EVALUATION OF THE ECONOMIC MINERAL POTENTIAL IN THE ANDREW LAKE-CHARLES LAKE AREA OF NORTHEAST ALBERTA

Canada-Alberta MDA project M92-04-07

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EXECUTIVE SUMMARY

The Alberta Geological Survey (AGS) assessed 88 mineral occurrences in the Andrew Lake-Charles Lake area of northeastern Alberta as part of the Canada-Alberta Partnership Agreement on Mineral Development. These mineral occurrences are related to gold, uranium, base metals, iron and rare earth elements. A complete database has been gathered which contains field observations, analytical results and a compilation of assessment reports archived by the Alberta Geological Survey. Groups of mineral occurrences, which hold significant mineralization are described in detail as mineral showings. The description of these 17 mineral showings provides details of past exploration, local geology and mineralization.

The 1992 investigation demonstrated the gold and base metal potential of the metasedimentary and metavolcanic belts of northeast Alberta. Geochemical analysis of grab samples collected on deeply weathered sulfidic horizons in the Potts Lake, Waugh Lake and Pythagoras Lake areas have indicated anomalous values of up to 770 parts per billion (ppb) gold. A deep trench at the north end of Selwyn Lake showed structures and textures similar to volcanogenic massive sulfide deposits. Geochemical analysis of samples from the trench yielded values of 294 parts per million (ppm) copper with some gold. Previous exploration work on the area had reported 0.1% copper. The deeply weathered rock exposures found at the location of other mineral occurrences hosted in the metasedimentary-metavolcanic belts, which contain elevated base metal values, are thought to represent the same geological setting as the one observed at Selwyn Lake

Quartz-tourmaline veins intruding granite and metasediments(east of Andrew Lake) are the second geological environment shown to be favorable for gold mineralization. Geochemical analysis of grab samples have returned anomalous gold values of up to 147 ppb, in association with elevated arsenic, molybdenum and tungsten values. These results suggest the possibility for Archean lode gold deposits similar to some Abitibi belt gold deposits.

Uranium showings account for nearly half of the showings described in this report. The majority of the uranium mineralization is hosted in pegmatite and related granitoids. Their average grades are sub-economic, and it is unlikely that pegmatite hosted occurrences hold much potential in present day market conditions. However, the uranium showing located at the West Arm of Andrew Lake has molybdenum values of up to 0.15%, associated with 0.25%.uranium. At this showing, Godfrey (1958) reported values of 1.40% molybdenum. Along with numerous molybdenite occurrences in the area, these values confirm the potential for molybdenum deposits in the high grade metamorphic terrains. Some radioactive occurrences are associated with anomalous amounts of thorium and rare earth elements. In the South Potts Lake showing, a sample returned a content of over 1% of the rare earth elements lanthanum, cerium, neodymium and samarium combined.

Two intriguing iron-rich pegmatitic breccias have been discovered in the area. They contain 25 to 29% iron expressed as magnetite and hematite, which form the breccia matrix. Vanadium values up to 381 ppm are associated with the high iron values.

The results obtained from the 1992 AGS investigation indicate that further study of the area is warranted. Other metasedimentary belts in northeast Alberta should receive closer examination in order to complete the mineral inventory. It is recommended that field examination be performed in areas such as the Ashton Lake, Potts Lake, Alexander Lake, Split Lake and Swinnerton Lake metasedimentary belts. Lithogeochemistry on samples stored by the Alberta Geological Survey could be used in conjunction with the field program. Airborne geophysics could also be considered, if funding is available. Geophysics could provide a depth investigation of the metasediment belts and help in the investigation of the numerous shear zones present in the area. These shear zones are considered to have good potential for gold mineralization, but are relatively unexplored.

INTRODUCTION

Much of the potential for significant metallic mineral resources in Alberta has not yet been 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 Alberta MDA) seeks to redress this deficiency and broaden Alberta's economic base. This report forms part of a project, that is jointly funded by this Alberta MDA and by the Alberta Research Council and describes both previously reported and new metallic mineral occurrences in the Andrew Lake-Charles Lake area.

LOCATION AND ACCESS

The project area is located in northeastern Alberta in NTS mapsheets 74M/9,10,15 and 16 (see Figure 1, in pocket). Regularly scheduled flights are available to Fort Smith, Northwest Territories, from which float planes give access to the project area.

PREVIOUS WORK

In 1957, the Alberta Research Council began systematic mapping of the Precambrian Shield in northeastern Alberta, and published district maps on a 1:31,680 scale (Godfrey, 1961, 1963, 1966). A 1:250,000 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. Peikert (1961, 1963) studied the petrogenesis of certain granitoid rocks in the Colin Lake area. Watanabe (1961) described metasediments of the Waugh Lake area and later (1965), cataclastic rocks of the Charles Lake area.

Langenberg and Nielsen (1982) prepared a detailed account of the metamorphic history of the area. Another publication (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.

The present MDA program resulted in two preliminary reports of the area by the Geological Survey of Canada one on the geology (McDonough et al., 1993) and the other on the metamorphic history (Grover et al., 1993).

GENERAL GEOLOGY

The Precambrian Shield of northeastern Alberta consists of massive to foliated granitoids, granite gneisses and metasediments (Figure 2). This Shield forms part of the Churchill Structural Province and is situated in the Athabasca Mobile Belt (Burwash and Culbert, 1976). This mobile belt has been subdivided into Rae Craton, Taltson Magmatic Arc and Buffalo Head Accreted Crust by Ross et al. (1991), see also McDonough et al. (1993). The geological history of the Athabasca Mobile Belt involves sedimentation, deformation, metamorphism and ultrametamorphism, accompanied by remobilization, anatexis and intrusion. These processes have operated during different orogenic periods, resulting in the formation of complex polymetamorphic rocks. Field contact relationships and bulk compositions suggest that the migmatitic granite gneisses and high-grade metasediments were parent materials for several of the granitoid rocks during the process of partial melting (Goff et al., 1986). Consequently, the granitoids may represent Archean basement remobilized during the Aphebian.

Geochronological studies of rocks from the area (Baadsgaard and Godfrey, 1967, 1972) provide further evidence of multiple orogenic cycles in northeastern Alberta. This latter work deals with the Charles Lake, Andrew Lake and Colin Lake districts and identifies two distinct orogenic cycles. Rb-Sr

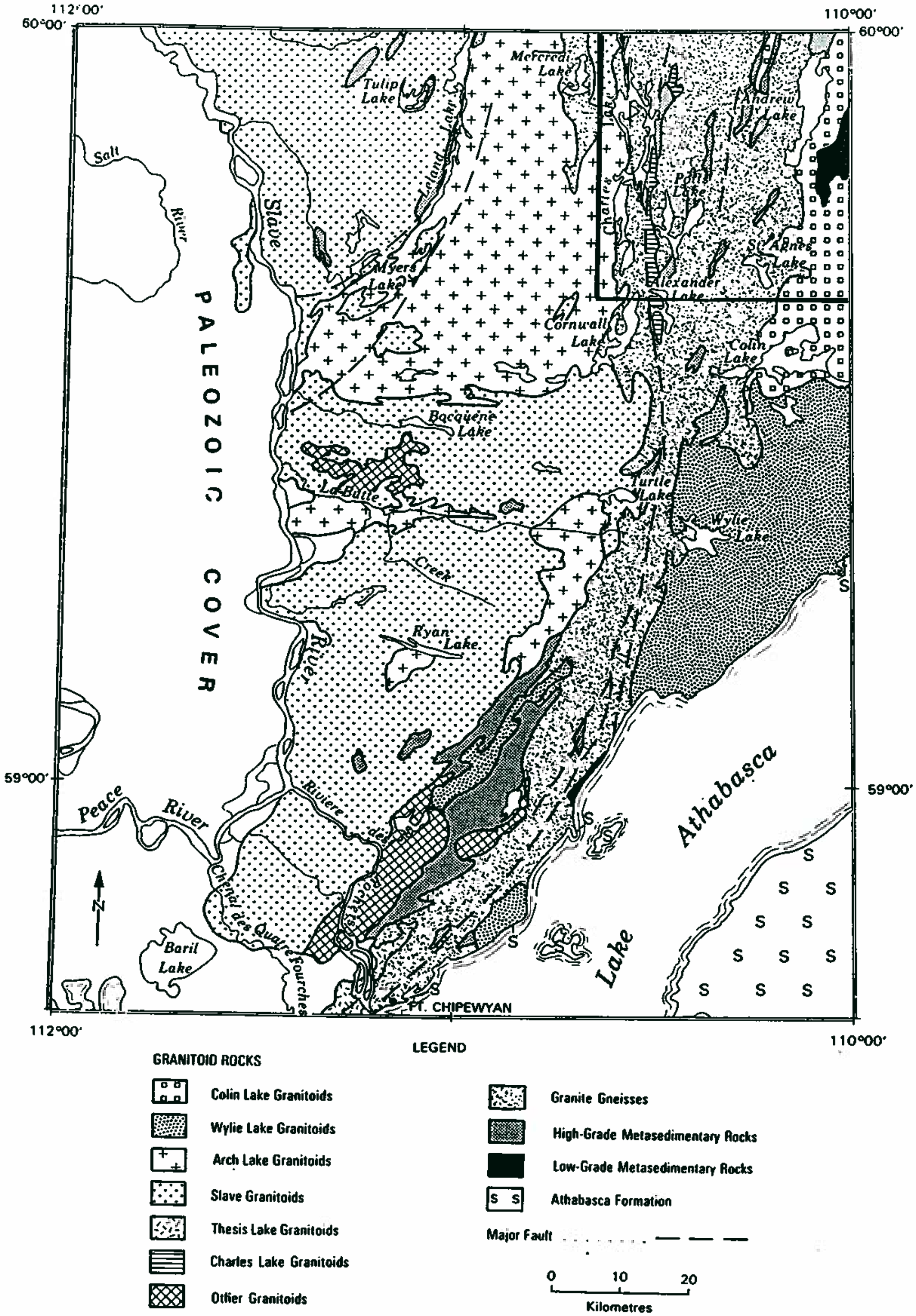

Figure 2. Simplified geological map of the Precambrian Shield of northeastern Alberta, north of Lake Athabasca.
From Langenberg (1983).

whole rock isochrons on pegmatites within granitoids, gneisses and metasediments in the Charles Lake area give ages of about 2500 Ma. Thus, they are considered part of an Archean basement gneiss complex. The low initial 87Sr/86Sr ratio (0.7030) of the pegmatites points to the presence of I-type granitoids. This initial Sr ratio is also within the limits for their derivation from mantle like source material.

Rb and Sr determinations on Colin Lake Granitoids plot on a well-defined isochron indicating an age of 1983 ± 6 Ma. A high initial 87Sr/86Sr ratio of 0.7083 ± 0.0002 indicates derivation of these rocks by anatexis of pre-existing sedimentary rocks (Baadsgaard and Godfrey, 1972, p.870). The immediate parent materials for the Colin Lake Granitoids are probably the nearby Archean granite gneisses and high-grade metasedimentary rocks. The Slave Granitoids give an age of 1938 ± 29 Ma (Nielsen et al., 1981). Most other granitoids (Wylie Lake, Arch Lake, Thesis Lake and minor Granitoids) also show Aphebian ages (Baadsgaard, pers. comm., 1982).

K-Ar determinations on muscovite, biotite and hornblende give a narrow distribution of ages. The average age of mica from many rock units is 1790 ± 40 Ma, which indicates that the K-Ar dates for all rocks within the region were effectively reset as a consequence of the Hudsonian orogeny. Thus, two Precambrian orogenic cycles are firmly established for the Shield rocks of northeastern Alberta. Two distinct cycles of metamorphism (Langenberg and Nielsen, 1982) represent these cycles. The Archean cycle shows high-pressure granulite facies conditions (P=750 MPa, T=900°C). The Aphebian 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. The dating of these cycles has been confirmed by Sm-Nd geochronolgy (Burwash et al. ,1985).

Low-grade metasedimentary rocks, accompanied by metavolcanics in the Waugh Lake area, show primary sedimentary and volcanic structures respectively (Watanabe, 1961). An unconformity is assumed between the low-grade metasedimentary rocks and the Archean granite gneisses with high-grade metasedimentary rocks. The age relationship between the low-grade metasedimentary rocks and the nearby Colin Lake Granitoids is uncertain. Peikert (1961, 1963) postulates that the Colin Lake Granitoids formed by anatexis of the low-grade metasedimentary rocks. This hypothesis, however, seems improbable, because temperatures in the greenschist facies are too low for partial melting to occur (Koster and Baadsgaard, 1970). Therefore, the high-grade metasedimentary rocks and granite gneisses are more likely parent materials for these and other nearby granitoid bodies. The contact relationships between the Waugh Lake metasediments and the Colin Lake granitoids appears to be intrusive (Watanabe, 1961; Koster, 1961). Koster (1961, p.18) clearly describes these intrusive relationships just east of the Alberta-Saskatchewan border, where the Waugh Lake metasediments form inclusions up to 25 cm long in the granitoids with sharp contacts and corroded outlines. A K-Ar age of 1760 Ma for biotite from the low-grade prograde greenschist facies metasediments (Baadsgaard and Godfrey, 1972) correlates with the retrograde greenschist facies found elsewhere in the area.

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 suggest 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., 1993). Extensive brecciation along most faults indicates still younger brittle fault movements at higher crustal levels.

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

METHODOLOGY

TARGET AREA SELECTION

The first phase of the present investigation involved the gathering of all available information regarding the mineral occurrences within the selected areas of northeastern Alberta (NTS 74 M/16 and parts of 74 M/9, 10 and 15). The starting point was the compilation done by Godfrey (1986b) of the mineral showings of the Precambrian Shield, which is based upon observations made in the course of mapping the area. Detailed information and location are provided by the large scale (1:31,680) geological maps of the district and the accompanying reports. Additional data about the district is found in Godfrey's (1958) preliminary report on the mineralization in the Andrew, Waugh and Johnson Lakes areas.

Interest in uranium deposits at the time of the mapping led the field parties to record with geiger counters, any elevated radioactivity spots and to pay particular attention to rock stains. It resulted in a large number of radioactive occurrences plotted on the geological maps. In the late 1960's and the 1970's, many of the radioactive occurrences were evaluated by private companies and all the area was surveyed by radiometric geophysical methods. This activity also resulted in the submission of assessment reports by the different companies which had acquired permits, leases or claims. The assessment reports provided additional information for the present gathering of data.

The primary criteria for the selection of target areas were the availability of documentation concerning the mineral occurrences and logistics of access. Also taken into consideration was the fact that past exploration by mining companies had been biased towards uranium. Areas containing belts of metasediments and extensive shear zones, judged favorable for base or precious metal mineralization, received less attention in the past. Consequently, bands of rusty metasediments and major shear zones in the proximity of known mineral occurrences were also investigated.

LOGISTICS

There is no road or major river system allowing easy access to the far northeastern corner of Alberta. Thanks to the many scattered lakes typical of the Canadian Shield, float planes provide good access to most part of the area. The area consists of gentle rolling hills covered with dense spruce forest and thick alder underbrush. The topography is more accentuated to the east with steeper hills and many cliffs. Muskeg and swamps are very extensive throughout. Away from lake shores, travel over land is difficult because of a forest fire, which swept across the area from the Saskatchewan border to the Slave River in 1979. Burns, deadfall and new growth make progress on foot slow; however, removal of moss and humus by the fire offers excellent rock exposures in some localities.

Charles Lake, Potts Lake, Cherry Lake, Waugh Lake and Andrew Lake were chosen as the best centrally located lakes with respect to selected mineral occurrences. Tent camps were established on their shores with the exception of Andrew Lake, where the fishing lodge was used. The owner of the lodge, Mr Glen Wettlaufer was contracted to fly the field party to remote medium-sized lakes with his Cessna 180 float plane. His services were used in the last part of the field program.

The field party consisted of a two to three men crew, with daily crew deployment by foot or using a 12 ft. Zodiac inflatable boat. Camp equipment, men and supplies were flown-in from Fort Smith, N.W.T. by Loon Air Ltd. and the field season extended from August 3 to September 11. Only two days were lost due to inclement weather.

LOCATION

The problem of location on the ground represented a critical issue as the main duty of the field party was to relocate and examine reported mineral occurrences. Most of the mineral occurrences have been reported on 1:31,380 scale geological maps. In addition, three occurrences were taken directly from the 1:250,000 scale compilation map of Godfrey (1986b), which were not reported on the detailed maps. It was assumed that the location of the occurrences was given with a precision of 100 m or better. Assessment reports usually show locations of mineralization and exploration works at even larger scale and provide accurate location. Success in relocation of the known mineral occurrences was good.

Nevertheless approximately 20% of occurrences could not be found, in spite of searches extending 250m around the expected location.

The field party used a hand-held Magellan Global Positioning System (GPS). Unfortunately, the instrument only displayed the location coordinates in longitudes and latitudes and not in UTM during the first half of the project. After the proper software was installed and locations could be recorded in UTM coordinates, the instrument proved to be very useful in relocating reported mineral occurrences. In the intervening period, positioning was done by means of topogaphical maps at 1:50,000 scale, geological maps at 1:31,380 scale and air photos at 1:60,000 scale. The accuracy is very good near recognizable features such as coves, bays, promontories, creeks or ponds. Accuracy and precision deteriorate very rapidly over featureless terrain such as broad forested hills of low relief, swamp areas, sand flats or even long straight lake shores. In such circumstances, triangulation was necessary.

DATABASE

All data collected were entered on a laptop computer using the Fieldlog system, that was obtained from the Geological Survey of Canada (Brodaric, 1992). A project definition form, which defines the database, was set up at the start of the field season. The database structure was regularly updated based on the type of data collected. Geochemical data was imported into Fieldlog using output from spreadsheet programs, once this data became available.

Fieldlog was linked with AutoCAD (Release 12) to provide the geologist with the ability to construct complex geological maps in the field and office. Map data (such as hydrography, topography, areas mapped as certain lithological unit, faults, etc.) was entered using a high resolution optical scanner and by manual digitization. Fieldlog can also create files compatible with a relational database (dBASE). These files could then be used in the Minerals Information System (MIS), that is presently being built at AGS.

Integrating cartographic and database software does not address complex spatial analysis problems that are in the realm of a Geographical Information System (GIS). However, it provides an inexpensive, reliable and efficient means of organizing, storing, analyzing and displaying geological data, in addition to facilitating the use of the data in more powerful software packages or by other users.

SAMPLES AND ANALYSES

The samples collected during the 1992 program consisted of 1 to 2 kilogram grab samples taken from surface outcrops or old trenches with geological pick and sometimes chisel. All samples collected in 1992 are shown on Figure 1 (in pocket), except the samples from the Waugh Lake area, which are shown in Figure 3. Samples were packed in plastic bags and numbered. Once in Edmonton, the samples were split and one portion was sent for analysis to 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 with atomic absorption emission spectrometry finish (FA/AA) was used to determine the gold content, using a 20 gram aliquot.

A portion of the samples taken from radioactive outcrops (outcrops with readings of more than 2,000 counts per second on the total count channel of an URTEC - UG 35 spectrometer) 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 were selected from the Alberta Geological Survey's sample collection (these samples were collected by Dr. J.D. Godfrey in the 50's and 60's and are prefixed by JG) and analyzed by ICP and FA/AA.

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.

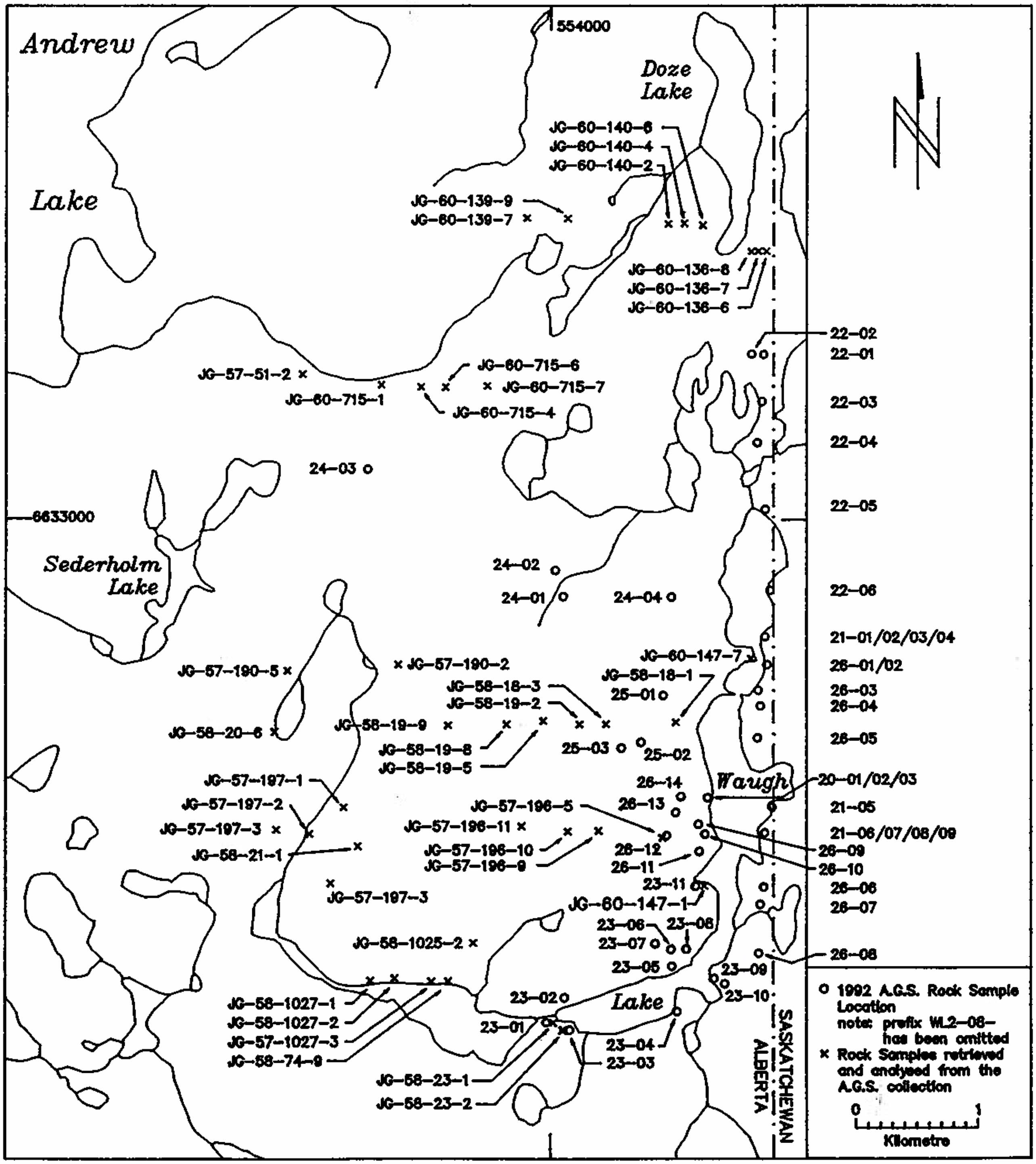

Figure 3. Map of Sample Locations in the Waugh Lake Area.

MINERAL OCCURRENCES

A total of 127 mineral occurrences are documented in this report (Figure 1 and Appendices). They include 88 mineral occurrences (M.O. numbers 1 to 88, Appendix 1) that were assessed by the 1992 AGS field party. Of these 88 occurrences, 43 contain U-Th-REE, 19 contain anomalously high Au content, 15 have anomalous amounts of base metals (Cu, Zn, Pb, Ni, Cr) and 11 are either sulfides or tourmaline veins. The other 39 mineral occurrences (M.O. numbers 89 to 127, Appendix 2) consist of occurrences compiled by Godfrey (1986b), that were not examined in the field in 1992 (M.O. numbers 89 to 120), in addition to samples from the AGS collection, that were analyzed for this report and that showed anomalous metalliferous contents (M.O. numbers 121 to 127).

In addition, 22 mineral occurrences, that have no further information, were transferred to Figure 1 from Godfrey's (1986b) compilation. These occurrences, which include 15 graphite, 5 radioactive and 2 tourmaline localities, do not have a number and are not reported in the appendices. They are indicated on Figure 1 by their commodity symbol.

DEFINITION

The Webster Dictionary defines a mineral occurrence as "the presence of a natural form or material at a particular place". Definition of a mineral showing on the other hand is to be found only in specialized references such as the Bureau of Mines' (U.S. Department of The Interior) Dictionary of Mining, Mineral, and Related Terms (1968). Showing is being defined there as " surface occurrence of mineral", therefore there is little difference in meaning between showing and occurrence. However, it is proposed that a distinction of meaning be introduced in this report, and that showing imply an occurrence of some merit which has not yet become a prospect ("a non-producing mining property under development" according to U.S. Bureau of Mines).

For the purpose of this report, a mineral occurrence is elevated to a showing if it meets at least one of the following criteria:

-the occurrence contains significant, i.e. economical to sub-economical, concentrations of base or precious metals or radioactive substances.

-the occurrence shows a radioactivity level above a threshold of 2,000 counts per second (Total Count channel) on the URTEC - UG 135 spectrometer used by the 1992 field party,

Similar showings in a relatively small area are grouped in one showing. Showings are considered similar when they show a similar geological and structural setting or show identical mineral association (paragenesis).

Based on these criteria 17 mineral showings were defined, which form a separate section of this report, containing complete description of the geology, structural setting, mineralization and exploration work performed in the area for each showing. The showings are discussed in sections of gold, copper, uranium and rare earth elements. They are given informal names referring to their general location, and their reports clearly list the mineral occurrences included in the area of the related showing.

DESCRIPTION

All 127 mineral occurrences are shown on figure 1 and are summarized in Appendix 1. This list includes both confirmed and previously reported mineral occurrences that could not be relocated or did not receive any reported follow-up work. A complete tabulation of all mineral occurrences, including station numbers, sample numbers, UTM coordinates and a short description, can be obtained from the authors on request.

Location

The location of a mineral occurrence is based upon the 1:50,000 scale NTS topographic system and uses the UTM coordinates. Although ground investigation failed to relocate some reported occurrences, the location indicated on the reference material for that particular occurrence is given a Mineral Occurrence number and a station number, indicating that the location and immediate area has been searched and geological observations have been made. Failure to relocate mineralization does not invalidate the existence of the mineral occurrence; thisoccurrence must remain for future reference. However, it cannot be given the status of mineral showing. The location has been sampled in the belief that the previously reported mineralization could be expressed in the lithogeochemistry of its immediate environment.

The 1992 program consisted of spot checks, traverses and comb-like searches of known or reported mineral occurrences. It also included some investigation of favorable rock-units, mostly rusty metasediments, which resulted in the discovery of new mineral occurrences. In every instance, the point of observation received a station number. Where a sample was collected, it also received a number. Both types of numbering were based on the month and the day the observation was conducted, but were kept independent of each other and in sequence in order to avoid any gap and subsequent confusion.

Each mineral occurrence visited in the field, has a corresponding station number with its UTM coordinates. If the mineral occurrence encompasses a large area and several observation points were made, several station numbers were attached to that particular mineral occurrence. They are all listed in the Mineral Occurrence Reports (Appendix 1).

History of exploration

This section provides for a quick overview of the discovery of the mineral occurrence and of the extent of exploration that the occurrence may have received. The information is drawn from the assessment reports filed at the Alberta Geological Survey, and maps and publications of the Alberta Research Council.

Geological Setting

Under this heading, the general geology of the area surrounding the mineral occurrence or showing is described . The main rock unit as defined by recent studies done on the Canadian Shield of Northeastern Alberta (Godfrey, 1986a) is indicated along with its most probable age.

Main lithologies

This section describes the main rock types encountered in the area of the mineral occurrence. It attempts to give the mineral composition, texture and structure of the rock outcrop and its variation. The description relies largely on observations made in the course of the 1992 investigation. Where possible, it integrates detailed description provided by previous work, especially information obtained from diamond drilling.

Structure

Description of structural features depend for the most part on observations made in the field during the 1992 investigation. Additional information on structural features found in assessment reports is sometimes also presented.

Mineralization

A detailed and complete description of the mineralization includes recent observations combined with information provided by assessment reports. Evaluation of grade and size is also extracted from the different sources and the most significant results are presented.

Alteration

Efforts have been made to describe the addition of alteration minerals to the country rocks. Particular attention was paid to the variation in texture or recrystallization of the host rock, indicative of a geological event associated with mineralization. Information from previous work is taken into consideration, whenever possible.

Geochemical data

A thorough presentation of the geochemical data concerning the mineral occurrence provides the necessary information to evaluate the elevated background, intensity and extent of the mineralization. All relevant information found in assessment reports is shown in table form. From the 1992 sampling of outcrops, pits or trenches in the vicinity of the mineral occurrence, the most representative geochemical data are included in this section to show elemental associations often not recognized in the past. Complete data listings of the different methods of analysis can be obtained from the authors on request.

Geophysical data

An account of the geophysical exploration provides useful information as to the extent, quality and relevance of the different surveys. Available data on instrumentation used for the surveys, enable one to judge and compare the various methods and the data acquisition. Unfortunately the raw geophysical data are rarely provided. During the 1992 program, a differentiating spectrometer (URTEC UG-135 model) was used for radioactive occurrences; the results of these surveys are reported in Table form.

Classification

In this report, a classification has been adopted in line with the most accepted practice of reporting mineral resources (Table 1). The first level of subdivision is based on commodity and commodity association. Gold and uranium occurrences are further subdivided based on host rock for gold and associated elements for uranium.

Assessment reports

This section lists relevant unpublished assessment reports submitted to the Alberta government and filed at the Alberta Geological Survey. It should be noted that references in the text to published reports or maps are grouped in the list of references provided at the end of the report.

Table 1. Classification of Mineral Occurrences in Northeastern Alberta.

GOLD (+ Cu + W + Mo)	1) in sulfide-rich metasediments / metavolcanics - stratiformal / shear related 2) in quartz - tourmaline veins associated with granitic intrusions and metasediments .
URANIUM (+/- Th)	in Pegmatites and related granite-gneiss / often associated with fractures or mylonites.
URANIUM (+/- Mo , Pb)	in pegmatite and granite, intruding or interlayered with granite gneis or metasediments / often shear related.
REE, Th	in pegmatite.
MOLYBDENUM	in granite or pegmatite
COPPER - LEAD -ZINC	in metasediments / metavolcanics - stratiformal.
NICKEL - CHROMIUM	in disseminated Sulfides within mafic (?) rock-units.
IRON - VANADIUM	in magnetite - hematite pegmatitic breccia.

Other mineral occurrences:

ALLANITE

ARSENOPYRITE

GRAPHITE

TOURMALINE-QUARTZ VEINS

SULFIDES

GOLD SHOWINGS

SOUTH POTTS LAKE — Mineral occurrence number (M.O. no.): 17

Location

300 m west from shore on south end of Potts Lake (NTS 74M/09).

History of exploration

Godfrey (1966) reports "concentrations of massive arsenopyrite were present in a 3-foot wide zone within a siliceous, chloritic metasedimentary band" at this location. No futher investigation is reported; however during relocation and checking of mineral occurrences in summer 1992, fairly recent (3 to 4 year old?) red flagging in a grid pattern over a small area was observed. Other than a small, shallow pit, no trace of physical work was noted.

