopyrite and pyrite
Commodity: Au
Host rock: sheared Waugh Lake Group
Reference: Trenched by Hudson's Bay Oil and Gas Co. Ltd. (Burgan, 1971)

Mineral Occurrence Number: 51
East of Waugh Lake
AGS Field-check: 1992
Northing: 6631560
Easting: 555705
Minerals:pyrite (and arsenopyrite?)
Commodity: ?
Host rock: sheared Waugh Lake Group
Reference: Trenched by Hudson's Bay Oil and Gas Co. Ltd. (Burgan, 1971)

Mineral Occurrence Number: 52
East of Waugh Lake
AGS Field-check: 1992
Northing: 6631440
Easting: 555710
Minerals: Pyrite and arsenopyrite
Commodities: Base metals (Zn and Cr)
Host rock: sheared Waugh Lake Group
Reference: Trenched by Hudson's Bay Oil and Gas Co. Ltd. (Burgan, 1971)

Mineral Occurrence Number: 53
East of Waugh Lake
AGS Field-check: 1992
Northing: 6631195
Easting: 555695
Minerals: Pyrite and chalcopyrite
Commodities: Cu, Zn, Ni, Cd and Au
Host rock: sheared Waugh Lake Group
Reference: Examined by Hudson's Bay Oil and Gas Co. Ltd. (Burgan, 1971)

Mineral Occurrence Number: 54
East of Waugh Lake
AGS Field-check: 1992
Northing: 6630000
Easting: 555710
Minerals: Tourmaline
Commodities: Quartz-tourmaline veins
Host rock: sheared Waugh Lake Group
Reference: From Godfrey (1963)

Mineral Occurrence Number: 55
3 sites west of Waugh Lake
AGS Field-check: 1992

Northing:	6630300	6630600	6630700
Easting:	555210	555000	555100

Minerals: Pyrite
Commodities: Base metals (Zn, Ni and Cr)
Host rock: Waugh Lake granites
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 56
In big bend of west arm of Andrew Lake
AGS Field-check: 1992
Northing: 6630700
Easting: 539325
Minerals: Molybdenite, galena and pyrite
Commoditie(s): U, Th, REE (radioactive site)
Host rock: Pegmatite within metasediments
Reference: From Godfrey (1958 and 1966)

Mineral Occurrence Number: 57
In big bend of west arm of Andrew Lake
AGS Field-check: 1992
Northing: 6630575
Easting: 539425
Minerals: Magnetite
Commodities: Fe and V
Host rock: Basement Gneiss
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 58
2 sites near west arm of Andrew Lake
AGS Field-check: 1992

Northing:	6630860	6631010
Easting:	541175	541110

Minerals: Graphite (molybdenite reported by Godfrey, 1958, **not found** in 1992)
Commodity: Mo?
Host rock: High grade metasediments
Reference: Showing reported by Godfrey (1958 and 1966)

Mineral Occurrence Number: 59
Near Lindgren Lake
AGS Field-check: 1992
Northing: 6650174
Easting: 543578
Minerals: Pyrite and arsenopyrite
Commodity: Au
Host rock: High grade metasediments
Reference: Reported by Godfrey (1958 and 1961)

Mineral Occurrence Number: 60
(Olson *et al.*, 1994: **74M-M7**)
Pythagoras Lake
AGS Field-check: 1992
Northing: 6649578
Easting: 543276
Minerals: Pyrite and arsenopyrite
Commodity: Au
Host rock: High grade metasediments
Reference: Reported by Godfrey (1958 and 1961)

Mineral Occurrence Number: 61
3 sites south of Pythagoras Lake
AGS Field-check: 1992

Northing:	6648361	6647170	6645500
Easting:	542834	542428	541846

Minerals: Pyrite and arsenopyrite(?)
Commodity: Au
Host rock: High grade metasediments
Reference: Reported by Godfrey (1958 and 1961)

Mineral Occurrence Number: 62
South of Pythagoras Lake
AGS Field-check: 1992
Northing: 6647629
Easting: 542481
Minerals: Pyrite (and arsenopyrite?)
Commodities: minor Au
Host rock: High grade metasediments
Reference: Reported by Godfrey (1961)

Mineral Occurrence Number: 63
South of Pythagoras Lake
AGS Field-check: 1992
Northing: 6647601
Easting: 542795
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in metasediments
Reference: Reported by Godfrey (1961)

Mineral Occurrence Number: 64
(Olson *et al.*, 1994: **74M-M13**)
2 sites on Spider Lake
AGS Field-check: 1992
Northing: 6626534 6626341
Easting: 544968 544606
Minerals: Molybdenite and pyrite
Commoditie(s): U, Th, REE (radioactive site) + Mo
Host rock: Pegmatite in metasediments
Reference: Drilled and trenched by McIntyre Porcupine Mines (Thorpe, 1969)

