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Geological Mapping
and Mineralization
on the south eastern part of the
Mumford Claim
Cardiff Township, Ontario

Cell claims; 287243, 228669, 307978, 172434 and 248132.

By

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Kingston, Ontario

For

Municipality of Highlands East
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2249 Loop Road
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March 31, 2020

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Introduction

For decades, recreational mineral collectors from around the world have been coming to south eastern Ontario to pursue their fascinating hobby by searching out mineral samples from the many available collecting sites for which the region is famous. For this reason, many consider the region, often referred to in general as the Bancroft area, the "Mineral Capital of Canada".

A wide variety of minerals are known from hundreds of different occurrences throughout the region. Sadly, over the years, many of these localities have been closed to mineral collectors due in part to park and cottage development and a host of other land access issues. It has been suggested that fewer mineral collectors are coming to the region now than in the past. If this is true it may be, in part, because there are fewer collecting sites available to the collector. The Municipality of Highlands East has acquired a number of mineral claims to explore the possibility of developing these claims as new recreational mineral collecting destinations, thereby providing incentive for mineral collectors to return and stay in the region.

One of the original claims held by the Municipality of Highlands East, known as either the Mumford claim or the Schickler Property, is the subject of this report. The original Mumford legacy claim has now been replaced by a contiguous group of 12 cell claims, all of which are located 5 km east of the town of Wilberforce. Superb mineral specimens of apatite, diopside, zircon, uraninite, amphibole, feldspar and titanite from localities in the Wilberforce area are well known among mineral collectors. Many well known mineral collecting sites are located on privately owned land within several kilometres of the Mumford claim. The Schickler Occurrence (Sabina 1986), which lies within the Mumford claim, was a poorly known mineral collecting site until recently. Because the Municipality of Highlands East has recently provided to the public, information about the Schickler Occurrence and opened the site, recreational minerals collectors have started returning to the region as tourists. It has become a mineral destination.

It seems reasonable to postulate that additional mineral collecting sites might be found on the Mumford legacy claim. The goal of this study was to explore for and identify additional sites on the Mumford legacy claim that would be attractive to the recreational mineral collector. This was done by mapping geology and prospecting over the south eastern part the original claim. The author spent 3 person days on the claim in May, 2019 gathering data for this report.

Claim Information and History

The original Mumford claim was staked on June 3, 2011 and its original claim number was SO 1500016. The Mumford Claim originally covered 4 concession lots in Cardiff Township (Lots 9-11, Concession 22 and Lot 11, Concession 21). The original claim was mostly surrounded by privately owned land. Only a short section along the southern most boundary of the original Mumford Claim was bounded by crown land.

The original Mumford Claim (SO 1500016) was converted to 19 encumbered cell claims in April, 2018, when the Ministry of Development and Mines introduced its new online claim and mining lands management system, MLAS. The 19 claims that covered the "Legacy" Mumford Claim were;

154450, 248131, 335599, 154451, 221210, 287242, 127938, 174595, 287243, 228669, 104803, 139407, 307978, 172434, 139408, 248132, 191421, 191423 and 191422.

In May 2019 the following 7 claims located along the edges of the original legacy claim were dropped; 154450, 335599, 287242, 139408, 191421, 191423 and 191422.

Only a small portion of each of these claims was available for mineral exploration because most of area of each claim was under private ownership.

The following 12 cell claims are currently owned by the Corporation of the Municipality of Highlands East and are the subject of this report;
248131, 154451, 221210, 127938, 174595, 287243, 228669, 104803, 139407, 307978, 172434 and 248132.

Location and Access

The original Mumford claim (SO 1500016) and the now current 12 cell claims cover most of the crown land on Lots 9-11, Concession 22 and Lot 11, Concession 21 in the township of Cardiff. These claims are located approximately 27 kilometres east from Haliburton and 25 km west from Bancroft, the two largest towns in the region (Figure 1).