Geological setting

The area is underlain by a 500 to 700m wide belt of high-grade metasediments consisting mainly of pure and impure quartzite, minor biotite-sericite schist and a sliver of amphibolite (Figure 4). The metasediments form part of the Archean basement complex and are of probable Archean age.

Main lithologies

Fifty percent of the outcrops consist of rusty, refolded quartz biotite schist and green chloritic schist. The remaining outcrops are made of grey-pink biotite gneiss and porphyroblastic gneiss.

Structure

The metasediment layers are tightly folded with a strong foliation striking N012°E and dipping 52°E. Many small scale fractures run parallel to the foliation. A narrow linear gully, probably indicating a fault, cuts across the area and trends N025°E.

Mineralization

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 enclosing angular fragments of chloritic schist, in contact to the west with a 35 cm wide very ferruginous chlorite schist. On both sides of this zone, the metasediments show a strong Fe-enrichment over 2 m (Figure 5).

Sulfides, mostly arsenopyrite, pyrite and marcasite (A. Skupinski, internal report), are found in centimeter-thick blebs and along quartz-chlorite shears within the breccia zone, where they can constitute locally 2 to 3% of the rock. Outside the breccia zone and over a 20 by 25m area, minor pyrite and arsenopyrite (less than 1%) are disseminated throughout the metasediments.

Alteration

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

Geochemical data

Three grab samples were collected over the mineralized areas. Sample WL-08-12-03 was taken in the breccia zone proper (see Figure 5). Sample WL-08-12-02 was taken 25 m west of the breccia zone in quartz-biotite sulfidic schist. Sample WL-08-12-04 was taken 20m south of the breccia zone in brecciated quartz feldspar amphibolite.

Sample (WL-08-11-03), collected 250 m north of the mineralized zone from a band of pyritic biotite schist rich in K-feldspar porphyroblasts, has returned slightly elevated values in nickel and gold. The most important geochemical results from the four samples are presented in Table 2.

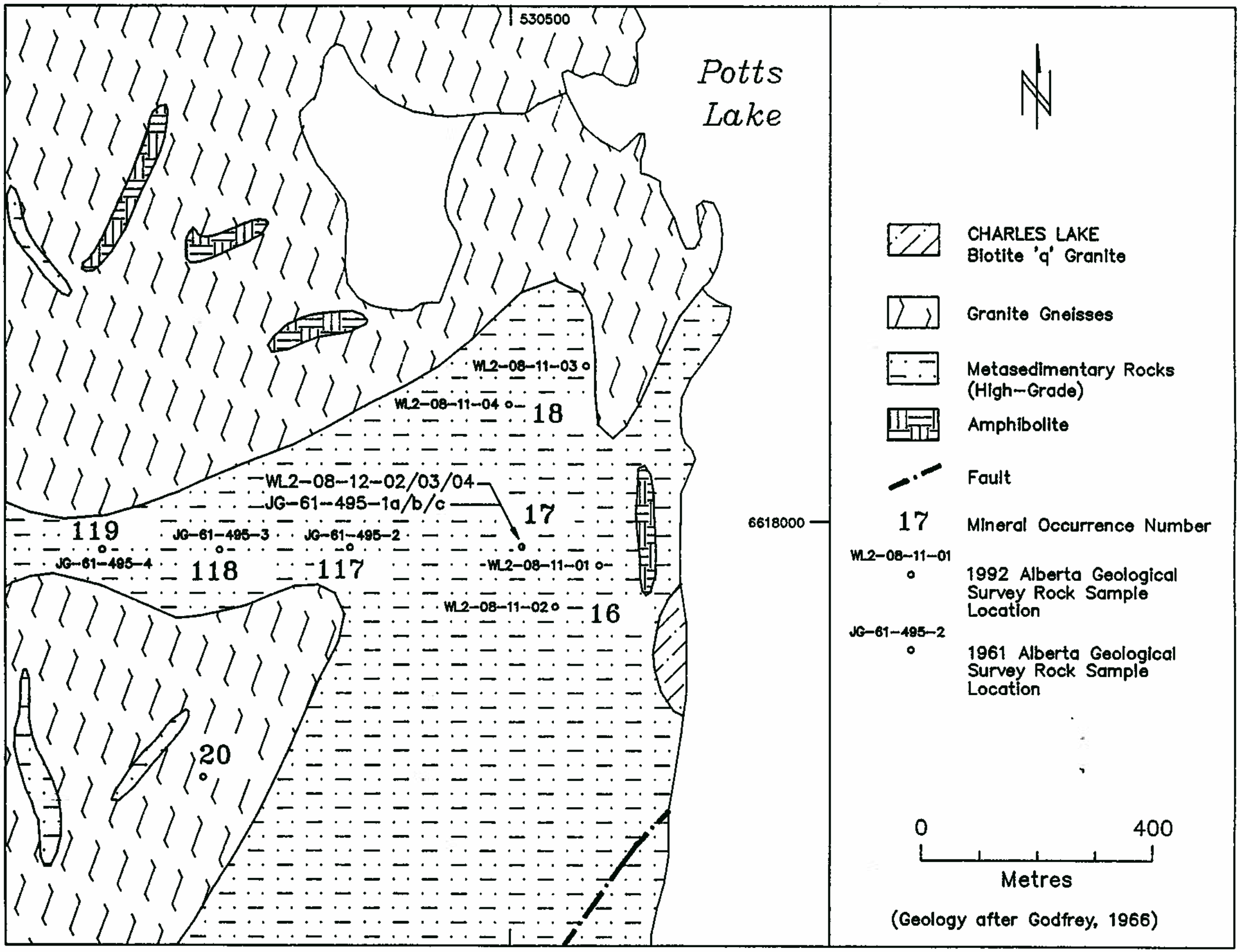

Figure 4. Geological Map of the South Potts Lake Gold Showing (Mineral Occurrence Number 17).

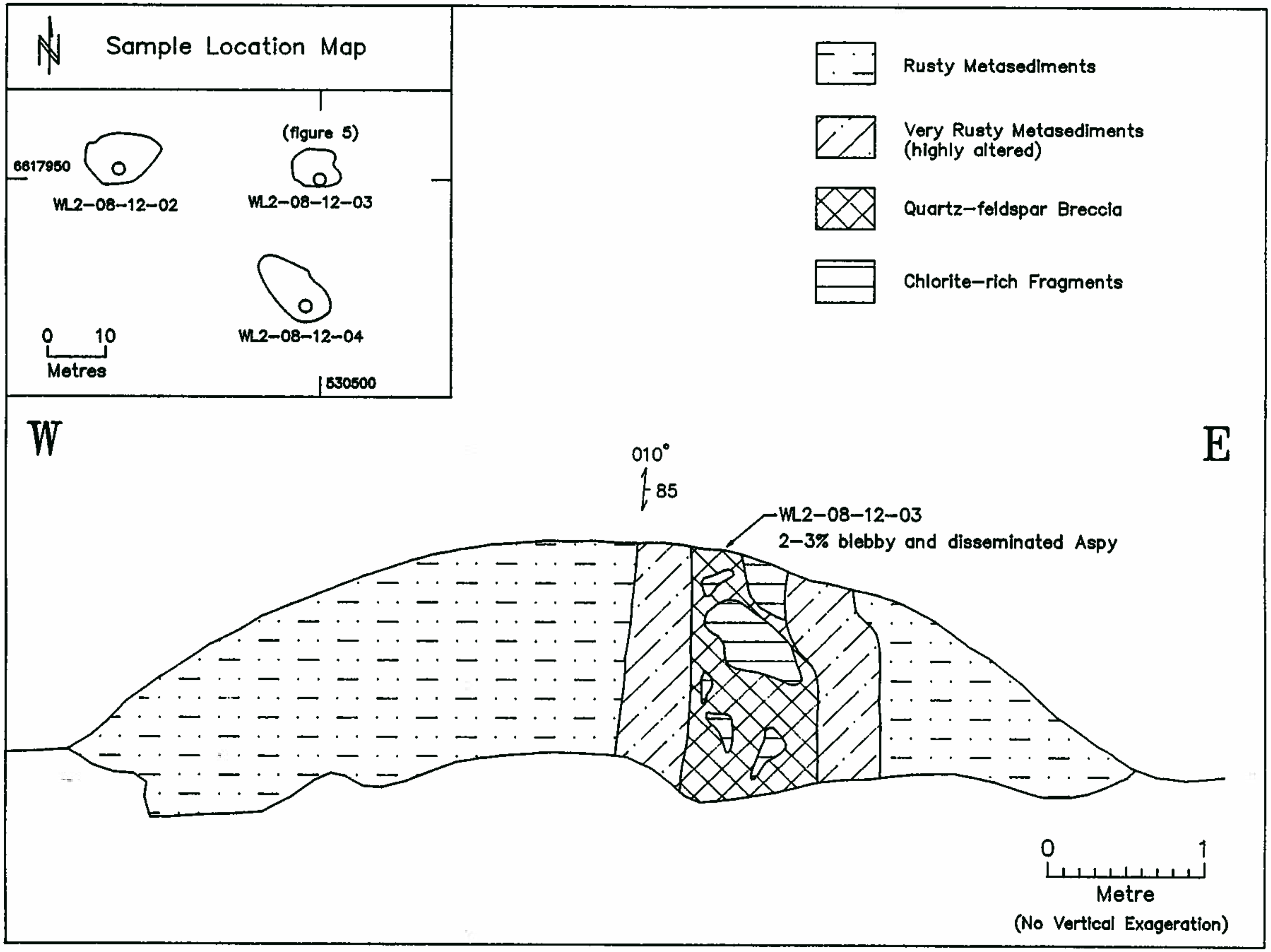

Figure 5. Sketch of the South Potts Lake Gold Showing (Mineral Occurrence 17), looking north.

Table 2- Selected results from geochemical analysis on 1992 AGS samples.

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.

Six samples collected by the Research Council of Alberta's field party during the geological mapping of the area, were retrieved from the Mineral Core Research Facility. Three of them (JG-61-495-1a, b & c) contain abundant sulfides and their given 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. The samples were sent for analysis and the most important results are shown in Table 3. The results confirm the association Au-As-W-Bi.

Table 3. Selected results from geochemical analysis on Godfrey's samples.

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

Classification

Sulfides and geochemical association of Au, As, W and Bi suggests a modified Archean shear-related gold deposit; silicification, quartz gangue and breccia are common features of these deposits.

SOUTH WAUGH LAKE

M.O. numbers: 43, 44, 45, 46

Location

Showings are scattered along the shores of the southern third of Waugh Lake where it makes a large bend to the west (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 composite veins which are concentrated on the north shore of the elbow of Waugh Lake". It appears that a few companies active in this part of Alberta, made a very cursory investigation of the area, but invariably arrived at a negative conclusion. However, no concrete evidence is provided to support this assessment of the mineral potential of the area.

Geological setting

The area which covers just over 2 km^2 (1.5 km by 1.3 km) is underlain by a complex of intrusive rocks, metasediments and metavolcanics (Figure 6). To the west, granitic stocks crop out into prominent hills and cliffs forming exposures along Waugh Lake; they form part of the Aphebian Colin Lake granitoids. To the east, probably in fault contact, lie rocks of the Waugh Lake Group, a low grade metamorphic asemblage of greywackes, volcanic tuffs, flows and quartzites. On the south shore of Waugh Lake, an amphibolite body, squeezed between the granitic intrusives and the metavolcano-sedimentary units, forms a prominent rounded hill which creates a headland restricting the width of the lake at this point.

Main lithologies

The intrusive suite is composed of two main rock types. The first one is exposed on the southern shore of Waugh Lake and consists of very leucocratic porphyritic granite. On the northern shore and to the west, the hills consist of an monotonous mass of grey, pinkish weathering medium grained (2 to 4 mm range) biotite granite. The granite contains a few rare, 5 to 10 cm long, biotite rich inclusions in the western exposures, and is cut by two ultramafic lamprophyre (?) dykes, 1 to 2m wide, cropping out above the cliffs on the northern shore and trending N100°E. On its western border but outside the area, the granite appears to be intrusive into the metavolcanic-sedimentary units. Narrow comagmatic granitic and granodioritic dykes are also observed to inject within the metamorphic formations. In the area, the Waugh Lake Group comprises essentially quartz sericite schist, tuffaceous sericitic or chloritic schist, quartzite and minor amphibolite.

Structure

The competent granitic rock units have a tendancy to show more than one foliation. Though weak, the two most common strikes in the area are N020°E and N040°E with variable but steep dips to the east and west. On the north shore of Waugh Lake, the granite outcrop displays a crenulation foliation at N056°E and 74°W. This superimposed foliation may be related to a strike-slip (dextral?) displacement along a fault, which is proposed parallel with the straight shoreline.

In the stratified rock formations to the east, foliation, bedding and lamination are essentially parallel and are consistent on both sides of the lake between N002°E and N020°E with vertical dip to 80°W. The foliation changes to a N145°E 80°E attitude a few hundreds of m to the southeast away from the lake. There, in massive quartzite, a N164°E 90° cleavage has also been measured. In this area, several brittle (?) faults are shown by Godfrey (1961). The faults are either parallel to the lake or intersecting it at high angles.

Mineralization

Mineralization in the area consists 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 units, the tourmaline appears in massive contorted layers, 15 to 75 centimeter thick; quartz is often only present in minor amounts.

In one instance, where a granitic dyke cuts through metasediments (quartzite and quartz sericite schist), the granitic material contains much tourmaline in the ground mass. Massive tourmaline with quartz forms selvages along one or both edges of the dyke, where they show a comb texture. In the area of good metasedimentary and metavolcanic rock exposure on the north shore of Waugh Lake, cross cutting veins of black tourmaline and grey quartz display very irregular contacts with tourmaline and quartz, which

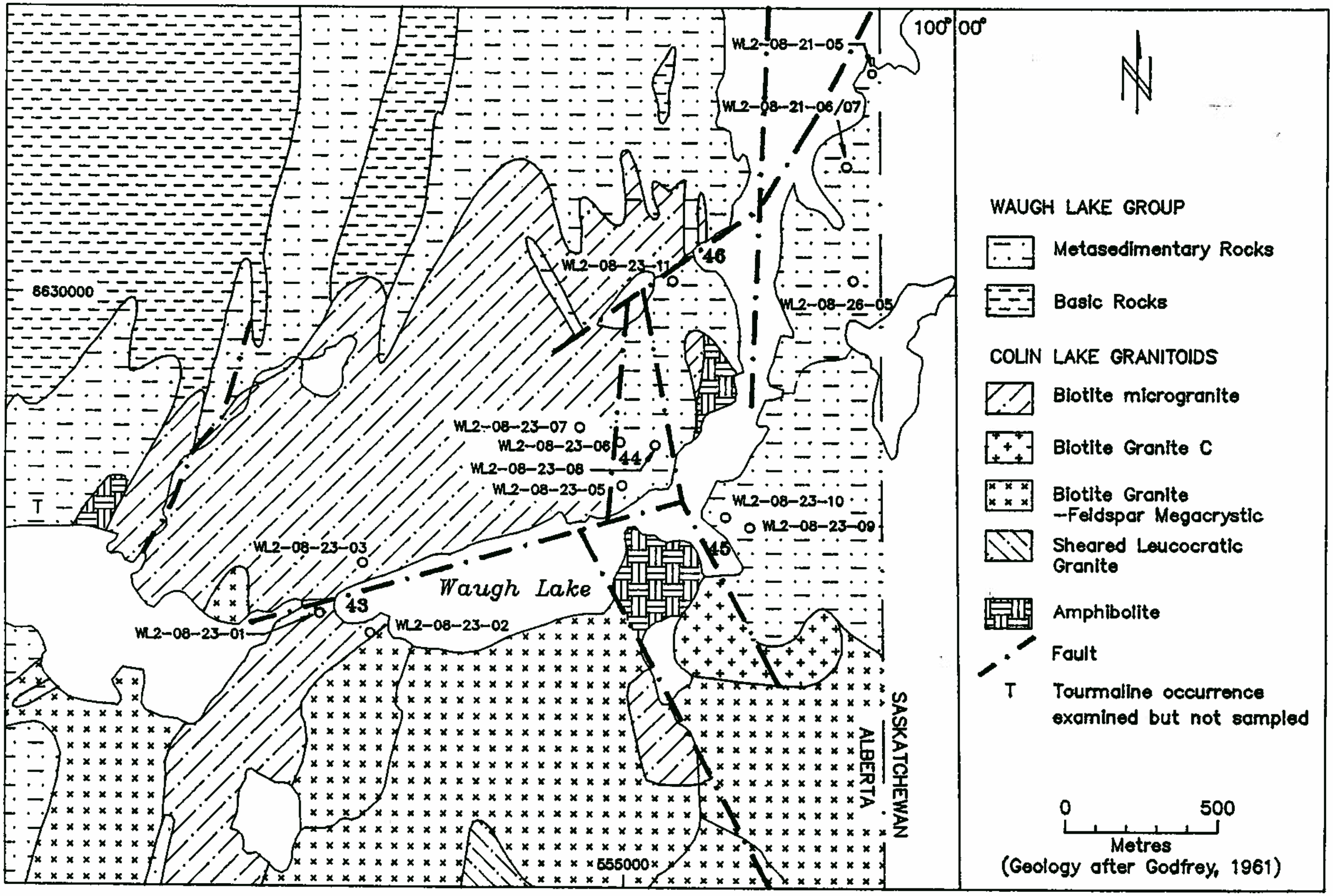

Figure 6. Geological Map of Quartz-Tourmaline Vein Occurrences in the South Waugh Lake area, (Mineral Occurrence Numbers 43, 44, 45 and 46).

is injected lit-par-lit into the more felsic metatuff, greywacke and arkosic siltstone layers. The vein looks like a giant centipede and each of its arms penetrating into the host rock creates a bleached halo a few millimeter wide on its edge. Where tourmaline and quartz veins cut through the metavolcanic-sedimentary units, they always contain a small amount of pyrite (1 to 2%). The overall direction of the veins in the area ranges from N040°E to N090°E with a higher frequency around N043°-044°E and N088°-090°E. There does not seem to be a difference in direction between veins hosted by granite or by layered metamorphic units.

Quartz-tourmaline veins are also found elsewhere in the Waugh Lake area, but nowhere with the abundance and size of veins which characterize this area. These veins are definitely late but are spatially related to the South Waugh Lake granitic intrusives and the fault system which affects the area. In one outcrop on the north side of the lake, a tourmaline quartz vein is cut by an even later fracture trending N032°E, which is filled with barren quartz.

Alteration

No major alteration seems to be associated with the quartz tourmaline veins. The only noticeable exception is found where the vein material is injected lit-par-lit into the metasediments or metavolcanics. The introduction of the vein material is favored by the chemical characteristics of the beds where it approximates granitic composition. In this case, a reaction halo is apparent in the host rock which looks bleached.

Geochemical data

A few of the tourmaline quartz veins encountered during the summer 1992 - AGS investigation, were grab sampled and the more significant results from the geochemical analysis of these samples are presented in Table 4. Most noticeable is the association through the whole area of Au, As, Mo and W with tourmaline and quartz. This element association is reminiscent of the mineral paragenesis found in typical Archean lode gold deposits of the Abitibi belt in Quebec.

Table 4. Selected results from geochemical analysis on 1992 AGS samples.

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

Classification

The geochemical data and the geological setting suggest that the tourmaline quartz mineralization in the area present many similarities to the Archean lode gold mineralization hosted in quartz veins.

NORTHEAST WAUGH LAKE

M.O. numbers: 39, 50, 51, 52, 53

Location

The mineralization occurs along a narrow north trending, 1 km long belt on the northeastern side of Waugh Lake (NTS 74M/16)

History of exploration

After acquiring Permits 24, 25 and 26 from the Alberta government in 1969, Hudson's Bay Oil and Gas Limited (HBOG) flew a series of airborne geophysical surveys, one of which was a magnetic, electromagnetic and radiometric survey (Assessment Report by Stamp, 1969). The electromagnetic survey recorded three conductors in the northern part of Waugh Lake, one of which was called "anomaly #1" and was rated as first priority. The discovery was followed by ground checking and some trenching at four locations across the anomaly. Although some additional work was recommended, no further exploration was carried out.

Geological setting

The Waugh Lake area sits on the eastern edge of a large low grade metamorphic belt of metasediments and metavolcanic rocks, which are Aphebian in age. The different rock units of the belt are grouped under the name of Waugh Lake Group and are composed of mafic to intermediate volcanics, greywacke, tuffs and fine grained clastic sediments. A major structure is interpreted along the length of Waugh Lake as either a fault or a shear zone.

Main lithologies

The mineralized occurrences are hosted in very schistose units ranging from schistose quartzite to biotite schist, to sericite sillimanite schist and to graphitic black schist. All these rock units are strongly pyritic in places.

Structure

Schistosity is very pronounced in the area due to the nature of the rocks and multiple folding events. At close examination, many small crenulation folds can be seen and several different foliations can be measured. Toward the eastern boundary of the mineralized zone, compositional layering and foliations tend to be parallel and strike in a north-south direction.

Mineralization

The mineralization in the northeast Waugh Lake area consists essentially of variable amounts of sulfides associated with quartz biotite schist or quartz sericite schist. Pyrite, pyrrhotite and arsenopyrite are the most easily recognizable minerals in spite of the deep weathering which has affected the exposed rock units; indeed large quantities of limonite and goethite are remnants most frequently observed. Rare specks of chalcopyrite and possibly niccolite are present. In the northern part of the mineralized belt, a slightly cross cutting dyke (N160°E) of microgranite has enhanced the concentratrion of sulfides over onem on both sides. There, massive pyrite, pyrrhotite and arsenopyrite stringers, a few millimeter thick, run along the schist foliation. Gold values to 416 ppb are obtained in samples collected over the stringer zone.

The best assays came from a composite chip sample over the length of Trench no. 2 (Figure 7), which returned 0.01% Cu and 0.01% Ni. In Trench no. 1, a chip sample yielded 0.017% Ni, 20 g/T Ag and 0.34 g/T Au (340 ppb).

Alteration

The deep weathering combined with the high amount of sulfides in the country rocks interfers with observation of superimposed alteration. However, large masses of chlorite in quartz rich graphitic schist in Trench no. 2, indicates some local Mg enrichment.

Geochemical data

No soil sampling was carried out by HBOG over their "anomaly #1" and only a total of five assays of the trenches were reported. The results are reproduced in Table 5.

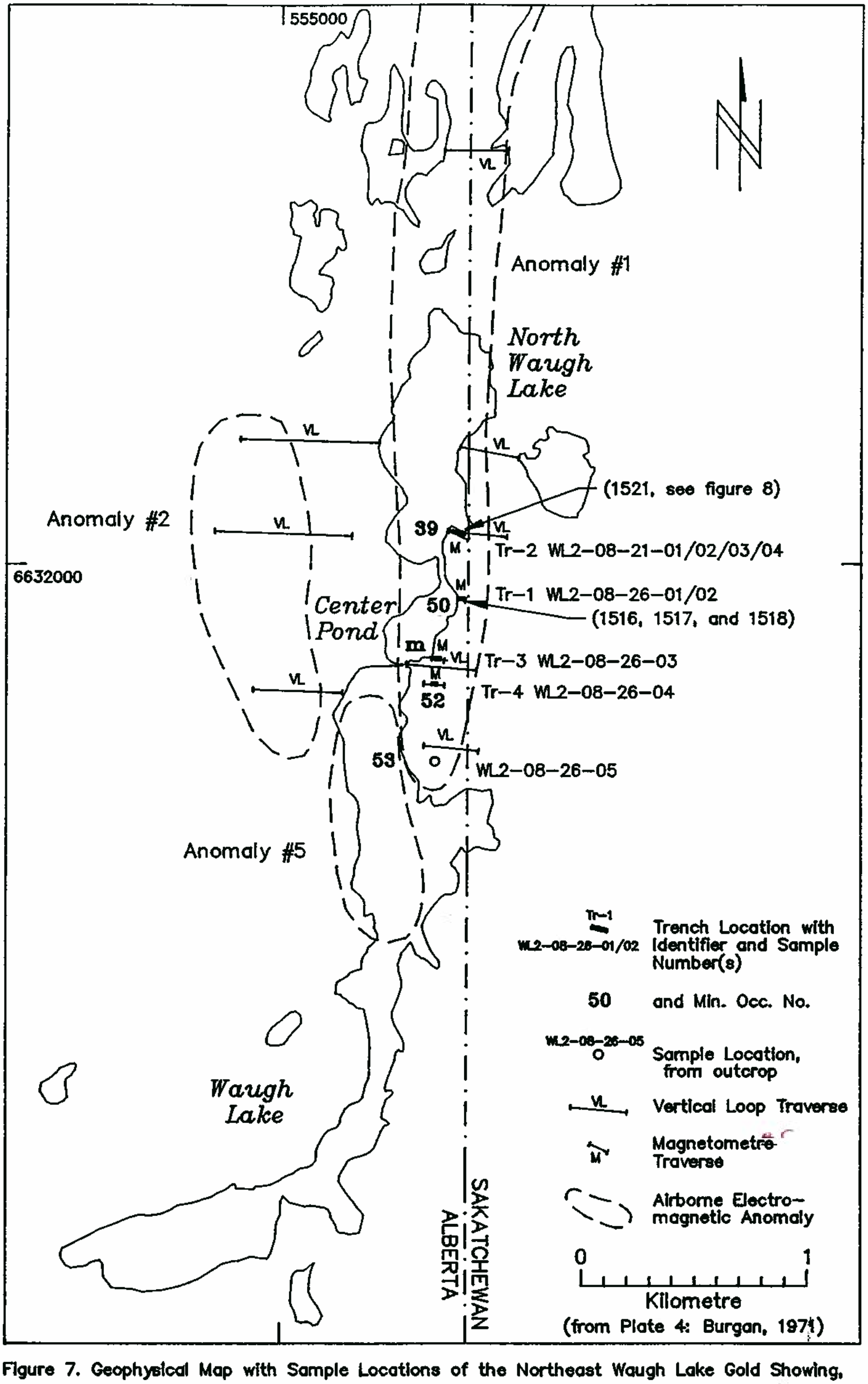

Figure 7. Geophysical Map with Sample Locations of the Northeast Waugh Lake Gold Showing, (Mineral Occurrence Numbers **39, 50, 51, 52** and **53**).

Table 5. Results of chemical analysis on samples from HBOG's trenches (Burgan, 1971).

Sample no.	Location	Cu %	Ni %	Au g/T	Ag g/T
1516 (8)	Trench no. 1	0.004	n.a.	n.d.	n.d.
1517 (9)	Trench no. 1	0.002	0.017	0.34	20.4
1518 (10)	Trench no. 1	0.005	n.a.	n.d.	n.d.
1521 "Composite" (S11-S18)	Trench no. 2	0.010	0.010	n.d.	n.d.
1520 (6)	Trench no. 4	0.004	n.a.	n.a.	n.a.

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

During the 1992 AGS investigation, the trenches were relocated and grab-sampled. 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 The main geochemical results of this sampling are presented in Table 6.

Table 6. Selected results from geochemical analysis on 1992 AGS samples.

Sample no. / (M.O. no.)	Location - Description.	Au ppb	As ppm	Cu ppm	Zn ppm	Ni ppm	Cr ppm
WL-08-21-01 (39)	Trench no.2-Center - Qtz bio.sillim.sch.+graph.,2%py	11	-	-	-	-	196
WL-08-21-02 (39)	Trench no.2-E.end - Qtz bio.sch.+10%py,po,aspy.	17	-	55	141	-	-
WL-08-21-03 (39)	Trench no.2-E,end - Qtz.bio.sch.+mass.sulf.stringers	29	-	62	157	-	-
WL-08-21-04 (39)	Trench no.2-10m from W.end - Bio.sch.+qtz vein +py.	9	-	53	-	-	205
WL-08-26-01 (50)	Trench no.1-E.end -Qtz.vein. +2%py,aspy.	28	29	-	-	-	197
WL-08-26-02 (50)	Trench no.1-W.end - Qtz.bio.sch. +10% aspy.	416	14,596	-	-	-	-
WL-08-26-03 (51)	Trench no.3 - Qtz.seric.sch.+5% py,aspy.	9	39	53	-	-	-
WL-08-26-04 (52)	Trench no.4 - Qtz.bio.sch.+5% py,aspy.	-	18	-	158	61	211
WL-08-26-05 (53)	250m. S. of Trench no.4 - Seric.sch. +10% py,chalc,niccol.	16	-	130	300	177	-

Geophysical data

The mineralization on the northeastern side of Waugh Lake was discovered following an airborne EM-Mag survey flown by Canadian Aero Mineral Surveys Limited of Ottawa on behalf of HBOG, in 1969 (assessment report by Stamp, 1969). The survey was flown with a Canso aircraft at a mean terrain clearance of 45 m with flight lines spaced at 200m intervals. All traverses were oriented east-west. The equipment included an in-phase/out-of-phase co-axial Canadian Aero MARK III low frequency (390 Hz) system and a fluxgate Gulf Research & Development Co Model III magnetometer. The survey recorded a 6 kilometer north south trending conductor extending from northern Waugh Lake along the Alberta-Saskatchewan border. Other lesser anomalies were located over the water of northern Waugh Lake and to the northwest of the lake.

The long conductor, named "anomaly #1" on HBOG's maps (Figure 7), was followed up by a series of ground EM and Mag profiles. They consisted of three Vertical Loop broadside traverses using a

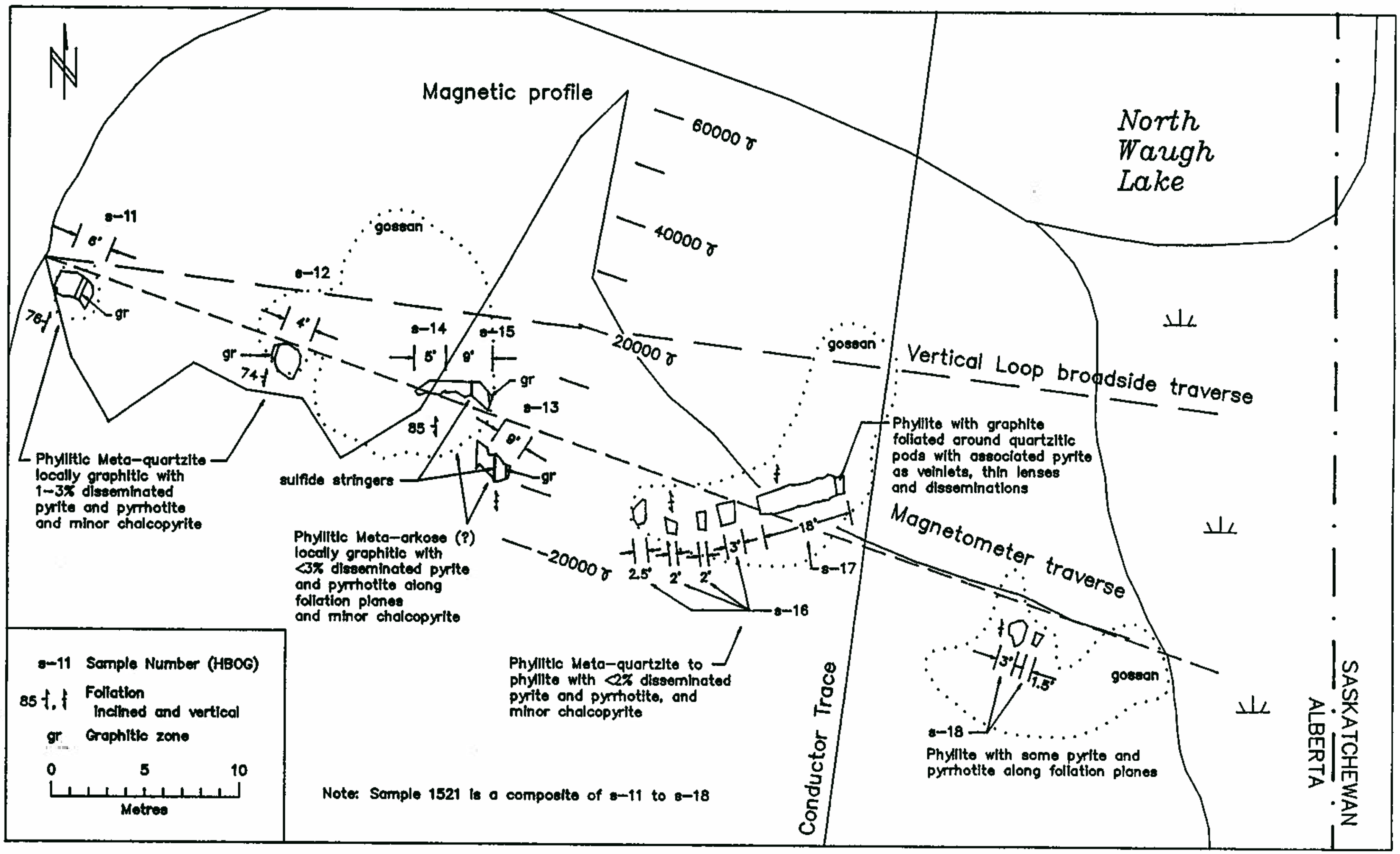

Figure 8. Geology and Sample Locations of Trench-2 (Burgan, 1971), Mineral Occurrence Number 39.