Mineral Occurrence Number: 65
Northeast of Spider Lake
AGS Field-check: 1992
Northing: 6626921
Easting: 545175
Minerals: Molybdenite and yellow uranium staining
Commoditie(s): U, Th, REE (radioactive site)+ Mo
Host rock: Pegmatite in metasediments
Reference: Trenched and drilled by McIntyre Porcupine Mines (Thorpe, 1969)

Mineral Occurrence Number: 66
North of Spider Lake
AGS Field-check: 1992
Northing: 6627100
Easting: 544900
Minerals: Molybdenite
Commoditie(s): U, Th, REE (radioactive site)+ Mo
Host rock: Pegmatite in metasediments
Reference: Trenched by McIntyre Porcupine Mines (Thorpe, 1969)

Mineral Occurrence Number: 67
2 sites on Johnson Lake
AGS Field-check: 1992
Northing: 6626382 6626600
Easting: 553301 553190
Minerals: Pyrite
Commodities: Zn
Host rock: Gossanous metasediments
Reference: From Godfrey (1958), but galena and chalcopyrite **not found** in 1992

Mineral Occurrence Number: 68
Southeast of Spider Lake
AGS Field-check: 1992
Northing: 6626123
Easting: 544886
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in metasediments
Reference: From Godfrey (1963)

Mineral Occurrence Number: 69
South of Spider Lake
AGS Field-check: 1992
Northing: 6625520
Easting: 543750
Minerals: Pyrite, Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in metasediments
Reference: From Godfrey (1958)

Mineral Occurrence Number: 70
Southeast of Hutton Lake
AGS Field-check: 1992
Northing: 6635111
Easting: 546472
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Small granite in Basement Gneiss
Reference: From Godfrey (1958)

Mineral Occurrence Number: 71
West of Hutton Lake
AGS Field-check: 1992
Northing: 6635928
Easting: 545537
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Small granite in Basement Gneiss
Reference: From Godfrey (1958)

Mineral Occurrence Number: 72
Northwest of Hutton Lake
AGS Field-check: 1992
Northing: 6636753
Easting: 545369
Minerals: Hematite
Commodities: U, Th, REE (radioactive site)
Host rock: Brecciated Basement Gneiss
Reference: From Godfrey (1958)

Mineral Occurrence Number: 73
North of Hutton Lake
AGS Field-check: 1992
Northing: 6637546
Easting: 545191
Minerals: Magnetite (arsenopyrite reported by Godfrey, 1961, **not found** in 1992)
Commodities: Fe and V
Host rock: Brecciated pegmatite and Basement gneiss
Reference: From Godfrey (1961)

Mineral Occurrence Number: 74
(Olson *et al.*, 1994: **74M-M20**)
West of Selwyn Lake
AGS Field-check: 1992
Northing: 6649685
Easting: 528024
Minerals: Pyrite and chalcopyrite
Commodities: Cu
Host rock: Gossanous sheared amphibolite, interlayered with metasediments
Reference: Old trenches explored by James (1970)

Mineral Occurrence Number: 75
Southwest of Holmes Lake
AGS Field-check: 1992
Northing: 6639344
Easting: 543853
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in metasediments
Reference: Trenched and drilled by McIntyre Porcupine Mines (Thorpe, 1969)

Mineral Occurrence Number: 76
South of West Arm of Andrew Lake
AGS Field-check: 1992
Northing: 6627915
Easting: 541360
Minerals: Molybdenite reported by Godfrey **not found** in 1992
Commodities: Mo?
Host rock: Basement Gneiss
Reference: From Godfrey (1958)

Mineral Occurrence Number: 77
Southeast of Spider Lake
AGS Field-check: 1992
Northing: 6625430
Easting: 545750
Minerals: Pyrite
Commodities: Au, Cu
Host rock: Metasediments
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 78
Trench at Carrot Lake (South of Andrew Lake)
AGS Field-check: 1992
Northing: 6628973
Easting: 548555
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Granite and pegmatite in Basement gneiss
Reference: Trenched by Hudson's Bay Oil and Gas (Burgan, 1971); reported by Allan (1977)

Mineral Occurrence Number: 79
Trenches at Carrot Lake (south of Andrew Lake)
AGS Field-check: 1992
Northing: 6628787
Easting: 548783
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Granite and pegmatite in Basement gneiss
Reference: Trenched by Hudson's Bay Oil and Gas (Burgan, 1971); reported by Allan (1977)

Mineral Occurrence Number: 80
(Olson *et al.*, 1994: **74M-M08**)
west of Carrot Lake (S. Andrew Lake)
AGS Field-check: 1992
Northing: 6628245 6628030 6627850
Easting: 548970 549065 549120
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Basement gneiss
Reference: Trenched by Hudson's Bay Oil and Gas (Burgan, 1971); reported by Allan (1977)

Mineral Occurrence Number: 81
Near center of west arm of Andrew Lake
AGS Field-check: 1992
Northing: 6632225
Easting: 538468
Minerals: Pyrite (Molybdenite reported by Godfrey was **not found**)
Commodities: Au, Zn and Mo?
Host rock: Gossanous metasediments
Reference: Godfrey, 1966