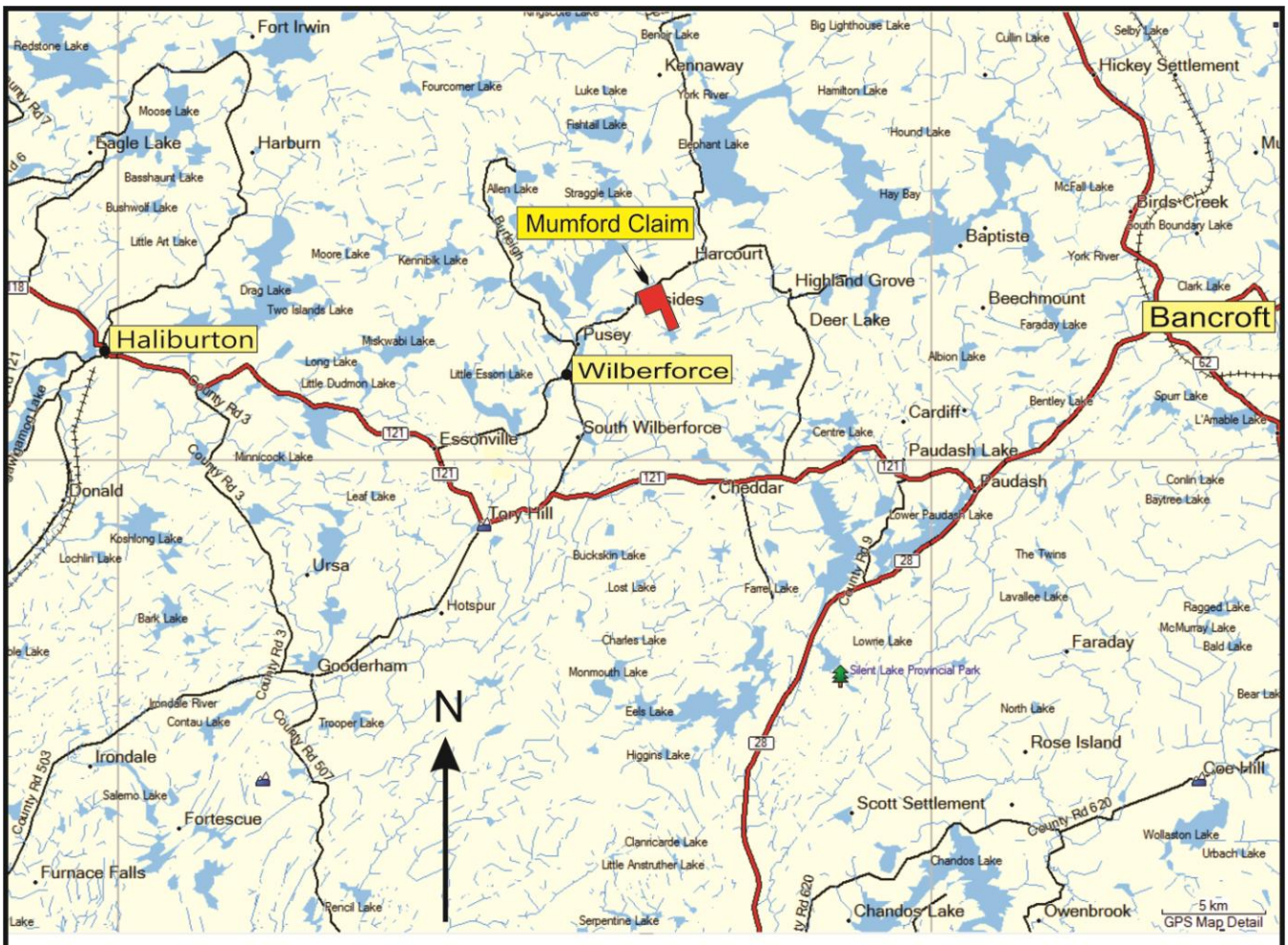


Figure 1: Mumford Claim Location Map.

The Mumford group of cell claims are approximately 5 kilometres northwest of Wilberforce and 3 kilometres southeast of Harcourt, the two easiest communities from which to access the claims (Figure 2). The claims are located on NTS map 31E/01. To access the claims from Wilberforce, travel along County Road 648 until Mumford road is reached (approximately 4.7 kilometres). Turn right onto Mumford Road and travel 1.0 kilometres. At this point, the western boundary of the Mumford group of claims is reached and Cope Lake Road branches off to the south.