McPhar M-660 VHEM instrument and a 60 to 100m coil separation. The follow up work also consisted of three magnetic traverses but unfortunately, the two types of traverses did not coincide and their results are not reported except for the area of Trench no. 2. In the area of mineralization, the conductor seems to be explained by conductive graphitic material. The conductor is close to a magnetically high zone containing large amounts of sulfides. However, it is interesting to note that the conductor and the magnetic anomaly are not coincident (Figure 8). The 1992 AGS investigation of the area found that the magnetic anomaly 300 m south of Trench no. 4 was strong enough to deflect the compass.

Classification

In the Northeast Waugh Lake area, the sulfides and associated gold occurrences are stratiformal. Some reconcentration of sulfides may be caused by late shearing.

Assessment reports

Burgan, E.C. - 1971 - Andrew Lake Project - Alberta Quartz Mineral Permits 24, 25 & 26, NTS 74M - Review of Work Completed during 3-year Permit Period - Hudson's Bay Oil and Gas Company Limited; Assessment Report U-AF-003(2) / U-AF-005(2), 18 p., 5 fig.,9 plates in folder, 6 appendices.

Stamp, R.W. - 1969 - Report on Airborne Geophysical Survey in the Andrew Lake Area of Alberta for Hudson's Bay Oil and Gas Company Limited by Canadian Aero Mineral Surveys Limited; Assessment Report U-AF-003(1) / U-AF-005(1), 5 p., 2 appendices, 24 maps in folder.

PYTHAGORAS LAKE

M.O. numbers: 59, 60, 61, 62

Location

The mineralization is found along a band of outcrops exposed on the western side of a chain of lakes extending in a NNE-SSW direction from Lindgren Lake to Sedgwick Lake (NTS 74M/16).

Access

By float plane to one of the larger lakes and then on foot.

History of exploration

During the geological mapping carried out by field parties of the Research Council of Alberta in 1957 and 1958, gossans were discovered on the southwest shore of Lindgren Lake and found to contain "massive arsenopyrite, pyrite and smaller amounts of pyrrhotite, smaltite and probably one other white arsenide similar to smaltite" (Godfrey, 1958) in a band of feldspathic quartzite and biotite schist. One grab sample collected from this location by the Research Council's party, assayed 0.39% nickel and 10 g/T silver and an undetermined amount of gold. Approximately 1500 m to the south and on the western margin of the same band of rocks, a 1 m wide gossan was also located and contained arsenopyrite and pyrite.

No exploration work is reported on the occurrences since that time. During the 1992 AGS field examination of the area, remains of a very old camp and evidence of broken-up outcrops were found on the western shore of Pythagoras Lake.

Geological setting

The chain of lakes and associated muskegs extending from Lindgren Lake to Sedgwick - Murchison Lakes occupies a 500 m wide belt underlain by high grade metasediments. The belt is bordered in the west by biotite granite gneiss and in the east by an elongated stock of biotite granite forming a series of prominent hills. All the rock formations in the area belong to the Archean Basement Complex (Figure 9).

Main lithologies

The widely scattered outcrops, which are exposed in the middle of the low lying metasedimentary belt, consist mostly of weathering resistant biotite quartzite. Many interlayers, 1 to 10 centimeter 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 red 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.

Structure

The foliation in the metasediments is fairly constant along the belt. Its strike ranges from N018°E to N035°E and it dips either steeply to the west or vertically. The shearing noted at Pythagoras Lake is essentially parallel to the foliation which is N031°E and 82°W at this locality.

Mineralization

Almost all of the few outcrops exposed in the low lying and flat bottomed valley are rusty and contain some limonite or pyrite. Many of the less recessive quartzite and associate biotite schist outcrops are very gossanous and include millimeter thick veinlets and seams of pyrite, pyrrhotite and arsenopyrite. The highest values of the 1992 samples are 603 ppb Au (0.018 ounces per ton) and 0.36% As. It is interesting to note that almost all the rock outcrops sampled along the belt of metasediments return anomalous values in gold.

Alteration

No conspicuous alteration is observed in association with the gossaneous zones.

Geochemical data

A total of eight samples were collected from the rusty outcrops and were sent for analysis. The most significant data is presented in Table 7.

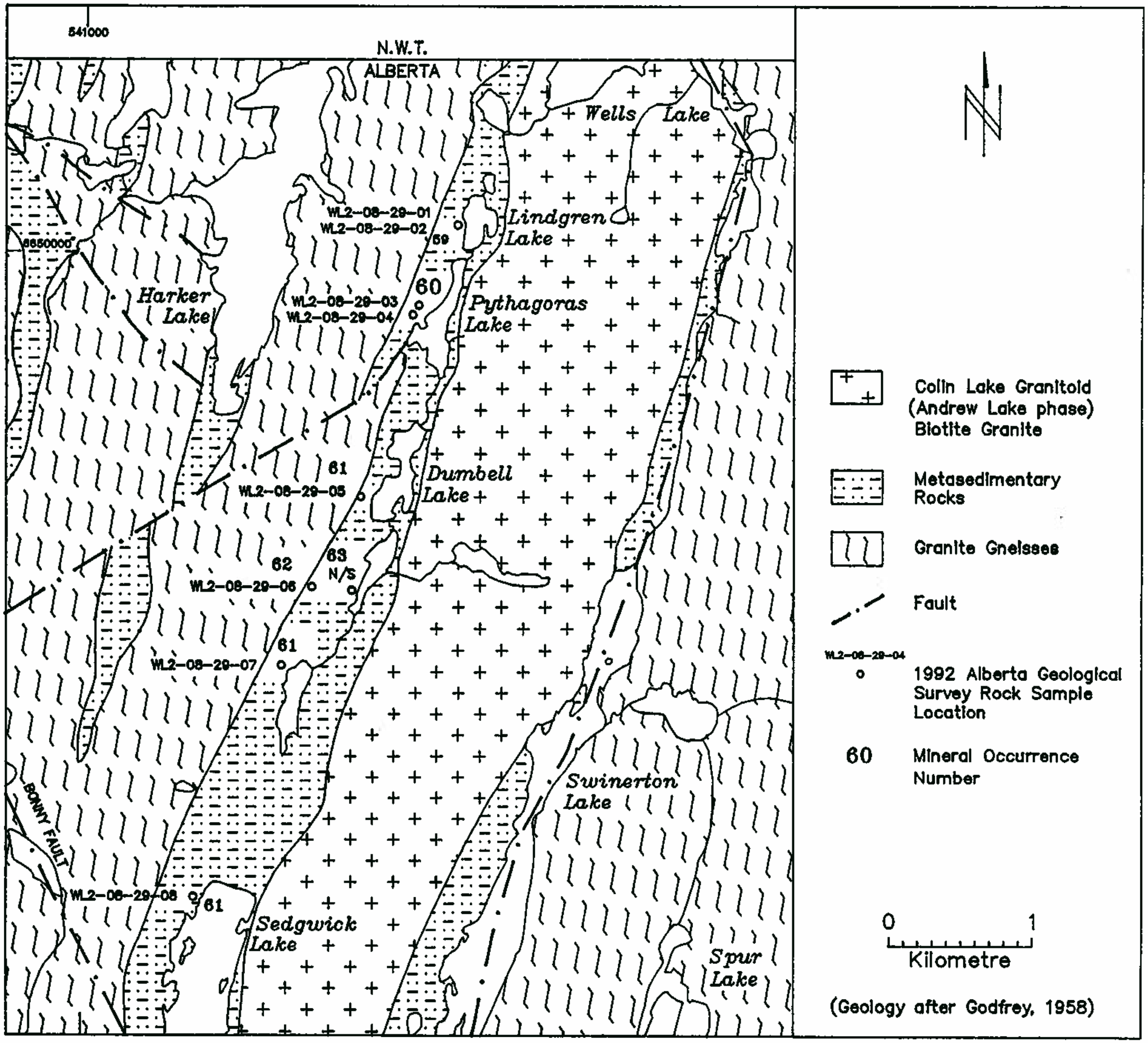

Figure 9. Geological Map of the Pythagoras Lake Gold Showing (Mineral Occurrence Number 60).

Table 7. Selected results from geochemical analysis on 1992 AGS samples.

M.O. no.	Sample no.	Location-Description.	Au (ppb)	As (ppm)	Zn (ppm)
59	WL-08-29-01	50 m. NW - Lindgren L. 0.1m.x 1m. qtzte +2% py,aspy.	131	3113	-
59	WL-08-29-02	SW shore - Lindgren L. 0.5m. x 5m. qtzte + 1%py, aspy.	-	433	105
60	WL-08-29-03	75m. W-Pythagoras L. 5m. x 25m. gossan in bio. qtzte	116	3611	-
60	WL-08-29-04	25m. W-Pythagoras L. garnet rich qtzte +2%py., aspy.	603	883	-
61	WL-08-29-05	50m. SW-Dumbell L. garnet-graphite qtzte.	21	16	105
62	WL-08-29-06	650m. SW-Dumbell L. contact granite-gneiss & bio. qtzte.	8	8	-
61	WL-08-29-07	1200m. SW-Dumbell L. garnet-graphite bio. schist.	26	146	-
61	WL-08-29-08	N. shore - Sedgwick L. rusty qtzte.	31	672	107

Classification

The widespread anomalous Au values encountered within the band of metasediments suggest the mineralization to be of stratiformal nature. The discovery of noticeable shearing could mean possible reconcentration of gold along shear zones.

COPPER SHOWING

SELWYN LAKE

M.O. number: 74

Location

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

History of exploration

The Selwyn Lake mineralization was first reported in an assessment report by James Exploration Ltd. (1970) This company, contracted by Rio Alto Exploration Ltd., carried out ground checking of radiometric anomalies recorded by an airborne radiometric survey and noted "several old trenches" There is no record of the older exploration work. Only two samples were collected by James Exploration Ltd. in the trenches. These samples were sent for assay and one contained 0.1% Cu. No further work was done after this date.

Geological setting

The Selwyn Lake zone sits on the western edge of the easternmost branch of the Charles Lake Mylonitic Shear Zone of which Selwyn Lake is a topographic expression (Figure 10). The mylonite zone runs through granite biotite gneiss which crops out along the first ledge west of the lake shore. On the slope and toward the top of the main north-south trending hill, large and continuous bands of highly metamorphosed rusty sediments are exposed. Some of the sediments could be metavolcanics. Overall, the rock units exposed in the area are part of the Archean Basement Complex, which is affected by the later major ductile Charles Lake Shear Zone.

Main lithologies

The mineralized zone is located within one band of high grade metasedimentary rocks which consist of grey biotite quartzite, sericite sillimanite schist and chlorite rich silicified amphibolite. The enclosing country rock is pink to red biotite granite gneiss which grades into a banded mylonite near the shore.

Structure

In the high grade metasediments, foliation and layering (bedding?) are parallel and strike N016°E with a dip of 70° to the west. The foliation of the granite gneiss strikes north-south close to the major Charles Lake Shear Zone.

Mineralization

The mineralization consists of pyrite, pyrrhotite and minor chalcopyrite. It is exposed in two old east-west trenches only 2 m apart. The trench to the north is 2 m by 2 m and is filled in by the collapsing of its walls; the second one is 3 m long by 2 m wide and its western end-wall dug into the steep side of the hill stands 3 m below the surface The rocks observed on the faces of the trench consists of between 20 and 50% sulfides. It contrasts with the large gossanous belt, 5 m wide by 15 m long surface expression of the sulfide mineralization. On these surfaces, only a few sulfides can be observed after breaking the rock.

In fresh samples, the sulfides occur in massive layers with a breccia-like texture and in anastomosed streaks within regular alternation of green and dark grey-green laminae of cherty looking chloritized quartzite. Some of the laminae contain large, millimeter-size feldspar porphyroblasts. The laminae are arranged in 3 to 5 cm wide sequences. Sulfidic horizons are also found in whitish grey biotite quartzite interlayered with layers of quartz sericite schist and chlorite rich silicified amphibolite. These rock types are not exposed on the trench walls, but are commonly distributed among the rubble at the entrance of the trench. They contain 15 to 40% sulfides which are well laminated, and have a breccia-like texture. The sulfide rich horizons have a true thickness of 3 m exposed at the site of the trench.

The composition of some of the rock units, their texture and rythmicity suggest that part of these rocks are of volcanic origin.

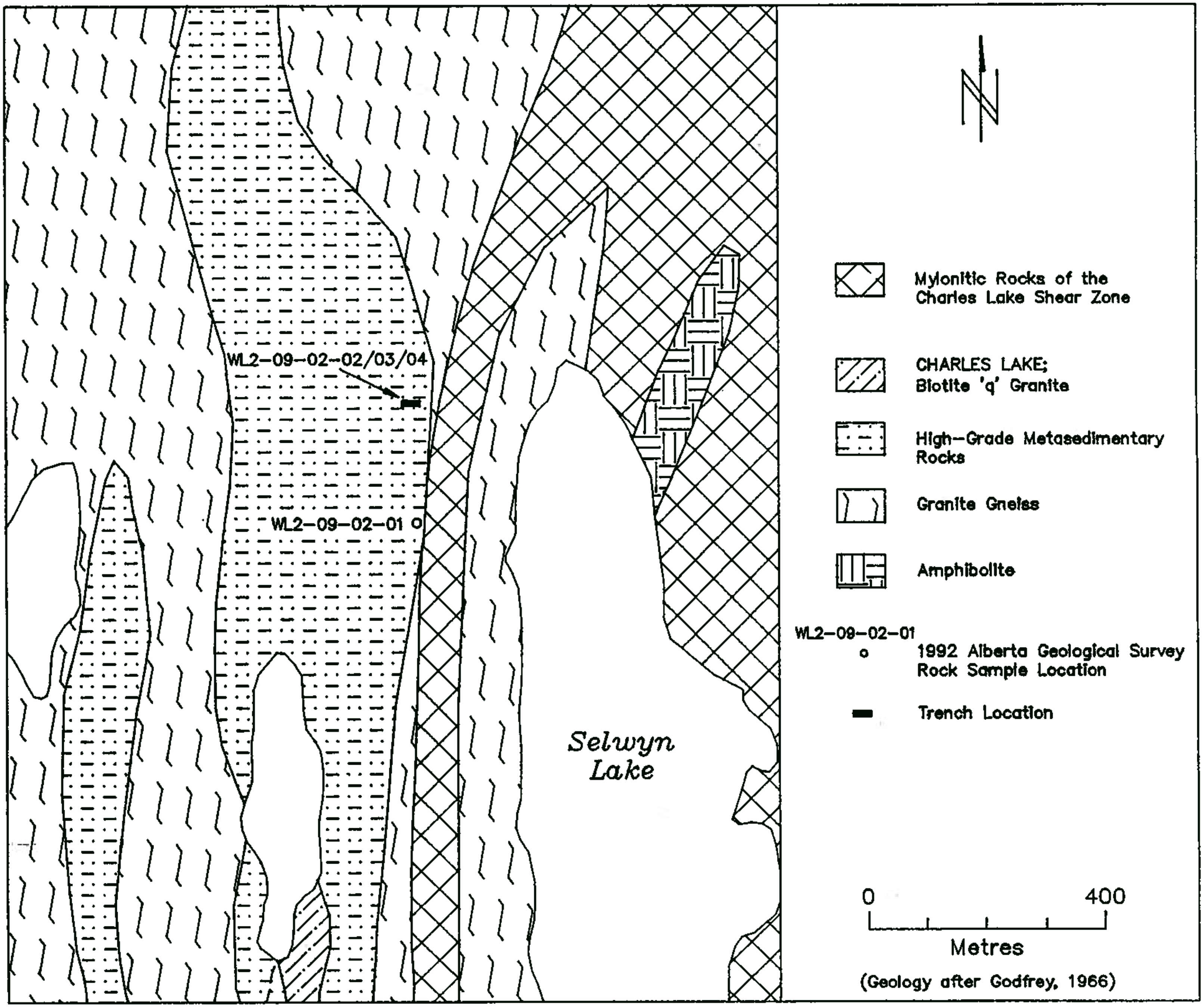

Figure 10. Geological Setting of the North Selwyn Lake Copper Showing (Mineral Occurrence Number 74).

Alteration

Two types of alteration seem to affect the different horizons. The main alteration is the pervasive silicification of the high grade metasediments and metavolcanics. Secondary chloritic alteration is observed in green quartzite and amphibolite layers.

Geochemical data

The assessment report of work done by James Exploration Ltd (1970) does not provide much information on the geochemistry of the area and its mineralization. Only two samples were analyzed for copper, nickel and zinc, and one of the samples taken across the "surface of a sulphide pod approximately 2' wide and 12' long" assayed 0.1% Cu

Four samples taken during the 1992 AGS investigation returned slighly anomalous values of gold and copper (Table 8).

Table 8. Selected results from geochemical analysis on 1992 AGS samples.

Sample no.	Location - Description	Au ppb	Cu ppm
WL-09-02-01	250 m S of trenched area - grey feldpathized qtzite+3% py,po.	-	22
WL-09-02-02	Trench. - grey cherty chlor.qtzite + 50% py,po.	20	209
WL-09-02-03	Trench area - grn chlor.qtzite-amplibol.+50% py,po.	7	294
WL-09-02-04	Trench area - grey bio.qtzite + 5% py,po.	-	58

Classification

The amount and distribution of sufides appear related to the stratification. The sulfidic zone can be considered stratiformal of the volcanogenic massive sulfide type. However, a relationship of the mineralization with shearing can not be excluded.

Assessment report

James, E.W. - 1970 - Geological Reconnaissance, Rio Alto Exploration Ltd - Permits 121, 122, 127 , Northeastern Alberta; Assessment Report U-AF-077(2) / 078(2) / 083(2),12 pages, 1 map in text, 3 maps in folder, 2 appendices.

URANIUM SHOWINGS

NORTH CHERRY LAKE **M.O. numbers: 25, 26, 27**

Location

From the northern shore of Cherry Lake the area of mineralization extends 750 m to the north and 400 m to the east (NTS 74M/16).

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, as a direct result of interest in uranium, 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 with a Geiger counter, sampling and blasting of a limited (approximately 18) number of pits and small trenches (assessment report by Hart, 1967). In 1968, McIntyre Porcupine Mines Ltd optioned the permit and followed up with helicopter scintillometer survey, rock trenching (11 trenches 1.5 m wide by 0.9 m deep) and 575 m of AX (28.6 mm core diameter) diamond drilling in 6 holes (assessment report by 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).

Main lithologies

The main rock unit consists of a light grey to pinkish, strongly foliated biotite hornblende granite; mostly medium grained and equigranular, the granite displays locally porphyritic texture. The granite is fairly uniform in the central and eastern part of the area and tends to be more mafic to the west where dioritic facies are common. It also includes several slivers of highly deformed metasediments as well as pegmatite and large quartz lenses (Figure 11). East of the northern end of Cherry Lake, 250 m from shore, a dark brown dyke, 20 to 25 meter wide, cuts across in a east-west direction; it is a very fine grained orbicular, hematitic dolerite.

Structure

The strike of the foliation in the granitic rocks varies from N0°E to N012°E and mainly dips 82° to the west. However in a large diorite inclusion located to the east of the area, the foliation turns N040°E and dips 87°N.

Many mylonitic shear zones are well exposed, especially near radioactive zones. They trend north-south near Cherry Lake and change to N015° to 025°E several hundreds of m away. The mylonite zones are offset by later brittle fracturing. The fractures are closely spaced and are often in conjugate sets. Some of the sets are striking N051°E and N106°E with a south dip while others are arranged around N005°E and N102°E and are vertical. Other major fractures are found trending N090°E, vertical, and N132°E, dipping 83°W.

Mineralization

Zone 1 (Mineral Occurrence No. 25) is on the northern shore of Cherry Lake, where extensive yellow staining is associated with a well banded mylonite (phyllonite) zone, cut by late fractures within an 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 returned 0.79% U_3O_8 over 1.2 m, which was confirmed by AGS-1992 grab sample WL-08-15-01 yielding 0.31% U_3O_8. Two diamond drill-holes by McIntyre Porcupine Mines Ltd., 136 and 50 m long and in opposite directions, gave negative results. The surficial yellow products are thought to be autunite, while some of the black material in highly radioactive fractures is probably pitchblende. Restricted to the west wall of the mylonite band, many tension gashes and short veins trend N135°E close to the mineralized zone, to N145°E farther away and are filled with white barren quartz.

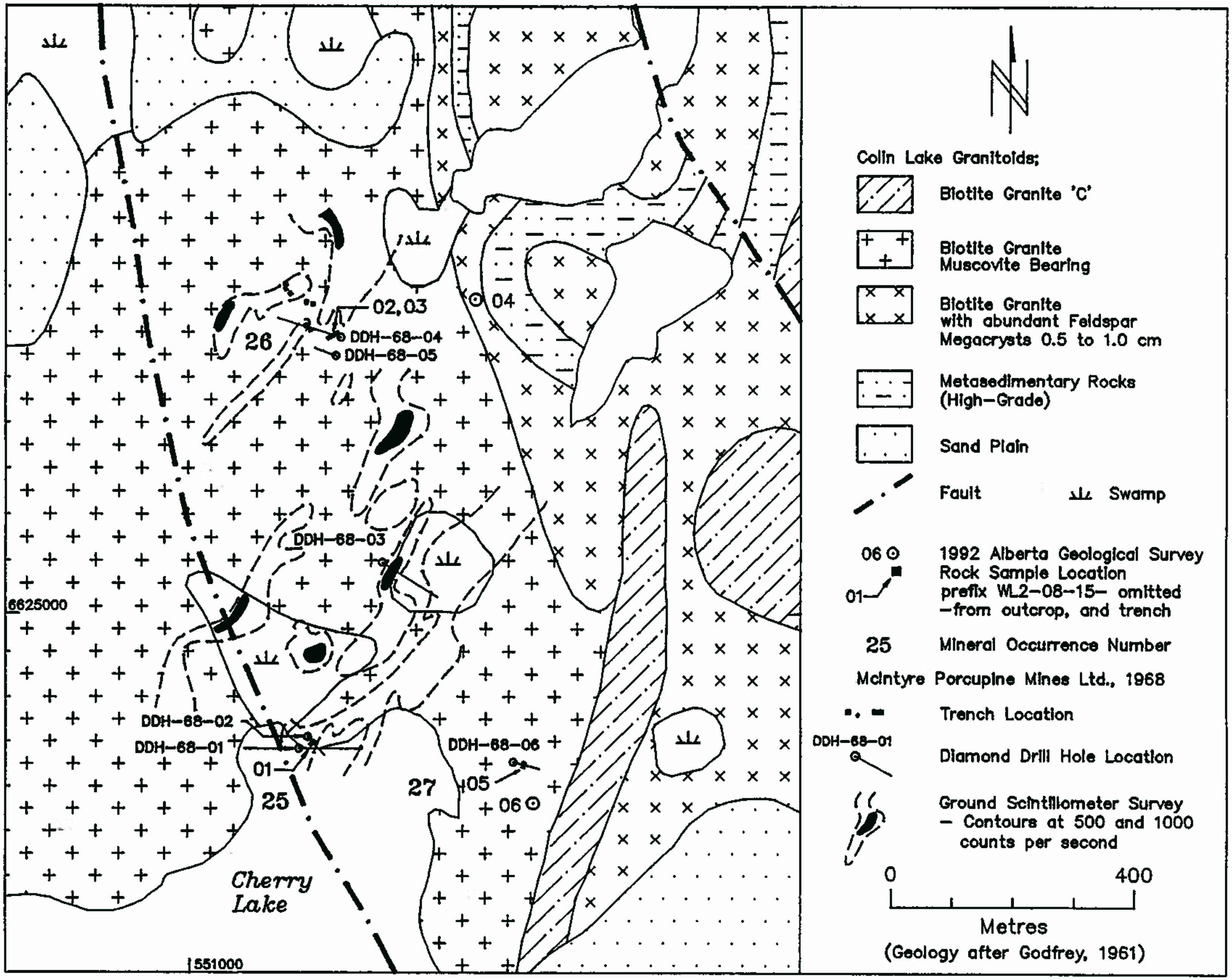

Figure 11. Geological and Geophysical Map of the North Cherry Lake Uranium Showing (Mineral Occurrence Numbers 25, 26 and 27), with Drill Hole, Trench, and 1992 Sample Locations.

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 staining (probably autunite) is scattered over a 20 m long trench, where McIntyre Porcupine Mines Ltd reported the highest grade of 0.10% U3O8 in a pegmatite. The two diamond drill-holes returned negative results.

Northeast of Cherry Lake, 120 m from shore, a third high radioactivity area, **zone 3** (Mineral Occurrence No. 27), was investigated by a 2 m long trench and a 60 m inclined drill-hole. Only weak values were encountered in brecciated pegmatite. The best result was 0.03% across 1.5 m.

A swampy area located a third of the way between the first and second mineralized zones, shows intriguing uranium values. Samples of the black "muck", probably humus rich soil or peat, returned very high contents of between 0.67% and 1.76% U3O8. However a 139 m long hole (DDH. 68-3) drilled by McIntyre Porcupine Mines Ltd under the swamp failed to intersect uranium mineralization. It is now thought that the uranium mineralization is a product of organic matter concentration after precipitating the uranyl ions from the local surface waters. These waters running off over U-rich granites or mylonites are probably enriched in uranium, especially if the latter is in fairly unstable form in the country rock.

Alteration

The main type of alteration seen around the mylonitic zone is an influx of silica. It pervades the host rocks over several m and is manifested by much quartz veining. In the northern showing, pyritization occurs in the biotite layers, which show elevated radioactivity.

Geochemical data

Data reported by the different companies which have worked in the area are probably incomplete. These data are reproduced in Tables 9 and 10.

Table 9. Results of chemical analysis on samles from the trench dug by McIntyre Porcupine Mines Ltd over the mineralized zone north of Cherry Lake next to shore (M.O. 25)

Sample number	Location	Width	% U3O8
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 10. Results of chemical analysis on mineralized samples from the swamp and collected by New Senator-Rouyn Ltd.

Sample number	% U3O8
33	1.21
34	1.76
35	0.25
36	0.76
37	0.67
-	1.40

The samples collected during the AGS 1992 investigation returned some significant values presented in table 11.

Table 11. Selected results from geochemical analysis on 1992 AGS samples.

Sample no. / (M.O. no.)	Location. - Description.	U ppm	Th ppm	Au ppb	Cu ppm	Pb ppm	Zn ppm
WL-08-15-01 (25)	Zone1 -Trench - granit. mylonite +joints w/ yel. stains.	2565	12	21	-	97	-
WL-08-15-02 (26)	Zone2 -Trench - rusty biotite granite.	125	114	5	32	232	122
WL-08-15-03 (26)	-Zone2-Trench. - yellow stains.	485	56	12	-	-	-
WL-08-15-04 (26)	Zone2.- rusty metased.	-	18	9	57	-	-
WL-08-15-05 (27)	Zone3-Trench. -shear.hemat. syenite.	-	38	10	-	-	150
WL-08-15-06 (27)	Zone3 - Hnbd-chlorite. granodiorite	400	26	7	-	59	90

Notice 1ppm U=1.179 ppm U_3O_8

Geophysical data

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, using a SRAT - SPP2 (assessment report by Thorpe, 1969); they found 5 small scattered anomalies with readings above 1,000 cps (counts per second). Table 12 summarizes the results obtained by the AGS 1992 investigation, using a URTEC UG-135 spectrometer.

Table 12 Results from the 1992 AGS spectrometer survey.

(M.O. no.)	Location	Area size	TC* cps	TK cps	TTh cps	TU cps
25	ZONE 1-Trench	2m x 2m (spots)	18,000	200	4	120
26	ZONE 2-Trench	0.8m x 0.15m	1,500	-	-	-
27	ZONE 3-Trench	2m x 1.5m	3,700	32	1	18

TC=Total Counts; TK=Total potassium; TTH=Total thorium; TU=Total uranium
*time constant = 10 seconds
cps = counts per second.

Classification

Uranium mineralization hosted in granite-pegmatite association modified by fracturing and mylonitization. The uranium concentrations encountered in the swamp area represent surficial enrichment due to absorption by organic matter (soil humus or peat).

Assessment reports

Hart, E.A. - 1967 - Report on Alberta Concessions for 1967.- New Senator-Rouyn Limited; Assessment Report U-AF-001(1)/002(1), 10 p.,3 maps (1 map in folder).

Thorpe, W.H. - 1969 - McIntyre Porcupine Mines Limited - New Senator-Rouyn Option, N.E. Alberta; Assessment Report U-AF-001(3)/002(3),7 p., 5 appendices, 12 maps (in folder)& 17 ddh logs and sections appended.

Trigg, Woollett & Associates Ltd. - 1968 - Airborne Scintillometer Survey of the New Senator Option, northeast Alberta.-McIntyre Porcupine Mines Limited; Assessment Report U-AF-001(1)/002(1), 4 p., 2 maps (1 in folder), 2 appendices.

TWIN LAKES **M.O. numbers: 28, 29, 30, 31, 32, 34**

Location

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

History of exploration

The radioactivity in the area was first reported by Godfrey (1963), in the mapping of the southern portion of the Andrew Lake district. In 1967, as a direct result of interest in uranium, 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 with a Geiger counter, sampling and blasting of a limited number of pits and small trenches mostly at the south end of Twin Lakes (assessment report by 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, an extensive grid system was cut in the area, and a ground scintillometer survey was carried out followed by blasting of 9 trenches. Four AX (28.6 mm core diameter) diamond drill holes, D.D.H. 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 (assessment report by Thorpe, 1969).