Mineral Occurrence Number: 82
Near north end of west arm of Andrew Lake
AGS Field-check: 1992
Northing: 6635421
Easting: 539287
Minerals: Trace pyrite (Molybdenite reported by Godfrey was **not found**)
Commodities: Cu and Au
Host rock: Paragneiss in Basement gneiss
Reference: Godfrey, 1958

Mineral Occurrence Number: 83
East center of west arm of Andrew Lake
AGS Field-check: 1992
Northing: 6629991
Easting: 541342
Minerals: Molybdenite reported by Godfrey was **not found** in 1992
Commodities: Mo?
Host rock: Basement Gneiss
Reference: Godfrey, 1958

Mineral Occurrence Number: 84
Second narrows in west arm of Andrew Lake
AGS Field-check: 1992
Northing: 6630765
Easting: 544300
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Brecciated Basement Gneiss
Reference: Trenched by Aquarius Mines (Sullivan, 1974)

Mineral Occurrence Number: 85
North of Andrew Lake Lodge
AGS Field-check: 1992
Northing: 6634100
Easting: 546967
Commodities: Rare earth elements
Host rock: Quartz vein in Basement Gneiss
Reference: Godfrey, 1958

Mineral Occurrence Number: 86
Southeast of Andrew Lake
AGS Field-check: 1992
Northing: 6633925
Easting: 549644
Minerals: Pyrite and pyrrhotite
Commodities: Au?, Cu, Pb and Zn
Host rock: Metasedimentary bands in Colin Lake Granite
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 87
Southeast of Andrew Lake
AGS Field-check: 1992
Northing: 6633855
Easting: 549701
Minerals: Yellow uranium staining
Commodities: U and Th
Host rock: Pegmatite in Colin Lake Granite
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 88
On island at north end of Andrew Lake
AGS Field-check: 1992
Northing: 6647660
Easting: 551540
Minerals: Pyrite/pyrrhotite
Commodities: Cu and Cr
Host rock: Mafic granite in metasediments
Reference: Langenberg *et al.*, 1993

Mineral Occurrence Number: 89
East of Bayonet lake
Northing: 6643665
Easting: 539500
Minerals: Allanite
Host rock: Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-59-599-2.

Mineral Occurrence Number: 90
West of Ashton Lake
Northing: 6634200 6634200
Easting: 531475 531830
Minerals: Allanite
Host rock: Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-60-618-0.

Mineral Occurrence Number: 91
3 sites near Doze Lake
Northing: 6636520 6635165 6632890
Easting: 555000 553720 553760
Minerals: Tourmaline-Quartz veins
Host rock: Waugh Lake Group
Reference: Godfrey (1986b); unpublished field notes JG-58-499-6 and JG-58-1022-1.

Mineral Occurrence Number: 92
North of Pans Lake
Northing: 6628260
Easting: 537100
Minerals: Allanite
Host rock: Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-60-103-7+.

Mineral Occurrence Number: 93
South of West Arm Andrew Lake
Northing: 6627744
Easting: 541100
Minerals: Allanite
Host rock: Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-63-523-1.

Mineral Occurrence Number: 94
Southeast of Waugh Lake
Northing: 6628605
Easting: 555400
Minerals: Arsenopyrite
Host rock: Colin Lake Granite
Reference: Godfrey (1986b); unpublished field notes JG-58-1031-3+.

Mineral Occurrence Number: 95
East of Cherry Lake
Northing: 6623980
Easting: 554350
Minerals: ?
Host rock: Colin Lake Granite
Reference: Godfrey (1986b); unpublished field notes JG-58-527-1.

Mineral Occurrence Number: 96
West of Waugh Lake
Northing: 6630470
Easting: 554830
Minerals: Tourmaline-Quartz veins
Host rock: Colin Lake Granite
Reference: Godfrey (1986b); unpublished field notes JG-58-196-7.

Mineral Occurrence Number: 97
Northwest of Charles Lake
Northing: 6649100
Easting: 521000
Minerals: Graphite
Host rock: Metasediment
Reference: Godfrey (1986b); unpublished field notes JG-74-25-3.

Mineral Occurrence Number: 98
East of Spider Lake
Northing: 6626485
Easting: 546300
Minerals: Molybdenite
Host rock: Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-58-591-1.

Mineral Occurrence Number: 99
Spider Lake

Northing:	6627290	6625500	6624000
Easting:	545570	544000	543375

Minerals: Yellow uranium staining
Host rock: Metasediments
Reference: Godfrey (1986b); unpublished field notes JG-58-52-1 to 5, JG-58-595-1, JG-58-600-1 and JG-58-622-0.

Mineral Occurrence Number: 100
North of Holmes Lake
Northing: 6642800
Easting: 544850
Minerals: Radioactivity (Uranium)
Host rock: Metasediments
Reference: Godfrey (1986b); unpublished field notes JG-57-137-3+.