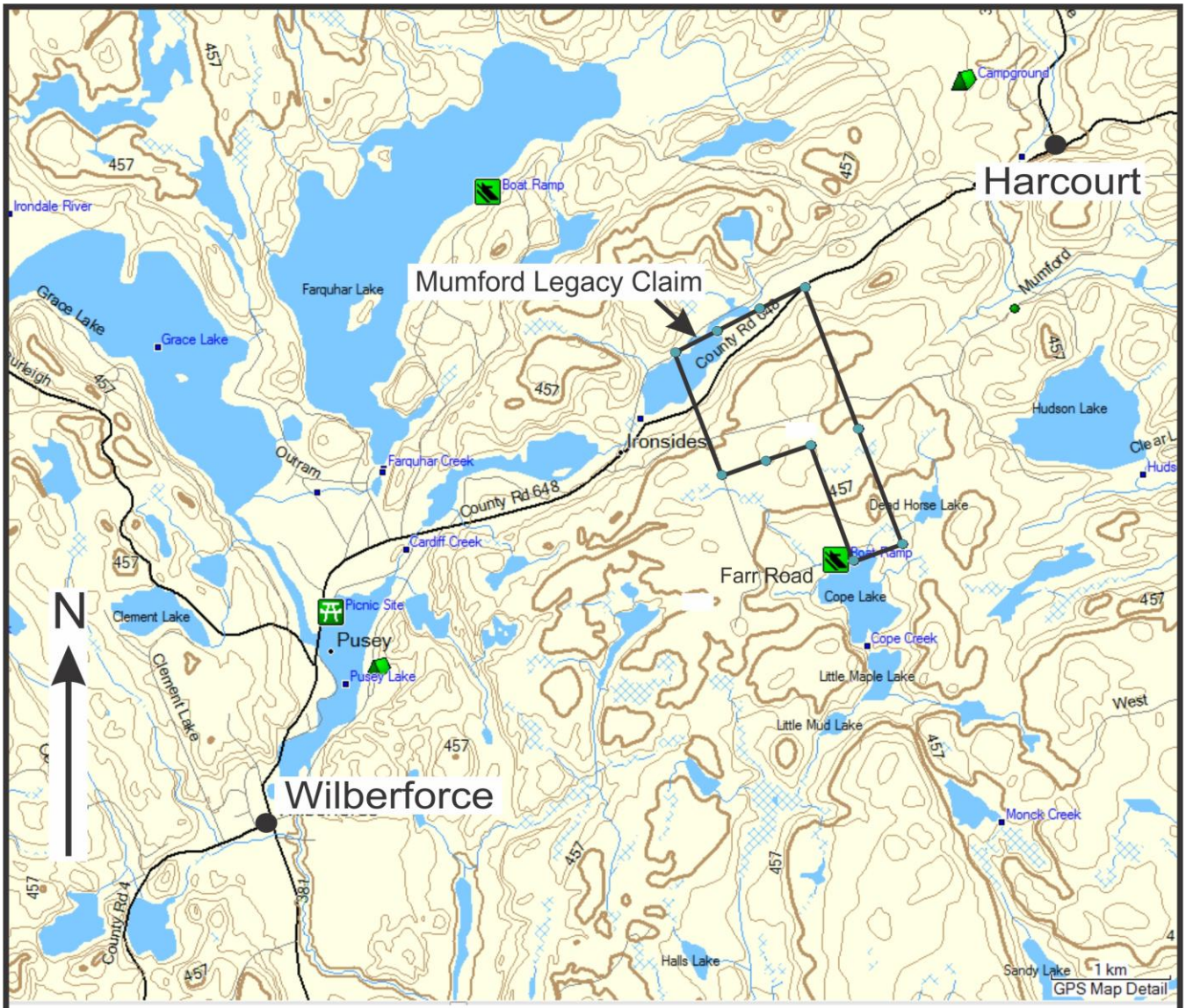


Figure 2: Detailed Location Map.
(Showing relationship to Wilberforce and Harcourt)

Although the Mumford group of claims are mostly surrounded by privately owned land, they are crossed by numerous roads and trails, making access very easy. Along the northern edge of the claims is paved County Road 648. The gravel covered Mumford Road traverses, in an east west direction, the central part of the claims. A narrow gravel road, called Manhire Road, leads to cottages on Cope Lake and provides access to the southern

part of the claims. Several trails, used by ATVs in the summer and snowmobiles in the winter, traverse the claims. People using these trails should be aware of the possibility of ATV traffic. Located near the centre of the claims is an active land fill site (garbage dump). Located on the north eastern corner of the claims is the abandoned Harcourt Graphite Mine.

