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

SO 1500016 (Lots 9-11, Concession 22 and Lot 11, Concession 21)),

By

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For

Municipality of Highlands East
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June, 2016

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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 specimens 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.

The Mumford claim, located 5 km from the town of Wilberforce, is one of the claims held by the Municipality of Highlands East and is the subject of this report. 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 claim. The goal of this study was to explore for and identify additional sites on the Mumford claim that would be attractive to the recreational mineral collector. This was done by mapping geology and prospecting over the north eastern part the claim. The author spent 3 1/2 person days on the claim in May 2016 gathering data for this report.

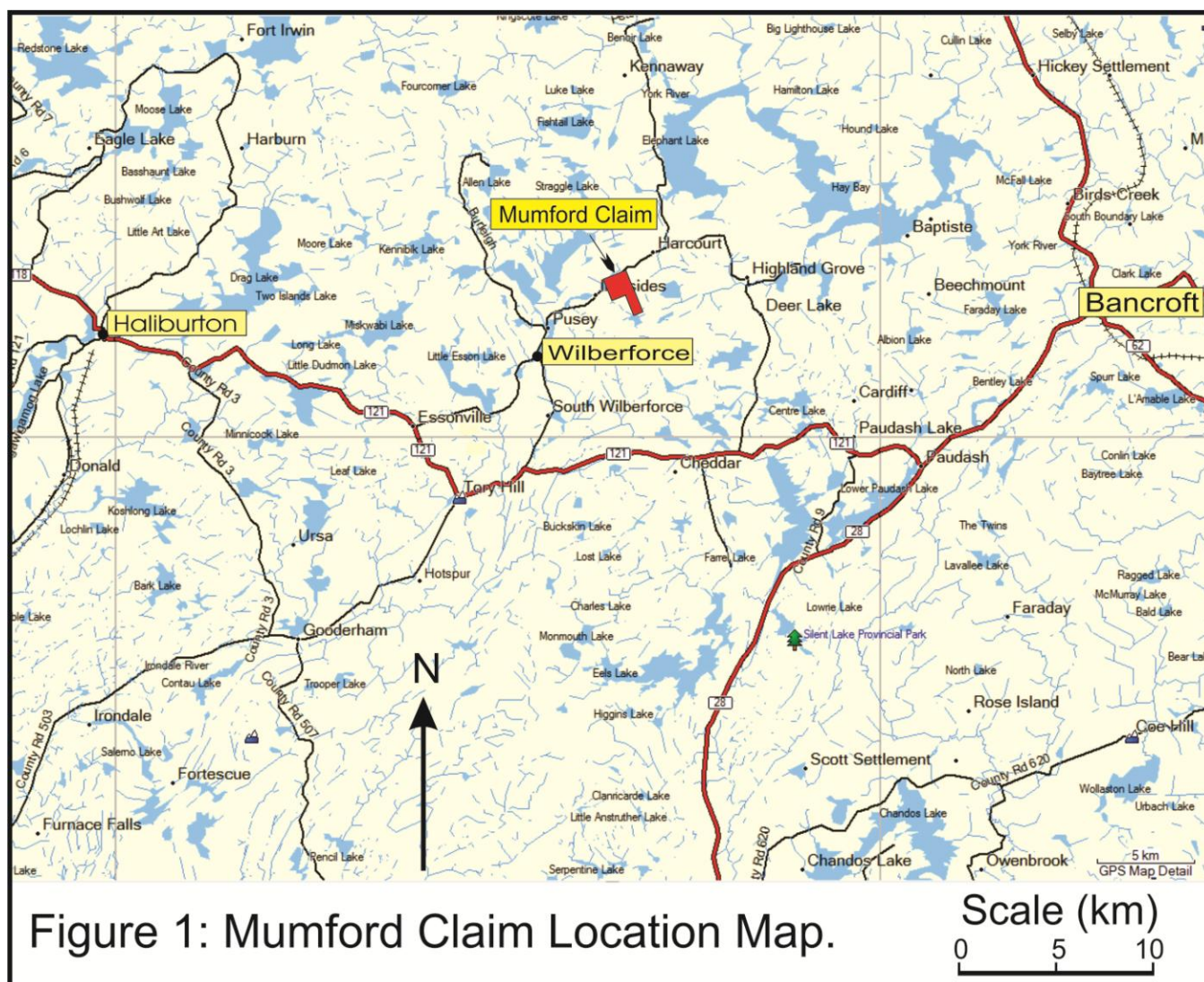
Claim Information

The Mumford claim was staked on June 3, 2011 and its claim number is SO 1500016. It is currently owned by the Corporation of the Municipality of Highlands East. The Mumford claim covers four concession lots in Cardiff Township, consists of eight claim units and carries a \$3,200 annual exploration work commitment. Currently \$2,275 of work is required to keep the claim in good standing until June 3, 2017.