In 1976, the area covered under Permit no. 247, was flown again radiometrically by a consortium of companies, including Tachyon Venture Management Ltd., Sacksville Oils & Minerals Ltd. and Conventures Ltd. (assessment report by Allan, 1976). In 1977, following up on six airborne radiometric anomalies, the exploration party reinvestigated the trenches previously dug by McIntyre and blasted an additional three trenches for a total of 54 m (north of McIntyre`s D.D.H. 68-7). The results of sampling in the trenches proved to be negative (assessment report by Allan, 1977).

Geological setting

All the area surrounding the northern part of Cherry Lake is underlain by rock units which belong to the Aphebian Colin Lake Granitoids (Figure 12).

Main lithologies

The rock unit in the immediate area consists of a foliated leucocratic porphyritic biotite-granite. In many trenches, biotite forms layers resulting in a gneissic texture. The granite units are injected with numerous bands of white muscovite pegmatite, locally containing wispy and discontinuous layers of biotite. The pegmatitic bodies are most frequently parallel to foliation.

Structure

Foliation and biotite layering are essentially parallel. They vary from N117°E with a 86°N dip in the southern part of the grid area, to N155°E dipping 79°E in the center and to N010°E and 74°W dip in the northern portion. In the trenches, very tight folding of the biotite layers has been observed. Some brittle fracturing is evident .

Mineralization

Mineralization is present in the form of yellow stains and hematitization scattered over the entire area. High radioactivity readings are associated with pegmatite, often showing a breccia-like texture. In most instances, high radioactivity areas have been trenched and drilled. Yellow staining (probably autunite) and hematite are found in the radiactive pegmatites which also contain many reddened feldspars. The best results have been reported from the south end of Twin Lakes with spots reporting up to 0.14% U3O8 (assessment report by Hart,1967) and from trench no. 2 (assessment report by Thorpe,1969, M.O. 30) with a 13 m long channel sample with 0.016% U3O8. The same range of values have been encountered in drilling and are considered uneconomic.

Alteration

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

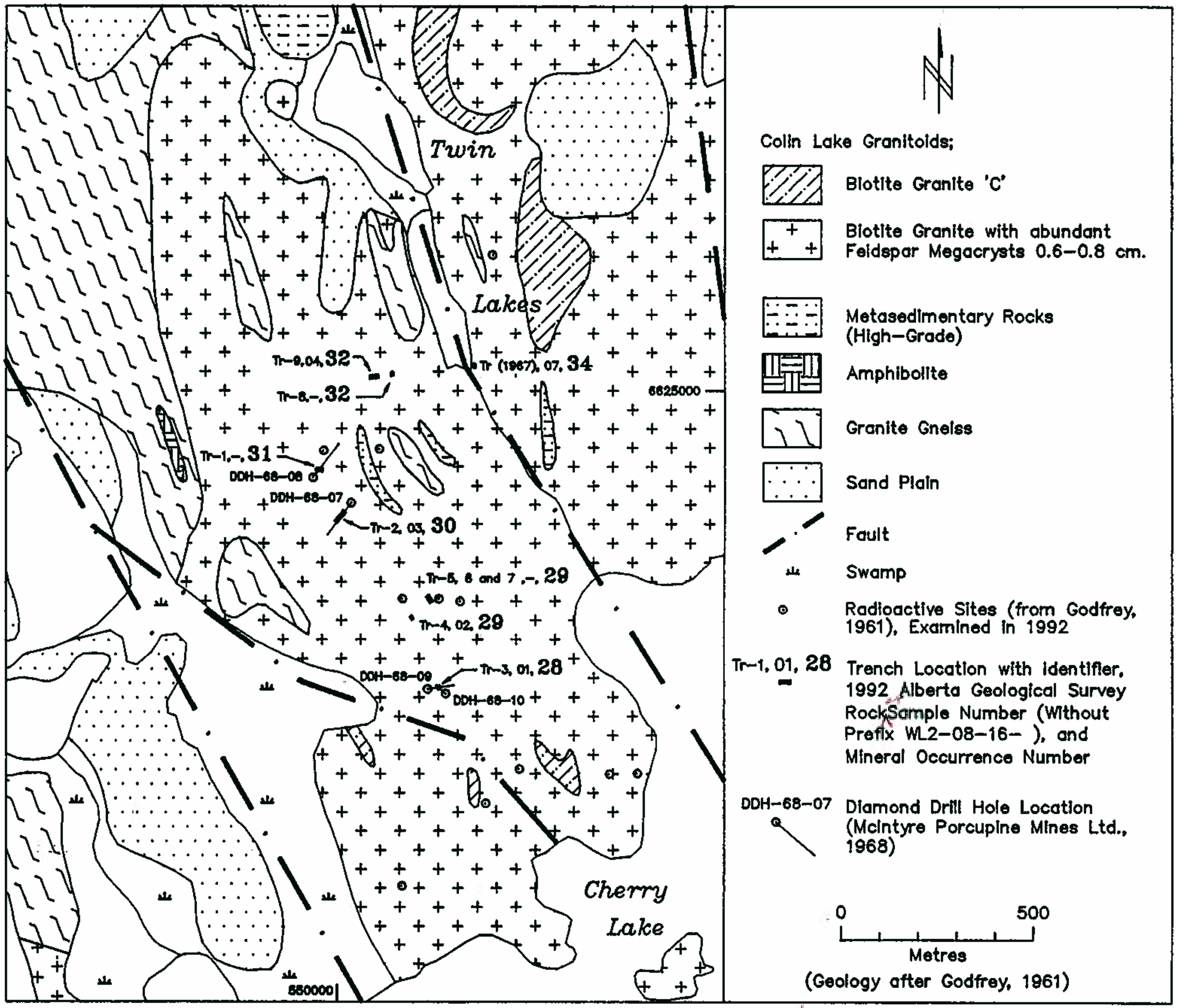

Figure 12. Geological Map of the Twin Lakes Uranium Showing (Mineral Occurrences Numbers 28, 29, 30, 31, 32 and 34). with Drill Hole, Trench and 1992 Sample Locations.

Geochemical data

Geochemical uranium values obtained in trenching are given in the different assessment reports and only the most significant results are presented here:

- from the 1967 work by New Senator-Rouyn Ltd. (Hart, 1967), two small trenches, 1.5 m each at the south shore of Twin Lakes, gave amounts of 0.06% and 0.14% U3O8.
- from the 1968 work performed by McIntyre Porcupine Mines Ltd. (Table 13).

Table 13. 1968 Geochemical results from McIntyre Porcupine Mines Ltd. (Thorpe, 1969)

Location	sample type	%U3O8
Trench no. 1	3 m chan.	0.03
Trench no. 1	Grab	0.11
Trench no. 2	3x1.5 m. chan.	0.04
Trench no. 3	Grabs	0.11
Trench no. 4	1.5 m chan.	0.05
Trench no. 6	1.5 m chan.	0.04
Trench no. 9	2.4 m chan.	0.03

- from the 1977 additional trenching, the best results are given as 274 ppm U3O8 over 6 m and 170 ppm U3O8 over 12 m in trench 77-1.

The investigation conducted by AGS in the summer of 1992 confirmed the previous results. However multi-element analysis indicated some weak but anomalous values in precious and base metals. The results are presented in Table 14.

Table 14. Selected results from geochemical analysis done on 1992 AGS samples.

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

Geophysical data

An heliborne scintillometer survey was flown over the area, part of Permit no. 6, by Trigg, Woollett & Associates Ltd. in 1968 on behalf of McIntyre Porcupine Mines Ltd. In this area, the flight lines were oriented east - west, spaced at 200 m with a ground clearance of 30 m; the equipment consisted of a Mount Sopris Scintillometer Model 160-12A. Ten radioactive occurrences were selected and investigated by means of grid linecutting and ground scintillometry (Figure 13). SRAT - SPP2 scintillometers were used and 4 strong linear anomalies were outlined, as well as 5 more localized anomalies. These anomalies have recorded readings above 2,500 cps (count per second). The ground scintillometer survey was followed by trenching and drilling as described above.

In 1976, Tachyon Venture Management Ltd. carried out another heliborne scintillometric survey using a SAR-1 two channel gamma-ray spectrometer equipped with a 13 liter size -Na(Tl)I crystal detector over its permit 247. The area was flown at a 100 meter spacing with a 60 m ground clearance and at an average speed of 145 km/hr. Six anomalies were detected to the west of Twin Lake.

Table 15 summarizes the results obtained by the AGS 1992 investigation using an URTEC UG-135 spectrometer.

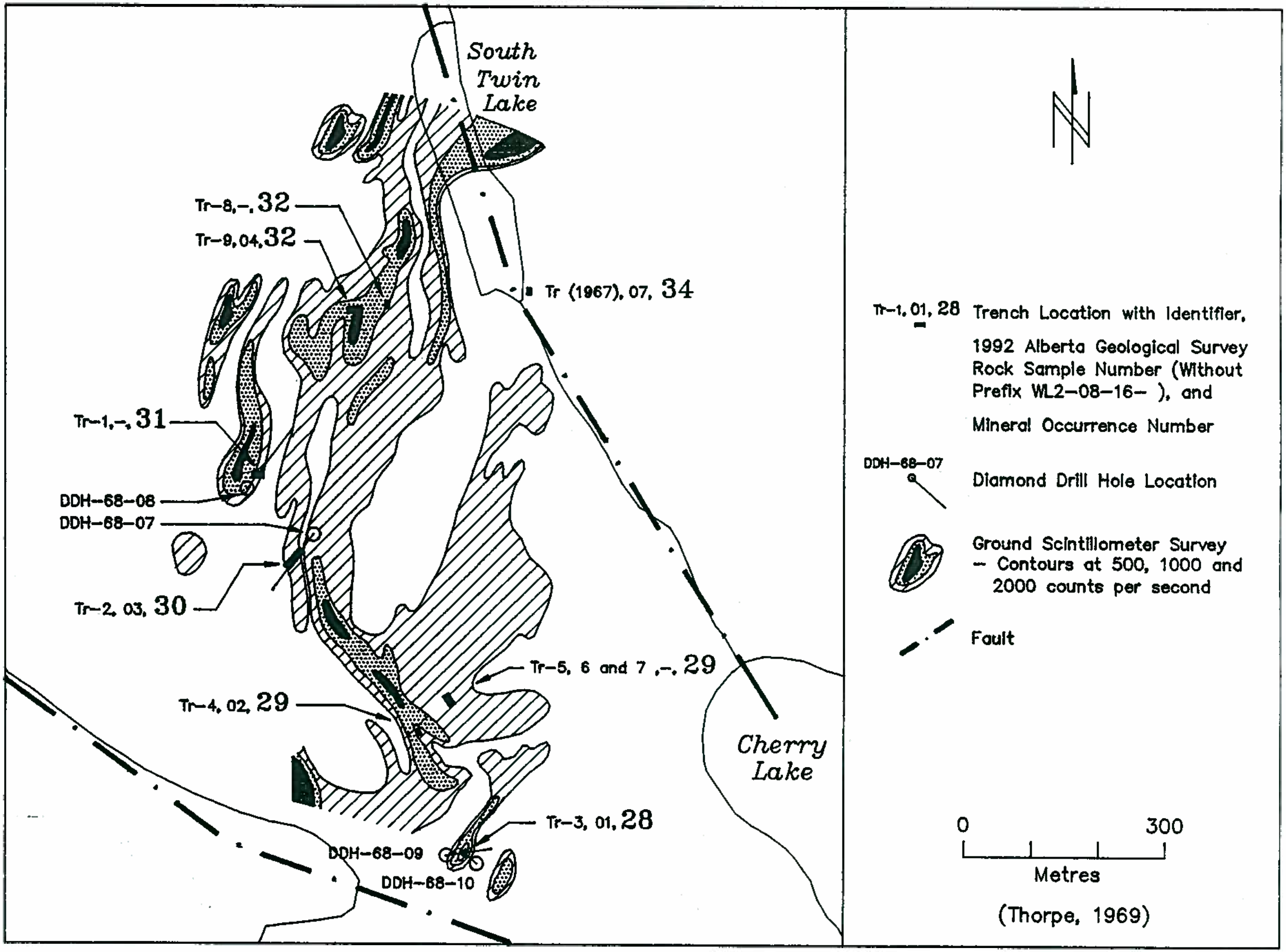

Figure 13. Ground Scintillometer Survey Map of the Twin Lakes Uranium Showing (Mineral Occurrence Numbers 28, 29, 30, 31, 32 and 34), with Drill Hole, Trench and Sample Locations.

Table 15. Results from the 1992 AGS spectrometer survey.

M.O. no.	Location	Area size	TC (Max.) cps	TK cps	TTh cps	TU cps
28	Trench no. 3	1.5m x 1.5m	2,500	26	1	16
29	20m. NE of Trench no. 4	1m x 1m	7,000	-	-	-
30	Trench no. 2	1m x 2m	6,300	45	1	25
31	E. end of Trench no. 1	1m x 10m	5,700	46	1	18
32	W. end of Trench no. 9	1m x 2m	8,300	65	1	24

cps = counts per second.

Classification

Uranium mineralization associated with pegmatite.

Assessment reports

Allan, J.R. - 1976 - Geological & Exploration Report, Andrew Lake Project, northeastern Alberta for Tachyon Venture Management Ltd.; Assessment Report U-AF-112(6) / 113(5) / 114(5) / 126(5), 41 P., 7 Fig.,14 maps in folder, 6 appendices.

Allan, J.R. - 1977 - Geological & Exploration Report, Andrew Lake Project, northeastern Alberta, Quartz Mineral Exploration Permits 182 & 247 for Tachyon Venture Management Ltd.; Assessment Report U-AF- 112(3) / 126(2), 10 p., 6 maps in folder, 1 appendix.

Hart, E.A. - 1967 - Report on Alberta Concessions for 1967.- New Senator-Rouyn Limited; Assessment Report U-AF-001(1)/002(1), 10 p.,3 maps (1 map in folder).

Thorpe, W.H. - 1969 - McIntyre Porcupine Mines Limited - New Senator-Rouyn Option, N.E. Alberta; Assessment Report U-AF-001(3)/002(3),7 p., 5 appendices, 12 maps (in folder)& 17 ddh logs and sections appended.

Trigg, Woollett & Associates Ltd. - 1968 - Airborne Scintillometer Survey of the New Senator Option, northeast Alberta.-McIntyre Porcupine Mines Limited; Assessment Report U-AF-001(1)/002(1), 4 p., 2 maps (1 in folder), 2 appendices.

SMALL LAKE **M.O. number: 33**

Location

The mineralized area is located on the northern shore of a "small lake" situated 1,800m to the northwest of the northern end of Cherry Lake. The area is 120m by 120m (NTS 74M/16).

Access

By float plane to Cherry Lake and then by foot.

History of exploration

The radioactivity in the area was first reported by Godfrey (1963) in the mapping of the southern portion of the Andrew Lake district. In 1967, as a direct result of interest in uranium, Astrabrun Mines Ltd. acquired exploration permit number 6 from the Alberta Government and subsequently transferred it to New Senator-Rouyn Ltd. After confirming interesting uranium mineralization near and around Cherry Lake (assessment report by Hart, 1967), New Senator-Rouyn Ltd. optioned their permit to McIntyre Porcupine Mines Ltd. which carried out a heliborne spectrometric survey (assessment report by Trigg et al., 1968). This survey rediscovered the radioactive zone located on the shore of "Small Lake". A grid was cut and a ground scintillometer survey, using SRAT-SPP2 instruments, was carried out. Ten trenches were blasted in the areas of greatest radioactivity and were followed by four AX (28.6 mm core diameter) diamond drill holes for a total of 521m. No intersection of economic interest was encountered in drilling (Thorpe, 1969) and exploration stopped.

Geological setting

The area is mapped as underlain by biotite granite, biotite granite gneiss and high grade metasediments; the geological setting appears transitional between the Archean Basement Complex to the west and the Aphebian Colin Lake Granitoids to the east (Figure 14).

Main lithologies

The main unit cropping out in the area of "Small Lake" consists of whitish grey foliated porphyritic biotite quartz rich granite with pink feldspar and many xenoliths of rusty biotite schist. In the trenches, biotite quartz paragneiss to granite gneiss, pegmatite and biotite schist layers are exposed.

Structure

The foliations found in granite as well as in granite gneiss are constant at N148°E and dip 70°W. Many small scale tight folds are observed in the trenches; their fold axial plane is striking at N135°E and the fold axis is plunging steeply.

Mineralization

Some high radioactivity is locally associated with yellow stains (autunite?) on the surface of biotite granite. However, the best mineralization occurs within biotite quartz-rich pegmatite with a breccia-like texture. The best results were obtained in trench no. 4 which assayed 0.50 % U3O8 over 1.5 m. Some MoS2 (molybdenite) values are reported in trenches; in trench no. 7, a 0.60 m channel sample returned 0.28% MoS2 and 0.19% U3O8. In drill holes, the mineralized intersections are in the same order of magnitude; the best intersection was found in drill hole D.D.H. 68-14 with assays of 0.05% U3O8 over 4.5m at a contact between pegmatite and biotite granite. In drill hole D.D.H. 69-1, a 2.25 m intersection in a biotite rich granite layer within pegmatite assayed 0.05% U3O8 and 0.05% MoS2 (Thorpe, 1969).

During the 1992 summer AGS investigation, pyrite (in the order of 2 to 3%) and some arsenic pyrite were noted to be associated with biotite rich layers; in trench no. 4, the contact of such a layer with pegmatite is the site of the highest radioactivity reading and a grab sample of that layer returned 0.69% U3O8 and 0.08% MoS2.

Alteration

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 gave some significant results. These are presented in Table 16.

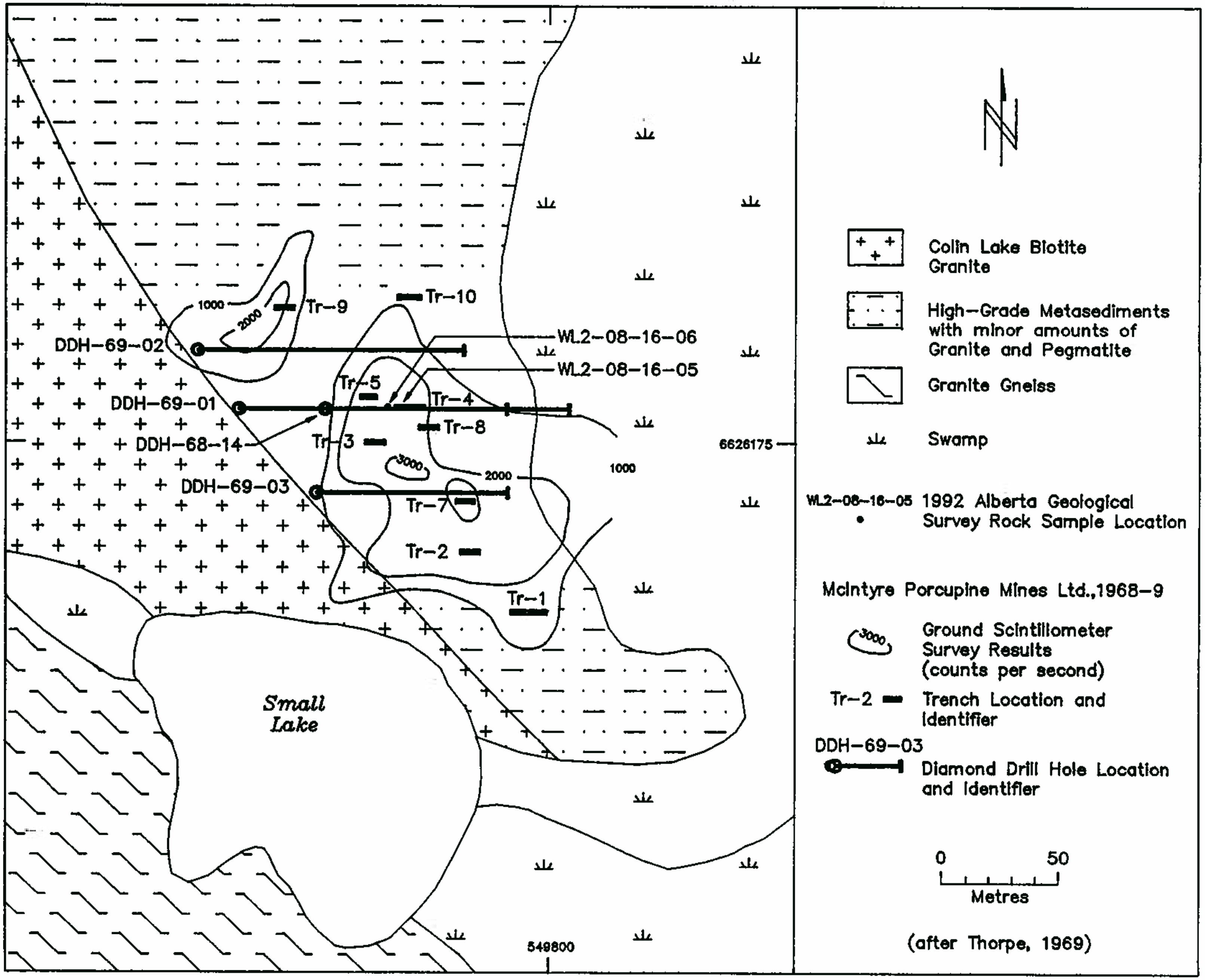

Figure 14. Geological and Geophysical Map of the Small Lake Uranium Showing (Mineral Occurrence Number 33), with Drill Hole, Trench and Sample Locations.

Table 16. Results of chemical analysis on samples from trenches (fromThorpe, 1969).

Location	Width	%U3O8	%ThO2	%MoS2
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 - 0.6m depth	0.3 m	0.08	0.04	0.08
Trench no. 4 - from 0.3m to0.6m - 0.6mdepth	0.3 m	0.04	0.03	0.06
Trench no. 4 - from 0.6m to 0.9m- 0.6 m depth	0.3 m	0.08	0.07	0.08
Trench no. 4 - from 0.9m to 1.2m- 0.6m depth	0.3m	0.05	0.03	0.07
Trench no. 4 - from 1.2m to 1.5m- 0.6m depth	0.3m	0.04	Tr.	0.02
Trench no. 4 - W. end - 0.6m depth	0.3m	0.49	0.16	0.16
Trench no. 4 - W. end - 1.2m depth	0.3m	0.07	0.02	0.02
Trench no. 4 - E. end -1.2m depth	0.3m	0.16	0.11	0.18
Trench no. 4 - from 0.3m to 0.9m-1.2m depth	0.6m	0.03	0.02	0.07
Trench no. 4 - from 0.9m to 1.5m- 1.2m depth	0.6m	0.05	Tr.	0.06
Trench no. 4 - grab / high radioact.	-	1.06	0.24	0.23
Trench no. 5 - W. end.	1.5m	0.04	0.01	-
Trench no. 7 - W. end.	0.3m	0.11	0.09	0.20
Trench no. 7.- E. end.	0.6m	0.19	0.11	0.28
Trench no. 9 - E. end.	1.5m	0.03	Tr.	-
Trench no. 9 - Grab.	-	0.08	0.01	-
Trench no. 10.- E. end.	1.8m	0.03	0.03	-

Two grab samples collected in the course of the AGS 1992 investigation confirm the amount of uraniferous mineralization. They also indicate some values in base and precious metals (Table 17).

Table 17. Selected results fom geochemical analysis on 1992 AGS samples.

Sample no	Location/descript.	U ppm	Th ppm	V ppm	Mo ppm	Cu ppm	Pb ppm	Zn ppm	Au ppb
WL-08-16-05	Trench no4/ W. end pegm.-bio.sch. contact	5865	1054	121	489	13	1144	124	12
WL-08-16-06	1m. W. of Trench no.4/ py.bio.sch.	120	55	103	14	122	89	77	8

Geophysical data

A heliborne scintillometer survey was flown over the area, part of Permit no. 6, by Trigg, Woollett & Associates Ltd. in 1968 on behalf of McIntyre Porcupine Mines Ltd. In this area, the flight lines were oriented east - west , spaced at 200m with a ground clearance of 30m; the equipment consisted of a Mount Sopris Scintillometer Model 160-12A. Two radioactive occurrences were selected and investigated by means of grid linecutting and ground scintillometry (Figure 14). SRAT - SPP2 scintillometers were used and 2 strong anomalies were outlined. These anomalies have recorded readings above 2000 cps. The ground scintillometer survey was followed by trenching and drilling as described above.

Table 18 summarizes the results obtained by the AGS 1992 investigation, using a URTEC UG-135 spectrometer.

Table 18. Results from the 1992 AGS spectrometer survey

Location	host-rock type	TC cps	TK cps	TTh cps	TU cps
Trench no. 4 (4m long)	yellow stains	3,000	-	-	-
Trench no. 4	brecciated pegmatite	4,000	-	-	-
Trench no. 4.	pegm./ next to rusty bio.schist / 1m x 1m	12,000	95	1	30

Classification

Uranium mineralization associated with molybdenum in pegmatite and granite gneiss in contact with rusty metasediments.

Assessment reports

Hart, E.A. - 1967 - Report on Alberta Concessions for 1967.- New Senator-Rouyn Limited; Assessment Report U-AF-001(1)/002(1), 10 p.,3 maps (1 map in folder).

Thorpe, W.H. - 1969 - McIntyre Porcupine Mines Limited - New Senator-Rouyn Option, N.E. Alberta; Assessment Report U-AF-001(3)/002(3),7 p., 5 appendices, 12 maps (in folder)& 17 ddh logs and sections appended.

Trigg, Woollett & Associates Ltd. - 1968 - Airborne Scintillometer Survey of the New Senator Option, northeast Alberta.-McIntyre Porcupine Mines Limited; Assessment Report U-AF-001(1)/002(1), 4 p., 2 maps (1 in folder), 2 appendices.

WEST ARM ANDREW LAKE (BIG BEND) M.O. number: 56

Location

400m west from shore of the large bend where the east-west trending west Arm of Andrew Lake shifts to a north-south direction (NTS 74M/16).

History of exploration

Mineralization in the area was first mentioned in Godfrey (1958) but never received much attention during the several phases of exploration linked to the increased interest in uranium in the early and late 1970s. It appears that the area was never picked up by airborne geophysical surveys, because of its location at the base of a major hill and under thick forest cover. Interestingly enough, three grab samples taken by Godfrey (1958) at this site, which ran extremely high uranium and molybdenum values, were reported at a wrong location. Rapid River Resources Ltd. acquired six mineral claims (Quartz Mineral Claims numbers 148 to 153) in 1968, a quarter of a section each, covering the entire area from the showing eastward. After ground prospecting, they drilled four holes (type of drilling is not known) totalling 530 m, to test the best surface radioactivity spots. The best intersection was 0.22% U (0.26% U3O8) 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 mapped as underlain by biotite granite gneiss, hornblende granite gneiss and a few bands of metasediments (Godfrey, 1966). These rock units form part of the Archean Basement Complex (Figure 15).

Main lithologies

In the mineralized area, the predominant rock type consists of tightly folded and laminated biotite schist and quartz feldspar biotite schist. Some interlayers are strongly paragneissic and grade toward the east to biotite granite gneiss. To the west before disappearing under overburden and muskeg, the outcrops are composed of very rusty metasediments in sheared contact with a pink to white leucogranite. The shear zone is 20 to 50 centimeter wide and contains pods and lenses of pegmatitic material. The leucogranite varies in texture. It is fine- to medium-grained and foliated on its northern exposure but shows a coarse and pegmatitic texture and is much less foliated to the south, where it is in contact with granite gneiss on its western margin. The leucogranite intrusive contains inclusions of metasediments and silicified mylonitic granite gneiss.of about one meter in size.

Structure

The main structural feature in the mineralized area consists of a wide shear zone striking N015°E and vertically dipping. The shear zone puts into contact an intrusive leucogranite and tightly folded metasediments. The metasediments display a well developed foliation slightly discordant with the shear zone direction; the foliation strikes N020°E with a 80° dip to the west. The metasediments also show many small S-folds, thin shear bands and associated cross-cutting extensional crenulation cleavages. Where the main shear zone widens, the associated schistose layers show S and M-shaped tight folds, 10 to 20 cm in size. Foliation in the leucogranite strikes N004°E to N015°E next to the shear zone.

Mineralization

Godfrey (1958) described the area as having "a very high level of radioactivity" and that the mineralization is concentrated in a band of biotite schist which "contains molybdenite and yellow stains which resemble carnotite". The band can be followed over a distance of 33 m before being covered by glacial drift. Godfrey (1958) reported high assays from three grab samples taken over the radioactive zone; these assays are reproduced in Table 19.

Table 19. Results from chemical analysis reported by Godfrey (1958)

Sample No	U3O8 %	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

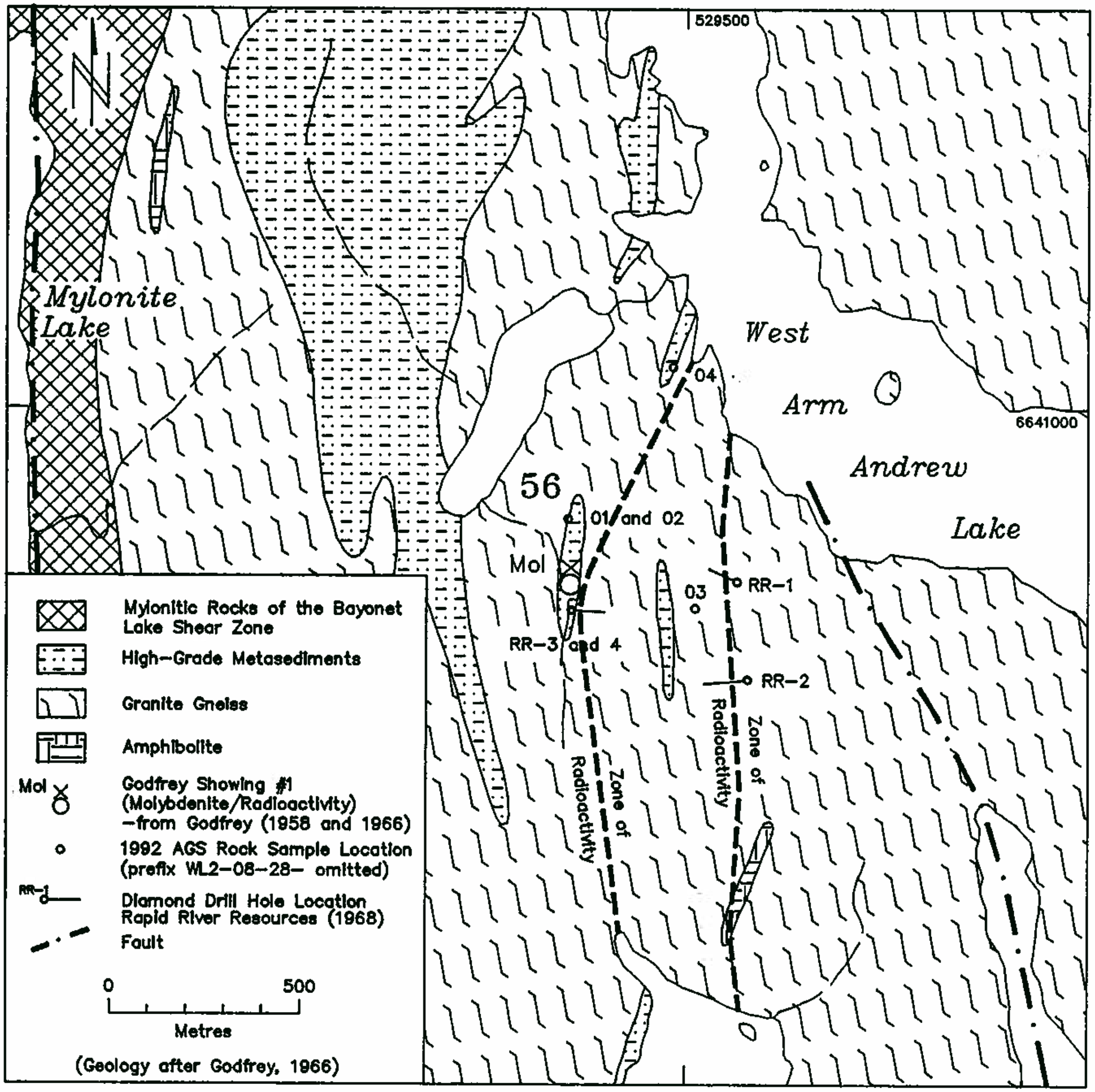

Figure 15. Geological Map of the West Arm of Andrew Lake (Big Bend) Uranium Showing (Mineral Occurrence Number 56), with Drill Hole and 1992 Sample Locations.