Previous Work

The Mumford group of claims is underlain by rocks of the Grenville Province of the Canadian Shield. On a regional level Grenville Province rocks have been extensively studied and prospected for various ores over the last century. Authors, too numerous to mention, have studied and described these rocks.

A township wide geological report was published in 1959 by Hewitt that included a detailed geologic map covering both Cardiff and neighbouring Faraday Townships. Hewitt's study concentrated on the geology and economic mineral deposits of Cardiff and Faraday Townships and not on occurrences of crystals and minerals suitable for the recreational mineral collector. Hewitt (1959) briefly describes both the Schickler Occurrence and the National (Harcourt) Graphite Property and lists but does not describe a uranium occurrence (referred to as D. E. Denfield), all of which lie on the Mumford group of claims.

Satterly (1957) reports that *circa* 1954, during exploration for radioactive minerals, stripping and trenching was conducted over claims that included Lot 11, Concession 21 (what is now the southern part of the Mumford group of claims), and that in 1955, a short (43 feet) hole was drilled on the same lot.

A detailed report covering an area around Cope Lake by Ennis (1968) documents geologic and radiometric surveys over a number of claims including what is now the southern part of the Mumford group of claims. Ennis was searching for radioactive minerals and not potential mineral collecting sites.

Guides to mineral collecting sites in southern Ontario have been published by various authors. One of the many guides covering the area is by Ann Sabina (1986). Sabina (1986) describes mineral collecting sites throughout the Bancroft region, including those in the Wilberforce and Harcourt areas.

Two mineral collecting localities that Sabina (1986) describes lie within the boundaries of the Mumford group of claims, the Schickler fluorite occurrence and the Harcourt Graphite Mine. In addition, Sabina (1986) describes four collecting localities within a few kilometres of the claims. These are the Clark Mine, Dwyer fluorite Mine, Trip (Nu-Age) Mine and the Richardson (Fission) Mine.

Both Sabina (1986) and Hewitt (1959) describe the history of the now abandoned graphite mine located in the north eastern part of the Mumford group of claims. Sabina (1986) calls this site the "Harcourt Graphite Mine", whereas Hewitt (1959) calls this the "National Graphite Property".

Fieldwork and Terminology

For ease of reference, the 12 cell claims covering Lots 9-11, Concession 22 and Lot 11 Concession 21 in the township of Cardiff is being referred to in this report as the "Mumford group of claims" or simply the "Mumford claims". The author spent 3 days mapping and gathering data on the Mumford claims on the following dates; May 6, 7 and 8, 2019. An additional 3 days were spent by the author preparing the geology map and writing this report.

Assumptions have been made and a number of terms used by the author in preparing this report. Some of these require clarification. The minerals found on the Mumford claims and those named in this report were identified using standard field identification practices (observations of lustre, hardness, cleavage, crystal form, etc). No analytical work was performed to verify these identifications. Amphiboles belong to a complex group of minerals whose individual mineral species are difficult, if not impossible, to identify without detailed