Location and Access

The Mumford claim measures approximately 1.2 by 2.3 kilometres in size and occupies Lots 9-11, Concession 22 and Lot 11, Concession 21 in the township of Cardiff. It is located approximately 27 kilometres east from Haliburton and 25 km west from Bancroft, the two largest towns in the region (Figure 1).

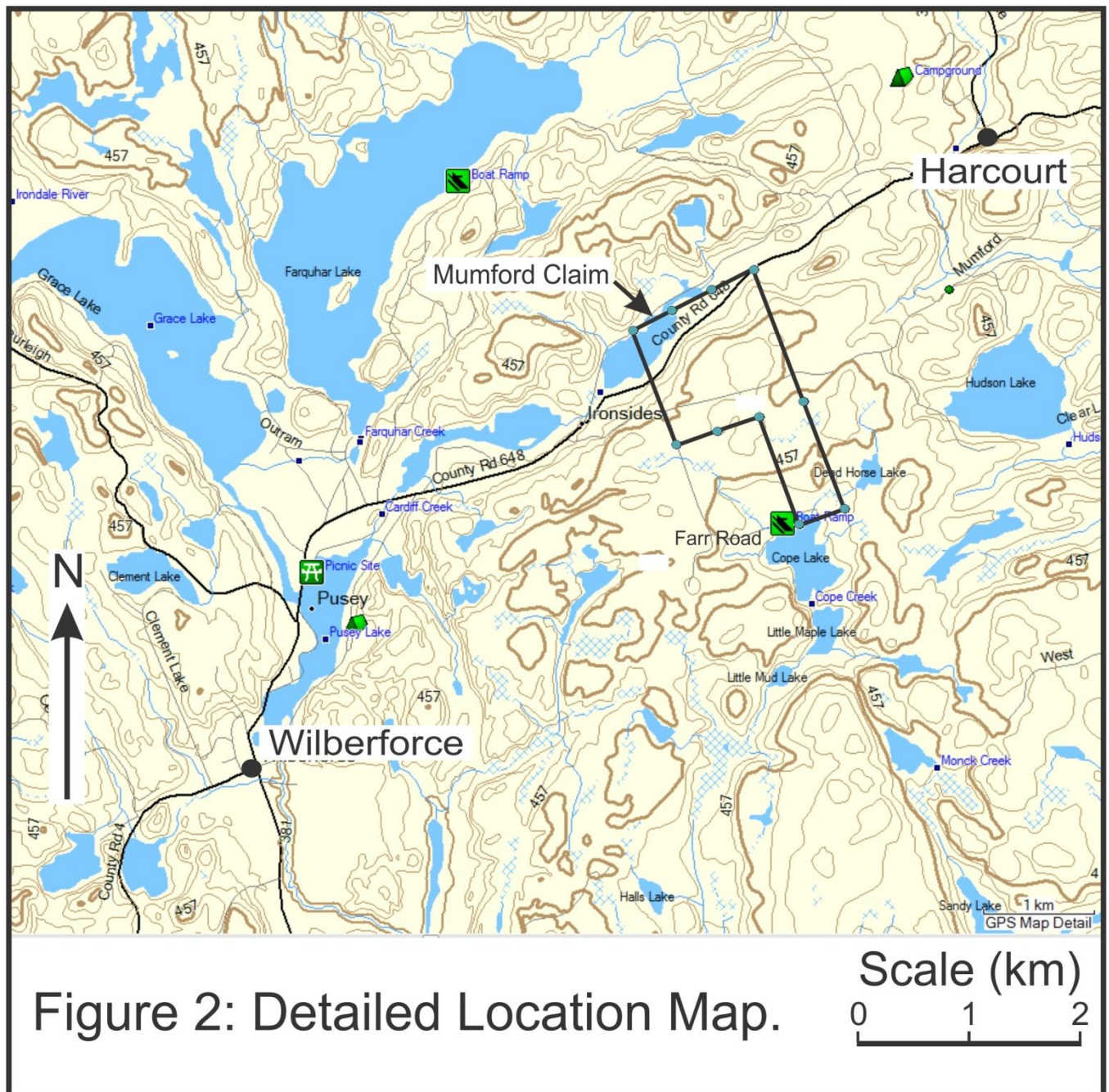
The Mumford claim is approximately 5 kilometres northwest of Wilberforce and 3 kilometres southeast of Harcourt, the two easiest communities from which to access the claim (Figure 2). The claim is located on NTS map 31E/01. To access the claim from Wilberforce, travel along County Road 648 until Mumford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



