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Geology of Madoc Township

and the

North Part of Huntingdon Township

Hastings County

By
D. F. Hewitt

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ABSTRACT

This report describes the geology and structure of Madoc township and the northern seven concessions of Huntingdon township, Hastings County, a total area of 156 square miles. Madoc has been a centre of mining activity in eastern Ontario for over 100 years, producing iron, gold, copper, pyrite, fluorspar, talc, slate, and marble. At the present time, talc and marble are the principal mineral products.

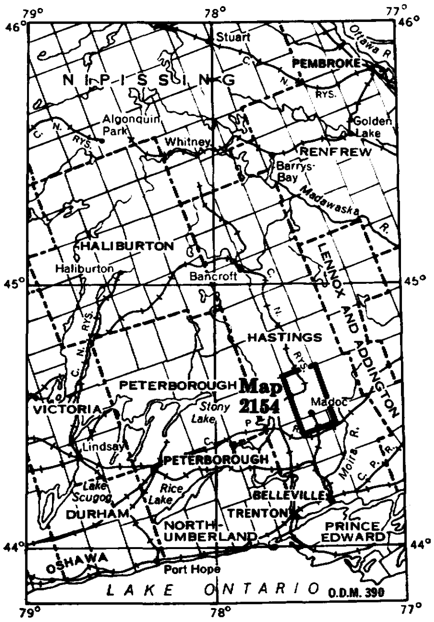

Figure 1—Key map showing location of map-area.

Physiographically the area is divided into two parts by the Paleozoic-Precambrian contact that runs along the south side of Moira Lake. The area south of Moira Lake is largely underlain by Ordovician limestone, and outliers of this limestone are common in all of Madoc township. The oldest Precambrian rocks are the Tudor volcanics, which are a series of dark-green basic lavas, lying in the eastern and northern parts of Madoc township. In the northern part of the township, the Tudor volcanics are overlain by grey-blue fine-grained marble. In the southeastern and central part of the township the basic volcanics are overlain by conglomerate, argillite, and pelitic and psammo-pelitic schists. Near Queensborough the period of basic volcanism closed with acid volcanism, and an acid volcanic centre is present.

In the south-central part of Madoc township north and west of the town of Madoc, the Madoc volcanics occupy a domical area of about 9 square miles. These volcanics range from andesite to rhyolite.

Intruding the volcanics and metasediments are 4 main bodies of pink granite and syenite: the Deloro granite, the Moira granite, the Gawley Creek syenite, and the Mount Moriah syenite.

The rocks are folded and faulted, the principal folds being the northwest-trending Queensborough syncline and the northeast-trending Madoc syncline. The principal faulting strikes northwest-southeast and some of these fault systems are occupied by fissure-filling fluorspar veins.

Geology of

Madoc Township and North Part of Huntingdon Township

Hastings County

by

D. F. Hewitt[1]

INTRODUCTION

This report describes the geology and structure of Madoc township and the northern seven concessions of Huntingdon township (concessions VIII to XIV), Hastings county, an area of 156 square miles. These townships are covered by the Tweed, Campbellford, Kaladar, and Bannockburn National Topographic sheets. Madoc is the principal town of the area, which also includes the communities of Crookston, Eldorado, Empey, Keller Bridge, Bannockburn, Cooper, Rimmington, and Hazzards Corners. Highway 7 crosses Madoc township from east to west, and Highway 62 crosses the township from north to south. All parts of the area are easily accessible by road.

Prospecting and Mining Activity. Madoc has been a centre of mining activity in eastern Ontario for over 100 years. In 1837 Uriah Seymour built a furnace for smelting iron ore and opened the Seymour iron mine, which operated from 1837 to 1845. Both hematite and magnetite ores were mined in the Madoc area, and iron mines operated intermittently from 1837 to about 1910. Among the active iron mines in Madoc township were the McKenty which produced hematite as early as 1877, the Miller, St. Charles, Brennan, Wallbridge, Dufferin, Forty-Nine Acre, Sexsmith, Cook, Coe, Cameron, Nelson, Fox, Knob, and Dominion mines. There was renewed interest in iron deposits in the 1950s, and several properties were drilled. In 1964 some work was done on the Dufferin mine near the community of Malone, which is outside the map-area.

In 1866 the first discovery of gold in Ontario was made at the Richardson mine near Eldorado. An interesting account of the ensuing "gold rush" is given by Gibson (1937, p.3). The Bannockburn gold mine operated from 1894 to 1898, and the Sophia (Diamond) gold mine operated from 1896 to 1901. The only lead mine in Madoc township was the Hollandia mine, which operated from 1898 to 1906. The Eldorado copper mine produced from 1903 to 1907 and a copper smelter was opened at Eldorado at that time. Pyrite mining began in Madoc township in 1901 with the opening of the Bannockburn pyrite mine, which finally closed in 1919. The Blakely pyrite mine operated from 1905 to 1908, and the Canadian Sulphur Ore Company mine from 1906 to 1919.

[1]Senior Geologist, Ontario Department of Mines, Toronto. Manuscript received by the Director, Geological Branch, 9 Dec. 1966.

Fluorspar mining began at Madoc in 1905, and a total of over 150,000 tons of fluorspar has been mined. The main periods of activity were 1916-1920 and 1940-1951. Thirty-one fluorspar mines have been opened in the map-area. Talc was discovered in the Madoc area in 1896, and talc has been produced continuously since that time. Total production was about 700,000 tons valued at $7,800,000. The principal producer has been Canada Talc Industries Limited and its predecessors.

Although marble was quarried at Madoc as early as 1900, it was not until 1936 that a permanent marble chip industry was established. Since that time marble production has increased until, in 1964, four companies, operating about 20 marble quarries, were active in the Madoc area producing marble chips for the terrazzo industry. In 1964 marble production in the Madoc area amounted to about $300,000.

Slate was quarried at Madoc from 1932 to 1937. Between 1940 and 1956, Building Products Limited operated 5 stone quarries in granite and rhyolite for the production of roofing granules. Paleozoic limestone is quarried for road stone on Highway 62 near Eldorado. Several sand and gravel pits operate intermittently in Madoc township.

Present Geological Survey. The geological survey of Madoc and north Huntingdon townships was carried out during parts of the summers of 1964 and 1966. In 1964 the author was ably assisted by Reg Tivy of Coe Hill. Geological mapping was done in July and August 1966 by E.C. Appleyard and G.R. Guillet. E.C. Appleyard was assisted by M. Shaw. Plotting of geological data was done on Perfatrace fitted over aerial photographs on the scale of 1 inch to 1320 feet. Additional geological data was obtained from the maps of M.E. Wilson (1939), A.K. Saha (1957), and Ian Bain (1960).

Previous Geological Work. The earliest geological map of the area, that of Eugene Coste and James White was published in 1889 by the Geological Survey of Canada. It is entitled "Geological and Topographical Map of the Madoc and Marmora Mining District" and is very useful because it shows the locations of many of the early iron mines in the area, including several not mentioned in the literature. In 1914, Miller and Knight (1913) published a report entitled "The Precambrian Geology of Southeastern Ontario". Maps of portions of the Madoc, Hazzards Corners, and Queensborough areas are included. Considerable information is given on mining properties active in the area at that time. This is the most comprehensive report available on the area. From 1920 to 1925, M.E. Wilson mapped the Madoc and Marmora sheets (G.S.C. Maps 559A and 560A) for the Geological Survey of Canada. These sheets were published in 1939 and are the most up-to-date and useful geological maps available for the southern part of Madoc township and the northern part of Huntingdon township. They are on the scale of 1 inch to 1 mile. No report was published to accompany these sheets, but Wilson described the talc and fluorspar deposits of the area in separate volumes on these commodities (Wilson 1926; 1929). Osborne (1930) described the "Non-Metallic Mineral Resources of Hastings County".

Aeromagnetic sheets are available on the scale of 1 inch to 1 mile for the Bannockburn, Kaladar, and Campbellford topographic sheets. The Deloro granite pluton was studied by A.K. Saha (1959). The southeastern corner of Madoc township was mapped and described by Ian Bain (1960).

Reports on various commodities describe properties in Madoc and Huntingdon townships. Several of these reports are listed in the Selected References.

Physiography. Physiographically the area is divided into two parts by the Paleozoic-Precambrian contact that runs along the south side of Moira Lake. The area to the north of Moira Lake forms part of the Precambrian peneplane, which slopes gently southward from an average elevation of about 900 feet north of Bannockburn to 600 feet in the vicinity of Madoc. The portion south of Moira Lake is underlain by flat-lying Paleozoic limestone of the Lake Ontario homocline.

The northwestern corner of Madoc township is a rough rocky upland underlain by the Gawley Creek syenite. The highest point in the township is a hill of this syenite that has an elevation of 1,050 feet. Relief in the township rarely exceeds 200 feet. The western part of Madoc township, between Highway 7 and the railway, is a rocky highland area formed by knobby granite hills of the Deloro granite pluton. These are known as the "Huckleberry Rocks". Flat-lying Paleozoic outliers are common in the northern part of Madoc township. The largest of these outliers is in the northeastern part of Madoc township at Cooper, where there is an extensive area of good farmland on the flat outlier.

The area is drained by the Moira and Black rivers and their tributaries, which flow into Lake Ontario. The main body of water is Moira Lake, which is 3 miles long and 1 mile wide. Its south shore is a Paleozoic limestone scarp that marks the north edge of the Lake Ontario homocline and the south edge of the Precambrian Shield.