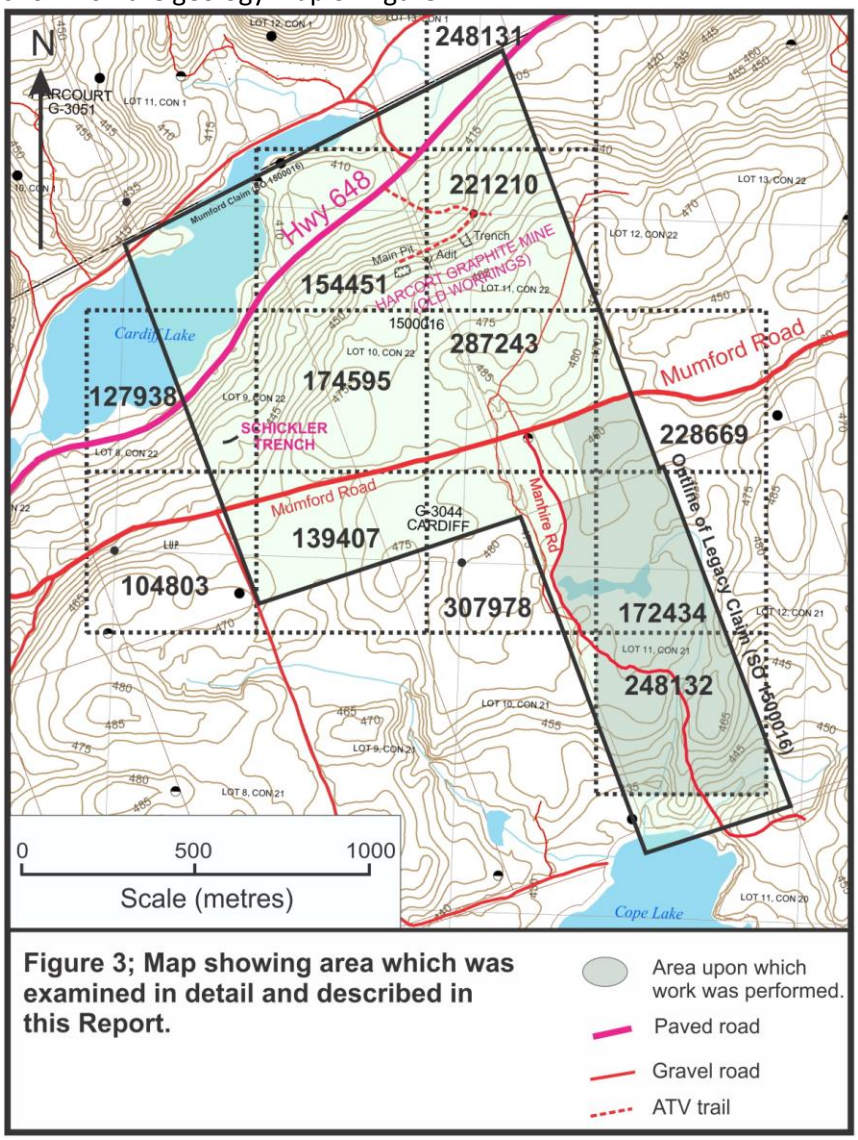
analytical work. Instead of going through the expense and time of having each sample analysed, the author has used the general terms "hornblende" for a black amphibole. Rocks were examined and identified visually.

Property Geology

The Mumford claim is underlain by high-grade metamorphic rocks of the Grenville Province of the Canadian Shield. Rocks of the Grenville Province are well known and have been described by many authors. These rocks host virtually all the known mineral and crystal occurrences that attract mineral collectors, both professional and recreational, to the Bancroft area.

A township wide geological report was published in 1959 by Hewitt that included a geology map covering both Cardiff and neighbouring Faraday Townships. Hewitt's geology map shows the Mumford claims being underlain by marble to the north and syenitic and granitic gneiss elsewhere. Included with these gneisses are pegmatite and sedimentary layers.

The author mapped local geology by noting outcrop locations with a hand held GPS device and examining rock types and structures. This was done concurrently with general prospecting for mineral and crystal occurrences of interest to recreational mineral collectors. The area examined during this study is shown in Figure 3. This area was chosen with the expectation that it could be covered in reasonable detail in 3 to 4 days. Results are shown on the geology map of Figure 4.