Although the Mumford claim is surrounded by privately owned land, it is crossed by numerous roads and trails, making access very easy. Along the northern edge of the claim is paved County Road 648. The gravel covered Mumford Road traverses, in an east west direction, the central part of the claim. A narrow gravel road, called Manhire Road, leads to cottages on Cope Lake and provides access to the southern part of the claim. Several trails, used by ATVs in the summer and snowmobiles in the winter, traverse the claim and mineral collectors using these trails should be aware of the possibility of ATV traffic. Located near the centre of the claim is an active land fill site (garbage dump). Located on the north eastern corner of the claim is the abandoned Harcourt Graphite Mine. This old mine was mapped and investigated as a potential collecting site during this study.

Previous Work

The Mumford claim 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 (D. E. Denfield), all of which lie on the Mumford claim.

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 claim), 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 claim. 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 more recent guides covering the area is by 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 claim, the Schickler fluorite occurrence and the Harcourt Graphite Mine. In addition, Sabina (1986) describes four collecting localities within a few kilometres of the claim. 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 the now abandoned graphite mine located in the area described in this report, the north eastern part of the Mumford claim. Sabina (1986) calls this site the "Harcourt Graphite Mine", whereas Hewitt (1959) calls this the "National Graphite Property". In this report the old mine site will be referred to as the Harcourt Graphite Mine.

Fieldwork and Terminology

For ease of reference, the mineral claim covering Lots 9-11, Concession 22 and Lot 11 Concession 21 in the township of Cardiff (SO 1500016) is being referred to in this report as the "Mumford claim". The author spent 3 1/2 days mapping and gathering data on the Mumford claim on the following dates; May 3, 4, 12 and 13, 2016. An additional 2 days were spent by the author preparing the geology map and writing this report.

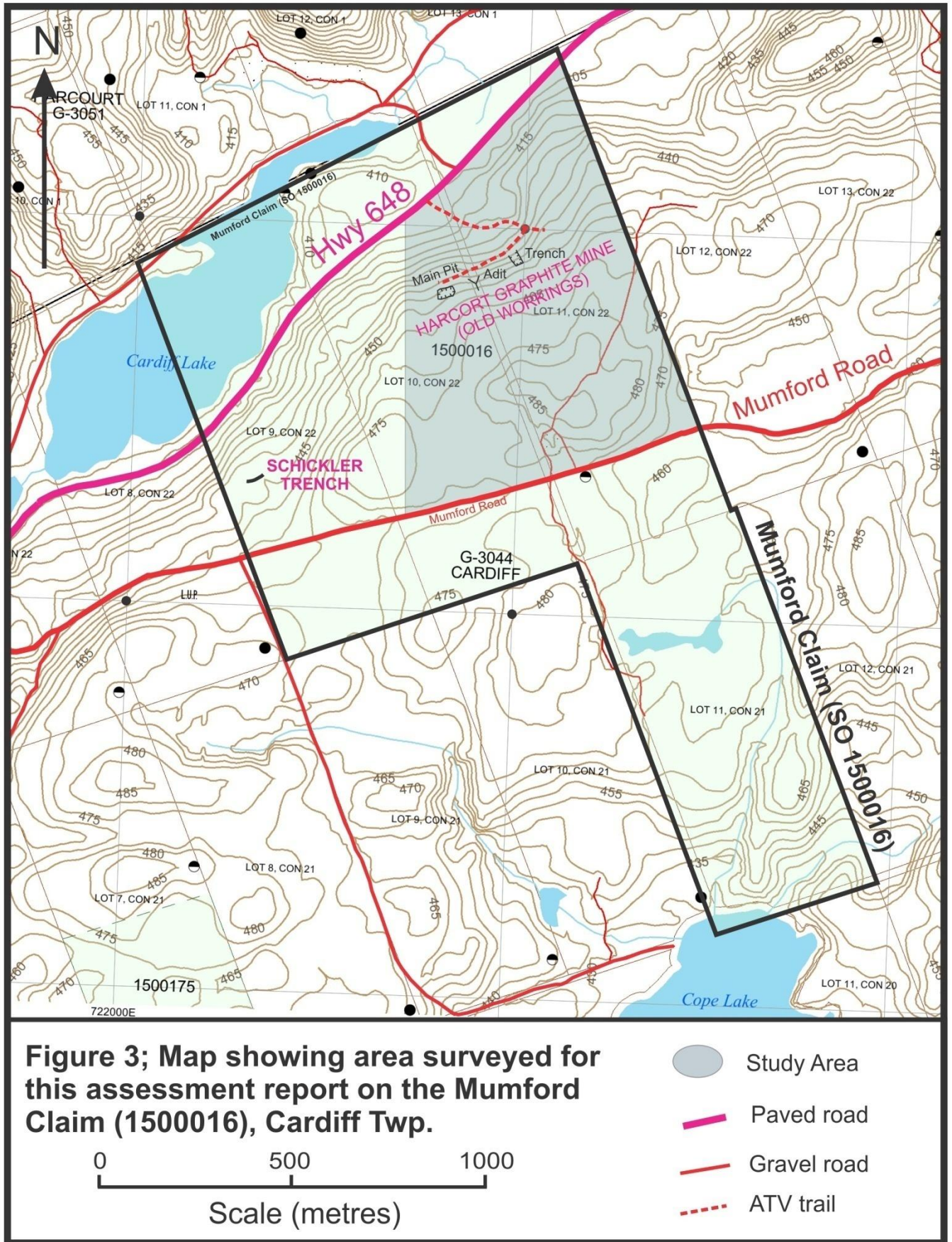
Assumptions have been made and a number of terms used by the author in preparing this report. Some of these require clarification. The minerals found on the Mumford claim and those named in this report were identified using standard field identification practices (observations of lustre, hardness, cleavage, 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 claim 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, which includes the Harcourt Graphite Mine, 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.