The only follow-up exploration work on the showing was carried out by Rapid River Resources Ltd. in 1968. Rapid River reported 300 scattered radiometric '"spot highs" in the order of 5 to 10 times background aligned along two north trending zones, approximately 1,800 m long by 300 m wide. The western zone relates to the mineralized area discovered by Godfrey (1958). Apparently this zone yielded the best intersection of 1 m assaying 0.22% U (0.26% U3O8) when drilled the following winter. The mineralized intersection is described to occur at a vertical depth of 20 m in a brecciated band of biotite schist.

During 1992 field checking, the mineralization was found to be confined to the strongly sheared biotite and quartz rich band associated with the shear zone. The schistose band shows good continuity over 10 m and a width of 0.2 to 0.5 m, contains much limonite and has a very high radioactivity. Molybdenite flakes ranging from 1 to 3 mm in size constitute locally up to 1% of the rock unit, together with galena, pyrite and probably pitchblende or coffinite. The schist band pinches to the south against two small white quartz veins and then swells again into a 1 meter wide rusty biotite schist band containing quartz and pegmatite pods and lenses. There, radioactivity is much weaker and sulfides, mostly molybdenite and pyrite are concentrated in pegmatite pods. Two grab samples were taken from the mineralized zone (Figure 15) and their assays are presented in Table 2, the best results being 0.29% U3O8 and 0.25% MoS2 in one sample. It should be noted that the mineralization was observed at a location about 200m north of the one reported by Godfrey (1958). It is possible that Godfrey (op. cit.) plotted this outcrop at the wrong location, because of the presence of heavy bush around this locality.

Alteration

The main alteration consists of silicification in the leucogranite which appears more intense some distance away from the shear zone and extend over 1 to 2m. However, some silicification in the form of quartz patches is also noted in the biotite rich schist in the shear zone.

Geochemical data

The 1992 samples obtained some interesting results (Table 20).

Table 20.- Selected results from geochemical analysis on 1992 AGS samples.

Sample no	Description/Remarks	Mo ppm	Pb ppm	U ppm	Th ppm	V ppm	Ba ppm
WL-08-28-01*	Shear-bio-schist zone/ High radioact.	1508	1100	2430	460	142	652
WL-08-28-02	Wide shear-zone +qtz+ pegm.pods.	619	342	645	128	-	213

* WL-08-28-01 contains 1333 ppm Mn.
Notice: 1 ppm Mo=1.669 MoS2

Geophysical data

Although the area has been flown by various radiometric airborne surveys, it did not show up. The only information available is provided by Rapid River Resources, who mentioned in their report that 300 radioactive "spot highs" with readings between 500 and 1000 cps were recorded with SRAT-SPP2 scintillometers. The spot anomalies are scattered along two north-south trends, 1.8 by 0.3 km, which are assumed to be related to lineaments. However, no map of the radioactivity readings is available.

The 1992 AGS investigation using a URTEC UG -135 differentiating spectrometer took some radiometric measurements over the mineralized zone (Table 21).

Table 21. Results from the 1992 AGS spectrometer survey.

Location	**Total Count** cps	**TK*** cps	**TTh*** cps	**TU*** cps
metasediments - background	200	-	-	-
leucogranite (mylonitic zone)	500 (1,000)	-	-	-
Shear zone - over 2m x 25m.	>= 1,000	-	-	-
Shear zone - over v. rust. bio. schist, 0.5 x 10 m	>= 20,000	-	-	-
- over high spot	40,000	590	17	340

Classification

Uranium - molybdenum mineralization associated with shearing at granite - metasediment contact.

Assessment reports

Geiger, K.W. - 1971 - Progress Report on Claims 148-153, Andrew Lake district on behalf of Rapid River Resources Ltd.; report filed for assessment credit- Research Council of Alberta - **referenced in** Allan, J.R. - 1976 - Geological & Exploration Report, Andrew Lake Project, northeastern Alberta for Tachyon Venture Management Ltd.; Assessment Report U-AF-112(6) / 113(5) / 114(5) / 126(5), 41 P., 7 Fig.,14 maps in folder, 6 appendices.

SPIDER LAKE

M.O. numbers: 64, 65, 66

Location

The mineralization is found on the wide northern peninsula of Spider Lake and on the string of small islands extending to the southwest (NTS 74M/16).

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, as a direct result of interest in uranium, 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 interesting uranium mineralization near and around Cherry Lake and Holmes Lake (Hart, 1967), New Senator-Rouyn Ltd. optioned their permits to McIntyre Porcupine Mines Ltd. which carried out a heliborne spectrometric survey in late spring of 1968 (Trigg et al., 1968). This survey confirmed the presence of the two strings of radioactive anomalies shown on the geological map and located on the northern shore of Spider Lake. After picketing several baselines for reconnaissance scintillometry, McIntyre Porcupine Mines Ltd. blasted a series of trenches (7 or more?) across the belt of radioactivity measurements extending from the small islands to the northeast corner of Spider Lake and drilled two AX (28.6 mm core diameter) diamond drill holes, D.D.H. 68-11 (92.3m) and D.D.H. 68-12 (142m). No intersection considered of economic interest was encountered either in the trenches or in the drill holes (Thorpe, 1969).

Geological setting

Spider Lake sits within a northeast-southwest trending belt, 400 to 600m wide, of high grade metasediments. The belt is enclosed between granite gneiss and is intruded by pink medium grained foliated granite. All the rock formations in the area are considered to belong to the Archean Basement Complex. A major fault, also trending NE-SW, cuts through the northeast corner of Spider Lake (Figure 16).

Main lithologies

The main rock units found in the vicinity of the mineralized area are metasediments, composed of massive biotite feldspathized quartzite and rusty biotite graphite schist, foliated to slightly foliated pink granite and transitional biotite granite gneiss. At contacts between granite gneiss and metasediments, the latter is frequently injected by muscovite bearing pegmatites.

Structure

Foliation is uniform in metasediments and paragneiss/granite gneiss; its strike ranges from N050°E to N090°E, and generally is vertical or dips steeply to the west. Mesoscopic folds are common in the metasediments and at one locality, measurement of the fold axial plane gave a trend of N106°E and a vertical plunge for the fold axis. A few small scale faults have been observed at the contact between granite gneiss, granite and metasediments; they trend N110°E. Shear bands are frequent in granite and trend at N088°E.

Mineralization

Three main radioactive zones have been delineated in the northeastern corner of Spider Lake; they are referred as **Showing no. 1** (part of Mineral Occurrence no. 64 , **Showing no. 2** (Mineral Occurrence no. 65), **and Showing no. 3** (Mineral Occurrence no. 66) of McIntyre Porcupine Mines Ltd. (Figure 16). Minor radioactivity is also encountered in the trenches on the small islands. High radioactivity is reported to be "concentrated and disseminated" along radioactive bands which follow the facies change from quartzite and biotite schist to biotite paragneiss and granite gneiss. However, the uranium content is low and ranges from 0.01 to 0.17% U_3O_8. No economic radioactive mineral has been mentioned, although yellow and green stains (autunite and uranophane?) have been seen in some trenches, during the AGS investigation in 1992. Also, some sulfides occur in rusty metasediments and account for 1 to 3% of the rock; flakes of molybdenite are often encountered.

Alteration

Silicification is generally pervasive in the area of radioactivity. It affects all rock types but more specifically the biotite schist and biotite rich paragneiss. Hematization is prominently expressed by reddening of felspars in pegmatites of areas of high radioactivity.

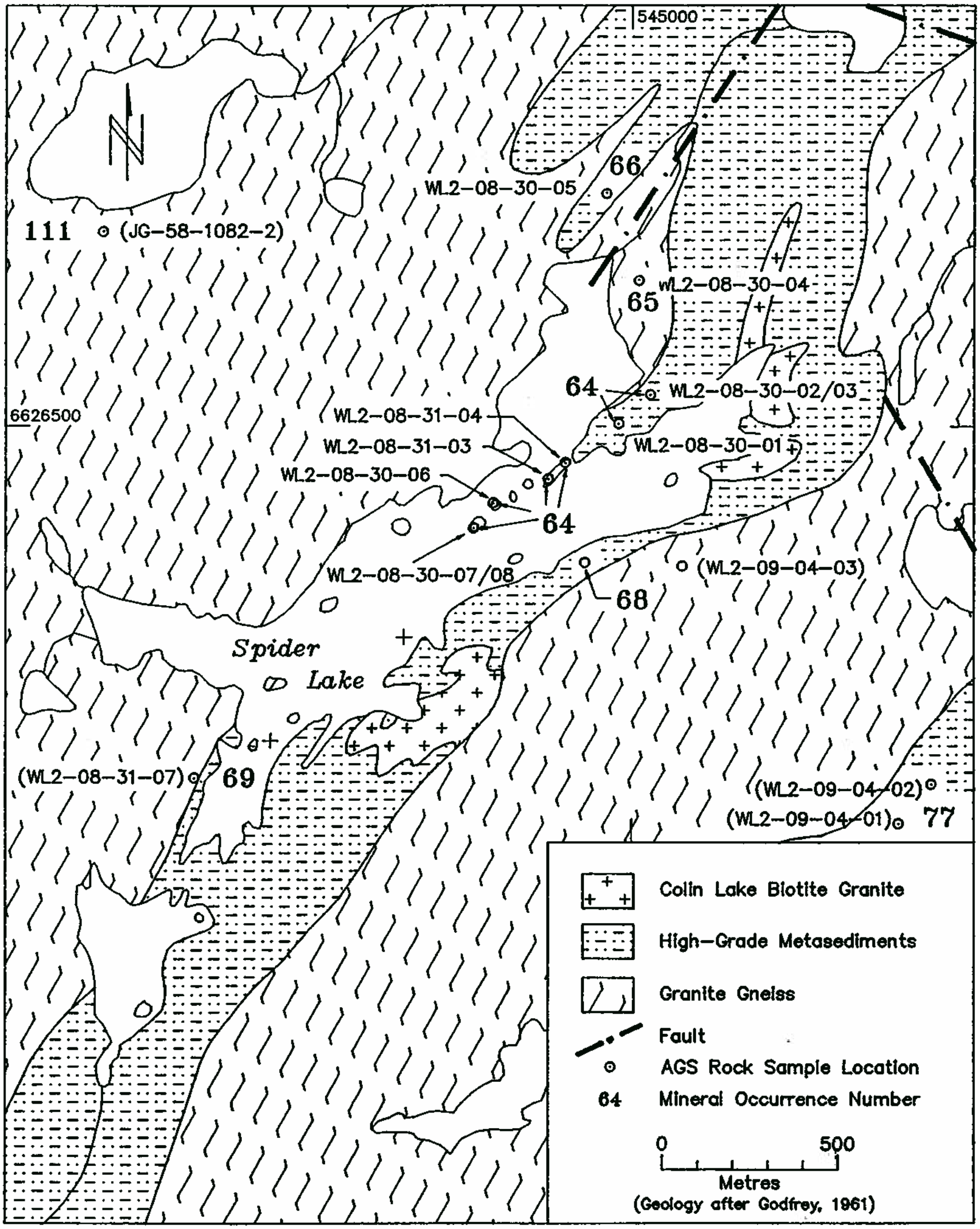

Figure 16. Geological Map of the Spider Lake Area with Alberta Geological Survey Sample Locations and Mineral Occurrence numbers.

Geochemical data

The geochemically significant values (above 0.03% U3O8) from the McIntyre Porcupine Mines Ltd.'s report (Thorpe, 1969), are presented in Table 22.

Table 22. Selected uranium results from samples taken by McIntyre Porcupine Mines Ltd. (after Thorpe, 1969; table accompanying Map no. 10)

Sample no	U3O8 %	Location (see Figure 17) and comments
6551	0.05	Showing no. 1-172 m on B.L. no.2 - Grab
6552	0.08	Showing no. 1-Island - 0 m to 1.5m
6553	0.11	Showing no. 1-Island - chips from bottom of trench.
6554	0.04	Showing no. 1-168 m on B.L. no.2 -0m to 1.4m.
6555	0.04	Showing no. 1-158 m on B.L.no.2 - 0m to 0.3m.
6556	0.17	Showing no. 1-Grab.
6568	0.16	Showing no. 1-113m on B.L. no.2 - Grab.
6573	0.03	Sh.1-149 m on B.L. no.2-Trench no6 - 1.8m to 3.2m.
6581	0.03	Sh no. 1-113 m on B.L. no.2-Trench no7 -.1.8m to 3m.
6583	0.11	Showing no. 1-145 m on B.L. no.2-Chips over 0.5 m.
6585	0.04	Showing no. 1-145 m on B.L. no.2-Chips over 0.7 m.
6587	0.04	Showing no. 1-0+00 m on B.L. no.1-Grab.
6588	0.03	Showing no. 1-46 m. on B.L. no.2-Grab over 3m.
6589	0.03	Showing no. 1-168 m on B.L. no.2-Grab -0m to 1.2m.
6595	0.05	Showing no. 2
6596	0.05	Showing no. 2 -Grab.
6597	0.07	Showing no. 2 -Chip/grab.
6598	0.09	Showing no. 2 -Chip/grab.
6599	0.10	Showing no. 2 -Chip/grab.
9801	0.09	Showing no. 2.
9802	0.12	Showing no. 2.
9803	0.11	Showing no. 2.
9804	0.05	Showing no. 2.
9805	0.04	Showing no. 3.
9806	0.05	Showing no. 3.
9807	0.04	Showing no. 3.

"Showing no. 1" refers to Station numbers-1992: 08-30-01 and -02 **(M.O. no. 64)**.
"Showing no. 2" refers to Station number-1992: 08-30-04 **(M.O. no. 65)**.
"Showing no. 3" refers to Station number-1992: 08-30-05 **(M.O. no. 66)**.

The 1992 AGS investigation and sampling corroborated the magnitude of the surface mineralization and confirmed the uranium - molybdenum association. The main geochemical data is presented in Table 23.

Table 23. Selected results from geochemical analysis on 1992 AGS samples.

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 paragn. +moly.	130	-	37	-	-	-
WL-08-30-02 (64)	"Showing no.1" - N.E. trench. pegmtite - biotite.sch.+py	530	-	87	257	-	-
WL-08-30-03 (64)	"Showing no. 1"-1m.E.of N.E. trench rust. silicified F. bio. sch.+3%py.	150	-	-	-	-	-
WL-08-30-04 (65)	"Showing no. 2" - central. trench. pegm. hemat. F. bio. sch.-paragneiss.	430	132	28	-	-	-
WL-08-30-05 (66)	"Showing no. 3" - centr. pit / yel stains contact pegm. bio. sch.+moly w/ paragneiss.	575	99	185	191	-	-
WL-08-30-06 (64)	Station"C"*.- trench. rust.bio.sch.+py.graph.	-	-	-	104	92	-
WL-08-30-07 (64)	Station "B"*.- trench./ yel.stains pegm. +py., po., moly.	1345	154	60	391	-	6
WL-08-30-08 (64)	Station "B"* - W.end of trench. v.rust.biotite.sch.	-	-	-	-	-	-
WL-08-31-03 (64)	Station"D"* -S.end of trench. rust.garnet qtzte +py., po.	-	-	-	-	-	-
WL-08-31-04 (64)	Station "E"* -trench. contact biotite.sch. w/ pegm.	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 17).

Geophysical data

A heliborne scintillometer survey was flown over the area, part of Permit no. 6, by Trigg, Woollett & Associates Ltd. in 1968 on behalf of McIntyre Porcupine Mines Ltd. In this area, the flight lines were oriented east-west, spaced at 200 m with a ground clearance of 30 m; the equipment consisted of a Mount Sopris Scintillometer Model 160-12A. Three radioactive anomalies were detected, which confirmed the radioactive areas already known. They were followed up by trenching and drilling as described previously. However, no systematic ground scintillometry has been reported.

Table 24 summarizes the results obtained by the AGS 1992 investigation using a URTEC UG-135 spectrometer, from McIntyre's **Showings no. 1, 2 and 3**, as well as from the islands to the southwest.

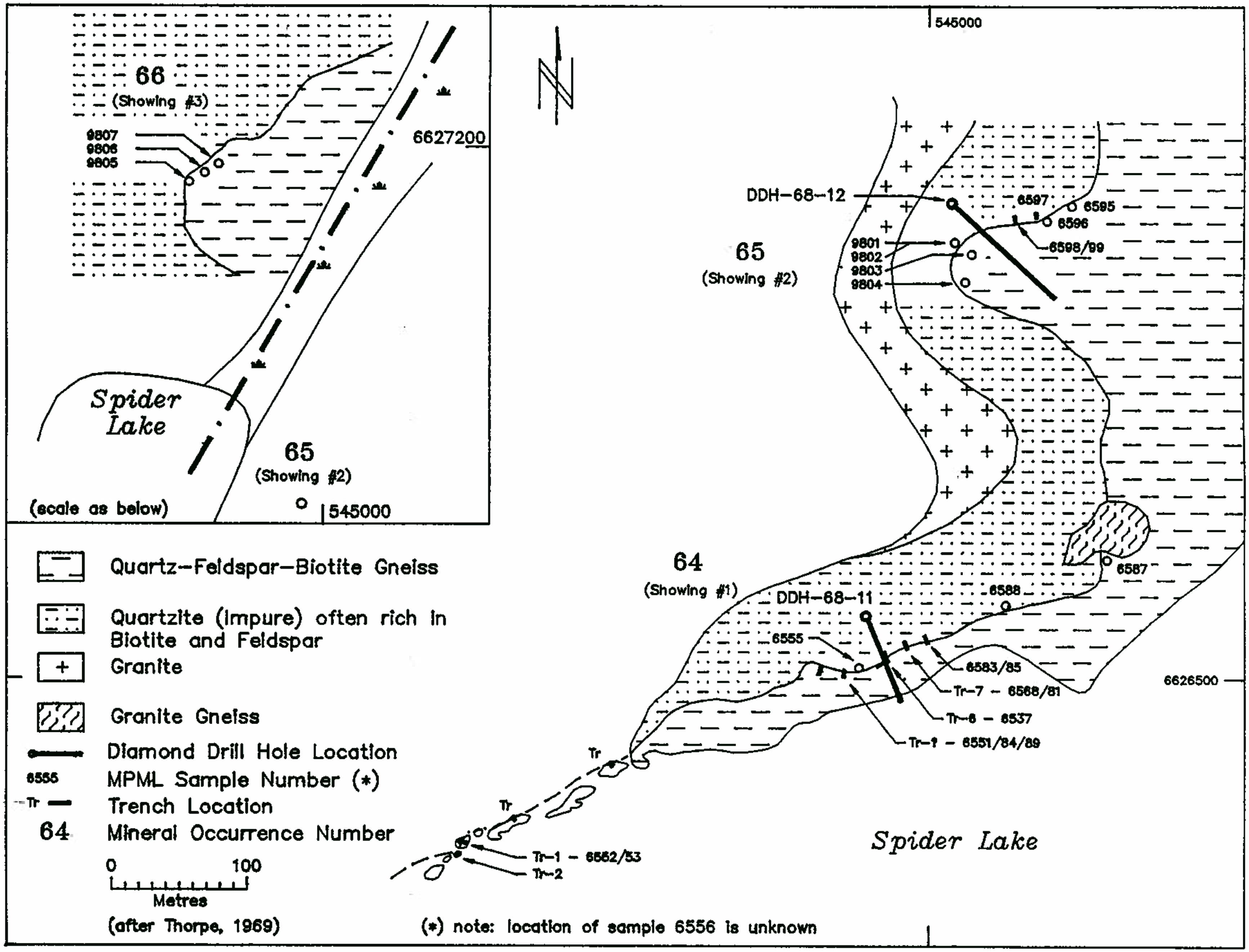

Figure 17. Geological Map of the Spider Lake Uranium Showing (Mineral Occurrence Numbers 64, 65 and 66 (insert)), with Drill Hole, Trench and Sample Locations.

Table 24. Results from the 1992 AGS spectrometer survey.

M.O. no.	Location	Area size	TC (Max) cps	TK cps	TTh cps	TU cps
64	Showing no1-S. Trench.	1m x 1.5m	4,300	40	1	24
64	Showing no1-C. Trench; 70m. to N.E.	1m x 1m	8,000	52	1	37
64	Showing.no1-N.Trench; 25m to N.E.	1m x 0.1m	7,500	-	-	-
65	Showing no2-Trench.	1m x 0.6m	13,000	89	1	39
66	Showing no3-Pits.	0.1m x 50m	4,000	-	-	-
64	Station "C"-Trench.	1m x 0.2m	2,500	-	-	-
64	Station "B"-Trench.	1m x 0.15m	11,000	95	2	55
64	Station "E"-Trench.	2m x 2m	2,250	-	-	-

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 17).

Classification

Two types of mineralization are encountered in the Spider Lake area. One consists of uranium associated with pegmatite layers intruding the metasediments and is exemplified by mineralization found in the islands trenches (Mineral Occurrence no. 64). The other type is uranium with associated molybdenite mineralization in pegmatite injected metasediments. The mineralization occurring in trenches and pits on-shore (Mineral Occurrences no. 65, 66 and part of 64) belong to the second type.

Assessment reports

Hart, E.A. - 1967 - Report on Alberta Concessions for 1967.- New Senator-Rouyn Limited; Assessment Report U-AF-001(1)/002(1), 10 p.,3 maps (1 map in folder).

Thorpe, W.H. - 1969 - McIntyre Porcupine Mines Limited - New Senator-Rouyn Option, N.E. Alberta; Assessment Report U-AF-001(3)/002(3),7 p., 5 appendices, 12 maps (in folder)& 17 ddh logs and sections appended.

Trigg, Woollett & Associates Ltd. - 1968 - Airborne Scintillometer Survey of the New Senator Option, northeast Alberta.-McIntyre Porcupine Mines Limited; Assessment Report U-AF-001(1)/002(1), 4 p., 2 maps (1 in folder), 2 appendices.

HOLMES LAKE

M.O. number: 75

Location

The mineralized area is found within 100m from the shore of a little bay at the southern tip of Holmes Lake (NTS 74M/16).

History of exploration

The radioactivity in the area was first reported by Godfrey (1961) in the mapping of the northern portion of the Andrew Lake district. In 1967, as a direct result of interest in uranium, Astrabrun Mines Ltd. acquired exploration permit number 7 from the Alberta Government and subsequently transferred it to New Senator-Rouyn Ltd. After confirming uranium mineralization in the southwest corner of Holmes Lake (a sample contained 0.14% U3O8), New Senator-Rouyn Ltd. optioned their permit to McIntyre Porcupine Mines Ltd. This company carried out a heliborne spectrometric survey in late spring of 1968, which came up with 5 radioactive anomalies recommended for investigation. The anomalies were tested by 7 small trenches and a single 123.75 m deep AX (28.6 mm core diameter) diamond drill hole. Low grade mineralization was found from the collar down to 50m, but was judged to be uneconomical (Thorpe, 1969).

Geological setting

The southern portion of Holmes Lake occupies the northern part of a high grade metasedimentary wedge, which is cut off by the prominent northwest - southeast trending Bonny Fault. The metasediments are bordered on all sides by biotite granite gneiss of the Archean Basement Complex (Figure 18).

Main lithologies

The main rock types in the trenched area consist of white silicified pegmatite, locally containing wispy bands of biotite and biotite-rich feldspathic quartzite. The quartzite are often interlayered with hematized biotite granite gneiss rich in feldspar porphyroblasts. To the west, amphibolite, biotite schist and grey pyritic quartzite are the dominant rock units (Figure 18).

Structure

Foliation and layering are concordant and fairly uniform over the entire area with a strike of N043°E and a dip of 85°S. The numerous pegmatite layers encountered in the trenched area, are conformable with the general foliation.

Mineralization

All the high radioactivity readings are obtained over the white pegmatite; however no uranium or thorium minerals can be recognized in the field except for some yellow stains (autunite?) in trenches 2-A and 2-B. The highest assay from the channel samples collected in the trenches is 0.07% U3O8 over 1.8 meter.

Drill hole D.D.H. 68-13 intersected three zones with some weak mineralization in pegmatite: from top to bottom they are 8 m at 0.015% U3O8, 1.5 m at 0.03% U3O8 and 4.5 m at 0.02% U3O8. McIntyre Porcupine Mines Ltd. also reports the discovery of a mineralized zone 800 m southwest of Holmes Lake. A piece of pink syenite assayed 0.14% U3O8 (Thorpe, 1969).

During the summer 1992 AGS investigation, sulfides (mostly pyrite and some pyrrhotite) were observed in outcropping biotite quartzite or in biotite gneiss exposed in trenches.

Alteration

Hematization is the most widespread alteration product encountered in the Holmes Lake area. It affects the granite gneiss units as well as the pegmatite. Silicification is more restricted to the pegmatite layers.

Geochemical data

The best results from the trenches dug by McIntyre Porcupine Mines Ltd. are shown in Table 25.

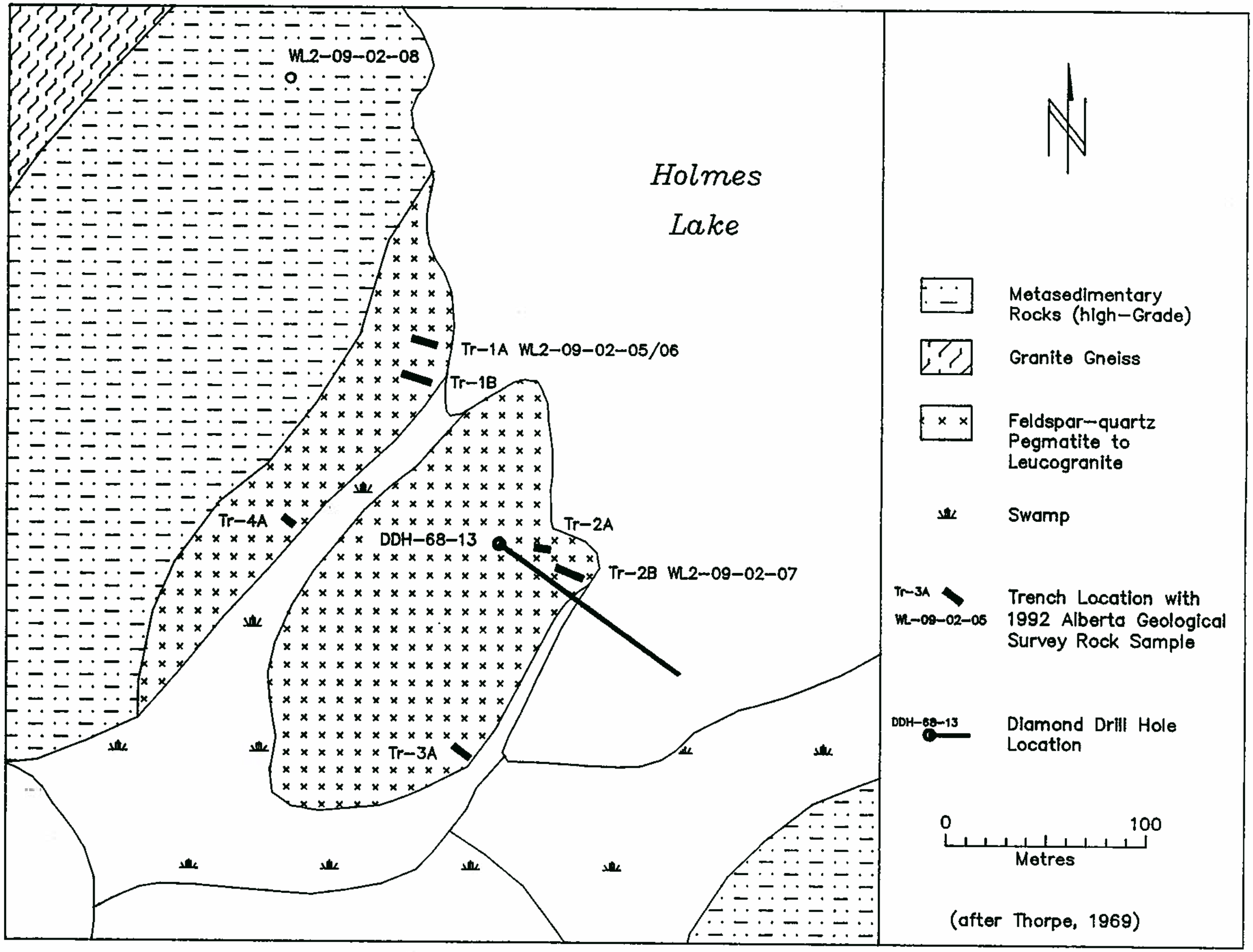

Figure 18. Geological Map of the Holmes Lake Uranium Showing (Mineral Occurrence Number 75), with Drill Hole, Trench and 1992 Sample Locations.

Table 25. Results from chemical analysis on samples taken in trenches by McIntyre Porcupine Mines Ltd. (Thorpe, 1969)

Location	From - To	% U3O8
Trench 2-A	0m to 1.8 m	0.05
Trench 3-A	3.0m to 4.5m	0.05
Trench 4-A	0m to 1.8m	0.05
Trench 4-A	1.8m to 4.2m	0.07

The geochemical analysis done on the 1992 grab samples collected by AGS confirm the low level of uranium mineralization. However, they reveal some interesting high base and precious metal values in pyrite rich quartzite and amphibolite (Table 26).

Table 26- Selected results from geochemical analysis on 1992 AGS samples.

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

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

Geophysical data

A heliborne scintillometer survey was flown over the area, part of Permit no. 7, by Trigg, Woollett & Associates Ltd. in 1968 on behalf of McIntyre Porcupine Mines Ltd. In this area, the flight lines were oriented east-west , spaced at 200 m with a ground clearance of 30 m; the equipment consisted of a Mount Sopris Scintillometer Model 160-12A. Five radioactive anomalies were detected but only two were followed up by trenching and drilling as described previously. They include the southwest corner of Holmes Lake area and an area 800m to the southwest. No systematic ground scintillometry has been reported.