Mineral Occurrence Number: 101
North of Holmes Lake
Northing: 6642750
Easting: 542300
Minerals: Yellow uranium staining
Host rock: Basement Gneiss
Reference: Godfrey (1986,b); unpublished field notes JG-57-167-0.

Mineral Occurrence Number: 102
East of Bayonet Lake
Northing: 6642825
Easting: 540950
Minerals: Yellow uranium staining
Host rock: Metasediments
Reference: Godfrey (1986b); unpublished field notes JG-59-99-6.

Mineral Occurrence Number: 103
East of Bayonet Lake
Northing: 6644500
Easting: 540640
Minerals: Yellow uranium staining
Host rock: Metasediments
Reference: Godfrey (1986b); unpublished field notes JG-59-97-4+

Mineral Occurrence Number: 104
East of Bayonet Lake
Northing: 6643150
Easting: 540340
Minerals: Yellow uranium staining
Host rock:Pegmatite in Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-59-94-4.

Mineral Occurrence Number: 105
On Sonja Island in Andrew Lake
Northing: 6642400
Easting: 549650
Minerals: Yellow uranium staining
Host rock: Pegmatite
Reference: Godfrey (1986b); unpublished field notes JG-57-70-6+.

Mineral Occurrence Number: 106
East of Charles Lake
Northing: 6635500
Easting: 532400
Minerals: Yellow uranium staining
Host rock:Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-60-617-4.

Mineral Occurrence Number: 107
East of Charles Lake
Northing: 6641000
Easting: 532335
Minerals: U, Th, REE (radioactive site)
Host rock: Charles Lake Granite
Reference: Godfrey (1986b); unpublished field notes JG-60-519-1.

Mineral Occurrence Number: 108
South Bayonet Lake
Northing: 6639565
Easting: 540565
Minerals: Yellow uranium staining
Host rock:Metasediment
Reference: Godfrey (1986b); unpublished field notes JG-60-566-3.

Mineral Occurrence Number: 109
South Bayonet Lake
Northing: 6639100
Easting: 536630
Minerals: Yellow uranium staining
Host rock:Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-60-59-3.

Mineral Occurrence Number: 110
South Bayonet Lake
Northing: 6640570
Easting: 537850
Minerals: Yellow uranium staining
Host rock:Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-59-140-1.

Mineral Occurrence Number: 111
North of Spider Lake
Northing: 6626830 6627000
Easting: 544230 543450
Minerals: Yellow uranium staining
Host rock:Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-58-1082-1 and -2.

Mineral Occurrence Number: 112
West of Cherry Lake
Northing: 6622450 6622030
Easting: 546785 546965
Minerals: Yellow uranium staining
Host rock:Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-58-1111-1 and -2.

Mineral Occurrence Number: 113
5 sites between Spider and Cherry Lakes
Northing: 6627270 6626300 6625090 6623820 6624220
Easting: 548050 548330 547433 547530 548735
Minerals: Yellow uranium staining
Host rock:Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-58-114-1, 58-617+-, 58-619-+, 58-628+-.

Mineral Occurrence Number: 114
South of Andrew Lake
Northing: 6628260
Easting: 546100
Minerals: Yellow uranium staining
Host rock:Basement Gneiss
Reference: Godfrey (1986b)

Mineral Occurrence Number: 115
South of Andrew Lake
Northing: 6629300
Easting: 549050
Minerals: Yellow uranium staining
Host rock:Basement Gneiss
Reference: Godfrey (1986b)

Mineral Occurrence Number: 116
On St. Agnes Lake
Northing: 6617850
Easting: 543225
Minerals: Yellow uranium staining
Host rock:Basement Gneiss
Reference: Godfrey (1986b); unpublished field notes JG-58-1176-2.

Mineral Occurrence Number: 117
South Potts Lake
Northing: 6617950
Easting: 530000
Minerals: pyrite
Commodities: Au — with anomalous As and W
Host rock: Metasediment
Reference: Godfrey — unpublished field notes JG-61-495-2.

Mineral Occurrence Number: 118
South Potts Lake
Northing: 6617950
Easting: 529800
Minerals: Pyrite
Host rock: Metasediment
Reference: Godfrey — unpublished field notes JG-61-495-3.

Mineral Occurrence Number: 119
South Potts Lake
Northing: 6617950
Easting: 529559
Minerals: Pyrite
Host rock:Metasediment
Reference: Godfrey — unpublished field notes JG-61-495-4.

Mineral Occurrence Number: 120
Southwest Waugh Lake
Northing: 6629300
Easting: 553240
Minerals: Tourmaline and Quartz veins
Host rock: Metasediment (Waugh Lake Group)
Reference: Godfrey (1963); unpublished field notes JG-58-1027-3.

Mineral Occurrence Number: 121
Southwest Waugh Lake
Northing: 6630420
Easting: 552125
Minerals: Tourmaline
Host rock: Metasediment (Waugh Lake Group)
Reference: Godfrey (1963)

Mineral Occurrence Number: 122
Southwest Waugh Lake
Northing: 6630446
Easting: 551852
Minerals: ?
Host rock: Metasediment (Waugh Lake Group)
Reference: AGS Sample JG-57-197-3 with anomalous Zn, Ni and Cr.