GENERAL GEOLOGY

The map-area straddles the Paleozoic-Precambrian contact. The area south of Moira Lake is largely underlain by Ordovician limestone. Outliers of Ordovician limestone are common in Madoc township north of Moira Lake. The oldest Precambrian rocks are the Tudor volcanics, a series of dark-green basic lavas that lie in the eastern and northern parts of Madoc township. In the northern part of the township, the Tudor volcanics are overlain by grey-blue fine-grained marble of the Hastings type. There is a transition from volcanism to sedimentation, and some volcanic bands are found within the marble sequence. In the southeastern part of the township, the basic volcanics are overlain by conglomerate, argillite, and pelitic and psammo-pelitic schists. At Queensborough the period of basic volcanism closed with acid volcanism. An acid volcanic centre is present a mile or so south of Queensborough in the trough of the Queensborough syncline. Rhyolite is associated with pyritiferous black slates and massive sulphides. Felsite and acid tuffs are found in the volcanic assemblage.

In the south-central part of Madoc township northwest of Madoc village, the Madoc volcanics occupy a domical area of about 9 square miles. These volcanics range from andesite to rhyolite. The andesite is overlain along the southeast side by conglomerate and slate. The rhyolite in part cuts and intrudes the marble. Apparently volcanism and sedimentation were concomitant in the area, and there is no widespread erosional unconformity between the volcanics and the sediments. Although the marble is chiefly of the grey-blue fine-grained well-bedded Hastings type, some medium crystalline white, buff, pink, green, and black dolomitic and calcitic marbles are also found.

Intruding the volcanics and sediments are four main bodies of pink granite and syenite. These are: the *Deloro granite*, which forms a stock of pink medium-grained granite in west-central Madoc and adjacent Marmora townships; the *Moira granite*, which is a pink medium- to coarse-grained granite outcropping on the south and northeast shores of Moira Lake; the *Gawley Creek syenite*, which is a coarse-grained pink biotite syenite occupying the northwestern part of Madoc township; and the *Mount Moriah syenite*, which is a pink coarse-grained biotite syenite, that just extends into the northeast corner of Madoc township. Minor intrusions of gabbro and diorite are found.

The rocks are folded, and the principal folds are the northwest-trending Queensborough syncline and the northeast-trending Madoc syncline.

Tudor Volcanics

A belt of basic volcanic rocks extends southward into Madoc township from Tudor township. These have been named, by Lumbers, (1968, p.9) the "Tudor volcanics". The band extends down the east side of Madoc township to lot 10. There the band swings westward around the axis of the Queensborough syncline. The basic volcanic band terminates in concession VIII, possibly because of faulting. The band is about 1½ miles wide. To the east the volcanic band is intruded by the Elzevir granite. To the west the volcanic band is overlain by metasedimentary rocks, chiefly marble.

TABLE OF FORMATIONS

CENOZOIC

PLEISTOCENE Till, sand, gravel, clay, marl.

Unconformity

PALEOZOIC

ORDOVICIAN Black River limestone.

Unconformity

PRECAMBRIAN

PLUTONIC ROCKS

Granite, syenite, diorite, gabbro.

Intrusive Contact

METASEDIMENTARY AND VOLCANIC ROCKS

Marble:
Conglomerate, pelitic and psammo-pelitic rocks, quartzite:
Acid and basic volcanic rocks.

ODM8163

Photo 1–Agglomerate on Highway 62.

The volcanics are green-weathering dark-coloured andesite. They belong to the greenschist facies. Thin sections indicate that the rocks are composed principally of hornblende and plagioclase, and some chlorite and carbonate. Talc and actinolite are developed as hydrothermal alteration products in some places.

Madoc Volcanics

The Madoc volcanics occupy an area of approximately 9 square miles in the south-central part of Madoc township. They outcrop on Highway 62 from lot 5 to lot 10 and along Highway 7 in concessions II, III, and IV. The volcanics range in composition from andesite to rhyolite and are predominantly black, grey-green, or pink in colour. Massive lava, pillowed lava, vesicular and amygdaloidal lava, tuff, and agglomerate are common facies of these volcanics.

A specimen of massive fine-grained black andesite from lot 6, concession V, Madoc township was examined in thin section. It is a very fresh andesite composed of elongate laths of hornblende and finely intergrown andesine feldspar. Abundant small opaque grains contribute to the black colour. Minor quantities of epidote and carbonate are present. A partial chemical analysis of the andesite is: silica 48.96 percent, soda 3.37 percent, and potash 1.00 percent. The specific gravity is 3.03.

Table 1 gives analyses of the Madoc andesite (Miller and Knight 1913, p.64).

Table 1 — TWO ANALYSES OF MADOC ANDESITE (MILLER AND KNIGHT 1913, P. 64)

SiO_2	60.34	54.44
Al_2O_3	15.01	17.63
Fe_2O_3	3.71	7.18
FeO	10.57	6.12
CaO	1.05	2.83
MgO	0.05	3.19
Na_2O	2.72	4.03
K_2O	3.23	1.49
H_2O	1.22	2.04
CO_2	2.57	1.64
Total	100.47	100.59

The Madoc andesite is much fresher than the Tudor basic volcanics that occupy the eastern part of the township.

The andesite shows vesicular structure along both sides of Highway 62 in lots 6 and 7. In lot 7, concession VI, on the east side of the highway, there is an excellent exposure of agglomerate. Fragments of vesicular andesite, tuff, greenstone, pink felsite, rhyolite, and aplite, varying in size from about 1 inch to 18 inches, are found in a grey-green andesitic to dacitic matrix. There are good exposures of agglomerate in concession II south of Highway 7.

There is a small outlier of grey-green agglomeratic lava that forms a hill on the north side of Madoc village. This agglomerate is described by Miller and Knight (1913, p.65). The occurrence was first described by Logan (1863, p.32,33) as conglomerate.

In lots 8, 9, and 10, concessions V and VI, the black andesite grades into black to pink rhyolite and trachyte. A specimen of mottled pink and black lava from a roadcut on the highway on lot 9, concession V, was examined under the microscope. It consists of a fine-grained intergrowth of feldspar laths, principally oligoclase, and some microcline. There are phenocrysts of microcline and oligoclase. The black colour is due to finely disseminated hornblende and opaque minerals. Minor carbonate is present. The rock is thought to be a trachyte. A partial chemical analysis indicates: 56.25 percent silica, 4.58 percent soda and 7.23 percent potash. The specific gravity is 2.75.

Pink rhyolitic lava from lot 10, concession V, is composed of a fine aggregate of quartz and feldspar, and minor carbonate and opaques. A partial chemical analysis indicates: 65.03 percent silica, 1.42 percent soda, and 10.79 percent potash. The specific gravity is 2.60.

A "black rhyolite" quarry was operated by Building Products Limited on the west half of lot 10, concession V, Madoc township. A thin section of this rock is composed of a fine aggregate of quartz and feldspar with fine hornblende and abundant finely disseminated fine-grained opaque minerals. Minor carbonate is present. Oligoclase phenocrysts are present in the rock. A partial chemical analysis indicates a silica content of 63.69 percent; a soda content of 5.15 percent; and a potash content of 2.81 percent.

Queensborough Acid Volcanic Centre

Lying above the Tudor volcanics in the trough of the Queensborough syncline are a series of rhyolite and felsite volcanics that form part of an acid volcanic centre in the vicinity of the Canadian Sulphur Ore Co. (10)* pyrite mine.

The rhyolite, which is dense aphanitic light-grey rock, has been quarried for roofing granules on lot 9, concession X. The felsite outcrops north and south of Hazzard Lake. It is a fine-grained buff-coloured rock composed of angular quartz and feldspar, rhyolite fragments, and some carbonate. It is an acid volcanic fragmental intrusive rock that cuts the marble.

The rhyolite, felsite, and pyrite orebodies, and pyritiferous black slates are all typical associated rocks of the acid volcanic centre.

*Number in brackets refers to property number on Map 2154 (back pocket).

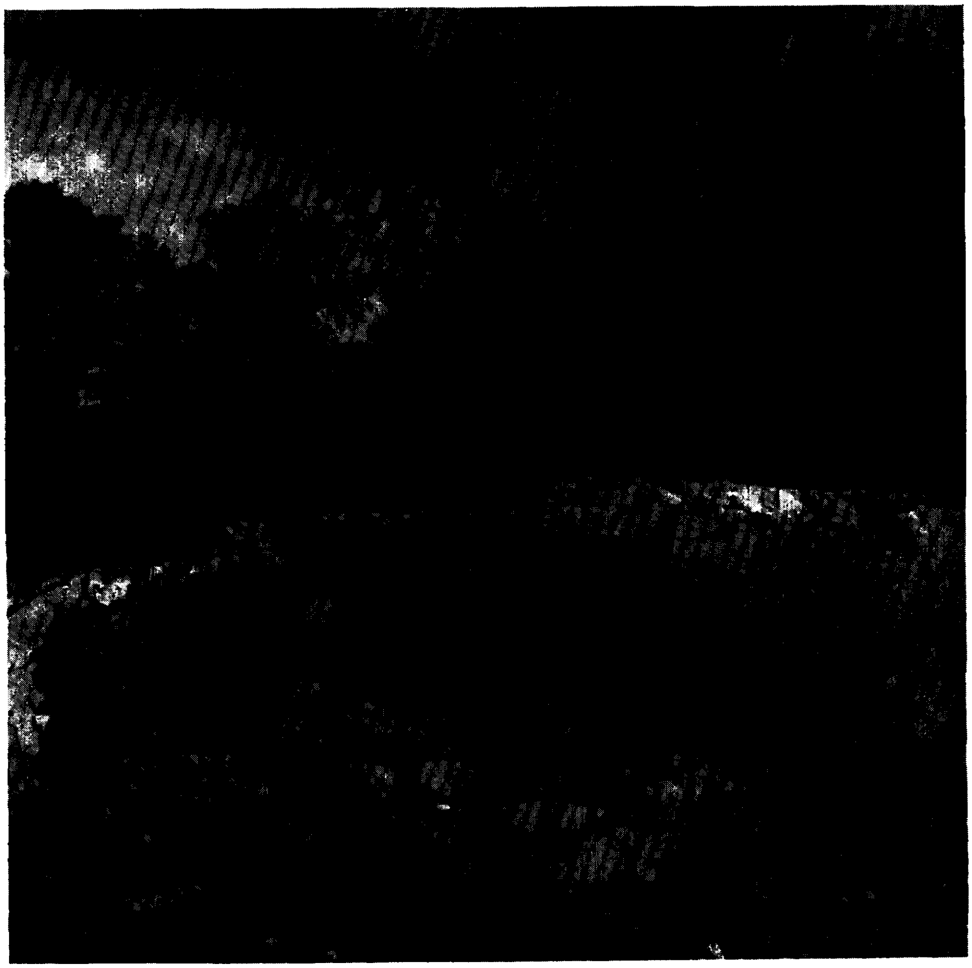

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Photo 2–Slate, 1 mile west of Madoc near Highway 7.