Table 27 summarizes the results obtained by the AGS 1992 investigation using a URTEC UG-135 spectrometer, over the trenched area lying to the southwest of Holmes Lake.

Table 27. Results from the 1992 AGS spectrometer survey.

Location	Host-rock	Size area	TC cps
N. end of trench 1	hemat. pegmatite	1m x 5m	2,000
Trench 1-B	hemat.-silicif. pegm.	1m x 3m	5,000
Trench 2-A	yellow stains - pegm.	1m x 0.5m	3,500
Trench 2-B	pegmatite	1m x 2m	2,000
Trench 3-A	pegmatite	1m x 4m	4,000
Between Trenches 2-B & 3-A	silicif. pegmatite	2m x 60m	>1,000

Classification

Pegmatite hosted uranium mineralization.

Assessment reports

Hart, E.A. - 1967 - Report on Alberta Concessions for 1967.- New Senator-Rouyn Limited; Assessment Report U-AF-001(1)/002(1), 10 p.,3 maps (1 map in folder).

Thorpe, W.H. - 1969 - McIntyre Porcupine Mines Limited - New Senator-Rouyn Option, N.E. Alberta; Assessment Report U-AF-001(3)/002(3),7 p., 5 appendices, 12 maps (in folder)& 17 ddh logs and sections appended.

Trigg, Woollett & Associates Ltd. - 1968 - Airborne Scintillometer Survey of the New Senator Option, northeast Alberta.-McIntyre Porcupine Mines Limited; Assessment Report U-AF-001(1)/002(1), 4 p., 2 maps (1 in folder), 2 appendices.

CARROT LAKE

M.O. numbers: 78, 79, 80

Location

Carrot Lake is the unofficial name given to a small lake, which is located 2.5 kilometers straight south from Andrew Lake. The 1.6 kilometer long radioactive belt is found on the western and northwestern hills overlooking Carrot Lake (NTS 74M/16).

Access

By float plane to Andrew Lake and then by foot over sand flats and across beaver dams.

History of exploration

The Carrot Lake zone was discovered by Hudson's Bay Oil and Gas Company Ltd. (HBOG) during routine ground follow-up of airborne radiometric anomalies. Owing to renewed interest in uranium exploration, HBOG had acquired in 1969 from Robert Bryant Schick of Salt Lake City, Utah, Permit numbered 24 issued on October 1967 by the Alberta government. The Carrot Lake zone is situated near the western boundary of Permit 24. HBOG carried out three airborne geophysical surveys followed by ground checking. A grid system was laid out followed by a detailed radiometric survey, detailed geological mapping and trenching on the best occurrences. 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 in the area (Thorpe, 1969).

In 1976, the area then covered by permit 182 was flown again by a consortium of companies, including Tachyon Venture Management Ltd., Sacksville Oils & Minerals Ltd. and Conventures Ltd. After the airborne radiometric survey, a program of soil geochemistry, Trach Etch emanometry (measurement of radon gas escaping from the earth's surface), ground magnetometry and some 84 overburden drill holes was carried out during the summers of 1976 and 1977 over a zone extending from the south shore of Andrew Lake to Carrot Lake. No additional zones were discovered and the previously discovered mineralized zones were found to be narrower and more erratic in grade than previously reported (assessment report by Allan, 1977).

Geological setting

The predominant rock types are granitic gneisses and pink granites with lesser amounts of pegmatite, migmatized schists, metasediments and amphibolite. This rock assemblage belongs to the Archean Basement Complex (Figure 19).

Main lithologies

Pink biotite granite and granite gneiss underlie the western part of the Carrot Lake zone which in turn, is bordered to the east by a complex of pink and grey migmatites and gneisses, porphyroblastic gneisses and pegmatites with an increasing content of biotite schist, migmatized biotite muscovite schist, and quartzite to the north and east. In the southern part of the Carrot Lake zone, dark medium grained amphibolite is a more common rock type, and metaconglomerate and metagreywacke have been mapped.

Structure

In the southern part of the Carrot Lake zone, the foliation strikes N010°E to N020°E and dips 70° to the west. In the northern part of the zone, where metasediments and migmatites are more abundant, the strike of the foliation is highly variable.and dips range from 80°W, to vertical, to steep easterly. Tight refolding, small shear planes and jointing are common features throughout the zone.

Mineralization

Mineralization spreads along a northeasterly trending belt, 120 to 150 m wide and 1.6 km long. Mineralization consists of uranium enrichment present under different modes and occurring in most rock units. At several locations it was noted to be cutting across the main rock trend. Overall, the mineralization appears to be controlled by fractures and shear planes. The Carrot Lake mineralized area may be subdivided in a north, central and south zone.

The **North Zone** (including Mineral Occurrences Nos. 78 and 79) extends from HBOG's Trench no. 21+00N to Trench 28+10N (Figure 19 and 20). The North Zone is mainly underlain by biotite microgranite, leucogranite, granite gneiss and migmatized biotite and muscovite schists and metaquartzite. The mineralization consists of veinlets and irregular pods found along fractures containing pitchblende and thucholite (a mixture of uraninite and carbonaceous matter). Yellow stains (autunite?) are

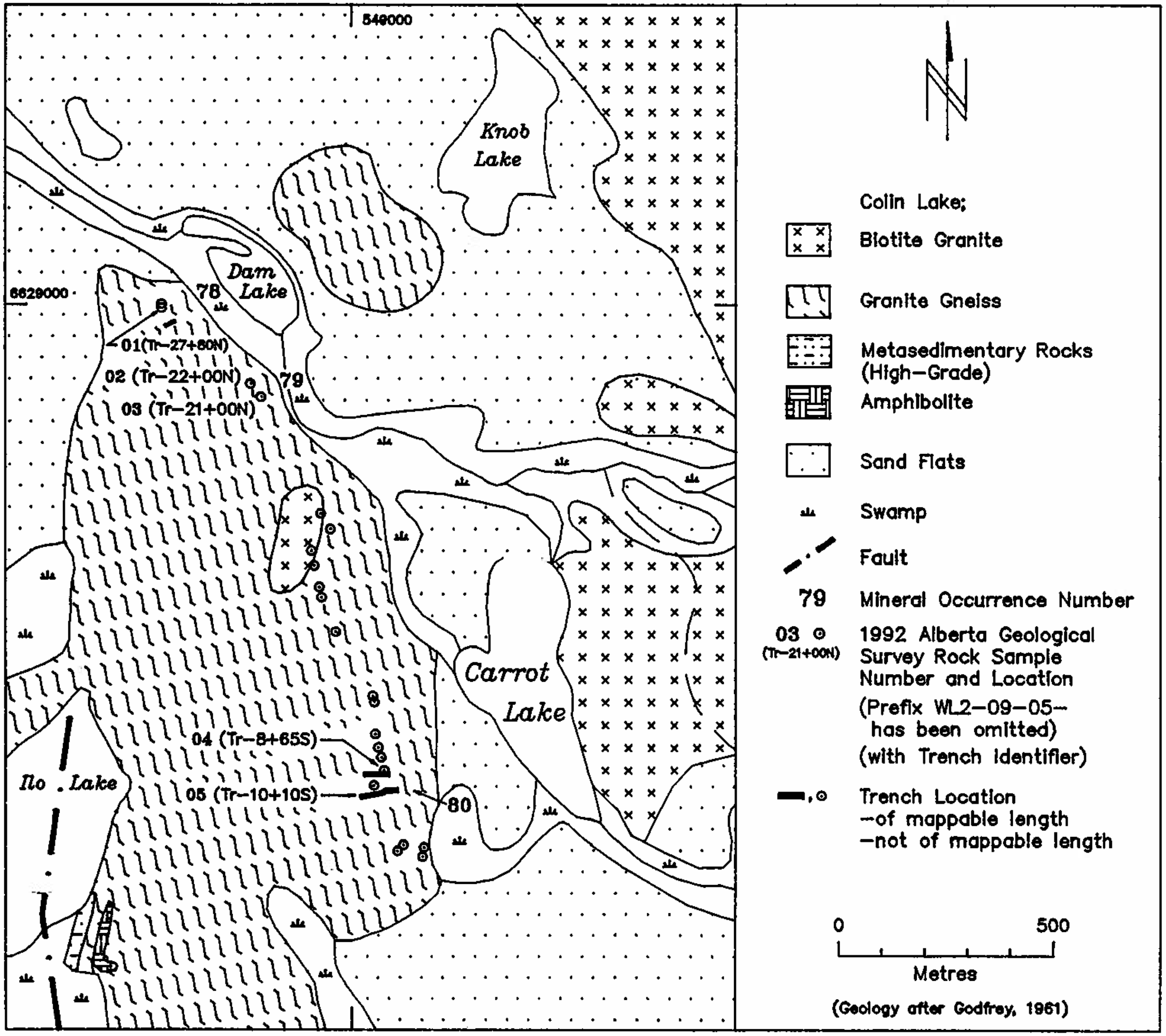

Figure 19. Geological Map of the Carrot Lake Uranium Showing (Mineral Occurrence Numbers 78, 79 and 80), with Trench and Sample Locations.

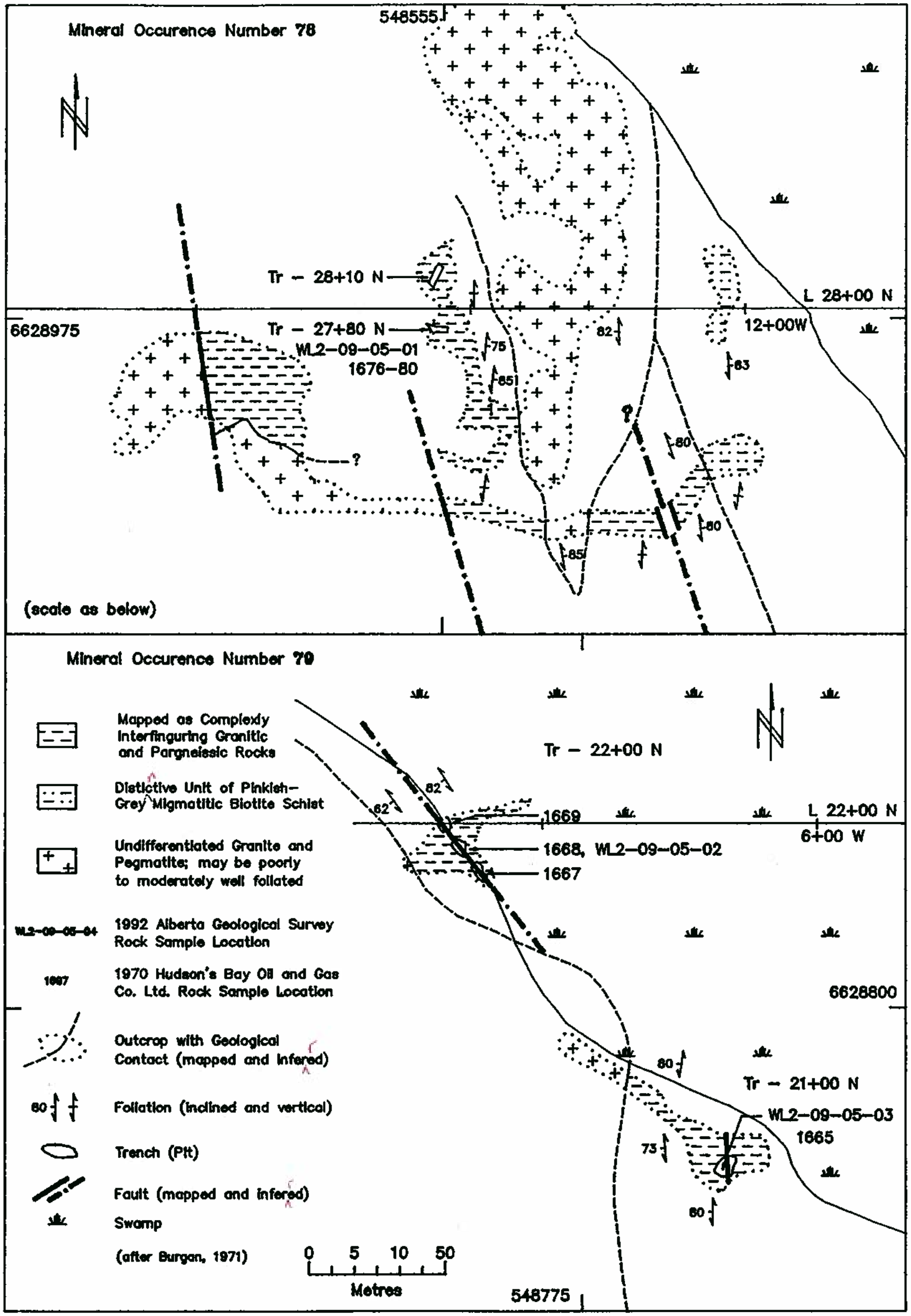

Figure 20. Geological Map of the Northern Zone of the Carrot Lake Uranium Showing, Mineral Occurrence Numbers 78 and 79.

seen in many trenches in this zone. The highest concentrations are found in Trenches 27+80N, 22+00N and 21+00N. At the west end of Trench 27+80N, a chip sample yielded 0.18% U3O8. In Trench 21+00N, excavated in low lying outcrops some distance away to the east from the main hills and on the edge of the large sand flat and muskeg area occupied by Carrot Lake, a chip sample from a 1 m interval shows 0.16% U3O8. In Trench 22+00N, two successive 0.6 m chip samples had values of 0.14% U3O8.

The **Central Zone** is located between Trench 11+50N and Trench 0+55N (Figure 19). It is underlain by pink equigranular foliated granite and pinkish quartz rich granite gneiss. Mineralization is low grade and occurs in small biotite shear bands.

The **South Zone** (Mineral Occurrence No.80) extends between Trench 2+70S and Trench 19+95S (Figure 19 and 21). The South Zone area is underlain by grey foliated biotite granite and granite gneiss, injected by quartz rich pegmatite layers. The pegmatite contains abundant red-pink hematized feldspar and much graphite has been noted in the biotite selvages against granite country rock. The southern half of that zone has many amphibolite, metagreywacke and quartzite interlayers cropping out. Metaconglomeratic beds are described in the area. Mineralization is mainly found in grey biotite pegmatite, in white pegmatite with books of biotite and in coarse porphyroblastic quartz biotite gneiss. No uranium mineral has been identified and values are in the range of 0.03 to 0.04% U3O8 (assessment report by Burgan, 1971).

Alteration

No alteration stands out in the rock units of the mineralized area. In the South zone, some silicification in the form of quartz enrichment may be present, along with hematization of the feldspars.

Geochemical data

The most significant geochemical values reported by HBOG in their trenches are presented in Table 28. They give an idea of the extent and magnitude of the mineralization. The locations are given in Figures 20 and 21.

Table 28. Selected results from geochemical asnalysis on samples taken in HBOG's trenches (Burgan, 1971)

Sample no	Location	Width	**U3O8 %**
1680	North Zone - Trench 27+80N	0.3m x 0.6m	0.18
1679	North Zone - Trench 27+80N	0.6m x 1.5m	0.05
1678	North Zone - Trench 27+80N	0.9m x 1.5m	0.04
1677	North Zone - Trench 27+80N	0.6m x 1.5m	0.04
1676	North Zone - Trench 27+80N	0.6m x 0.7m	0.05
1669	North Zone - Trench 22+00N	0.3m	0.09
1668	North Zone - Trench 22+00N	0.6m	0.14
1667	North Zone - Trench 22+00N	0.6m	0.14
1665	North Zone - Trench 21+00N	1.0m	0.16
1692	South Zone - Trench 9+55S	0.5m	0.04
1693	South Zone - Trench 9+55S	0.6m	0.03
1697	South Zone - Trench 10+10S	0.5m	0.03

In the 1976/1977 program, a total of 2,000 soil samples were collected over an area between Carrot Lake and Andrew Lake (Allan, 1976, 1977). Eleven anomalous zones ranging from 20 to 30 ppm U were found; many were coincidental with airborne anomalies and downslope from previously discovered mineralized areas. However, the thick blanketing of the area by glacial material makes the interpretation of geochemical anomalies as well as emanometry results fairly difficult. An attempt to resolve the problem was done by drilling 84 overburden holes and sampling of the basal till. The highest value obtained was only 43 ppm U.

During the 1992 AGS investigation of the Carrot Lake area, a number of samples were taken over the radioactive spots. Also some rusty or sulfide rich horizons, mainly associated with biotite laminations

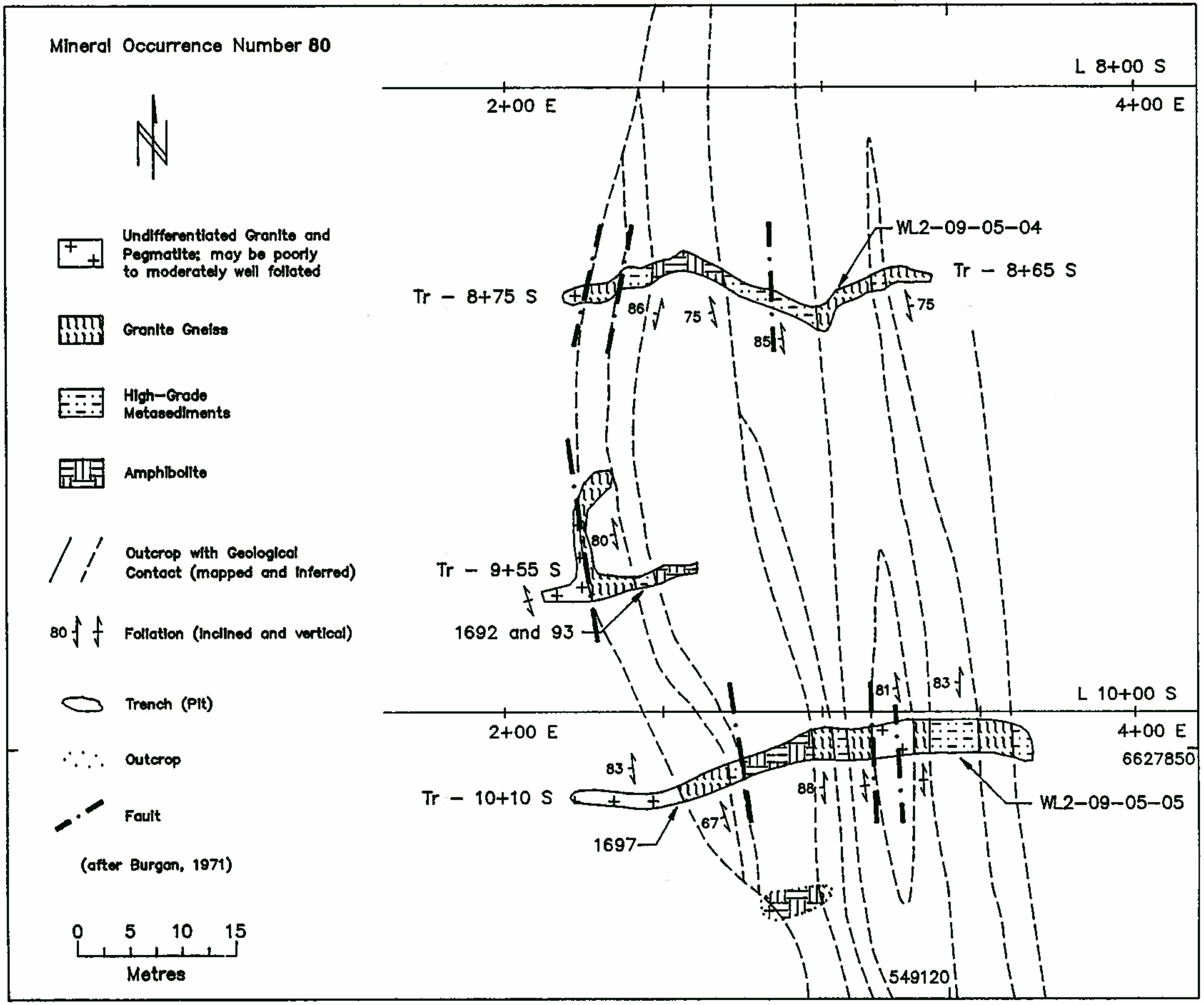

Figure 21. Geological Trench Map of the Southern Zone of the Carrot Lake Uranium Showing (Mineral Occurrence Number 80).

were sampled in the South Zone. The results of the geochemical analyses are shown in Table 29. It is interesting to note anomalous levels of silver and copper in some of the samples, in addition to a lack of elevated thorium values.

Table 29. Selected results from geochemical analysis on 1992 AGS samples.

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 - E.end - gouge zone	17957	86	29	103	382	-	5.7
WL-09-05-02 (79)	North Zone - Tr. 22+00N. yel.st. in bio.sch.	767	103	-	-	65	117	2.9
WL-09-05-03 (79)	North Zone - Tr. 21+00N. yel.st., rust bio.musc.sch.	1636	-	-	-	217	85	2.2
WL-09-05-04 (80)	South Zone - Tr. 8+65S. - rust bio gn.+2/3%py	68	65	-	189	-	-	-
WL-09-05-05 (80)	South Zone - Tr. 10+10S. bio.gn.+2%py	21	86	-	139	-	-	-

Geophysical data

Three airborne geophysical surveys were carried out by HBOG over their Permit no. 24 which includes the Carrot Lake area (Stamp, 1969). The first survey consisted of a radiometric survey flown by Federal Resources Corp. of Salt Lake City, but this survey recorded only total count and had no elevation control. It was therefore discarded and superseded by a second combined radiometric, magnetic and electromagnetic survey carried out by Canadian Aero Services Ltd. Equipment for the survey included a four window Exploranium DGRS 1000 spectrometer, a Canso (in-phase/out-of-phase) electromagnetic system and a fluxgate magnetometer. The survey was flown at a 45m clearance and at a 200m spacing. However, due to technical problems with the spectrometer, the radiometric data recovered from this survey was considered invalid. A third survey was flown by Geo-X Surveys Ltd. with a 30 to 45 m clearance and at a 400 m spacing. This survey used a four-window Exploranium DGRS 2000 spectrometer with three 10 by 15 cm crystals and proved to be of high quality.

Two bedrock anomalies were recorded in the Carrot Lake area and the mineralized zone was subsequently outlined by ground follow-up. This work consisted of the picketing of a grid to allow a detailed radiometric survey. The survey was carried out using McPhar TV-5 scintillometers. The strong radioactive zones were thereafter trenched. The results of this work are not reported.

In 1976, Tachyon Venture Management Ltd. and its partners carried out a heliborne spectrometer survey using a SAR-1 two channel gamma-ray spectrometer with a Na(Tl)I 13 liter size crystal detector. The area was flown at a 100 m spacing with a 60 m ground clearance and at an average speed of 145 km/hr. A follow-up survey was conducted, consisting of a 60 kilometer cut-and-picket grid over the Carrot Lake zone and the large glaciofluviatile outwash sand plain, masking its possible northward extension. A total of 72 line-kilometers of magnetometry and 9 line-kilometers of VLF-EM survey as well as a limited ground scintillometry were conducted over the grid area. These surveys did not delineate any significant zones. In addition, the sandy plain was surveyed by Trach-Etch emanometry, with cups placed every 120 m. Three linear anomalies were detected. In 1977, an additional enamometer survey was carried out with an E.D.A. Electronics Ltd. Model RD 200 probe. Reproducibility of the Trach-Etch results was very poor and the radon detection measurements were generally low.

During the 1992 AGS investigation, many measurements were recorded with a URTEC UG-135 spectrometer over the area of mineralization. The best results are presented in Table 30.

Table 30. Results from the 1992 AGS spectrometer survey.

M.O. no.	Location	Area size (m x m)	TC (Max.) cps	TK cps	TTh cps	TU cps
78	N. Zone - Trench 27+80N	2 x 0.30	35,000	580	19	360
79	N. Zone - Trench 22+00N	3 x 0.20	2,200	-	-	-
79	N. Zone - Trench 21+00N	1 x 0.10	12,000	125	2	70
80	N. Zone - Trench 2+45N	1 x 0.25	5,000	-	-	-
80	S. Zone - Trench 2+70S	1 x 1	3,000	-	-	-
80	S. Zone - Trench 8+65S	1 x 0.05	7,000	-	-	-
80	S. Zone - Trench 10+10S	1 x 0.30	4,000	-	-	-

Classification

The uranium mineralization at Carrot Lake displays a uniform character throughout the zones. The highest values are associated with fractures and shears located in granite and granite gneiss, while the majority of lower valued occurrences are found in (graphite rich) biotite pegmatite and granite gneiss.

Assessment reports

Allan, J.R. - 1976 - Geological & Exploration Report, Andrew Lake Project, Northeastern Alberta for Tachyon Venture Management Ltd.; Assessment Report U-AF-112(6) / 113(5) / 114(5)/126(5), 41 P., 7 Fig.,14 maps in folder, 6 appendices.

Allan J.R. - 1977 - Geological & Exploration Report, Andrew Lake Project, Northeastern Alberta, Quartz Mineral Exploration Permits 182 & 247 for Tachyon Venture Management Ltd.; Assessment Report U-AF- 112(3) / 126(2), 10 p., 6 maps in folder, 1 appendix.

Burgan, E.C. - 1971 - Andrew Lake Project - Alberta Quartz Mineral Permits 24, 25 & 26, NTS 74M - Review of Work Completed during 3-year Permit Period - Hudson's Bay Oil and Gas Company Limited; Assessment Report U-AF-003(2) / U-AF-005(2), 18 p., 5 fig.,9 plates in folder, 6 appendices.

Stamp, R.W. - 1969 - Report on Airborne Geophysical Survey in the Andrew Lake Area of Alberta for Hudson's Bay Oil and Gas Company Limited by Canadian Aero Mineral Surveys Limited; Assessment Report U-AF-003(1) / U-AF-005(1), 5 p., 2 appendices, 24 maps in folder.

WEST ARM ANDREW LAKE (SECOND NARROWS) M.O. number: 84

Location

2,750 m west of the southern outlet of Andrew Lake (NTS 74M/16).

History of exploration

In 1974, Aquarius Mines Ltd. of Edmonton acquired three Quartz Mineral Permits, nos 182, 183 and 184 from the Alberta government, and the same year carried out a selective ground prospecting program in the vicinity of the previously reported radioactive occurrences. A six-man party conducted closely spaced scintillometer traverses. This party seems to have focused its efforts on major fault breaks. Following up on the cluster of radioactice anomalies reported on Godfrey's (1963) map along the southern shores of Hutton Lake, these occurrences were correlated to a north-south break named the Hutton Lake Fault, which extends southward to the west Arm of Andrew Lake. The prospectors working for Aquarius Mines Ltd., made a discovery of a long radioactive zone on the north shore of a long embayment on the western arm of Andrew Lake north of the second narrows. The radioactive zone was traced north over a distance of 550m. At the south end of that zone on the north shore of the second narrows, two small trenches were blasted. Only one assay value on one sample was reported which showed low uranium content (assessment report by Sullivan, 1974).

The Aquarius permits were subsequently optioned in 1976 to a consortium of companies (Tachyon Venture Management Ltd., Sacksville Oils & Minerals Ltd. and Conventures Ltd.) which carried out an airborne radiometric survey over the entire area of the permits. This survey indicated previously undetected, twice-background anomalies along the western margin of the Hutton Lake Fault. The anomalies showed good continuity over a distance of 2.5 km and were investigated on the ground by means of a detailed geochemical, geophysical and geological program. A grid was laid out north of Andrew Lake shore toward Hutton Lake, and the grid-area was radiometrically surveyed and soil sampled (assessment report by Allan, 1976). However, there was no work done in the immediate vicinity of the previously dug trenches on the north shore of the second narrows. The exploration program failed to encounter any significant mineralization.

Geological setting

The area around the second narrows of the west arm of Andrew Lake and the large bay to the north is underlain essentially by biotite granite gneiss, which constitutes the main lithology of the Archean Basement Complex. Minor dispersed slivers of metasediments and rare amphibolite are mapped in the area by Godfrey (1963). Airborne magnetic and radiometric surveys indicate that a major break or fault cuts through the area and extends to Hutton Lake in a north-south direction; the fault is a splay of the prominent Bonny Fault to the north (Figure 22).

Main lithologies

The dominant lithology consists of dark pink red granite gneiss containing pods and veins, 5 to 10 cm wide by 2 m long, of quartz-feldspar pegmatite. In the trenches, the granite gneiss is cataclastic, partly recrystallized and hematized. The mafic minerals consist of chloritized biotite and hornblende. Incipient augen texture is also apparent throughout the granite gneiss.

Structure

Foliation in the granite gneiss is highly variable as measured in the northern trench (N077°E - 58°N) and in the southern trench (N172°E - 78°W). The foliation is well indicated by a strong layering and the pegmatite veins or veinlets. Cataclasis and shearing are pronounced in the trenches, where the country rocks have been crushed, sheared and recrystallized.

Mineralization

The radioactivity zone in the northern trench is associated with a 50 cm wide zone of completely broken-up and hematized granite gneiss. No obvious economic mineral was observed, however, Aquarius Mines Ltd. reported some "greenish yellow encrustation" interpreted as autunite, and "limonite common in fractures". Aquarius reported one assay of 0.147% U_3O_8.