Mineral Occurrence Number: 123
Southwest Waugh Lake
Northing: 6629259
Easting: 552855
Minerals: Pyrite
Host rock: Metasediment (Waugh Lake Group)
Reference: AGS Sample JG-58-1027-2 with anomalous Ni and Cr.

Mineral Occurrence Number: 124
Southwest of Doze Lake
Northing: 6635370
Easting: 553910
Minerals: Tourmaline and Quartz veins
Host rock: Metasediment (Waugh Lake Group)
Reference: Godfrey (1963)

Mineral Occurrence Number: 125
Southwest of Doze Lake
Northing: 6635370
Easting: 554263
Minerals: Tourmaline and Quartz veins
Host rock: Metasediment (Waugh Lake Group)
Reference: Godfrey (1963)

Mineral Occurrence Number: 126
Southwest of Doze Lake
Northing: 6635343
Easting: 555089
Minerals: ?
Host rock: Metasediment (Waugh Lake Group)
Reference: AGS Sample JG-60-140-2/4 with anomalous Au and Zn.

Mineral Occurrence Number: 127
East of Waugh Lake
Northing: 6630100
Easting: 555670
Minerals: ?
Commodity: Au
Host rock: Metasediment (Waugh Lake Group)
Reference: AGS Sample JG-60-147-7 with anomalous Au and Mo.

Mineral Occurrence Number: 128
Doze Lake
Northing: 6635924
Easting: 555687
Minerals: Pyrite and hematite
Commodity: Au
Host rock: Metasediment (Waugh Lake Group)
Reference: Salat *et al.* (1994)

Mineral Occurrence Number: 129
South of Doze Lake
Northing: 6636988
Easting: 555497
Minerals: Pyrite and tourmaline
Commodity: ?
Host rock: Quartz veins in metasediment (Waugh Lake Group)
Reference: Salat *et al.* (1994)

Mineral Occurrence Number: 130
Near Doze Lake
Northing: 6635145
Easting: 555461
Minerals: Pyrite?
Commodity: Au (3.2 g/t)
Host rock: Sheared metasediment (Waugh Lake Group)
Reference: Salat *et al.* (1994)

Mineral Occurrence Number: 131
Northwest of Waugh Lake
Northing: 6634500
Easting: 553160
Minerals: Pyrite and arsenopyrite
Commodity: Au
Host rock: Metasediment (Waugh Lake Group)
Reference: Salat *et al.* (1994)

Mineral Occurrence Number: 132
Waugh Lake
Northing: 6631880
Easting: 555630
Minerals: Pyrite
Commodity: Au?
Host rock: Metasediment (Waugh Lake Group)
Reference: Salat *et al.* (1994)

Mineral Occurrence Number: 133
West of Waugh Lake
Northing: 6632170
Easting: 554040
Minerals: Pyrite, arsenopyrite and tourmaline
Commodity: Au?
Host rock: Metasediment (Waugh Lake Group)
Reference: Salat *et al.* (1994)

Mineral Occurrence Number: 134
West of Waugh Lake
Northing: 6632330
Easting: 554220
Minerals: Tourmaline
Commodity: Au?
Host rock: Tourmaline/quartz veins in metasediment (Waugh Lake Group)
Reference: Salat *et al.* (1994)

Mineral Occurrence Number: 135
Northwest of Waugh Lake
Northing: 6634020
Easting: 552590
Minerals: Pyrite
Commodity: Au
Host rock: Metasediment (Waugh Lake Group)
Reference: Salat *et al.* (1994)

Mineral Occurrence Number: 136
West Waugh Lake
Northing: 6629520
Easting: 551590
Minerals: Pyrite
Commodity: ?
Host rock: Metasediment (Waugh Lake Group)
Reference: Salat *et al.* (1994)

Mineral Occurrence Number: 137 (Langenberg *et al.*, 1994, **M1**)
Central Leland Lakes
Northing: 6634850
Easting: 498750
Minerals: Pyrite
Commodity: Au?
Host rock: Sheared metasediment
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 138 (Langenberg *et al.*, 1994, **M2**)
Central Leland Lakes
Northing: 6634720
Easting: 498850
Minerals: Pyrite
Commodity: Au?
Host rock: Sheared Basement Gneiss
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 139 (Langenberg *et al.*, 1994, **M3**)
Central Leland Lakes
Northing: 6636250
Easting: 499050
Minerals: Pyrite
Commodity: Au?
Host rock: Sheared metasediment
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 140 (Langenberg *et al.*, 1994, **M4**)
Central Leland Lakes
Northing: 6637670
Easting: 499350
Minerals: Pyrite
Commodity: Au?
Host rock: Sheared metasediment
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 141
(Langenberg *et al.*, 1994, **M5**)
South Leland Lakes
Northing: 6630970
Easting: 498150
Minerals: Quartz vein
Commodity: Au?
Host rock: Sheared Basement Gneiss
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 142
(Langenberg *et al.*, 1994, **M6**)
South Leland Lakes
Northing: 6631790
Easting: 497730
Minerals: Hematite
Commodity: Au?
Host rock: Sheared metasediment
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 143
(Langenberg *et al.*, 1994, **M7**)
South Leland Lakes
Northing: 6630000
Easting: 496900
Minerals: Hematite
Commodity: Au?
Host rock: Sheared metasediment
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 144
(Olson *et al.*, 1994, **74M-M48**)
Myers Lake
AGS Field-check: 1993
Northing: 6631790
Easting: 497730
Minerals: Pyrite and pyrrhotite (?)
Commodity: Au
Host rock: Sheared Slave Granite
Reference: Williams, 1970a