Conglomerate, Slate, Argillite, Pelitic Schist

Conglomerate bands, which lie in part above the basic volcanics and below the marbles, have been referred to as the Hastings series by Miller and Knight (1913) and on G.S.C. Map 559A. The conglomerates in southeastern Madoc township have been recently studied by Bain (1960). He calls them the Skootamatta conglomerate. He notes that this conglomerate is mingled with the basic volcanics in two places, and he states that no evidence of unconformity was found to suggest that the volcanics were peneplaned before the conglomerate was formed.

An extensive band of conglomerate extends across lots 2 and 3, concessions IX and X. It rests on basic volcanics to the north and is intruded by diabase to the south. Pebbles are mainly black, red, and grey quartzite in a matrix of biotite schist. Some conglomerate is present to the south in lot 1, concessions X

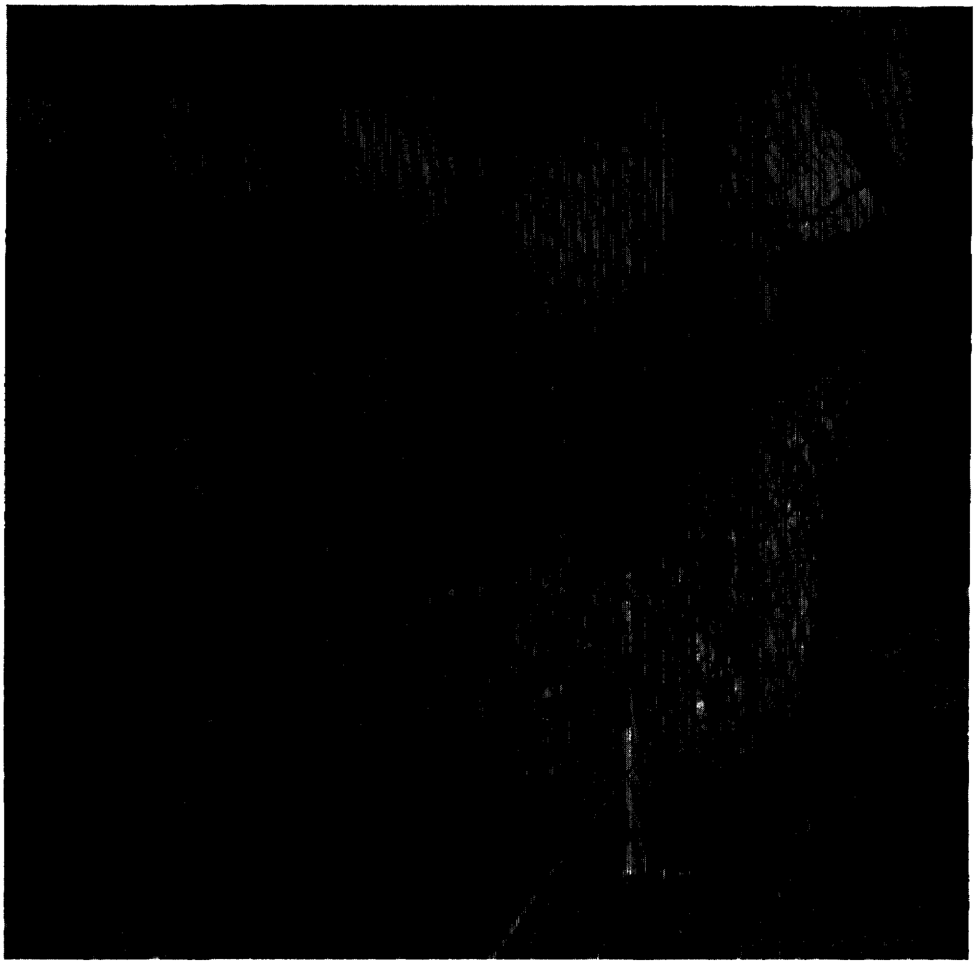

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Photo 3–Marble conglomerate, 1 mile west of Madoc.

and XI. It appears to be a faulted remnant in marble. Another area of conglomerate is present in lot 3, concession IX, north of Highway 7. The pebbles are quartzite, marble, schist, and chert in a matrix that grades from schist to quartzite.

A conglomerate band resting on Madoc andesite extends across lots 4, 5, and 6, concessions V and VI, Madoc township. The conglomerate is composed chiefly of marble and quartzite pebbles. This conglomerate is overlain by slate, which forms a band extending around the nose of the Madoc syncline. The slate was quarried in lot 2, concession V and lot 5, concession VI. Slate is interbanded in places with the conglomerate.

At the time of Miller and Knight's report on the Madoc area (Miller and Knight 1913), the origin of this conglomerate band was in dispute. There was a question of whether the conglomerate was a true conglomerate or a conglomerate of autoclastic origin (Miller and Knight 1913, p.60,61). Also, the relation of the conglomerate to the underlying andesite was in dispute. Some observers thought the contact was an unconformity while others thought the andesite intruded the conglomerate.

A band of conglomerate is present at Hazzards Corners in lot 12, concession VIII. The pebbles consist of marble, felsite, quartz, chert, and rare porphyry. Overlying the conglomerate is a band of buff-coloured fine-grained felsite that resembles quartzite. The conglomerate rests on pelitic schist, which is underlain by marble.

The principal slate band in Madoc township forms a wide band extending down the north side and around the nose of the Madoc syncline. The slate is a very fine-grained olive-drab-coloured rock with good slaty cleavage. At the quarry in lot 5, concession VI, pebble bands may be seen in the slate.

ODM8106

Photo 4–Glacial striae on slate, Madoc township.

Table 2 gives three analyses of the slate (after Miller and Knight 1913, p.69).

Table 2 THREE ANALYSES OF SLATE (AFTER MILLER AND KNIGHT 1913, P. 69).

	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3
SiO_2	56.40	52.92	53.90
Al_2O_3	17.80	16.69	20.71
Fe_2O_3	7.52	9.75	8.31
FeO	1.53		
CaO	3.67	4.36	3.15
MgO	3.45	2.38	0.34
Na_2O	0.75	0.80	0.76
K_2O	4.38	5.36	5.83
H_2O	4.42	7.32	6.88
CO_2	trace		
Total	99.92	99.58	99.88

NOTES:
Analysis 1. Old slate quarry, northwest corner, lot 5, concession VI, Madoc township.
Analysis 2. North part of lot 2, concession VI, Madoc township, near boundary of lot.
Analysis 3. North part of lot 2, concession VI, Madoc township, near boundary of lot.

Black and grey pyritiferous slates are associated with the rocks at the Canadian Sulphur Ore Co. (10) mine and the Bannockburn pyrite mine (3).

Argillite and pelitic schist and gneiss make up the bulk of the sediments of this group. The largest area of these rocks outcrops in the vicinity of Bannockburn and paragneiss is predominate. Dark-coloured fine-grained argillite and greywacke are common in the southern part of Madoc township. Table 3 gives an analysis of altered greywacke, which occurs two or three hundred yards southwest of the Presbyterian church (after Miller and Knight 1913, p.70).

Garnet schist is found in the vicinity of the Canadian Sulphur Ore Company pyrite mine and the Blakely pyrite mine (5). Garnets are up to ½ inch in size, set in a fine-grained matrix of quartz, feldspar, and biotite, and accessory pyrite, magnetite, chlorite, and sericite. A chemical analysis of the garnet from near Queensborough (Table 4) by Miller and Knight (1913, p.91) indicates that it is almandite.

Table 3 ANALYSIS OF ALTERED GREYWACKE (AFTER MILLER AND KNIGHT 1913, P. 70).

SiO_2	70.52
Al_2O_3	16.73
Fe_2O_3	0.74
FeO	1.47
CaO	1.47
MgO	0.05
Na_2O	0.93
K_2O	4.27
H_2O	1.62
CO_2	1.90
Total	99.70

Table 4 ANALYSIS OF GARNET (AFTER MILLER AND KNIGHT 1913, P. 91).

SiO_2	46.06
Fe_2O_3	8.18
FeO	17.75
MnO	0.24
CaO	3.84
MgO	1.05
Al_2O_3	22.62
Total	99.74

Marble

There are extensive deposits of calcitic and dolomitic marble present in Madoc township. In the northern part of the township in the Queensborough

Photo 5–Banded marble, 1 mile west of Madoc. ODM8107

syncline, blue-grey well-bedded marble of the Hastings type predominates. In other areas there are large deposits of white, buff, green, black, and pink marble, many of which are operated for the production of terrazzo chips. The marble deposits of Madoc township are described by Hewitt (1964).

Deloro Granite

The half-moon-shaped Deloro pluton has a length of 6 miles and a width of 4 miles. The pluton lies on the west boundary of Madoc township. About half the intrusive body is in Madoc township and half is in Marmora township. There are three facies present in the pluton, the principal facies is pink medium-grained to coarse-grained perthite granite. Along the west border of the pluton in Marmora township there is syenite. In the east central part in an elongate area 2½ miles long and 1½ miles wide northeast of Jarvis Lake in lots 8 to 13, concessions I to III, there is a body of pink fine-grained to medium-grained granophyric granite. This facies cuts the perthite granite.