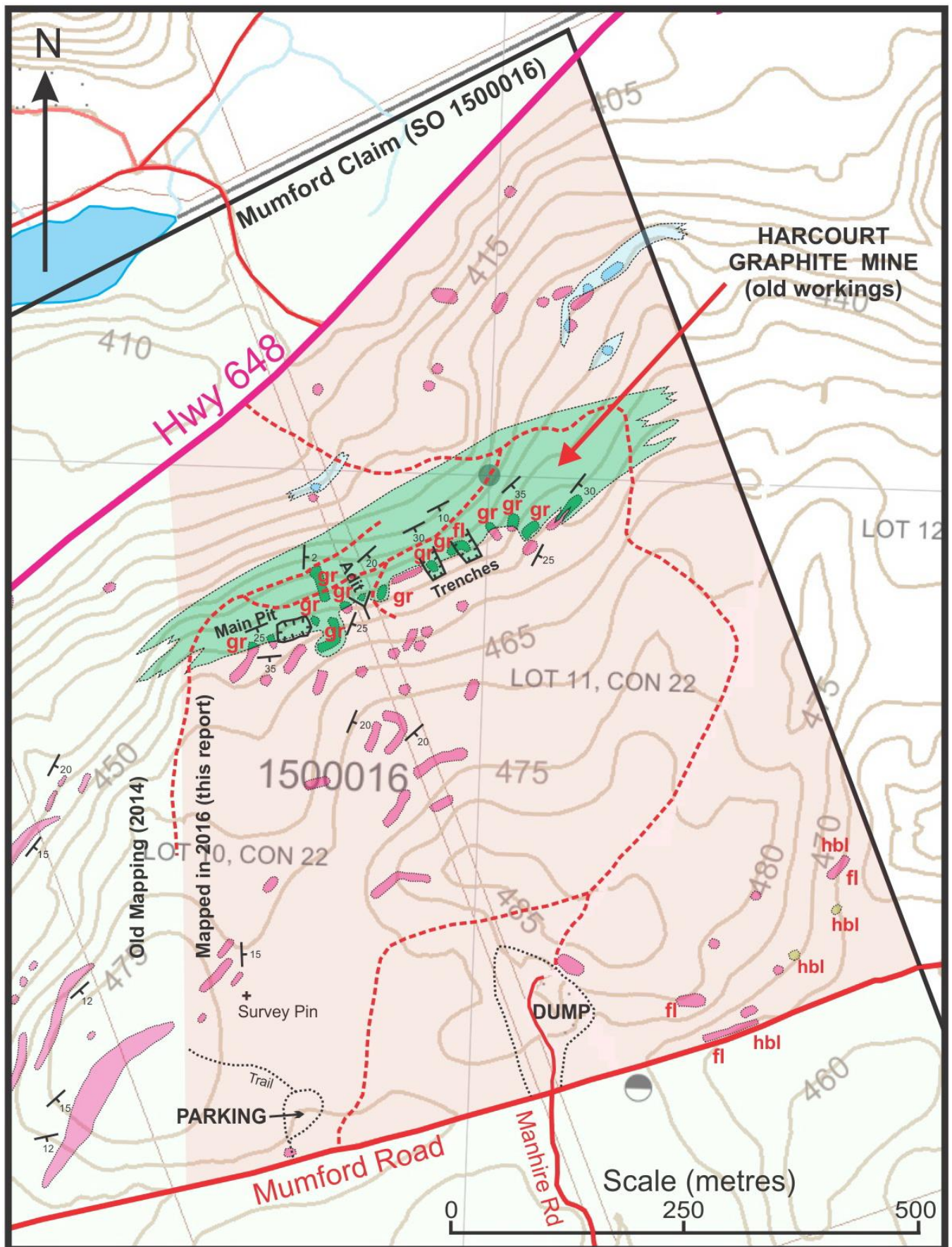
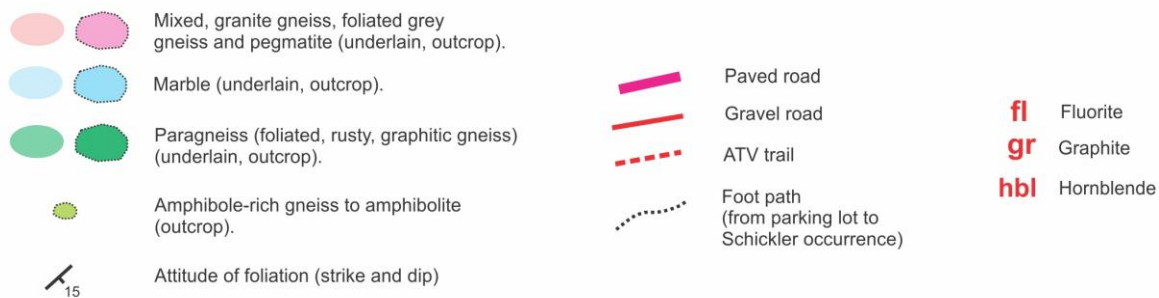