Mineral Occurrence Number: 145
(Langenberg *et al.*, 1994, **M9**)
North Leland Lakes
Northing: 6643450
Easting: 499400
Minerals: Pyrite
Commodity: Cu
Host rock: Sheared metasediment
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 146
(Langenberg *et al.*, 1994, **M10**)
North Leland Lakes
Northing: 6639875
Easting: 499900
Minerals: Pyrite
Commodity: Cu
Host rock: Sheared Arch Lake Granite
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 147
(Langenberg *et al.*, 1994, **M11**)
North Leland Lakes
Northing: 6638800
Easting: 499600
Minerals: Pyrite
Commodity: Cu
Host rock: Sheared metasediment
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 148
(Langenberg *et al.*, 1994, **M12**)
South Leland Lakes
Northing: 6630400
Easting: 497350
Minerals: Pyrite
Commodity: Cu
Host rock: Sheared metasediment
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 149
(Langenberg *et al.*, 1994, **M13**)
South Leland Lakes
Northing: 6629750
Easting: 497050
Minerals: Pyrite
Commodity: Cu
Host rock: Sheared metasediment
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 150
(Langenberg *et al.*, 1994, **M14**)
South Leland Lakes
Northing: 6632950
Easting: 498200
Minerals: Magnetite
Commodity: Fe
Host rock: Sheared metasediment
Reference: Langenberg *et al.* (1994)

Mineral Occurrence Number: 151
(Olson *et al.*, 1994, **74M-M47**)
Myers Lake
Northing: 6615800
Easting: 487330
Minerals: Yellow uranium staining
Commodity: U, Th, REE (radioactive site)
Host rock: Slave Granite
Reference: Babcock and Hartley (1971)

Mineral Occurrence Number: 152
(Langenberg *et al.*, 1994, **M16**)
Myers Lake
Northing: 6614480
Easting: 485790
Minerals: ?
Commodity: U, Th, REE (radioactive site)
Host rock: Slave Granite
Reference: Babcock and Hartley (1971)

Mineral Occurrence Number: 153
(Langenberg *et al.*, 1994, **M17**)
Myers Lake
Northing: 6613960
Easting: 485060
Minerals: ?
Commodity: U, Th, REE (radioactive site)
Host rock: Slave Granite
Reference: Babcock and Hartley (1971)

Mineral Occurrence Number: 154
(Olson *et al.*, 1994: **74M-M41**)
Northeast of Fidler Point
Northing: 6555937
Easting: 535410
Minerals: Autunite (Yellow uranium staining)
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Wylie Lake Granites
Reference: Drilled, see Hale, 1970

Mineral Occurrence Number: 155
(Olson *et al.*, 1994: **74M-M49**)
Near Disappointment Lake
Northing: 6587470
Easting: 512040
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Sheared Slave Granite
Reference: Anderson (1970)

Mineral Occurrence Number: 156
(Olson *et al.*, 1994: **74M-M55**)
Near Dismal Lake
Northing: 6549250
Easting: 504600
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in metasediments
Reference: Trenched as described by Williams (1970)

Mineral Occurrence Number: 157
(Olson *et al.*, 1994: **74M-M59**)
Near Fallingsand Point
Northing: 6570000
Easting: 550660
Minerals: Radioactive Athabasca Sandstone boulders, close to outcrop
Commodities: U, Th, REE (radioactive site)
Host rock: Athabasca Group
Reference: Drilled by Uranerz (Lehnert-Thiel and Kretchmar, 1976)

Mineral Occurrence Number: 158
(Olson *et al.*, 1994: **74M-M60**)
Near Greywillow Point
Northing: 6573410
Easting: 553730
Minerals: Radioactive Athabasca Sandstone outcrop
Commodities: U, Th, REE (radioactive site)
Host rock: Athabasca Group
Reference: Drilled by Uranerz (Lehnert-Thiel and Kretchmar, 1976)

Mineral Occurrence Number: 159
(Olson *et al.*, 1994: **74M-M61**)
Near Greywillow Point
Northing: 6574660
Easting: 556620
Minerals: Radioactive Athabasca Sandstone boulders, close to outcrop
Commodities: U, Th, REE (radioactive site)
Host rock: Athabasca Group
Reference: Lehnert-Thiel and Kretchmar, 1976