The southern trench which is over 10 m long, shows moderate radioactivity throughout, but no economic minerals are directly visible. The exposed granite gneiss is strongly hematized. 2 m north of the

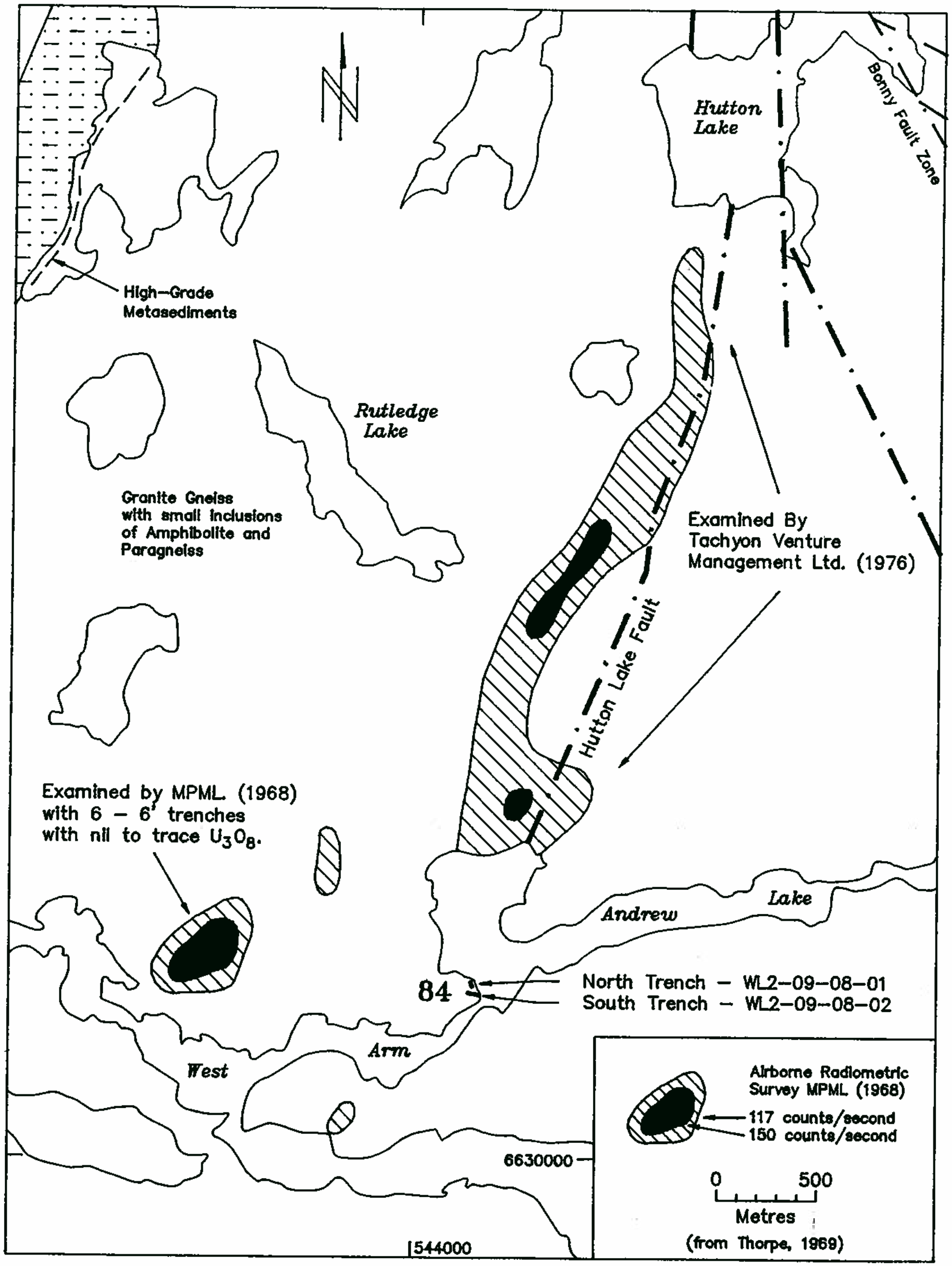

Figure 22. Geophysical Map of the Second Narrows (West Arm of Andrew Lake) Uranium Showing. (Mineral Occurrence Number 84).

trench, 1 to 2% pyrite is found in a 0.05 m thick by 2 m long quartz vein. A grab sample from the vein failed to give any elevated uranium or metal values.

Alteration

Widespread hematization is the main alteration product encountered over the whole area and is well expressed in the trenches. Feldspar seems to be the most easily hematized mineral. In the northern trench, hematite has turned into limonite along the fractures. Beside hematization, chlorite replacement seems to be common among the mafic minerals.

Geochemical data

Tachyon Venture Management Ltd. collected 114 soil samples along the Hutton Lake Fault zone over a 3.3 kilometer long grid. Results presented on a map, indicate low uranium concentration in the order of 8 to 25 ppm U. However, in two instances, the samples contained more than 100 ppm U. These samples are near the supposed Hutton Lake Fault. Previously, Aquarius had reported one assay from a grab sample originating from the cataclastic zone in the northern trench; it returned a value of 0.147% U3O8.

During the 1992 AGS field investigation, two grab samples were collected and the main geochemical results are presented in Table 31.

Table 31. Selected results from geochemical analysis on 1992 AGS samples.

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	2m N. of southern trench / quartz vein +1-2% py.	-	99	-	40	-

Geophysical data

The area was flown by McIntyre Porcupine Mines Ltd. using an heliborne scintillometer system in 1968. The scintillometry survey (Thorpe, 1969) showed an elevated radioactivity trend between the large embayment on the west Arm of Andrew Lake and Hutton Lake and an anomalous radioactive spot to the west (Figure 22). McIntyre Porcupine carried out some follow up work, consisting of six small trenches on the radioactive spot, with negative results.

The original discovery on the north shore of the large embayment north of the second narrows on the west arm of Andrew Lake, was followed up by pace and compass traverses by Aquarius Mines. The traverses were surveyed with scintillometers, the make and model of which are not provided. Readings of 4500 to 5000 cps are reported in the trenched area; elsewhere, from the north shore of the embayment and for a distance of 550m toward the northeast, many scattered readings of 1000 to 2000 cps were recorded.

In 1976, Tachyon Venture Management Ltd and its partners carried out an heliborne spectrometer survey using a SAR-1 two channel gamma-ray spectrometer with a Na(Tl)I 13 liter size crystal detector. The area was flown at a 100 m spacing with a 60 m ground clearance and at an average speed of 145 km/hr. A continuous belt of anomalies were detected over a distance of 2.5 kilometers on the western flank of the Hutton Lake Fault zone. Ground follow-up of the anomalies was performed with the use of McPhar TV-1 spectrometer. Many zones, which were associated with pegmatitic granite gneiss, ran between 10,000 to 20,000 cpm (counts per minute) which represent 2 to 8 time background. The discontinuous distribution of the radioactive zones discouraged further exploration. However, the airborne survey failed to detect the anomalous radioactivity over the trenched area on the north shore of the second narrows. This area, located 600m south of the detailed grid along Hutton Lake Fault, did not receive any additional work.

Revisiting the old trenches dug by Aquarius Mines Ltd and using an URTEC - UG 135 differentiating spectrometer, the 1992 AGS ground investigation obtained the data presented in Table 32.

Table 32. Results from the 1992 AGS spectrometer survey.

Location	Area size / remarks	TC Max-cps	TK cps	TTh cps	TU cps
North trench	0.50m x 1m./hematitic brecciated granite-gneiss + fractures	8,000	100	4	60
South trench	10m x 1m	1,000	-	-	-

Classification

Uranium mineralization hosted in pegmatitic granite gneiss and reconcentrated along brittle fracture zones.

Assessment reports

Allan, J.R. - 1976 - Geological & Exploration Report, Andrew Lake Project, northeastern Alberta for Tachyon Venture Management Ltd (Quartz Mineral Permits 182, 183, 184, 247); Assessment Report U-AF-112(6)/113(5)/114(5)/ 126(5), 41 P., 7 Fig.,14 maps in folder, 6 appendices.

Sullivan, J. - 1974 - Report on the northeast Alberta Project of Aquarius Mines Ltd (Quartz Mineral Exploration Permits no. 182, 183, 184); Assessment Report U-AF-112 (1) / 113(2) / 114(2), 15 p., 10 figures.

Thorpe, W.H. - 1969 - McIntyre Porcupine Mines Limited - New Senator-Rouyn Option, N.E. Alberta; Assessment Report U-AF-001(3)/002(3),7 p., 5 appendices, 12 maps (in folder)& 17 ddh logs and sections appended.

NORTHEAST CHARLES LAKE — M.O. number: 6

Location

East of Charles Lake at the entrance of a narrow channel to the northeast extension of the lake (NTS 74M/16).

History of exploration

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

Geological setting

The area is mapped as underlain by high-grade metasediments of probable Archean age (Godfrey, 1966), in contact with recrystallized mylonite of granite composition and part of the Charles Lake Shear Zone.

Main lithologies

Thin bands of refolded rusty biotite schists and biotite quartzite are injected with much leucogranite and white pegmatite (Figure 23).

Structure

The metasediments layers show tight to isoclinal folding. Foliation strikes at N016°E and dips 55°E. The rock units are cut by a conjugate set of brittle fractures trending N065°E and N115°E.

Mineralization

The highest reading with a URTEC spectrometer was taken over a fractured area where the fractures are filled with gougy pink K-feldspar material. The other high radioactive zones are associated with layers of white pegmatite with a wispy dark groundmass consisting of biotite and indistinct very fine grained material interbedded within leucogranite. The pegmatite takes on a breccia-like texture and yield readings 5 to 10 times background. No identifiable economic mineral could be observed.

Alteration

None observed.

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 over the radioactive pegmatitic layers. The significant values are presented in Table 33.

Table 33. Selected results from geochemical analysis on 1992 AGS samples.

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

Geophysical data

The highest radioactivity reading over the fractured area gave the results for the different channels listed in Table 34.

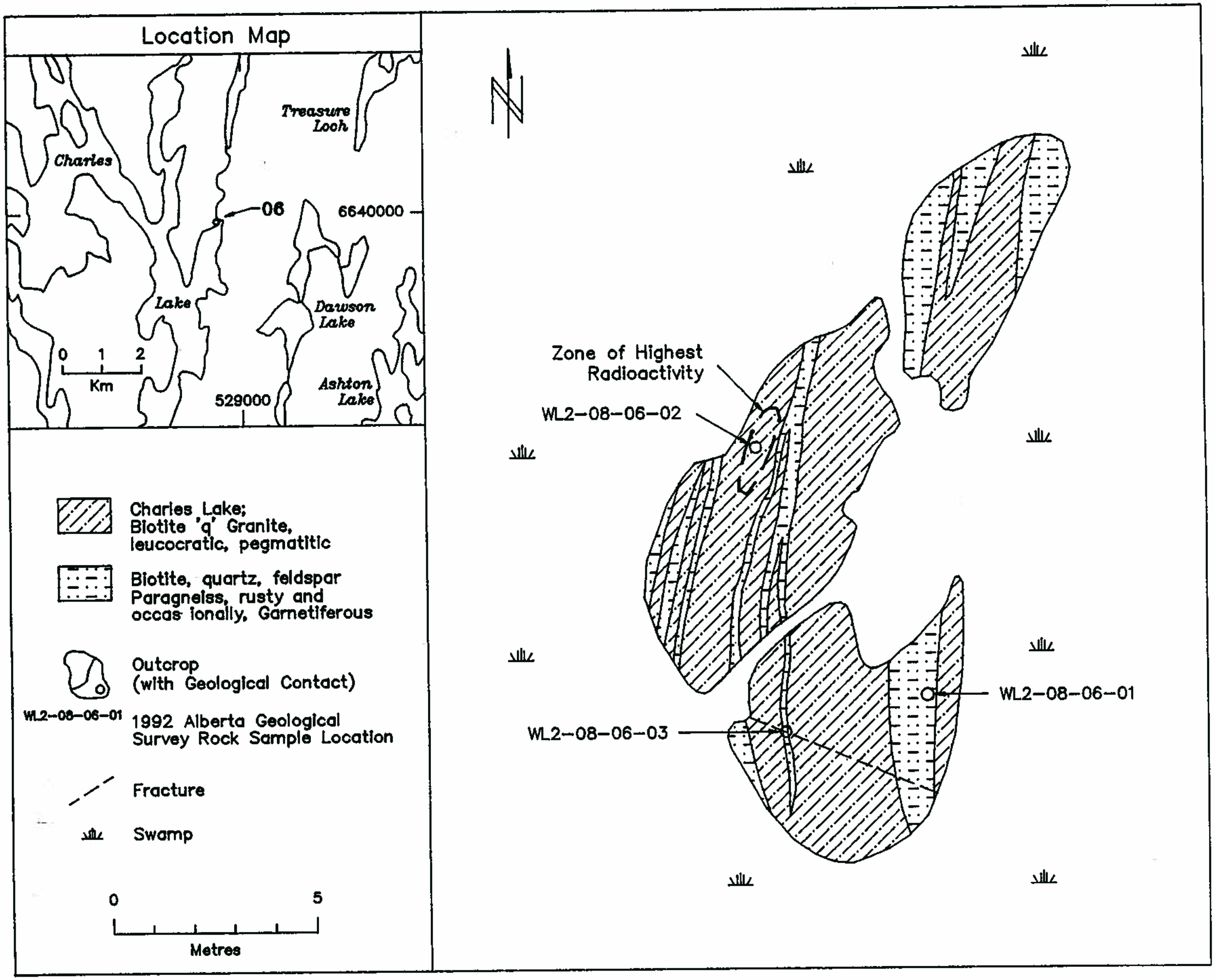

Figure 23. Geological Map of the Northeast Charles Lake Rare Earth Elements Showing (Mineral Occurrence Number 06).

Table 34. Results from the 1992 AGS spectrometer survey.

TC (Max.) cps	TK cps	TTh cps	TU cps
2,500	20	0.1	17

Classification

Two types of mineralization are present at this locality. One type is hosted in leucogranitic pegmatite and consists of a rare earth elements-thorium association, while the other is stratiformal and represented by an elevated Zn geochemical value in now oxidized, weathered metasediments.

NORTH POTTS LAKE

M.O. number: 15

Location

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

History of exploration

Geological map 65-6C (Godfrey, 1966) shows a black dot indicating a zone of increased radioactivity found in the course of mapping of the general area. No further investigation has been reported on this showing.

Geological setting

The bedrock around the northern end of the eastern arm of Potts Lake is mapped as mainly granite-gneiss interspersed with slivers of high-grade metasediment, of hornblende granite-gneiss and feldspar porphyritic biotite granite. These rock units belong to the Archean Basement Complex (Figure 24).

Main lithologies

Bands of rusty quartz-biotite schist containing abundant graphite and red garnets intermixed with quartz-rich pegmatite representing 25% of the outcrops.

Structure

The foliation of the metasediments and the layering of the pegmatites are essentially parallel. Evidence of boudinage in the metasediments can be observed at this location. The main foliation plane strikes N015°E and dips at 69° to the west. A prominent network of joints and small open fractures is more or less concordant with that direction (Figure 24). Quartz filled tension gashes, 1 to 3 cm wide, in pegmatite layers trend N080°E. A set of conjugate fractures without quartz show trends of N080°E and N110°E.

Mineralization

The high radioactivity readings are located over an area 2 to 3 m wide and 25 m long, underlain by white quartz-rich pegmatite affected by intense fracturing. The fractures, a few millimeters wide, are filled with black sooty material and are interconnected in an anastomosing pattern (see Figure 24). The pegmatite takes on a breccia-like texture. No economic mineral was identified.

Alteration

None observed.

Geochemical data

Sample WL2-08-10-03, collected over the radioactive pegmatite, returned 269 ppm Th and 201 ppm La. Sample WL2-08-10-04, collected 15 m southeast of the previous one from a 50 cm wide band of very rusty graphitic metasediment, gave values of 98 ppm Cu and 7 ppb Au.

Geophysical data

In contrast to background readings of 250 cps , the highest reading obtained over the pegmatite, using a URTEC UG-135 spectrometer and recording with a time constant of 1 second, is given in Table 35.

Table 35. Results from the 1992 AGS spectrometer survey.

TC (Max.) cps	TK cps	TTh cps	TU cps
3,500	32	3	25

Classification

Rare earth elements-thorium association in pegmatite.

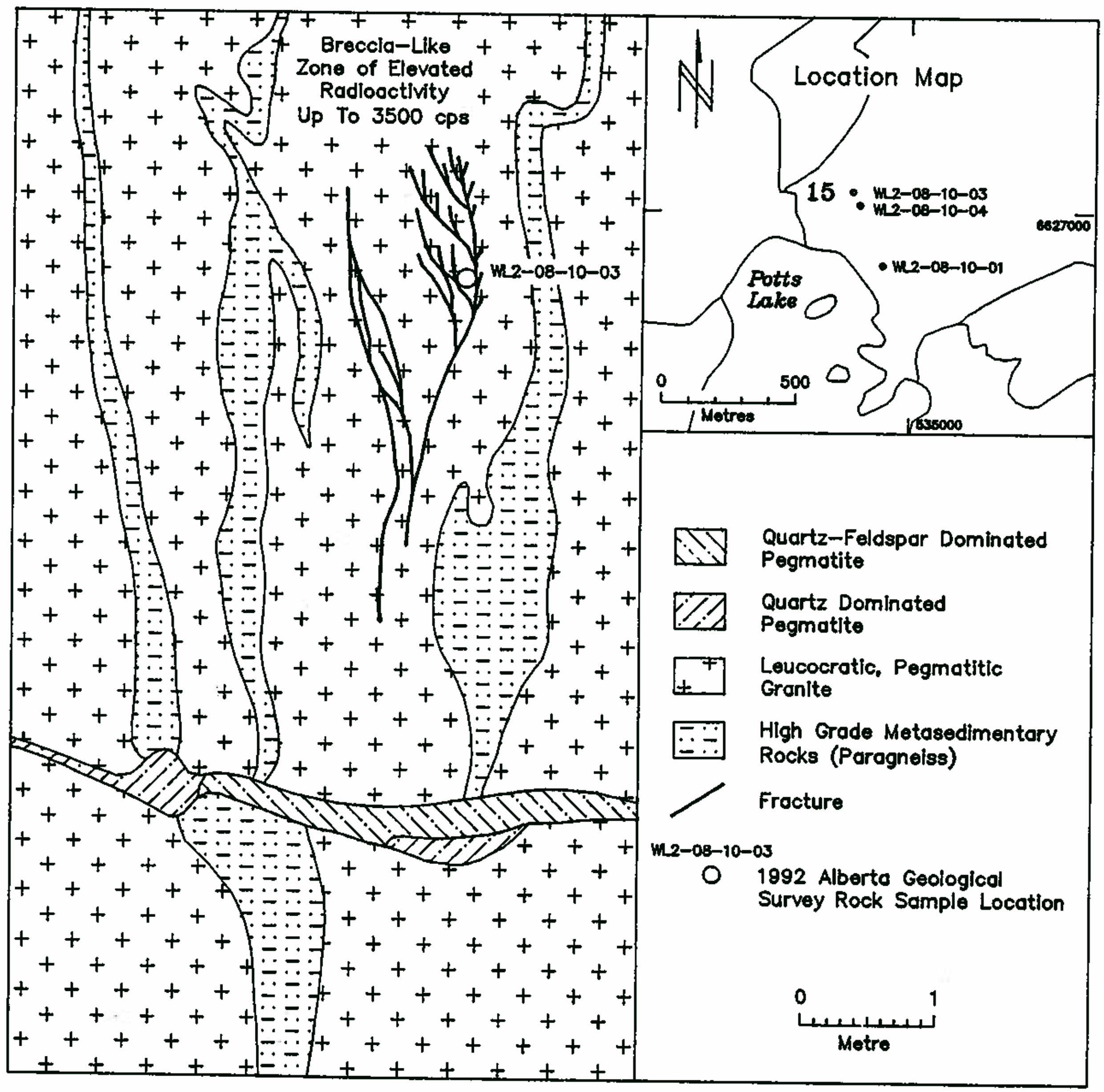

Figure 24. Geological Map of the North Potts Lake Rare Earth Element Showing (Mineral Occurrence Number 15).

SOUTH POTTS LAKE - RARE EARTH ELEMENTS

M.O. number: 16

Location

250m west from shore on the south end of Potts Lake (NTS 74M/09).

History of exploration

Mineralization was discovered when searching to relocate the South Potts Lake showing (Mineral Occurrence No. 17). Strong indication of radioactivity led to sampling the outcrop.

Geological setting

The area is mapped by Godfrey (1966) as underlain by quartzite, biotite and sericite schist formations part of a 500 to 700 m wide belt of metasediments. However, a fair number of outcrops in the area are biotite gneiss and porphyroblastic gneiss. All the rock units belong to the Basement Complex of Archean age (Figure 25).

Main lithologies

In the vicinity of the mineral occurrence, the rock units are composed of biotite gneiss interlayered with numerous whitish to pinkish pegmatites. The pegmatite layers are 1 to 2 m wide and extend the length of the outcrops.

Structure

In the gneiss, the foliation strikes N035°E and dips vertically. A shear band is encountered within the gneiss; the shear band and its internal foliation have a N010°E strike and dip vertically. In the mineralized pegmatite, numerous vertical fractures trend N038°E.

Mineralization

The high radioactivity is associated with a pink pegmatite interlayered in the biotite gneiss. The pegmatite contains little mafic minerals and is highly fractured in the radioactive zone. In outcrop, it extends over 2m by 20m. No recognizable economic mineral was observed; however analysis of a grab sample from the pegmatite returned 1.06% total rare earth elements, and up to 0.27% thorium content

Alteration

No major alteration pattern was observed outside a light reddening of feldspar in the mineralized pegmatite. The reddening is probably due to some hematization of the pegmatite, judging from the iron content (3.9% Fe) given by the geochemical analysis.

Geochemical data

One grab sample (WL-08-11-02) was collected over the high radioactivity zone in this locality. This sample was split in two portion, one being sent for ICP/FA-AA analysis, the other for INAA which allows a more accurate breakdown of the concentation of individual REE. Results from both methods are presented in Table 36.

Table 36. Selected results from geochemical analysis on sample WL-08-11-02.

	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.

Some of the discrepancies noticed between the different methods of geochemical analysis can be explained by the variability inherent in hand splitting of the sample and to the heterogenous megacrystic texture of the rock.

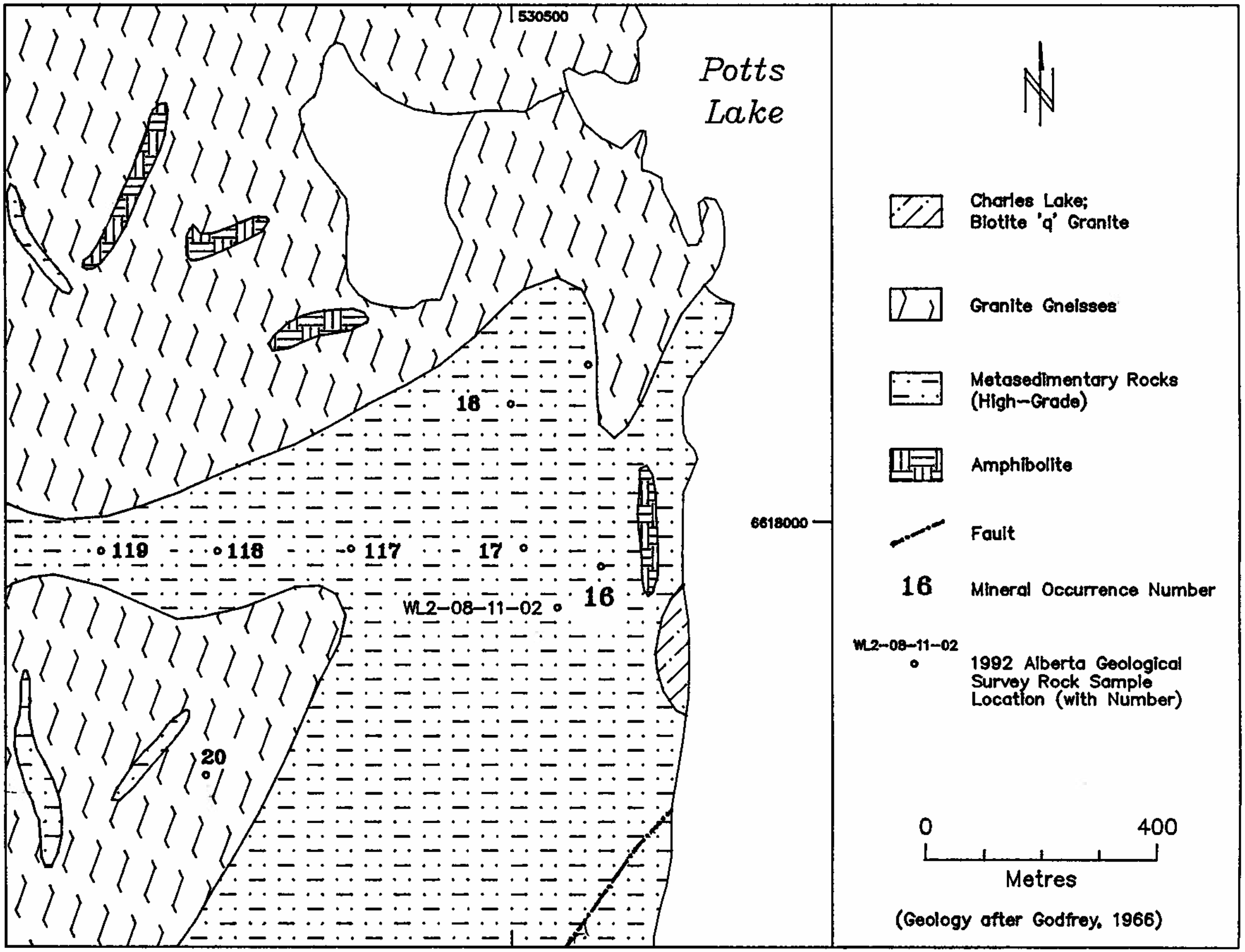

Figure 25. Geological Map of the South Potts Lake Rare Earth Element Showing (Mineral Occurrence Number 16).

Geophysical data

The whole outcrop of pegmatite was surveyed with a URTEC UG-135 differentiating spectrometer. The result of the survey are shown in Table 37

Table 37.Results from the 1992 AGS spectrometer survey.

Location	Area size	TC (Max) cps	TK cps	TTh cps	TU cps
Pegmatite - average	2 m. x 20 m.	1500	-	-	-
Much fractured zone.	1 m.x 10 m.	3700	42	2	25
20 cm N. of fractured zone.	0.25 m. x 5 m.	5600	70	4	40

Note: Sample WL-08-11-02 was taken just north of the fractured zone in the highly radioactive pegmatite.

Classification

The mineralization is hosted in a REE - rich pegmatite.

IRON - VANADIUM SHOWING

NORTH HUTTON LAKE **M.O. number: 73**

Location

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

History of exploration

On the geological map 58-3A, Godfrey (1961) indicates 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; however, in the process outcrops of magnetite-hematite rich rocks were discovered.

Geological setting

The northern end of Hutton Lake is underlain by biotite granite gneiss which is considered one of the main rock units of the Archean Basement Complex. The straight eastern edges of Hutton Lake are interpretated as the topographical expression of the late northwest-southeast trending Bonny Fault (Figure 1).

Main lithologies

The main rock units exposed in the area consist of foliated leucogranite and granite gneiss containing many bands (2 to 3 m wide) of thinly laminated biotite gneiss. These bands are 5 to 10 m long and show a light grey-tan colour on weathered surfaces.

Structure

In the biotite gneiss bands, the foliation is well displayed and trends N008°E with a dip of 82° to the west. In the surrounding country rocks, the foliation is more variable.

Mineralization

A series of veins and patches of white pegmatitic breccia cuts across the country rock following a N010°E direction. The veins are only a few centimeters thick and extend over a length of one m. The patches are irregular and represent swells within contorted pegmatite layers, 15 to 20 centimeter wide, and are approximately 60 centimeters in diameter. The vein material is composed of brecciated quartz minerals and some veins show pink feldspar selvages. The pegmatitic layers are composed essentially of 4 to 5 cm sized 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 which can account for 30 to 50 % of the rock.

Epidote is common at this locality and is found in millimeter thick fractures either trending N070°E or sub-horizontal. Patches, 5 cm by 10 cm, of epidote are found within the magnetite rich pematite layers.

A ten kilogram sample was collected from the site. Geochemical analysis shows a content of 25.1% Fe and 274 ppm V. The amount of vanadium is interesting due to the fact that vanadium substitutes for ferric ion in silicates, magnetite, ilmenite and chromite. However, granites typically contains 5 to 80 ppm compared with 200 to 300 ppm vanadium for gabbros and norites. Vanadium-magnetite ore deposits are associated with mafic to ultramafic rocks in Scandinavia and in the Bushveld Igneous Complex of the Republic of South Africa.

Alteration

Quartz in veins and pegmatitic breccia patches appears to be late and could represent a phase of silicification . Epidote is also evident in late fractures and in pegmatitic breccia., however, the relationship to magnetite-hematite mineralization is not clear; epidote could be related to late regional metamorphic stages or to the proximity to the Bonny Fault.

Geochemical data

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

Classification

The mineralization found at Hutton Lake is a type of magnetite-vanadium occurrence.

OTHER SIGNIFICANT MINERAL OCCURRENCES

A number of samples collected during verification of reported mineral occurrences or when traversing over bands of rusty metasediments/metavolcanics, have yielded geochemically elevated values. The sites of the samples have generally been entered into the database as mineral occurrences which are described in Appendix 1 (Mineral Occurrence Reports). The elevated geochemical values in these host rocks are worth noting, especially considering that weathering has removed most of the sulfides over 2 to 3 m below surface as exemplified in the deep trench at north Selwyn Lake (Table 38).

Table 38. Geochemical results from some rusty metasediments.

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

Similarly, geochemical analysis of samples taken from some locations with elevated radioactivity has indicated that the level of radioactivity originated not from uranium but from thorium. Several of these mineral occurrences have been found anomalous in both Th and La from ICP analysis. Mineralization 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 criss-crossing red hematized crushed rock units associated with the Bonny Fault, west of Andrew Lake. Their geochemical data are recapitulated in Table 39.

Table 39. Geochemical results from radioactive and REE-enriched samples.

M.O. no.	Sample no.	Location	Host rock	Thorium & Lanthanum values
08	WL-08-06-07	500m.E.of N. extension Charles Lake.	red granite.	192 ppm Th - 333 ppm La.
11	WL-08-07-02	E. of centr Charles Lake.	white pegmatite	355 ppm Th - 363 ppm La
12	WL-08-07-05	E. of centr 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

Finally, another intriguing mineral occurrence (Mineral Occurrences no. 57) similar to the North Hutton Lake showing, was discovered during the 1992 AGS investigation. It consists of massive to semi-massive magnetite and hematite forming the matrix of a brecciated pegmatite; the general country rock is foliated leucogranite. Geochemical analysis indicates a Vanadium association (Table 40).

Table 40.Geochemical results of an iron rich occurrence.

M.O. no.	Sample no.	Location	Host rock	Geochemical results
57	WL-08-28-03	S.W.- big bend on west Arm Andrew Lake.	sheared pegmatite breccia.	29.2% Fe - 381 ppm V

ECONOMIC GEOLOGY

A major goal of the 1992 AGS investigation was to establish the geological and metallogenic environments, and to evaluate the size and potential of known occurrences. In the past, most efforts have been directed toward uranium exploration; therefore, the uranium and associated commodities represent a larger percentage of the reported mineral occurrences than would normally be expected. In the past, little attention has been paid to gold or base metals. The widespread gossanous belts of metasediments have received very little exploration and the potential for shear-related gold deposits has been ignored. The present survey has endeavored to gather, wherever possible, data which could open the way to new insights or ideas about mineral deposit models in northeast Alberta.

GOLD

Godfrey (1963) mentioned Au value in samples obtained from quartz-tourmaline-arsenopyrite veins in the Waugh Lake area. In addition, gold along with some nickel and silver was reported from rocks from the shore of Lindgren Lake (Godfrey, 1961). However, the many other arsenopyrite occurrences reported on Alberta Research Council's maps are also considered as good targets for gold mineralization and worth close examination. In the past, Hudson Bay Oil and Gas Ltd (HBOG) was the only company to have attempted analyzing for gold. HBOG was mainly attracted to the base metal potential of the electromagnetic conductors located northeast of Waugh Lake.

Systematic sampling during 1992 showed that two geological settings were favorable for Au enrichment. The first one is exemplified by the showings of South Potts Lake (up to 770 ppb Au), Pythagoras Lake (up to 603 ppb Au) and Northeast Waugh Lake (up to 416 ppb Au), where gold values are found in rusty metasediments associated with arsenopyrite mineralization. However, a certain degree of variation is evident in the host rock as well as associated metallic elements. Brecciation and silicification are well developed at South Potts Lake whereas microgranitic intrusions at Northeast Waugh Lake and shearing at Pythagoras may have played an important role. Elemental association varies greatly, but gold-arsenic correlation appears to be the rule. In these stratiformal occurrences, variable amounts of base metals are present in association with gold. The same is true at South Potts Lake with the addition of anomalous amounts of tungsten, bismuth and barium. Further study is needed to elucidate the reasons for such differences in geochemistry relative to the geological setting.