A detailed study of the Deloro pluton has recently been made by A.K. Saha, and the reader is referred to his thesis (1957) and paper (1959) for a detailed description of the body.

The granite of the Deloro pluton is quite massive, and it generally lacks foliation or lineation.

PERTHITE GRANITE

The perthite granite, which makes up the bulk of the pluton, is a medium-grained to coarse-grained pink granite composed predominantly of microcline microperthite and quartz, and minor albite, chlorite, amphibole, and magnetite, and accessory calcite, muscovite, sphene, and zircon. Tuttle (1952, p.116) examined sections of the Deloro (Madoc) granite and points out that perthite of this type, when composed of nearly equal amounts of albite and microcline, is evidence, in itself, of high temperature. Tuttle suggests a magmatic history for the rock. Since metamorphism will promote unmixing in the alkali feldspars, it is apparent that the Deloro pluton has not suffered much regional metamorphism since emplacement.

The average modal analysis of 40 perthite granite samples from the Deloro pluton is shown in Table 5 (after Saha 1957, p.124).

Table 5 AVERAGE MODAL ANALYSIS OF PERTHITE GRANITE FROM THE DELORO PLUTON (AFTER SAHA 1957, P. 124).

	VOLUME %
Quartz	27.1
Perthite[1]	62.4
"Free" albite	5.2
Biotite+chlorite+alkali amphibole	3.7
Magnetite	1.1
Calcite, muscovite, sphene, zircon, etc.	0.5

[1]The average potash feldspar in the perthite is 49.0%.

Chemical analyses of the perthite granite and the granophyric granite from the Deloro pluton are shown in Table 6 (after Saha 1959, p.1310).

Table 6 CHEMICAL AND MODAL ANALYSES OF PERTHITE GRANITE AND GRANOPHYRIC GRANITE (AFTER SAHA 1959, P. 1310).

CHEMICAL ANALYSIS	PERTHITE GRANITE	GRANOPHYRIC GRANITE
SiO_2	75.45	75.88
TiO_2	0.23	0.19
Al_2O_3	11.34	11.92
Fe_2O_3	1.82	2.14
FeO	1.21	0.64
MnO	0.03	0.01
MgO	0.42	0.07
CaO	0.42	0.60
Na_2O	4.04	4.28
K_2O	4.20	4.18
P_2O_5	0.02	0.01
H_2O+	0.69	0.47
H_2O-	0.05	0.00
Total	99.92	100.39

MODAL ANALYSES	PERTHITE GRANITE
Quartz	31.3
Perthite	55.2
"Free" albite	8.5
Biotite	1.4
Hornblende	1.9
Calcite	0.2
Muscovite	0.3
Magnetite	1.2
Total	100.0

	GRANOPHYRIC GRANITE
Quartz	32.9
Cryptoperthitic albite	18.1
Microcline microperthite	45.0
Biotite	1.3
Chlorite	0.5
Magnetite	2.1
Total	99.9

GRANOPHYRIC GRANITE

The granophyric granite is a fine-grained to medium-grained pink granite that is composed essentially of a graphic intergrowth of microcline microperthite and quartz. There are some phenocrysts of cryptoperthitic albite. Minor magnetite, pyrite, biotite, chlorite, zircon, and fluorite is present.

The average modal analysis of seven specimens of granophyric granite is shown in Table 7 (after Saha) 1957, p.134).

Table 7 AVERAGE MODAL ANALYSIS OF SEVEN SPECIMENS OF GRANOPHYRIC GRANITE (AFTER SAHA 1957, P. 134).

	VOLUME %
Quartz	29.9
Feldspars	66.7
Biotite+chlorite	1.5
Magnetite	1.5
Muscovite+fluorite+zircon	0.5
Total	100.1

The granophyric granite was quarried for roofing granules by Minnesota Minerals Limited on lot 8, concession III, Madoc township. Saha (1957) points out that compared with the perthite granite, the granophyre is less mafic, more alkaline, and higher in Na_20/K_20 ratio.

CONTACTS

Along the north contact, the Deloro granite is in contact with grey and white marble. There is some recrystallization of the marble near the granite contacts and some development of contact metamorphic minerals, such as tremolite and serpentine in concession VI. Several small magnetite deposits are found in the marble along the north contact of the pluton. The granite intrudes acid and basic lavas of the Madoc volcanics, and inclusions of the volcanics are found in the granite. Much of the south contact of the granite in Madoc township is hidden beneath Paleozoic limestone. Many small arsenical gold deposits are clustered along the west contact of the Deloro granite in Marmora township.

W.G. Wahl (1960) has contrasted the magnetic susceptibility of the Deloro pluton with that of the Mount Moriah and Skootamatta stocks, and he has indicated a relationship between susceptibility and tenor of retained metals in the stocks. It is postulated that the environs of the Deloro stock is a favourable location for ore deposits.

Gawley Creek Syenite

The Gawley Creek syenite occupies the northwestern part of Madoc township. The syenite pluton is about 4 miles long in a north-south direction and 4 miles wide in an east-west direction. It extends into Marmora township. Most of the pluton is composed of coarse-grained pink biotite-hornblende syenite similar to the Mount Moriah syenite of Grimsthorpe township. Thin section examination indicates that the syenite is composed predominantly of microcline microperthite and cryptoperthitic oligoclase in large irregular sutured grains. Hornblende and biotite are varietal accessories. Minor accessories include sphene, opaques, apatite, and epidote. Some oligoclase is present in several slides.

The eastern end of the syenite pluton in the vicinity of the Bannockburn gold mine is dark-grey coarse-grained biotite syenodiorite that is composed of large crystals of oligoclase with biotite as a varietal accessory. Minor constituents include magnetite, pyrite, apatite, titanite, zoisite, and calcite.

Examination of the Bannockburn aeromagnetic sheet indicates that there is a magnetic high over the Gawley Creek syenite in the vicinity of Moss Marsh. This high has an intensity of 7,500 gammas and a magnetic relief of about 5,500 gammas above general level. The magnetic susceptibility of the stock is high and, in contrast to the Deloro pluton, there are few known mineral deposits surrounding it. The Moss Marsh anomaly was drilled in the 1950s and was found to be due to disseminated magnetite.

Empey Granite

A small area of coarse-grained pink granite outcrops on lot 21, concession III, Madoc township, near Empey. The granite is composed of interlocking grains of quartz, oligoclase, and microcline microperthite, and minor accessory fluorite, magnetite, muscovite, and biotite. The granite may be related in age to the Deloro pluton.

Mount Moriah Syenite

The south edge of the Mount Moriah syenite just extends into the northeast corner of Madoc township. The pink coarse-grained syenite is similar in lithology to the Gawley Creek syenite. The syenite is described by Meen (1942, p.21).

Noyes Granite

On the south shore of Moira Lake in the vicinity of the Noyes fluorspar mine, there are outcrops of pink medium-grained to coarse-grained granophyric granite that is composed of graphically intergrown quartz and feldspar, principally microcline and microcline perthite. Some plagioclase is present. Minor accessories are magnetite, muscovite, and zircon. This may be a part of the Moira granite.

Moira Granite

The Moira granite outcrops on Stony Island in Moira Lake, and also outcrops for a distance of about 1 mile along the northeast shore of Moira Lake in concession XIV, Huntingdon township. The granite area extends north from the lake for ½ to ¾ mile and extends into Madoc and Hungerford townships.

The Moira granite is a pink albite granite composed largely of albite and quartz with minor microcline. The body is described in detail by Bain (1960) who recognized three phases: an albitite phase, which makes up 90 percent of the complex; a mylonitic phase in the northeast part; and a hybrid intrusive granitic phase in the southeast part where there is a gradation from albitite to hybrid granite rock. Bain attributes the development of the albitite to a period of soda metasomatism. The hybrid granite gneiss facies carries muscovite, tourmaline and rutile. Bain also describes an area of rhyolite porphyry ½ mile long on the north shore of Moira Lake that appears to be earlier than the Moira granite complex. This area was formerly quarried for roofing granules by Building Products Limited. The porphyry is cut by black trap dikes.