Mineral Occurrence Number: 160
(Olson *et al.*, 1994: **74M-M62**)
Near Fallingsand Point
Northing: 6567210
Easting: 548170
Minerals: Radioactive Athabasca Sandstone boulders, close to outcrop
Commodities: U, Th, REE (radioactive site)
Host rock: Athabasca Group
Reference: Lehnert-Thiel *et al.*, 1978

Mineral Occurrence Number: 161
(Olson *et al.*, 1994: **74M-M63**)
Near Fallingsand Point
Northing: 6568930
Easting: 549580
Minerals: Radioactive Athabasca Sandstone boulders, close to outcrop
Commodities: U, Th, REE (radioactive site)
Host rock: Athabasca Group
Reference: Lehnert-Thiel *et al.*, 1978

Mineral Occurrence Number: 162
(Olson *et al.*, 1994: **74M-M64**)
North of Fallingsand Point
Northing: 6570900
Easting: 551330
Minerals: Radioactive Athabasca Sandstone boulders, close to outcrop
Commodities: U, Th, REE (radioactive site)
Host rock: Athabasca Group
Reference: Lehnert-Thiel *et al.*, 1978

Mineral Occurrence Number: 163
(Olson *et al.*, 1994: **74M-M65**)
Near Greywillow Point
Northing: 6571960
Easting: 553610
Minerals: Radioactive Athabasca Sandstone boulders, close to outcrop
Commodities: U, Th, REE (radioactive site)
Host rock: Athabasca Group
Reference: Lehnert-Thiel *et al.*, 1978

Mineral Occurrence Number: 164
(Olson *et al.*, 1994: **74M-M66**)
Near Fallingsand Point
Northing: 6573650
Easting: 554900
Minerals: Radioactive Athabasca Sandstone boulders, close to outcrop
Commodities: U, Th, REE (radioactive site)
Host rock: Athabasca Group
Reference: Lehnert-Thiel *et al.*, 1978

Mineral Occurrence Number: 165
(Olson *et al.*, 1994: **74M-M78**)
Near Turtle Lake
Northing: 6585630
Easting: 523180
Minerals: Molybdenite and yellow staining
Commodities: U, Th, REE (radioactive site)
Host rock: Quartz veins in metasediments
Reference: C & E Exploration Ltd. (1976)

Mineral Occurrence Number: 166
(Olson *et al.*, 1994: **74M-M88**)
Near Saskatchewan border
Northing: 6580410
Easting: 556220
Minerals: Radioactive Athabasca Sandstone boulders and crystalline boulders
Commodities: U, Th, REE (radioactive site)
Host rock: Athabasca Group
Reference: Kilby and Walker, 1979

Mineral Occurrence Number: 167
(Olson *et al.*, 1994: **74M-M90**)
Near Burstall Lake
Northing: 6589680
Easting: 551100
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Wylie Lake Granite
Reference: Allan, 1978

Mineral Occurrence Number: 168
(Olson *et al.*, 1994: **74L-M01**)
Near Fort Chipewyan
Northing: 6518000
Easting: 503200
Minerals: Autunite (Yellow uranium staining)
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Wylie Lake Granite
Reference: Hale, 1970

Mineral Occurrence Number: 169
(Olson *et al.*, 1994: **74L-M02**)
East end John Barr Lake
Northing: 6536870
Easting: 500600
Minerals: Malachite, pyrite and graphite
Commodities: Cu
Host rock: Gossanous metasediments
Reference: Turner, 1969

Mineral Occurrence Number: 170
(Olson *et al.*, 1994: **74L-M03**)
West of Loutit Lake
Northing: 6537440
Easting: 506200
Minerals: Yellow uranium staining
Commodities: U, Th, REE (radioactive site)
Host rock: Sheared metasediments
Reference: Turner, 1969

Mineral Occurrence Number: 171
(Olson *et al.*, 1994: **74L-M04**)
East of Loutit Lake
Northing: 6536510
Easting: 509230
Minerals: Monazite?
Commodities: U, Th, REE (radioactive site)
Host rock: Pegmatite in Basement Gneiss
Reference: Turner, 1969

Mineral Occurrence Number: 172
(Olson *et al.*, 1994: **74L-M05**)
East of Loutit Lake
Northing: 6536920
Easting: 511530
Minerals: Chalcopyrite, Malachite
Commodities: U, Th, REE (radioactive site)
Host rock: Gossanous sheared metasediments
Reference: Turner, 1969

Mineral Occurrence Number: 173
(Olson *et al.*, 1994: **74L-M06**)
Near Ft. Chipewyan
Northing: 6517980
Easting: 496180
Minerals: Chalcopyrite
Commodities: Cu?
Host rock: Basement Gneiss
Reference: Ellison, 1969

Mineral Occurrence Number: 174
(Olson *et al.*, 1994: **74L-M07**)
North of Sand Point
Northing: 6538830
Easting: 517400
Minerals: Uraniferous boulders (close to outcrop below lake)
Commodities: U, Th, REE (radioactive site)
Host rock: Athabasca Group
Reference: MacMahon (1977).