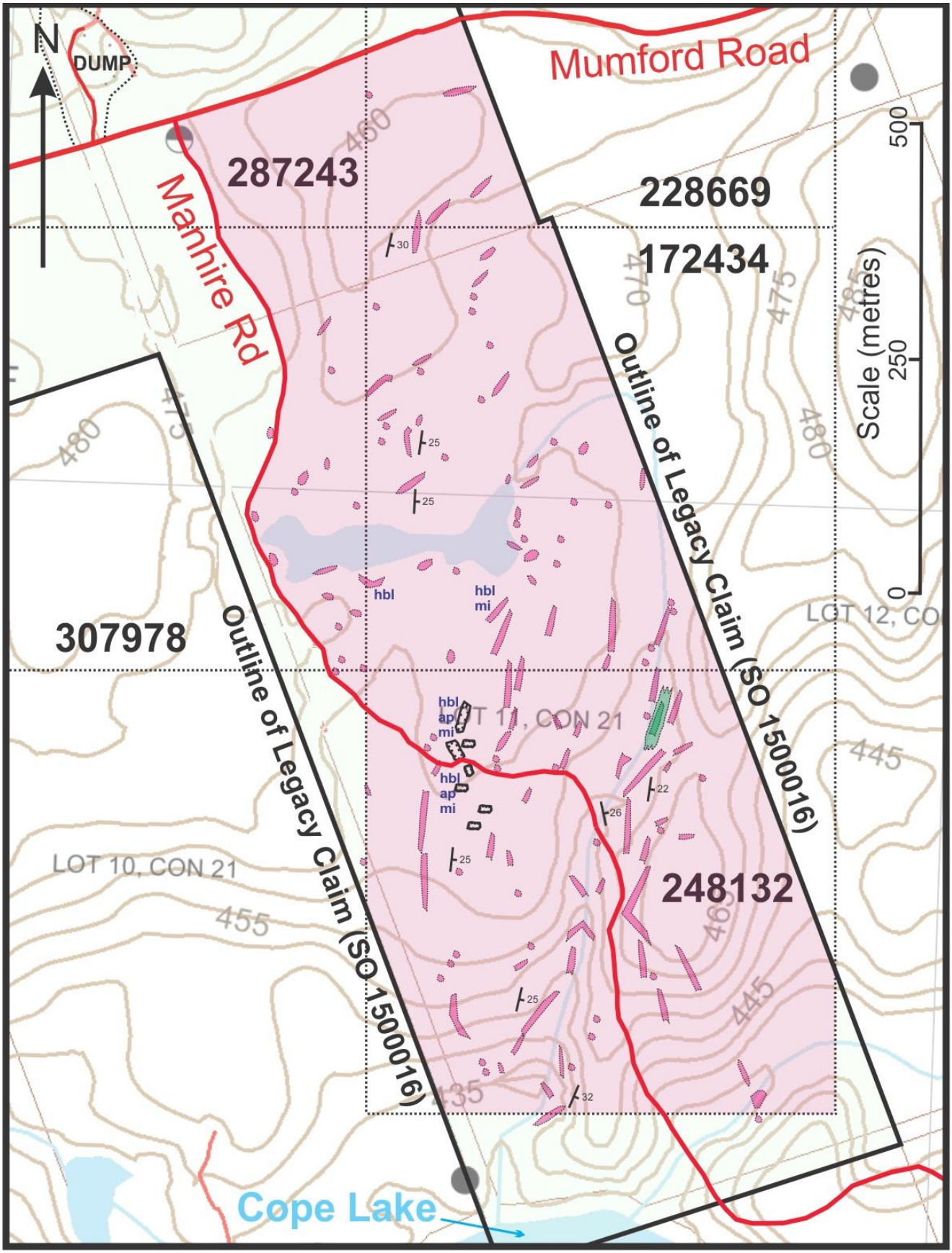


Figure 4; Geology and Mineralization on cell claims 287243, 228669, 307978, 172434 and 248132, Cardiff Twp.