The second geological setting consists of quartz-tourmaline veins intruding into granite and surrounding metasediments (South Waugh Lake Showing no 44). In this area, tungsten along with minor amount of molybdenum are found in partial association with gold values up to 157 ppb; however, tungsten and molybdenum show a strong negative correlation with respect to As. Interestingly, geochemical analysis carried out on old Alberta Geological Survey samples from the area, returned anomalous values in gold (6 to 133 ppb) as well as in tungsten (65 to 1155 ppm) in samples located near Doze Lake (Figure 3; Mineral Occurrences nos. 124 to 127). According to the sample descriptions which accompany the sample number in the Alberta Research Council's archives, it appears that the geological setting is similar to the quartz-tourmaline setting observed around South Waugh Lake.

BASE METALS

Only one base metal occurrence is described in some detail. The occurrence is anomalous in copper and associated with a stratiformal sulfidic zone near Selwyn Lake (Selwyn Lake Showing). Although no great amount of metals was found in the four samples taken from the trenches or in the vicinity, the concentation of pyrite-pyrrhotite is important. The sulfides, which show a brecciated texture , are well layered, massive in places and interbedded with fine grained volcanic material ranging from basic to acidic composition. It may represent the distal expression of a volcanogenic massive sulfide deposit.

Besides this showing, several other mineral occurrences have shown anomalous levels of base metals, as discussed in the section on "Other Significant Mineral Occurrences". These occurrences can be divided into two groups. One group, consisting of a copper-lead-zinc (and often minor gold) association, reflects the metasedimentary-metavolcanic assemblage with a felsic bulk composition and is transitional to the gold stratiformal type of deposits (Mineral Occurrences no. 7, 23, 24, 38, 77 and 86). The other group correlates with rock units of more basic composition (diorite, amphibolite) which is indicated by high nickel-chromium values (Mineral Occurrences no. 55 and 88). Both groups have been given separate status in the classification of mineral occurrences used for northeastern Alberta. In addition, many of the gold showings are anomalous in base metals.

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. The uranium occurrences are overwhelmingly hosted in pegmatite and pegmatitic phases of granitoids or granite gneisses. In many instances, uranium is reconcentrated along shear zones and fractures. Interestingly enough, this type of deposit contains no or very little thorium associated with the uranium mineralization. At Carrot Lake, high silver values of 5 g/t are encountered.

A second type of mineralization occurs in pegmatite or pegmatitic material at the contact of, or interlayered with, metasediments and 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 substantial levels (Godfrey, 1958) with up to 1.40%. Mineralization at Small Lake, the West Arm of Andrew Lake (Big Bend) and Spider Lake (on shore) falls in the molybdenum-enriched category and appears to have the best continuity and overall grades. However, trenching and drilling have shown the mineralized zones to be less than of mineable width and grades are sub-economic. In comparison, the first type of pegmatite-hosted uranium mineralization is found to be too erratic even for bulk mining.

RARE EARTH ELEMENTS

The amount of Rare Earth Elements discovered at the South Potts Lake (REE) showing, can be considered 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.

MOLYBDENUM

A total of eleven occurrences, reported on the 1:31,860 scale geological maps of the area, could not be relocated. Godfrey (1958) warned about the possibility of confusion with graphite which is a very common mineral in the area in granite gneisses and in pegmatites; these occurrences could be examples of this phenomenon. However, tiny flakes of molybdenite can be easily missed. In one case (Mineral Occurrence no 43), molybdenite was not observed but geochemical assay indicated the presence of elevated molybdenum (455 ppm). In another case (Mineral Occurrence no 48), there is a contradiction in the location of the molybdenum occurrence between maps and written reports.

However, molybdenum mineralization remains a definite possibility in high grade gneissic to granitic terrain. It could represent the end member of a mineralization trend starting with the uranium-thorium association and continuing with the uranium-thorium-molybdenum association as documented previously. 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), the Mätäsvaara Mine in Finland (Isokangas, 1978) and the Knaben Mine in Norway (Bugge, 1978).

IRON-VANADIUM

The two magnetite-hematite occurrences hosted in feldspar-rich pegmatitic breccia within granitic country rocks, show a distinct Fe-V association which is unusual in a granitic environment. Fe-V mineralization characterizes iron deposits in the mafic to ultramafic rocks of Norway and Finland. It is too early to draw conclusion from only two samples; however results are enticing enough to warrant a further survey of these occurrences, considering that the area has a high magnetic signature in the regional magnetic maps (Sprenke et al., 1986).

CONCLUSIONS AND RECOMMENDATIONS

Most of the mineral occurrences which could be accessed by float plane in the Andrew Lake Charles Lake area, have been visited, evaluated, documented, and are described in this report Whenever possible, information from past exploration has been reviewed and included in the database gathered in the course of field examination. The mineral occurrences are the subject of individual reports and are indicated by a symbol and number on the accompanying map (Figure 1), and listed in Appendix 1. The most significant occurrences are discussed in greater detail as mineral showings. The classification of the metallic mineral occurrences provides models for the various types of mineral deposition in the area. This work provides insights into the economic potential of the mineral showings.

The most interesting results from this project are the potential for gold and base metals associated with either metasedimentary belts or numerous late phase quartz-tourmaline veins in the Waugh Lake area. The stratiformal structure of many sulfide rich horizons is indicative of the potential for massive sulfide deposits with a gold association.

The large number of uranium occurrences in the area reflect the focus of past exploration. Most of the uranium mineralized zones are pegmatite hosted. Under present market conditions, it is unlikely that the pegmatite hosted uranium showings in the area hold much economic potential. However, some radioactive occurrences are associated with rare earth elements in appreciable quantities. These occurrences may warrant further exploration.

The results from the 1992 field investigation indicate that additional geoscientific studies are needed in selected areas of northeast Alberta. During the past field season, the program was designed to allow for preliminary examination of discrete locations. Some areas are worth examining in more detail in order to provide more information regarding their mineral potential and enhance their attractiveness to industry. The most interesting areas are the Waugh Lake-Doze Lake and Pythagoras Lake with their elevated Au and base metals in metasedimentary-metavolcanic belts. These two belts should be mapped and prospected in greater detail. As well, geologically similar belts such as in the Ashton Lake, Potts Lake, Alexander Lake, Split Lake and Swinnerton Lake areas should be further investigated.

The newly discovered REE occurrences are interesting and should be systematically mapped and sampled. This study should include detailed mineralogical work. Geological environments similar to the discovered REE occurrences are common in northeast Alberta, hence undiscovered REE occurrences are probably present. The allanite occurrences reported by Godfrey (1986b) on the compilation map of mineral showings, none of which were visited during the 1992 field project, should be given high priority for future examination.

Lithogeochemistry, which has proven to be an efficient tool for delineating deposits in the Precambrian Shield (Grunsky, 1986), could be applied in northeast Alberta. First, all existing AGS samples which have been collected from the metasediment belts could be analyzed. Secondly, systematic sampling of the metasediment belts under investigation would increase the statistical chance of detecting mineralized zones and alteration. To fully appraise the mineral potential of the metasediment belts, it is recommended that geophysical methods be considered. Geophysical methods have been applied successfully in similar circumstances in other parts of the Canadian Shield. In particular, airborne electromagnetic (EM) techniques are highly favored to detect mineralization and quickly survey in detail a good proportion of the vast areas which are not yet explored. The EM methods also have the advantage of depth penetration. Because the favorable metasedimentary belts are fairly recessive and sulfide mineralization tends to intensify the effect of weathering, airborne geophysics could help to gather data on the many minor belts of metasediments that have been mapped throughout the district. It could also detect sulfide rich zones associated with the numerous shear zones. These shear zones have, so far, remained relatively unexplored and are considered favorable targets for potential gold deposits.

However, lithogeochemistry and airborne EM geophysics are expensive methods to implement and supplementary funding is required. These two methods have provided great incentives to exploration in Ontario and Quebec and should be considered to help generate a more detailed metallogenic database for northeastern Alberta.

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APPENDIX 1. INVENTORY OF MINERAL OCCURRENCES ASSESSED IN 1992

Mineral Occurrence Number: **1**
Northing: **6630350** Center of Charles Lake
Easting: **526310**
Commodities: Sulfides

Mineral Occurr61ence Number: **2**
Northing: **6630550** Eastcentral Charles Lake
Easting: **527160**
Commodities: Radioactive site

Mineral Occurrence Number: **3**
Northing: **6630590** Eastcental Charles Lake
Easting: **526780**
Commodities: Radioactive site

Mineral Occurrence Number: **4**
Northing: **6615080** Southwest Charles Lake
Easting: **522890**
Commodities: Cu and Mo ?

Mineral Occurrence Number: **5**
Northing: **6612960** South of Charles Lake
Easting: **523150**
Commodities: Ni, Cr and Zn

Mineral Occurrence Number: **6**
Northing: **6639750** Northeast of Charles Lake
Easting: **528300**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **7**
Northing: **6643850** Northeast of Charles Lake
Easting: **529200**
Commodities: Cu

Mineral Occurrence Number: **8**
Northing: **6642200** North of Charles Lake
Easting: **529130**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **9**
Northing: **6625700** Southcentral Charles Lake
Easting: **527400**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **10**
Northing: **6626000** Eastcentral Charles Lake
Easting: **527680**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **11**
Northing: **6626400** Eastcentral Charles Lake
Easting: **527725**
Commodities: Rare Earth Elements

Mineral Occurrence Number: **12**
Northing: **6627415** Eastcentral Charles Lake
Easting: **527975**
Commodities: Rare Earth Elements

Mineral Occurrence Number: **13**
Northing: **6627500** Eastcentral charles Lake
Easting: **528100**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **14**
Northing: **6622600** Northeast Potts Lake
Easting: **534775**
Commodities: Mo

Mineral Occurrence Number: **15**
Northing: **6626525** North Potts lake
Easting: **534800**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **16**
Northing: **6617850** Southwest of Potts Lake
Easting: **530575**
Commodities: Rare Earth Elements

Mineral Occurrence Number: **17**
Northing: **6617950** Southwest of Potts Lake
Easting: **530500**
Commodities: Gold associated with sulfides

Mineral Occurrence Number: **18**
Northing: **6618190** Southwest of Potts Lake
Easting: **530500**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **19**
Northing: **6618875** Southwest of Potts Lake
Easting: **528600**
Commodities: Mo?

Mineral Occurrence Number: **20**
Northing: **6617575** Southwest of Potts Lake
Easting: **530000**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **21**
Northing: **6619490** Southeast of Potts Lake
Easting: **532280**
Commodities: Ni and Cr

Mineral Occurrence Number: **22**
Northing: **6621110** Central Potts Lake
Easting: **530940**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **23**
Northing: **6624980** Northcentral Potts Lake
Easting: **532800**
Commodities: Base metals (Au, Cu, Zn, V and Cr)

Mineral Occurrence Number: **24**
Northing: **6620520** Eastcentral Potts Lake
Easting: **534350**
Commodities: Base metals (Cu)

Mineral Occurrence Number: **25**
Northing: **6624800** North Cherry Lake
Easting: **551200**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **26**
Northing: **6625500** North Cherry Lake
Easting: **551170**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **27**
Northing: **6624710** North Cherry Lake
Easting: **551660**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **28**
Northing: **6624400** North Cherry Lake
Easting: **550100**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **29**
Northing: **6624630** North Cherry Lake
Easting: **550030**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **30**
Northing: **6624810** North Cherry Lake
Easting: **549880**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **31**
Northing: **6624950** North Cherry Lake
Easting: **549790**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **32**
Northing: **6625000** North Cherry Lake
Easting: **549925**
Commodities: U (Th, REE...etc.)
Mineral Occurrence Number: **33**
Northing: **6626200** North Cherry Lake
Easting: **549675**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **34**
Northing: **6625075** North Cherry Lake
Easting: **550360**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **35**
Northing: **6622160** East Cherry Lake
Easting: **551125**
Commodities: U, (TH, REE...etc.)

Mineral Occurrence Number: **36**
Northing: **6623000** Island in Cherry Lake
Easting: **550740**
Commodities: U, (Th, REE...etc.)

Mineral Occurrence Number: **37**
Northing: **6623980** North Cherry Lake
Easting: **550350**
Commodities: U,(Th, REE...etc.)

Mineral Occurrence Number: **38**
Northing: **6630750** West of Waugh Lake
Easting: **555250**
Commodities: Base metals (Zn and Cr)

Mineral Occurrence Number: **39**
Northing: **6632060** Northeast of Waugh Lake
Easting: **555720**
Commodities: Base metals (Zn and Cr)

Mineral Occurrence Number: **40**
Northing: **6630410** East of Waugh Lake
Easting: **555725**
Commodities: Base metals (Cr and Cu)

Mineral Occurrence Number: **41**
Northing: **6634360** North of Waugh Lake
Easting: **555700**
Commodities: Base metals (Cu-Zn)

Mineral Occurrence Number: **42**
Northing: **6632425** East of Waugh Lake
Easting: **555750**
Commodities: Sulfides

Mineral Occurrence Number: **43**

Northing:	**6628925**	**6629140**	**6628825**	Southwest of Waugh Lake
Easting:	**554000**	**554150**	**554140**	

Commodities: Tourmaline-quartz veins with Mo and W (Au potential)

Mineral Occurrence Number: **44**
Northing: **6629520** West of Waugh Lake
Easting: **555100**
Commodities: Tourmaline-quartz veins with Au, Pb and Cu

Mineral Occurrence Number: **45**
Northing: **6629250** Southeast of Waugh Lake
Easting: **555420**
Commodities: Tourmaline-quartz veins with Au

Mineral Occurrence Number: **46**
Northing: **6630010** West of Waugh Lake
Easting: **555180**
Commodities: Tourmaline-quartz veins

Mineral Occurrence Number: **47**
Northing: **6633050** Northwest of Waugh Lake
Easting: **553350**
Commodities: Tourmaline-quartz veins

Mineral Occurrence Number: **48**
Northing: **6633500** Northwest of Waugh Lake
Easting: **552500**
Commodities: Mo?

Mineral Occurrence Number: **49**
Northing: **6631150** West of Waugh Lake
Easting: **554750**
Commodities: (Pb)

Mineral Occurrence Number: **50**
Northing: **6631760** Northeast of Waugh Lake
Easting: **555770**
Commodity: Au

Mineral Occurrence Number: **51**
Northing: **6631560** East of Waugh Lake
Easting: **555705**
Commodity: Au

Mineral Occurrence Number: **52**
Northing: **6631440** East of Waugh Lake
Easting: **555710**
Commodities: Base metals (Zn and Cr)

Mineral Occurrence Number: **53**
Northing: **6631195** East of Waugh Lake
Easting: **555695**
Commodities: Cu, Zn, Ni, Cd and Au

Mineral Occurrence Number: **54**
Northing: **6630000** East of Waugh Lake
Easting: **555710**
Commodities: Au

Mineral Occurrence Number: **55**
Northing: **6630300** **6630600** **6630700** 3 sites west of Waugh Lake
Easting: **555210** **555000** **555100**
Commodities: Base metals (Zn, Ni and Cr)

Mineral Occurrence Number: **56**
Northing: **6630700** In big bend of west arm of Andrew Lake
Easting: **539325**
Commoditie(s): U (Th, REE...etc.)

Mineral Occurrence Number: **57**
Northing: **6630575** In big bend of west arm of Andrew Lake
Easting: **539425**
Commodities: Fe and V

Mineral Occurrence Number: **58**
Northing: **6630860** **6631010** 2 sites in west arm of Andrew Lake
Easting: **541175** **541110**
Commodity: Graphite and Molybdenite?

Mineral Occurrence Number: **59**
Northing: **6650174** Near Lindgren Lake
Easting: **543578**
Commodity: Au

Mineral Occurrence Number: **60**

Northing:	**6649578**	Pythagoras Lake		
Easting:	**543276**			

Commodities: Au

Mineral Occurrence Number: **61**

Northing:	**6648361**	**6647170**	**6645500**	3 sites south of Pythagoras Lake
Easting:	**542834**	**542428**	**541846**	

Commoditie(s): Au

Mineral Occurrence Number: **62**

Northing:	**6647629**	South of Pythagoras Lake
Easting:	**542481**	

Commodities: sulfides and minor Au

Mineral Occurrence Number: **63**

Northing:	**6647601**	South of Pythagoras Lake
Easting:	**542795**	

Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **64**

Northing:	**6626534**	**6626341**	2 sites on Spider Lake
Easting:	**544968**	**544606**	

Commoditie(s): U (Th, REE...etc.) + Mo

Mineral Occurrence Number: **65**

Northing:	**6626921**	Northeast of Spider Lake
Easting:	**545175**	

Commoditie(s): U (Th, REE...etc.) + Mo

Mineral Occurrence Number: **66**

Northing:	**6627100**	North of Spider Lake
Easting:	**544900**	

Commoditie(s): U (Th, REE...etc.) + Mo

Mineral Occurrence Number: **67**

Northing:	**6626382**	**6626600**	2 sites on Johnson Lake
Easting:	**553301**	**553190**	

Commodities: (Zn)

Mineral Occurrence Number: **68**

Northing:	**6626123**	Southeast of Spider Lake
Easting:	**544886**	

Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **69**

Northing:	**6625520**	South of Spider Lake
Easting:	**543750**	

Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **70**
Northing: **6635111** Southeast of Hutton Lake
Easting: **546472**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **71**
Northing: **6635928** West of hutton Lake
Easting: **545537**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **72**
Northing: **6636753** Northwest of Hutton Lake
Easting: **545369**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **73**
Northing: **6637546** North of Hutton Lake
Easting: **545191**
Commodities: V (and PGE's ?)

Mineral Occurrence Number: **74**
Northing: **6649685** West of Selwyn Lake
Easting: **528024**
Commodities: Cu

Mineral Occurrence Number: **75**
Northing: **6639344** Southwest of Holmes Lake
Easting: **543853**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **76**
Northing: **6627915** West of Hieroglyphic Lake
Easting: **541360**
Commodities: Mo?
Mineral Occurrence Number: **77**
Northing: **6625430** Southeast of Spider Lake
Easting: **545750**
Commodities: Au, Cu

Mineral Occurrence Number: **78**
Northing: **6628973** South of Andrew Lake
Easting: **548555**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **79**
Northing: **6628787** Trenches south of Andrew Lake
Easting: **548783**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **80**

Northing:	**6628245**	**6628030**	**6627850**	3 sites west of Carrot Lake
Easting:	**548970**	**549065**	**549120**	

Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **81**
Northing: **6632225** Near center of west arm of Andrew Lake
Easting: **538468**
Commodities: Au, Zn and Mo?

Mineral Occurrence Number: **82**
Northing: **6635421** Near north end of west arm of Andrew Lake
Easting: **539287**
Commodities: (Cu and Au)

Mineral Occurrence Number: **83**
Northing: **6629991** East center of west arm of Andrew Lake
Easting: **541342**
Commodities: Mo?

Mineral Occurrence Number: **84**
Northing: **6630765** Second narrows in west arm of Andrew Lake
Easting: **544300**
Commodities: U (Th, REE...etc.)

Mineral Occurrence Number: **85**
Northing: **6634100** North of Andrew Lake Lodge
Easting: **546967**
Commodities: REE

Mineral Occurrence Number: **86**
Northing: **6633925** Southeast of Andrew Lake
Easting: **549644**
Commodities: Au, Cu, Pb and Zn

Mineral Occurrence Number: **87**
Northing: **6633855** Southeast of Andrew Lake
Easting: **549701**
Commodities: U and Th

Mineral Occurrence Number: **88**
Northing: **6647660** On island at north end of Andrew Lake
Easting: **551540**
Commodities: Cu and Cr

APPENDIX 2. INVENTORY OF ADDITIONAL MINERAL OCCURRENCES

This listing includes occurrences reported by Godfrey (1986b), but not visited in 1992 and samples from the AGS collection with anomalous metalliferous contents

Mineral Occurrence Number: **89**
Northing: **6643665** East of Bayonet lake
Easting: **539500**
Commodities: Allanite

Mineral Occurrence Number: **90**
Northing: **6634200** **6634200** West of Ashton Lake
Easting: **531475** **531830**
Commodities: Allanite

Mineral Occurrence Number: **91**
Northing: **6636520** **6635165** **6632890** 3 sites near Doze Lake
Easting: **555000** **553720** **553760**
Commodities: Tourmaline-Quartz veins

Mineral Occurrence Number: **92**
Northing: **6628260** North of Pans Lake
Easting: **537100**
Commodities: Allanite

Mineral Occurrence Number: **93**
Northing: **6627744** West of Hieroglyphic Lake
Easting: **541100**
Commodities: Allanite

Mineral Occurrence Number: **94**
Northing: **6628605** Southeast of Waugh Lake
Easting: **555400**
Commodities: Aspy

Mineral Occurrence Number: **95**
Northing: **6623980** West of Ney Lake
Easting: **554350**
Commodities: Sulfides

Mineral Occurrence Number: **96**
Northing: **6630470** West of Waugh Lake
Easting: **554830**
Commodities: Tourmaline-Quartz veins

Mineral Occurrence Number: **97**
Northing: **6649100** Northwest of Charles Lake
Easting: **521000**
Commodities: Graphite

Mineral Occurrence Number: **98**
Northing: **6626485** East of Spider Lake
Easting: **546300**
Commodities: Mo

Mineral Occurrence Number: **99**
Northing: **6627290** **6625500** **6624000** Spider Lake
Easting: **545570** **544000** **543375**
Commodities: Radioactivity (Uranium or REE)

Mineral Occurrence Number: **100**
Northing: **6642800** **East of Henson Lake**
Easting: **544850**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **101**
Northing: **6642750** South of Murchison Lake
Easting: **542300**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **102**
Northing: **6642825** East of Bayonet Lake
Easting: **540950**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **103**
Northing: **6644500** East of Bayonet Lake
Easting: **540640**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **104**
Northing: **6643150** East of Bayonet Lake
Easting: **540340**

Mineral Occurrence Number: **105**
Northing: **6642400** On Sonja Island in Andrew Lake
Easting: **549650**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **106**
Northing: **6635500** Near Ashton Lake
Easting: **532400**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **107**
Northing: **6641000** North of Dawson Lake
Easting: **532335**
Commodities: Radioactivity (Uranium, REE)

Mineral Occurrence Number: **108**
Northing: **6639565** North of One Week Lake
Easting: **540565**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **109**
Northing: **6639100** West of One Week Lake
Easting: **536630**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **110**
Northing: **6640570** North of One Week Lake
Easting: **537850**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **111**
Northing: 6626830 **6627000** North of Spider Lake
Easting: 544230 **543450**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **112**
Northing: 6622450 **6622030** West of Cherry Lake
Easting: 546785 **546965**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **113** 5 sites between Spider and Cherry Lakes

Northing:	6627270	6626300	6625090	6623820	**6624220**
Easting:	548050	548330	547433	547530	**548735**

Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **114**
Northing: **6628260** South of Andrew Lake
Easting: **546100**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **115**
Northing: **6629300** South of Andrew Lake
Easting: **549050**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **116**
Northing: **6617850** On St. Agnes Lake
Easting: **543225**
Commodities: Radioactivity (Uranium)

Mineral Occurrence Number: **117**
Northing: **6617950** South Potts Lake
Easting: **530000**
Commodities: Au - with anomalous As and W

Mineral Occurrence Number: **118**
Northing: **6617950** South Potts Lake
Easting: **529800**
Commodities: Sulfides

Mineral Occurrence Number: **119**
Northing: **6617950** South Potts Lake
Easting: **529559**
Commodities: Sulfides

Mineral Occurrence Number: **120**
Northing: **6629300** Southwest Waugh Lake
Easting: **553240**
Commodities: Tourmaline and Quartz veins

Mineral Occurrence Number: **121**
Northing: **6630420** Southwest Waugh Lake
Easting: **552125**
Commodities: Tourmaline

Mineral Occurrence Number: **122**
Northing: **6630446** Southwest Waugh Lake
Easting: **551852**
Commodities: Cr-Ni (+Zn)

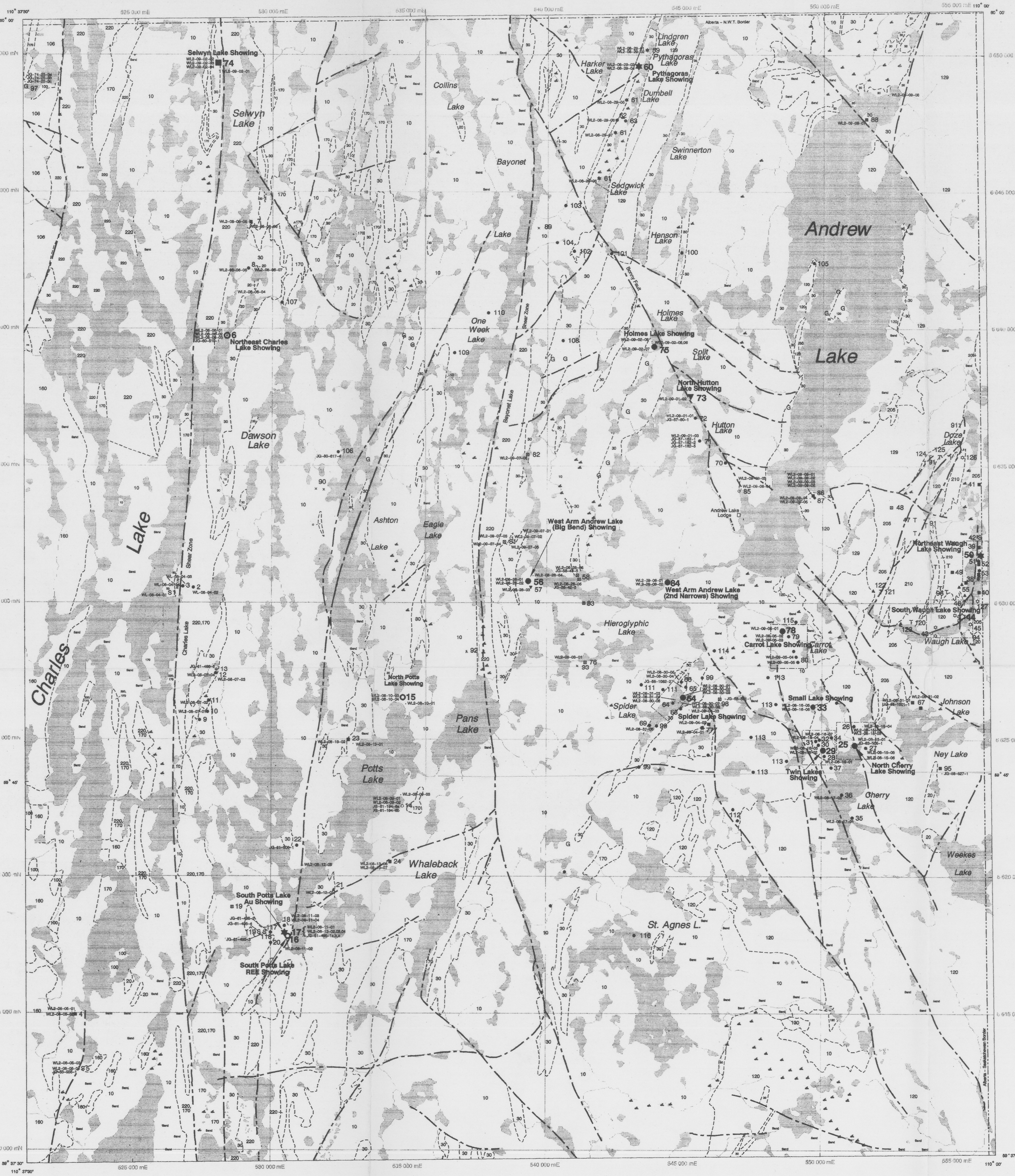
Mineral Occurrence Number: **123**
Northing: **6629259** Southwest Waugh Lake
Easting: **552855**
Commodities: Cr-Ni

Mineral Occurrence Number: **124**
Northing: **6635370** Southwest of Doze Lake
Easting: **553910**
Commodities: Tourmaline and Quartz veins

Mineral Occurrence Number: **125**
Northing: **6635370** Southwest of Doze Lake
Easting: **554263**
Commodities: Tourmaline and Quartz veins

Mineral Occurrence Number: **126**
Northing: **6635343** Southwest of Doze Lake
Easting: **555089**
Commodities: Au assoc. with Tourmaline-quartz

Mineral Occurrence Number: **127**
Northing: **6630100** East of Waugh Lake
Easting: **555670**
Commodities: Au assoc. with Tourmaline-quartz



MINERAL OCCURRENCES OF THE ANDREW LAKE–CHARLES LAKE AREA OF NORTHEASTERN ALBERTA

Willem Langenberg, Hughes Salat, Andrew Turner and Roy Eccles

FIGURE 1: To Accompany Open File Report 1993–08

APHEBIAN

210	Waugh Lake Group (low grade metavolcanic rocks)
205	Waugh Lake Group (low grade metasedimentary rocks)
220	Recrystallized Mylonitic Rocks
160	Arch Lake Granitoids
130	Wylie Lake Granitoids
120	Colin Lake Granitoids
129	Colin Lake Granitoids; Andrew Lake Granite Phase
100	Slave Granitoids
106	Slave Granitoids; Raisin Granite Phase

ARCHEAN

170	Charles Lake Granitoids
30	High-grade Metasedimentary Rocks
20	Amphibolite
10	Granite Gneiss
Sand	Sand Covered
	Muskeg
	Fault

Geology simplified after Godfrey (1986)–Alberta Research Council Map EM180

EXPLANATION OF MINERAL OCCURRENCE SYMBOLS

Mineral Showing Consisting of Several Mineral Occurrences
Rock Sample Number
Mineral Showing Symbol
Mineral Showing Name
Rock Sample Location
Mineral Occurrence Number
Mineral Occurrence Symbol
Mineral Showing Number

WL2-08-29-01 +
WL2-08-29-02 59
WL2-08-29-03
WL2-08-29-04 60
Pythagoras Lake Showing

* Mineral Occurrences without numbers indicate anomalies transferred from Map EM-182 (Godfrey, 1986b)

MINERAL OCCURRENCE SYMBOLS

- Gold associated with sulfides
- Gold associated with tourmaline quartz veins
- Base metals (Pb, Zn, Cu)
- Molybdenite
- Uranium or radioactive site
- Rare earth elements
- Fe–V (semi–massive magnetite)
- Nickel–Chromium

OTHER MINERAL OCCURRENCE SYMBOLS

X	Allanite
Aspy	Arsenopyrite
G	Graphite
T	Tourmaline quartz veins
S	Sulfides

MINERAL SHOWINGS

6 – Northeast Charles Lake
16 – South Potts Lake REE
17 – South Potts Lake Au
25 – North Cherry Lake
29 – Twin Lakes
33 – Small Lake
39 – Northeast Waugh Lake
44 – South Waugh Lake
56 – West Arm Andrew Lake (Big Bend)
60 – Pythagoras Lake
64 – Spider Lake
73 – North Hutton Lake
74 – Selwyn Lake
75 – Holmes Lake
78 – Carrot Lake
84 – 2nd Narrows West Arm of Andrew Lake

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Kilometres