Mineral Occurrence Number: 175
(Olson *et al.*, 1994: **74L-M08**)
North of Shelter Point
Northing: 6522470
Easting: 509550
Minerals: Uraniferous boulders (close to outcrop below lake)
Commodities: U, Th, REE (radioactive site)
Host rock: Athabasca Group
Reference: MacMahon (1977).

Mineral Occurrence Number: 176
(Olson *et al.*, 1994: **74L-M11**)
Near Ft. Chipewyan
Northing: 6517450
Easting: 505430
Minerals: Pyrite
Commodities: ?
Host rock: Metasediments
Reference: Brown and Slack (1980)

Mineral Occurrence Number: 177
(Olson *et al.*, 1994: **74L-M19**)
East of Archer Lake
Northing: 6463800
Easting: 542300
Minerals: Uraniferous boulder
Commodities: U
Host rock: Athabasca Group
Reference: McWilliams and Sawyer (1976)

Mineral Occurrence Number: 178
(Olson *et al.*, 1994: **74L-M38**)
On Richardson River
Northing: 6434070
Easting: 504010
Minerals: Graphite
Commodities: ?
Host rock: Sheared metasediments and granites
Reference: Drilled by Norcen, see McWilliams *et al.* (1979)

Mineral Occurrence Number: 179
(Olson *et al.*, 1994: **74L-M78**)
South shore Lake Athabasca near Saskatchewan border
Northing: 6534360
Easting: 556620
Minerals: Graphite, Hematite
Commodities: Au (2.7 g/t), Ag, Co, Ni, U
Host rock: Regolith (weathered zone) in migmatitic granite below Athabasca Group at 890 m depth
Reference: Drilled by Golden Eagle Oil and Gas, see Nelson (1978)

Mineral Occurrence Number: 180
(Olson *et al.*, 1994: **74L-M79**)
East of Stone Point, South shore Lake Athabasca
Northing: 6522920
Easting: 541440
Minerals: Galena, sphalerite, chalcopyrite, pyrite
Commodities: Lead, zinc, uranium
Host rock: Athabasca Group
Reference: Drilled by Golden Eagle Oil and Gas, see Nelson (1978)

Mineral Occurrence Number: 181
Three sites near Maguerite River
Northing: 6394335 6393660 6393640
Easting: 524190 523800 523700
Minerals: pyrite and pyrrhotite
Commodities: Cu, Cr
Host rock: Sheared mafic schists and granites
Reference: Dufresne *et al.*, 1994

Mineral Occurrence Number: 182
Marguerite River area
Northing: 6396660
Easting: 521887
Minerals: pyrite?
Commodities: Cr
Host rock: mylonitic granites
Reference: Dufresne *et al.*, 1994

Mineral Occurrence Number: 183
Marguerite River area (North of Johnson Lake)
Northing: 6393300
Easting: 538850
Minerals: pyrite
Commodities: Cu
Host rock: Megacrystic granite
Reference: Dufresne *et al.*, 1994

Mineral Occurrence Number: 184
Marguerite River area
Northing: 6404585 6404390 6404750
Easting: 526170 526080 525130
Minerals: Hematite and yellow uranium staining
Commodities: Th, Rare earth elements
Host rock: Megacrystic granite
Reference: Dufresne *et al.*, 1994

Mineral Occurrence Number: 185
Marguerite River area
Northing: 6402950
Easting: 526520
Minerals: Yellow uranium staining
Commodities: Th, Rare earth elements
Host rock: Megacrystic granite
Reference: Dufresne *et al.*, 1994

Mineral Occurrence Number: 186
Whaleback Lake
Northing: 6617450 6617475
Easting: 534595 534460
Minerals: Pyrite, pyrrhotite, chalcopyrite and galena
Commodities: Cu, Pb
Host rock: Sheared Basement Gneiss and metasediments
Reference: McDonough, *in press*

Mineral Occurrence Number: 187
Florence Lake
Northing: 6570200
Easting: 539000
Minerals: Pyrite
Commodities: ?
Host rock: Sheared metasediments
Reference: McDonough, *in press*

Mineral Occurrence Number: 188
Flett Lake
Northing: 6536960
Easting: 499590
Minerals: Pyrite
Commodities: ?
Host rock: Sheared metasediments
Reference: McDonough, *in press*

Mineral Occurrence Number: 189
Dore Lake
Northing: 6516690
Easting: 498090
Minerals: Pyrite
Commodities: ?
Host rock: Sheared Basement Gneiss
Reference: McDonough, *in press*

Mineral Occurrence Number: 190
Stony Islands
Northing: 6605100 6605200 6605400
Easting: 475900 476120 476100
Minerals: Chalcopyrite and marcasite
Commodities: Cu
Host rock: Devonian carbonates
Reference: Godfrey, 1973