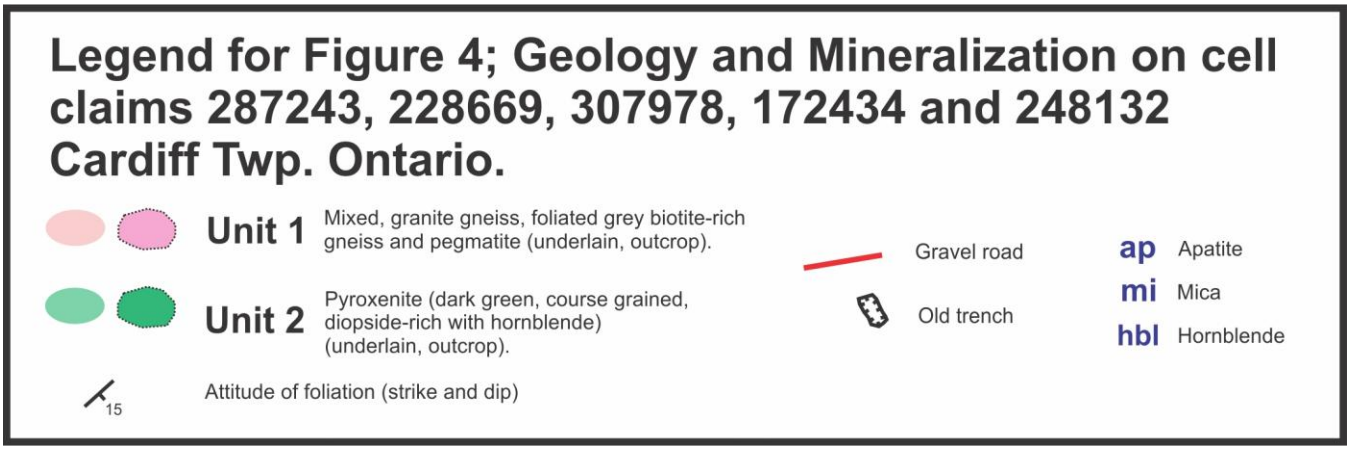


Figure 5; Legend for map on Figure 4.

The area prospected and mapped for this report covers most of Lot 11, Concession 21 and a small area in the south east corner of Lot 11, Concession 22. The cell claims mapped are 287243 (SE corner), 228669 (SW corner), 307978 (eastern edge), 172434 (~western half) and 248132 (most of). The northern third to half of this area has many swampy areas, hence the overall amount of outcrop is small, but in the southern half of this area outcrop is surprisingly abundant.

Two rock units were identified during mapping; Unit 1, which consists of mixed granitic and biotite-rich gneiss and Unit 2, a diopside-rich pyroxenite. Unit 1 is by far the most abundant unit. The pyroxenite (Unit 2) was noted in only one low-lying outcrop on the northern part of cell claim 248132. The granitic and biotite-rich gneiss (Unit 1) underlies over 95% of the mapped area and varies from a nearly massive granite gneiss to a well foliated biotite- and feldspar-rich gneiss.

The granitic gneiss part of Unit 1 is massive to weakly foliated, medium to coarse grained (4+ mm), is mostly pink in colour, and consists primarily of potassium feldspar, quartz, and minor amounts of either biotite or hornblende. The well layered and strongly foliated biotite-rich gneiss part of Unit 1 is mostly fine-to medium grained (1-2+ mm), has an overall light gray to pinkish gray colour and can contain dark coloured, hornblende-rich bands up to 10 cm thick. Its mineralogy is similar to that of the granitic gneiss, but with a greater proportion of biotite and/or hornblende, and it may contain variable amounts of plagioclase. The feldspar in the biotite-rich gneiss is probably a mix of plagioclase and potassium feldspar and is generally finer grained and lighter in colour than the feldspar in the granitic gneiss.

Granite pegmatite veins and zones are common within Unit 1. Pegmatitic veins range in thickness from 1 cm to 1.5 m and are generally parallel to foliation or cross cut foliation at low angles.

The orientation of foliation is fairly consistent throughout the mapped area. It generally strikes north to slightly east of north and dips 22 to 32 degrees to the east.

Pyroxenite (Unit 2) was identified from one low-lying, moss-covered outcrop. It consists of mostly massive pyroxene (diopside?) with a grain size of 0.5-2 cm. Within the pyroxene are patches of hornblende up to 2-3 cm across and rare biotite up to 6 cm across. Potassium feldspar occurs interstitially and as coarse-grained pegmatite-like patches and stringers within the pyroxene. This outcrop was examined with the speed required to complete mapping within the 3 day project time frame. The author acknowledges that the uniqueness of this outcrop warrants additional examination. The thick covering of moss over most of the outcrop can obscure

potential occurrences of euhedral, collector-quality minerals, such as, hornblende, mica, apatite, feldspar and diopside. Because pyroxenite is host to collector-quality minerals elsewhere in the Bancroft region, the author recommends a detailed re-examination of this outcrop.

Mineralization

In the northwest corner of cell claim 248132 are a series of old trenches (Figure 4) which were probably created during uranium exploration conducted *circa* 1954-1955. A number of these trenches are shallow (1 m) and don't currently reach bedrock.