Figure 4; Geology and Mineralization on Part of the Mumford Claim (1500016), Cardiff Twp.

Figure 4 - Legend; Geology and Mineralization on part of the Mumford Claim (1500016), Cardiff Twp.



Along the northern ridge in which the Harcourt Graphite mine was developed, outcrops are abundant, elsewhere bedrock exposure is sparse or absent.

Three rock units were identified and mapped; marble, paragneiss and mixed granitic gneiss. A fourth possible unit (amphibole-rich gneiss to amphibolite) was identified in two small outcrops in the south east corner of the area mapped. These are noted on the map. Because their importance and areal extent is not known, this rock has been included with the granitic gneiss unit.

Marble was found in 5 small, poorly exposed outcrops in the northern part of the map area and may even be continuous with the small marble exposures mapped in 2014. This marble is typical for the Grenville Province, consisting of coarse-grained calcite with lesser amounts of non-carbonate minerals, including but not limited to phlogopite, diopside and graphite. Outcrops are typically covered by a thick layer of moss, making them easy to overlook.

The granitic gneiss unit has the greatest areal extent in the area mapped, covering 80% or more of the area. This unit is a heterogeneous mixture of gneiss, with minor pegmatite. The gneiss varies from moderately foliated grey gneiss, consisting of variable amounts of feldspar, quartz, hornblende and mica to weakly foliated pink granitic gneiss composed of mostly potassium feldspar, quartz, hornblende, mica and possibly titanite. Variable amounts of mafic minerals (as high as 30% or more) help define banding in the foliated grey gneiss, some of which appears micaceous on fresh surfaces. In places the foliated grey gneiss contains up to several percent sulphide minerals and can possess very rusty weathering surfaces. Grain size varies from about 1 mm to over 6 mm. Pink granitic gneiss has variably developed foliation, probably a reflection of variable mica and hornblende contents, that grade from weakly foliated to nearly non-foliated. Hewitt (1959) mapped and described these rocks generally as syenite, but within this study area the author found enough quartz in most of these rocks to classify them as granite.