Paleozoic Limestone

The youngest bedrock formation is the Black River limestone of Ordovician age. The basal member of the Black River limestone is frequently a reddish, greenish, or chocolate-brown arkose. This is often overlain by several feet of chocolate-brown limestone that grades in grain size from cryptocrys-

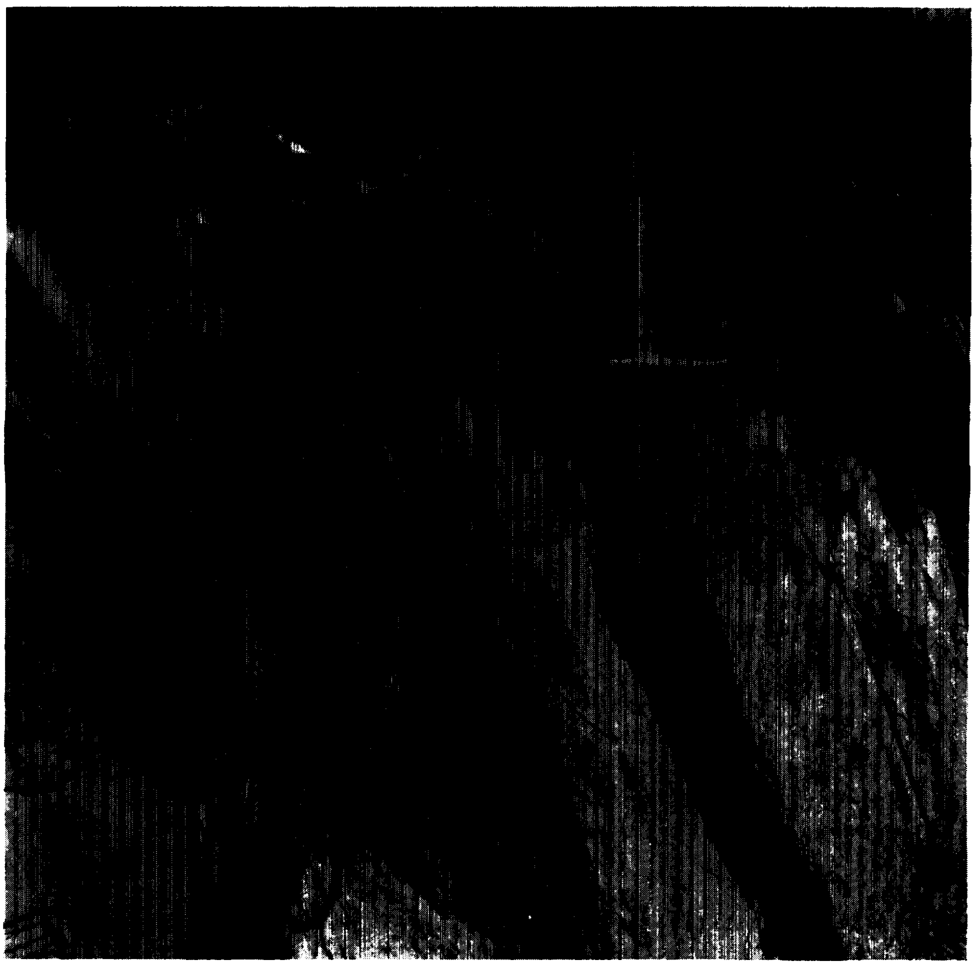


Photo 6–Paleozoic-Precambrian contact on Highway 7 west of Madoc. ODM8108

talline to medium crystalline. Above this the Black River formation consists of medium-grey limestone that is light-grey-weathering, cryptocrystalline to fine crystalline, and medium-bedded to thick-bedded.

Some small quarries have been opened in the chocolate-brown limestone for terrazzo chips and in the grey limestone for roadstone.

Pleistocene

The whole area has been glaciated. The glacial deposits consist mainly of boulder moraine and kame moraine. In the central and southern part of Madoc township, kame moraines have been opened as gravel pits.

FOLDING AND FAULTING

The two major folds in Madoc township are the Queensborough syncline and the Madoc syncline. The Queensborough syncline has its axis trending northwest about 2 miles west of Queensborough. The Tudor basic volcanics are folded around the nose of the syncline, which pitches northwest. The nose is occupied by the Queensborough acid volcanic centre, which is composed of felsite, rhyolite, schist, pyritiferous slate, and massive pyrite lenses. The central part of the syncline is occupied by marble.

The Madoc syncline lies just north of Madoc and is crossed by Highway 62. The axis of the syncline trends northeast. The north arm is flanked by Madoc andesite which is overlain by conglomerate and slate. The central part of the northeast-pitching syncline is occupied by black fine-grained marble, which is quarried for terrazzo chips.

Minor folding and faulting is common in Madoc and north Huntingdon townships. Widespread folding and faulting are indicated in the workings of the mines of Canada Talc Industries Ltd.

There is a prominent set of northwest-trending faults in Madoc and Huntingdon townships. All the fluorspar and barite veins of the Madoc area occupy fault fissures of post-Ordovician age. The main fault zone, which is occupied by fluorspar veins, is the Moira Lake fault zone, along which are the Howard (21)*, Johnston (22), Noyes (26), Perry Lake (28), Perry (27), Rogers (29), Kilpatrick (23), Keene (32), Bailey (1), and McIlroy (25) mines and the McBeath occurrence (34). A further series of northwest-trending faults make up the Lee-Miller group, and the fault fissure veins are worked by the Lee Junior (33), Lee Senior (24), Wallbridge (54), Rooks (45) and Miller (35) mines, and the Stewart occurrence (51). In Huntingdon township the Palmateer (37) and Jones (31) mines are on northwest-trending faults parallel to, and south of, the main Moira Lake fault.

The faults show abundant fracturing and brecciation of the wallrock. The wallrock frequently shows striations and slickensides, and often indicates horizontal movement on the faults. Wilson (1929, p.46) has estimated horizontal displacement on one fault, at the Noyes mine, to be about 100 feet. Horizontal striations are common along the Moira Lake fault system. Wilson

*Numbers in brackets refer to property numbers on Map 2154 (back pocket).

states that wallrock striations are vertical on the Lee-Miller group of fluorspar veins. The age of faulting is post-Ordovician, but the faulting cannot be exactly dated owing to lack of information.

ECONOMIC GEOLOGY

Barite

Barite occurs with calcite and fluorite in veins that cut the Paleozoic and Precambrian rocks. The fissure veins generally trend northwest-southeast parallel to the Moira Lake fault. Barite is a common constituent in most of the Madoc fluorspar mines. It is particularly abundant in the following three fluorspar properties, which are in Huntingdon township, and which are described by Guillet (1963, p.29,30): the Howard (Hill) mine (21), east half of lot 14, concession XI; the Johnston mine (22), west half of lot 14, concession XI; and the Noyes mine (26), in lot 13, concession XII.

HUNTINGDON TOWNSHIP

Lot 1, Concession XII

A large part of lot 1, concession XII, Huntingdon township, is underlain by a Paleozoic limestone plain with very little soil cover. Several small barite veins are found cutting the limestone. The veins strike N30°W and dip vertically. Three of the veins examined by the author were 3 to 6 inches wide and were composed of barite with minor fluorite and calcite.

Pit 1 consisted of an open cut 70 feet long, 1 to 3 feet wide and a maximum of 12 feet deep. A second vein is exposed in pit 2, which is situated 50 feet east of pit 1. This pit is 400 feet long, 1 to 2 feet wide, and up to 6 feet deep. A third pit, 600 feet north, is 60 feet long, 2 feet wide, and 1 to 6 feet deep. The vein strikes N38°W and dips vertically. It is 6 inches wide.

Fluorspar

Thirty-one fluorspar properties have been opened in Madoc and northern Huntingdon townships. Mining began in 1905 and was particularly active during the periods 1916-1921 and 1940-1951. About 150,000 tons of fluorspar have been mined from the Madoc area, which has been the centre of fluorspar mining in Ontario.

The fluorspar occurs in fissure-filling veins with barite and calcite. The veins generally occupy northwest-trending fractures that are associated with a period of post-Paleozoic northwest faulting. The most important fluorite deposits have been found along the Moira Lake fault, which extends in a northwest-southeast direction through Moira Lake. The fluorite veins cut both the Precambrian and Paleozoic rocks.

The fluorspar mines and occurrences in the map-area are listed in Table 8 (after Guillet 1964, p.26).

The fluorspar mines and occurrences of the Madoc area are described by G.R. Guillet (1964). The reader is referred to this report for descriptions of individual properties.

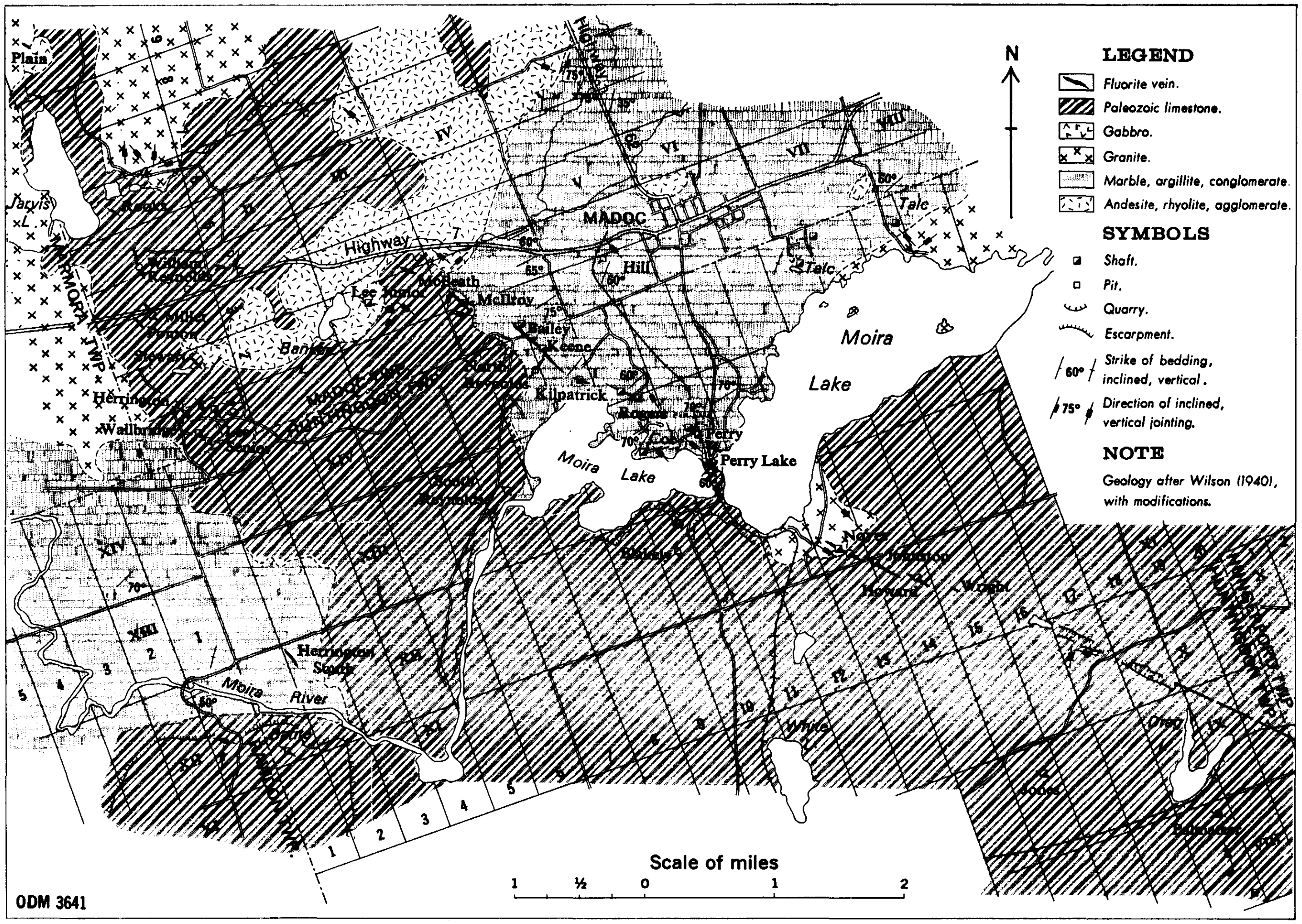


Figure 2–Fluorite occurrences in the Madoc area (after Guillet 1964).