Since overburden in the immediate area is thin, it's probable that these shallow trenches reached bedrock when created. That they were not made deeper and larger probably indicates that nothing of economic interest was exposed in these trenches. Several of the trenches on either side of Manhire Road are deeper, within bedrock and intersect some kind of mineralization.

On the north side of Manhire Road is a water-filled trench 3-4 m wide, 8 m long and 3-4 m deep to the water surface. Outcrop on one side of this trench exposes a zone of extremely coarse-grained hornblende with a core of massive coarse-grained calcite. Within the hornblende and calcite are euhedral crystals of mica up to 10 cm across and euhedral apatite prisms up to 3 cm across. Within a trench north of the water-filled trench are zones of coarse-grained hornblende and veins of coarse-grained hornblende, calcite, apatite and feldspar which cross-cut foliation in the host biotite-rich gneiss.

A trench/pit in bedrock, located immediately south of Manhire Road, measures approximately 2 x 3 m. Exposed on its walls are zones of extremely coarse-grained minerals. Here hornblende with a grain-size up to 8-10 cm, biotite with a grain-size of up to 10 cm and apatite crystals and masses up to 5 cm across occur. Coarse hornblende is abundant in loose rubble surrounding the trench.

The zones of coarse-grained hornblende, mica, apatite and feldspar found in these trenches are of possible interest to the recreational mineral collector. Some of these trenches could potentially be developed into collector destinations similar to that already done at the Schickler Occurrence, which is also located on the Mumford Claim.

Summary and Recommendations

The south-eastern tip of the Mumford claim (south of the Mumford Road) was geologically mapped and prospected. Several sites with mineral collecting potential were identified.

The amount of follow up work recommended for this area of the Mumford claim is going to depend on budget and the degree of commitment to develop this claim for mineral collectors. Based on the limited success of this survey the author recommends the following;

1/ Continue exploring the remainder of the Mumford claim with geological mapping and prospecting.
Finish the present geologic survey so it covers the remainer of the claim (the western area south of Mumford Road). If budget allows consider the use of the RS-230 Spectrometer or similar instrument in conjunction with mapping and prospecting for identifying areas of increased radioactivity.

2/ Investigate the mineral collector potential of the trenches on either side of Manhire Road.
Trenches on the southern most cell claim (248132) host zones with hornblende, apatite, mica and feldspar as large masses and euhedral crystals. At least two of these trenches have the potential to be mineral collector destinations, similar to the Schickler Occurrence.

3/ Examine in detail the outcrop of pyroxenite identified in this report.
Pyroxenite is known to host occurrences of collector-quality minerals elsewhere in the region. This outcrop should be examined in detail to see if any collector-quality minerals can be identified.

References

Ennis, G. F., 1968: *Ontario Assessment Report 31E01SE0060 63.2418*

Hewitt, D. F., 1959: Geology of Cardiff and Faraday Townships; *Ontario Department of Mines, Annual Report, V. 66, pt. 3, 1957.*

Satterly, J., 1957: Radioactive mineral occurrences in the Bancroft area, Ontario; *Ontario Department of Mines, Annual Report, v. 65, pt. 6.*

Sabina, Ann P., 1986: Rocks and Minerals for the Collector: Bancroft - Parry Sound Area and Southern Ontario; *Geological Survey of Canada Miscellaneous Report 39*, 182 p.

Appendix 1;
Statement of Qualifications of the Author

I, Bradley S. Wilson of P.O. Box 352, Kingston, Ontario, K7L 4W2, do hereby state that I:

1/ graduated from Queen's University in 1982 with an Honours B.Sc. degree in Geology.
2/ graduated from Carleton University in 1987 with a M.Sc. degree in Geology.
3/ received a degree in gemmology in 1991 from the Canadian Gemmological Association (F.C.Gm.A).
4/ worked as an independent consultant on over 20 coloured gemstone projects since 1991.
5/ worked for mineral exploration companies since 1978 on many projects either as a consultant or as a seasonal employee.
6/ conducted gemstone exploration on my own behalf, nearly continuously, since 1982.
7/ have no interest, direct or indirect, in the Mumford claim.
8/ performed the work described in this report.

Bradley S. Wilson

March 31, 2020