The paragneiss unit crops out along the north facing slope of the ridge hosting the Harcourt Graphite Mine workings (Figure 4). The top of the paragneiss unit is located just below the crest of this ridge. In most places the crest of the ridge is composed of the more competent granitic gneiss. The paragneiss unit is laminated, well foliated, rusty weathering and commonly contains up to 5 percent graphite. It is fine- to medium-grained and consists of siliceous, hornblende-rich, mica-rich, quartz-rich and calc-silicate layers. Minor marble bands and boudins occur locally in some exposures. Throughout most outcrops graphite is conspicuous as flakes up to a centimetre across. The large eastern-most outcrop that spans the paragneiss and granitic gneiss contains little graphite and is probably transitional between the two units. The paragneiss is the source of the graphite that was mined at this site.

The contacts between marble, paragneiss and granitic gneiss, where exposed, are mostly parallel to foliation. Foliation in general is gently dipping, ranging from nearly flat to about 35 degrees. Foliation generally strikes in a north easterly direction, but is closer to north in a few locations. An accurate measurement of strike is difficult when the dip is low.

Mineralization

Other than the graphite, which will be discussed below in a separate section, little mineralization of interest to mineral collectors was identified.

Fluorite was identified in several outcrops of granitic gneiss in the south eastern corner of the mapped area but not in the same abundance as is found closer to the Schickler Trench. Grains of fluorite were found in one sample from one of the graphite trenches at the Harcourt Graphite Mine.

Graphite

Graphite occurs in abundance within the paragneiss unit exposed at the northern part of the mapped area. In the early 1900s the Harcourt Graphite Mine exploited this resource. Mining occurred between 1912 and 1915. Hewitt (1959) gives an account of mining and development of the graphite deposit on the Mumford claim as follows;

"A graphite prospect in lot 11, concession XXII, Cardiff township, was opened up by New York Graphite Company in 1912. This company sunk a number of test pits and did some diamond-drilling along the north slope of the hill facing the railway. The largest opening was an open pit 40 feet deep, 60 feet long, and 15 feet wide. The company built a mill and operated intermittently until 1915 when it was merged with National Graphite Company. Mining was discontinued, and the mill operated in 1915 and 1916 on ore from Montegale township, Hastings County.

During 1951, Black Donald Division of Frobisher, Limited, drilled the property under the supervision of B. G. Edward. A graphite-bearing zone 1,200 feet long and 60 feet thick was disclosed by 4,270 feet of diamond-drilling. An orebody of 1,440,000 tons grading 4.1 percent carbon was indicated. Within this orebody there is a richer zone of 800,000 tons grading 5 percent carbon.

Flake graphite, up to 1/8 inch in size, occurs in limy paragneiss, which strikes N.30°E. and dips 15°S."

If this site were opened up to mineral collectors as a collecting site, similar to that done at the nearby Schickler trench, the graphite would likely be of interest primarily to beginner-level amateur collectors. Graphite is a fairly common mineral and the graphite hasn't been found to occur as euhedral crystals which could attract a more advanced-level amateur collector. This site might have hazards associated with old mine workings. These potential hazards should be considered and addressed before opening this site to the public.

From a historical perspective, this site could offer a tourism opportunity. If the site were cleaned up and information presented, both geological and historical, it could provide another offering to bring tourists to the region. Addressing the potential hazards of the open pit, the adit and the decapitated mining and milling buildings should be considered before opening this site up to the public.

Summary and Recommendations

The north eastern corner of the Mumford claim (south of Hwy 648) was geologically mapped and prospected. The basic layout of the roads, trenches and outcrops of the Harcourt Graphite mine have been mapped out (Figure 4). Other than the graphite at the abandoned Harcourt Graphite Mine, no new sites with mineral collecting potential were identified.

The amount of follow up work on this 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. Expand the present survey so it covers the rest of the claim. Mineralization is known to exist in the southern portion of the claim (Ennis, 1968) and should be investigated further. 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 potential of the Harcourt Graphite Mine for mineral collecting and mining history tourism.

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 during parts of 23 of the last 35 years 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 (SO 1500016).
- 8/ performed the work described in this report.

Bradley S. Wilson

June 1, 2016