Table 8 FLUORITE OCCURRENCES IN THE MADOC AREA, HASTINGS COUNTY (MODIFIED AFTER GUILLET 1964, P. 26).

CONCESSION	LOT	NAME	APPROXIMATE PRODUCTION (TONS)
HUNTINGDON TOWNSHIP			
VIII	18	Palmateer (37)	44
IX	15	Jones (31)	——
XI	1	Williams	prospect
XI	14,E½	Howard (Hill) (21)	2,500
XI	14,W½	Johnston (22)	187
XI	15	Wright (55)	occurrence
XII	2	Herrington South (17)	13
XII	10	Blakely (4)	5,026
XII	13	Noyes (26)	25,000
XIII	7	Reynolds South (43)	100
XIII	10	Coe (20)	114
XIII	11	Perry (27)	8,000
XIII	11	Perry Lake (28)	4,000
XIV	8	Reynolds North (42)	10
XIV	9,E½	Kilpatrick (Detomac) (23)	11,566
XIV	9,W½	Keene (32)	5,000
XIV	10	Rogers (29)	45,000
MADOC TOWNSHIP			
I	1,E½	Lee Senior (24)	1,600
I	1,2,W½	Wallbridge (fluorspar) and Herrington (54)	6,600
I	2,E½	Stewart (51)	occurrence
I	3	Ponton (39)	1,500
I	4,W½	Miller (35)	460
I	5	Reynolds (41)	88
I	6	Rooks (45)	100
I	9	Plain (38)	20
III	2	Lee Junior (33)	2,000
III	3,E½	McBeath (34)	occurrence
IV	1	Bailey (1)	25,000
IV	2,W½	McIlroy (25)	540
V	1	Hill (18)	occurrence

*Numbers in brackets refer to property numbers on Map 2154 (back pocket).

Gold

ST. JOE MINE

In 1898, A. Slaght (O.B.M. 1898, p.89) described the workings of the St. Joe gold mine (not shown on Map 2154) in lot 25, concession V, Madoc township, 1,000 feet west of the Hastings road. The main vein strikes east-west, and a shaft was sunk 30 feet on the vein. An open cut was put down on the vein and about 300 tons of ore was mined. Assays given by Slaght range from $2 to $60 per ton, with gold at $20.67 per ounce.

BANNOCKBURN MINE (2)*

The Bannockburn gold mine is situated on lot 28, concession V, Madoc township, about ¼ mile west of the village of Bannockburn. The date that the mine was established is not recorded in Ontario Bureau of Mines reports, but Slaght (O.B.M. 1895, p.264) stated that the mine was established "several years ago". Work recommenced in 1894 and continued until 1898. A 10-stamp mill was built on the property.

Gold was found in a quartz vein that strikes north-south and dips vertically to steeply east. The vein has been stripped and trenched for a continuous length of 700 feet along strike, and four shafts and several open cuts were put down. The deepest shaft is reported to be 75 feet deep. Drifting extends both ways from the shaft. The quartz vein is on the contact between an intrusive body on the west, which grades from biotite syenite to diorite, and rusty schists on the east. The schists strike north-south and dip vertically. There is strong shearing along the hanging-wall or east-wall of the vein, and there was development of mica and carbonate schists. The vein is up to 3 feet wide and, in places, consists of three or more parallel veins. There is some carbonate and pyrite in the quartz. High gold values have been reported. A grab sample of quartz vein material taken by the author assayed $6.00 gold per ton (gold at $35.00 U.S. per ounce).

SOPHIA (DIAMOND) MINE (49)

In 1896, a quartz vein carrying arsenopyrite and gold was discovered on lot 14, concession X, Madoc township, ½ mile west of Queensborough. The veins occur in volcanic rocks, which strike northwest and dip vertically. C. De Kalb (O.B.M. 1901, p.117) reports that "there are two veins on the property, viz.: the 'mispickel vein' with a course due north and south; and, the 'free milling' vein running northwest and southeast." On the mispickel vein, a shaft (No. 1) was sunk to 60 feet. Shaft No. 2 on the free milling vein had a depth of 105 feet with levels at 60 and 100 feet. No. 3 shaft was put down on the free milling vein. Operations were suspended in 1901, but the workings were dewatered in 1908. No further work has been reported.

Iron, Copper

ELDORADO COPPER MINE (COE IRON MINE) (13)

In 1901, the Coe iron mine was opened in lot 17, concession V, Madoc township, on top of a low ridge about ⅜ mile west of Eldorado. Red hematite ore was mined from three open cuts: the east pit was 60 feet long, 50 feet wide, and 45 feet deep; the centre pit was 46 feet long, 20 feet wide, and 45 feet deep; and the west pit was 20 feet long, 15 feet wide, and 10 feet deep. Mining of hematite continued in 1902 and 1903, and in 1903 chalcopyrite was found in the bottom of the mine at a depth of 75 feet. Good chalcopyrite and chalcocite ore averaging 4 to 10 percent copper was reported by E. T. Corkill (O.B.M. 1906, p.90). The mine was then known as the Eldorado copper mine, and it was worked until about 1907. A copper smelter was built on the property in 1906.

*Numbers in brackets refer to property numbers on Map 2154 (back pocket).

Corkill (O.B.M. 1906, p.90) describes the property as follows:

The north or hanging wall of the ore body is granite, and the south or footwall is crystalline limestone. The ore body runs east and west in a wide open fissure in the contact between the granite and the limestone. The open cut worked for iron is 75 feet in depth. From this level a shaft has been sunk 75 feet with drifts and crosscuts at different levels. At a depth of 35 feet in the shaft a level has been driven, and 105 feet of drifting done. Twenty feet deeper in the shaft, another level has been run and 170 feet of drifting done. At the 75 foot level there are 175 feet of drifting. The ore body which occurs as a shoot, dips to the northeast.

In 1906, the mine was reported to be 300 feet deep (O.B.M. 1907, p.76).

Iron

DUFFERIN MINE (12)

The Dufferin iron mine is located on the west half of lot 18, concession I, Madoc township, and extends westward into Marmora township. The magnetite zone is in blue-grey fine-grained Grenville marble near the north contact of the Deloro granite batholith. The marble strikes N70°E and dips 50° to 60° south.

A series of open cuts trend N70°E from the township boundary for a length of over 800 feet. The open cuts vary from 150 feet long, 30 feet wide, and 25 feet deep to 50 feet long, 15 feet wide, and 20 feet deep. Magnetite occurs in disseminated and massive form in the marble. Gibson (1937, p.115) states that the Dufferin ore zone "has a length of 1700 feet and a width of 20 to 120 feet. The ore assayed 63.80 percent iron, 0.23 percent sulphur and 2.30 percent manganese."

SEYMOUR MINE (48)

The Seymour iron mine is on the west half of lot 11, concession V, Madoc township, about 200 feet east of the road. An open cut 180 feet long and 20 to 25 feet wide trends east-west in basic volcanic rocks. The cut is reported to have a shaft 125 feet deep. Fine-grained disseminated magnetite occurs in the basic volcanics. The mine was operated from 1837 to 1845. Uraconite was reported by Miller (1898, p.232,233) to have been found in fissures in the magnetite.

WALLBRIDGE IRON MINE (53)

The Wallbridge iron mine is in lot 12, concession V, Madoc township, on the west side of Highway 62. Soft red hematite ore was mined from an open pit about 150 feet in diameter and was reported to be 60 feet deep. Some of the mining was done prior to 1900, but the mine was still in operation in 1906 when it was supplying flux to the Stanley Smelting Works at Bannockburn. The property was drilled in 1952 by Trent River Iron Limited (Rose 1958, p.65).

The hematite ore occurred in ferruginous dolomitic marble of the Grenville series. The marble is capped by a few feet of Ordovician limestone and conglomerate. The marble strikes east-west and dips steeply to the south. Rose (1958, p.65) states:

. . . hard and soft red hematite as mined apparently occurred in a large pocket in the crystalline carbonate rocks, at or near the contact with overlying Paleozoic rocks. A narrow band of soft red hematite was intersected in the crystalline carbonate rocks about 20 feet below the

Paleozoic contact in a drill hole east of the main pit, so the hematite here is not entirely confined to the Paleozoic-Precambrian contact, in fact, most of the hematite occurs within the Precambrian rocks.

Hematite, specularite, magnetite, goethite, pyrite, and chalcopyrite are reported by Rose.

COOK MINE (11)

The Cook iron mine is in lot 15, concession V, Madoc township, in a woodlot just east of a small swampy lake. In 1898 the mine was shipping 30 tons of ore per day from a small open pit that was 25 feet in diameter and 30 feet deep. The ore is hematite and magnetite in fine-grained grey crystalline limestone. Outcrops are scarce in the vicinity of the pit.

ST. CHARLES MINE (50)

The St. Charles iron mine is located on lot 4, concession VI, Madoc township, about 1,000 feet southwest of the Walsh farmhouse. The country rock is black basic volcanics. An open cut, which is 100 feet long, 20 feet wide, and 30 feet deep to water-level trends north-south. The ore is magnetite, which occurred in a lens in the basic volcanics. About 100 yards east of the pit, there are large outcrops of pink granite. The mine was worked in 1898 and 1899.

LOT 5, CONCESSION VI

There is a hematite mine on lot 5, concession VI, Madoc township, 1,000 feet west of the Walsh farmhouse. An open cut, measuring 130 feet long in a north-south direction, 20 feet wide, and 30 feet deep, exposes a narrow band of hematite-bearing carbonate rock. The carbonate lens is in contact with granite on the west side. The east contact was not seen. Some magnetite is present. Red hematite is formed by the alteration of magnetite-bearing ferruginous carbonate rock.

Another iron pit is located 600 feet south of the main pit.

BRENNAN MINE (6)

The Brennan mine, in lot 7, concession VI, Madoc township, is reported to have shipped 250 tons of hematite ore in 1901 (I.O.C. 1924, p.222).

CAMERON MINE (7)

Iron ore is reported to have been mined from the Cameron mine, in lot 9, concession VI, Madoc township (I.O.C. 1924, p.222).

FORTY-NINE ACRE MINE (15)

The Forty-Nine Acre mine is in lot 10, concession VI, Madoc township, ⅜ of a mile east of Highway 62. The mine was also known as the "Sidmag property". A narrow band of crystalline limestone 300 to 400 feet wide, striking N30°W, lies between pink rhyolite on the west and pink medium-grained granite on the east. About 1,000 feet south of the road, a north-south-trending line of pits has been put down in the limestone. These expose hematite, siderite, and magnetite mineralization in the crystalline limestone. In 1956 a considerable amount of diamond-drilling was done by Stratmat Limited, and areas of siderite and magnetite mineralization were outlined in the limestone. Tonnage and grade values are not available.

MILLER MINE (35)

The Miller iron mine was operated in lot 12, concession VI, Madoc township, in 1898. There was an open pit 34 feet deep with a 38-foot shaft in the bottom of the pit. The ore is red hematite.

SEXSMITH MINE (47)

Several open pits were put down in lot 8, concession VII, Madoc township, near the concession VI line. The pits are in white Grenville marble and expose magnetite mineralization. Some pyrite occurs in the magnetite, which is fine-grained and massive. The property operated many years ago under the name Sexsmith mine. Little information is available on the operations.

Lead

HOLLANDIA MINE (19)

The Hollandia lead mine is in lot A, concession VI, Madoc township, about 2 miles north of Bannockburn. The mine was opened in 1898, and several open cuts were put down. The mine later closed but re-opened in 1906. There were four shafts; the east shaft is 132 feet deep; No. 1 shaft, 70 feet west, is 90 feet deep; No. 2 shaft, 90 feet west of No. 1 shaft, is 65 feet deep; No. 3 shaft, the most westerly, is 40 feet deep. Eighteen holes were drilled in 1956 by Teck Exploration Company, Limited.

The country rocks are rusty paragneiss and schist, which strike N40°E and dip vertically. Galena occurs in a calcite vein, which strikes N40°W and dips vertically or steeply northeast. The vein is 2 to 4 feet wide. The walls show slickensides. Alcock (1930, p.156) reports that the ore is chiefly galena with minor sphalerite and pyrite. The gangue is calcite with minor barite. High grade ore was reported to have been produced from the upper 20 to 40 feet of the vein.

From shaft No. 1, at a depth of 90 feet, drifts were run east for 181 feet and west for 159 feet. Sampling of the vein along the drift is reported to have given values of 1 to 12 percent lead (Alcock 1930, p.157).

Marble and Limestone

Madoc is the centre of a marble quarrying industry. The three principal operating companies are Stoklosar Marble Quarries Limited, Madoc Marble Quarries Limited, and Hastings Marble Products Limited. Madoc Marble and Hastings Marble were taken over in 1965 by Grenville Aggregate Specialties Ltd.

The principal quarry operations in the map-area are shown in Table 9.

Table 9 PRINCIPAL MARBLE AND LIMESTONE QUARRIES IN THE MADOC AREA, HASTINGS COUNTY.

LOCATION	TYPE OF STONE	OPERATOR
MADOC TOWNSHIP		
Con. I, Lot 11, S.W.¼	Brown Pamelia limestone	Stoklosar Marble Quarries
Con. IV, Lot 9	Brown Pamelia limestone	Hastings Marble Products
Con. IV, Lot 10	Brown Pamelia limestone	Madoc Marble Quarries
Con. V, Lot 3	Black calcitic marble	Madoc Marble Quarries
Con. V, Lot 4, E½	Black calcitic marble	Hastings Marble Products
Con. V, Lot 22	Yellow dolomitic marble	Hastings Marble Products
Con. VI, Lot 4	Black calcitic marble	Stoklosar Marble Quarries
*Con. VI, Lot 9	Green calcitic marble	Madoc Marble Quarries
Con. VI, Lot 19	Buff dolomitic marble	Stoklosar Marble Quarries
Con. VI, Lot 19	Buff dolomitic marble	Hastings Marble Products
Con. VI, Lot 20	Pink calcitic marble	Madoc Marble Quarries
Con. VI, Lot 22, E½	Pink calcitic marble	Stoklosar Marble Quarries
Con. VIII, Lot 2	Pink dolomitic marble	Hastings Marble Products
*Con. VIII, Lot 12	Buff dolomitic marble	Stoklosar Marble Quarries
Con. VIII, Lot 15	Buff dolomitic marble	Madoc Marble Quarries
Con. IX, Lot 2	White dolomitic marble	Hastings Marble Products
HUNTINGDON TOWNSHIP		
Con. XIV, Lot 1	Green calcitic marble	Stoklosar Marble Quarries
Con. XIV, Lot 15	White dolomitic marble	Canada Talc Industries

*Inactive in 1964.

These marble quarries are described by D.F. Hewitt (1964). The reader is referred to his report for descriptions of the quarries.

Pyrite

BANNOCKBURN PYRITE MINE (3)

The Bannockburn pyrite mine is in lot 25, concession VI, Madoc township, about 1 mile southeast of Bannockburn and ⅜ mile east of Highway 62. The mine was also known as the Jarman pyrite mine (1901-1907) and the Mundic mine (1918-1919). Initial openings were made on the property in 1898 when a gossan zone 8 to 15 feet thick was discovered. Shipments were made in 1898 and 1899 by Stephen Wellington of Madoc to the Hamilton Iron and Steel Company, (Wilson 1912, p.62). The gossan is reported to have run over 38 percent iron. In 1900, the American Madoc Mining Company began operations under the name Jarman pyrite mine. An open pit was sunk on the pyrite lens; the pit measured 32 feet long, 85 feet wide, and 84 feet deep. The pyrite occurred as bedded lenses in grey-green chlorite schist striking east-west and dipping 55°N. Soft chlorite schist formed the hanging-wall of the pit, and this led to dangerous mining conditions which caused the pit to be abandoned in1901.

A second pyrite orebody was found about 500 feet south of the open pit. A shaft was sunk in 1901 on this pyrite lens, which was reported to be about 160 feet long and 8 to 15 feet wide. The south lens and its enclosing chlorite schist strike slightly west of north. There is a folded structure between the two pyrite deposits that is probably an anticline pitching northwest. The

American Madoc Mining Company continued to produce pyrite from the south orebody until 1907 when the mine was closed apparently because of unsafe mining conditions. At the time of closing, the shaft was 275 feet deep with levels at 64, 113, and 175 feet. Wilson (1912, p.63) reports that the monthly production was about 580 tons, averaging 40 percent sulphur. He reports that the ore fell off neither in grade nor quality with depth. The mine was not worked out when closed.

The country rock is Grenville marble and soft grey chlorite schist. The fine-grained granular pyrite occurs in the chlorite schist. There is little outcrop in the vicinity of the open pit and shaft, which are on the west side of an area of low swampy ground.

FARRELL MINE

A number of test pits have been put down in crystalline limestone in lot 9, concession VII, Madoc township. The marble band strikes northwest and is flanked on the northeast by pink granite. The property has been known as the Farrell mine (not shown on Map 2154). Gossan and pyrite were encountered in the pits. Janes (1952, p.39) reports:

> A sample, representing about 75 percent of the dump material, alongside a 25 foot shaft, is reported as having contained 40.65 percent sulphur. The pyrite deposit on this prospect is about 5 feet wide with crystalline limestone as the gangue material.

DAVIS PROSPECT

An occurrence of pyrite in marble has been reported in the south half of lot 10, concession IX, Madoc township. A test pit 10 feet deep was put down on the deposit (Wilson 1912, p.69). This prospect is not shown on Map 2154 (back pocket).

CANADIAN SULPHUR ORE COMPANY (10)

The pyrite property, operated by Canadian Sulphur Ore Company from 1910 to 1919, is located in the north half of lot 9, concession X, Madoc township. The mine was established by Stephen Wellington. A gossan zone 500 feet long, 200 feet wide and 12 feet deep was opened up in 1906. After sinking two shafts, pyrite was encountered and the first shipment was made in 1908. Canadian Sulphur Ore Company took over the property in 1910.

The mine workings consisted of three shafts and two open cuts. Shafts No. 1 and No. 2 were 75 and 100 feet deep respectively. The main shaft, No. 3, reached a depth of 460 feet in 1919, and six levels were developed.

Pyrite occurs in massive lenses along the contact between rusty schist to the south and quartzite to the north. Some pyritic black slate is present. At open pits No. 3 and No. 4, the pyrite lenses are 25 feet wide. The pyrite ore is reported to have been of two grades. Miller and Knight (1913, p.98) state:

> The low grade is a siliceous, distinctly banded pyrites which contains about 35 percent of sulphur. At times, it passes into pure quartzite in a short distance. The better quality of mineral, which is hard and dense, is faintly banded in places and contains from 46 to 49 percent of sulphur. The richness of the mineral may depend to some extent on the nature of the country rock. The pyrites as well as the adjacent rock, is fractured in all directions, the cracks being filled with small veinlets of quartz, calcite and more coarsely crystallized pyrites. [The pyrites has been brecciated and] the deposits consist of large angular pieces of pyrites, slate and quartzite cemented by quartz, calcite and secondary pyrites.

A little pyrrhotite and chalcopyrite is present.

BLAKELY PYRITE MINE (5)

Mining began in 1905, on a pyrite deposit in lot 11, concession XI, Madoc township, about 1 mile southwest of Queensborough. In 1905 and 1906, 65 cars of pyrite ore averaging 45 percent sulphur are reported to have been shipped by the British American Development Company. Pyrite is reported to have occurred in lenses, one of which had a length of 50 feet and a width of 15 feet, in garnetiferous rusty schist near the contact with rhyolite. The schist zone strikes north and lies between marble to the west and volcanics to the east. The schist zone is intruded by rhyolite, which, on the property, lies west of the schist.

A shaft was sunk on the main pyrite lens to a depth of 135 feet with drifts on the 50- to 85-foot levels. A second shaft, 150 feet west, was sunk to a depth of 30 feet.

Wilson (1912, p.68) reports that an open cut was put down 100 feet southwest of the main shaft on a zone of pyrite-bearing schist. Lenses of pyrite 4 to 5 feet thick were mined. One lens contained disseminated chalcopyrite. The pyrite is coarse-grained and massive.

West of the workings, in an open cut, there is a 2-foot quartz vein carrying chalcopyrite and jamesonite. Massive sphalerite can be seen just east of the open cuts, and zincblende has been reported with the pyrite in places.

The Blakely pyrite mine was apparently closed in 1908.

Pyrite and Iron

McKENTY MINE

The McKenty mine (not shown on Map 2154) is in lot 6, concession VII, Madoc township, 2 miles east of Madoc. Hematite was mined and shipped from this property about 1877 (Wilson 1912, p.69). An open pit, reported to be 60 feet deep, has caved in. Some hematite lumps have a core of pyrite.

Slate

The chief uses of slate are for roofing. It is also used as millstock for wallboard, baseboard, stair tread, garden walks, flooring, mantels, sinks, shower stalls, billiard table tops, etc.; for blackboards; for roofing granules; and in the pulverized state for industrial fillers in paint, linoleum, rubber, and certain soaps.

For roofing slate the cleavage should be straight, uniform and smooth, and the colour should be attractive and permanent. Standard slates for roofing range from 6 inches by 10 inches, to 4 inches by 24 inches in size, and $\frac{3}{16}$ inch to $\frac{1}{4}$ inch thick. They are sold by the "square": i.e. the slate necessary to cover 100 square feet, with necessary overlap.

For millstock, slate should be soft, even-grained, and preferably not highly fissile. Certain types of slate have a high dielectric strength and are suitable for electric panels and switchboards. For this use the slate should be low in magnetite, carbon, and other minerals of low resistance, and should be capable of being cut and drilled easily without scaling.

The production of slate for flagstones is large in the United States. Slate crushed to granular form is widely used for roofing granules, both in its natural colour and artificially coloured.

Available supplies of good grade slate in the U.S.A. far exceed the demand, and the establishment of a slate industry depends largely upon the solution of marketing problems. Quarrying of slate generally ceases, not because reserves are used up, but because of a shift in demand. Slate must meet keen competition in the building trade from other natural building materials and from many other types of lower-cost roofing materials.

Important properties of commercial slate are cleavability, colour and its constancy, density, porosity and absorption, hardness, toughness, transverse and crushing strength, elasticity, electrical resistance, and corrodibility. Systematic testing is described by the American Society for Testing and Materials.

MADOC SLATE DEPOSITS

A total of 938 tons of slate valued at $8,056 has been produced in the Madoc area during the years 1934 to 1939. Companies active in the area were Ontario Slate Mines Limited, and its successors, Canadian Slate Products Limited and Canada Slate Products Limited, operating from 1934 to 1939 on lot 5, concession VI, and Crespey Slate Products operating in 1936 and 1937 probably from lot 2, concession V.

A band of slate several hundred feet wide forms a synclinal fold that extends from lot 2, concession V, Madoc township, at Highway 7, to lot 5, concession VI on Highway 62. A small slate quarry that was opened on lot 5, concession VI, exposes a 15-foot face of dark-grey slate interbedded with slaty conglomerate beds up to 3 feet thick. The bedding strikes N25°E and dips 40°E. Prominent slaty cleavage strikes N60°E and dips 70°S. A vertical joint system strikes east-west. Some fine-grained garnet schist is interbedded with the slate. The slaty cleavage is not perfect, and the slate does not split well into uniform sheets.

A second small slate quarry has been opened on lot 2, concession V, Madoc township. The slate is dark-grey and fine-grained with silver-grey spots that weather out. Strongly developed vertical slaty cleavage strikes N60°E. Bedding swings from north-south to east-west, and the quarry appears to be in the trough of a syncline.

Minnesota Minerals Limited holds 24 acres of lot 2, concession V. The north 50 acres of the west half of lot 5, concession VI, is held by Stoklosar Marble Quarries.

Stone for Roofing Granules

From 1940 to 1956, Building Products Limited operated several granite and rhyolite quarries in the Madoc area for the production of roofing granules. The principal quarries are shown in Table 10.

Table 10	PRINCIPAL QUARRIES FOR STONE FOR ROOFING GRANULES IN THE MADOC AREA, HASTINGS COUNTY.
LOCATION	PRODUCT
MADOC TOWNSHIP	
Concession III, Lot 8	Red granite
Concession V, Lot 11	Black rhyolite
Concession VIII, Lot 8	Pink rhyolite
Concession X, Lot 9	White rhyolite
HUNTINGDON TOWNSHIP	
Concession XIV, Lot 18	Red granite

Talc

ELDORADO TALC MINE (14)

The Eldorado talc mine is on the east bank of the Moira River, in lot 20, concession V, Madoc township, 1¼ miles northwest of Eldorado village. The mine was worked from 1911 to 1920 but has been idle since. In 1911, The Canadian Talc and Silica Company sank a 75-foot inclined shaft and built a mill. The company was re-organized in 1914 as Eldorite Limited and operated until 1916. In 1919, the Eldorado Mining and Milling Company took over the property and operated it until November 1920.

Wilson (1926, p.75,76) describes the workings as follows:

> Except for a few small prospect pits (Nos. 1 to 5), none of which is more than 10 feet deep, all the development work in the Eldorado property has been performed from two shafts about 210 feet apart; No. 1 inclined 75 degrees to the west and No. 2 inclined 75 degrees to the northwest. These shafts are connected at a depth of 65 feet by a succession of large openings up to 60 feet in diameter formed in mining the talc-dolomite schist. At 200 feet, the shafts are connected by a drift which has been extended 30 feet to the southwest of shaft No. 1 and 160 feet to the northeast of shaft No. 2.

Eleven short crosscuts were driven off this drift.

Talc occurs in a tremolite-dolomite schist that also carries quartz. The talc content is reported by Wilson (1926, p.73) to average about 20 percent. The width of the talc-bearing schist is approximately 100 feet. The talc schist zone extends northwest from shaft No. 1 with a dip of 40° to 60° northeast. At the shaft the zone appears to fold around to the southwest in an anticlinal structure. The rocks are highly folded and crenulated. There is a strong mineral lineation in the shafts pitching northeast at about 40°. Dikes of granite cut the marble in lot 21, concession IV.

The following is taken from Spence (1940, p.73):

> A short distance to the east of the main deposit, a 20-foot band of crumpled, dark grey, graphitic talc schist outcrops, and in 1919 a separate small mill unit was installed to grind this material for the rubber and foundry trades.

LOT 15, CONCESSION XI

An occurrence of talc-dolomite schist is reported by Wilson (1926, p.77) in lot 15, concession XI, Madoc township. The talc schist zone, 5 feet wide, is exposed in a pit measuring 10 feet long, 10 feet wide, and 5 feet deep. The talc deposit is in basic volcanics.

PRICE MINE (40)

In 1941 and 1942, the Trent Mining Syndicate Limited sunk two shafts on the northeast quarter of lot 15, concession XIV, Huntingdon township, known as the Price mine. The principal shaft is 90 feet deep with levels at 40 and 80 feet. The dolomite strikes N10°E and dips 55°W. On the 40-foot level, a drift goes 140 feet north along a narrow sericite-talc schist zone, is 2 to 5 feet wide, and cuts dolomite. The footwall is a green sericite carbonate schist; the hanging-wall is black amphibolite and graphitic schist. An 85-foot crosscut running west from the shaft on the 40-foot level exposes dark-coloured graphitic schist and amphibolite. On the 80-foot level, 108 feet of drifting is reported.

A pit 15 feet long, 12 feet wide, and 4 feet deep was put down in fine-grained buff to white marble 150 feet northwest of the shaft. Pits east of the shaft expose foliated sericite carbonate schist, which is green in colour due to chlorite and serpentine.

INTERNATIONAL PULP COMPANY OCCURRENCE (30)

Three shafts were put down in lot 16, concession XIV, Huntingdon township, between 1917 and 1919 by the International Pulp Company of Gouverneur, N.Y., U.S.A. (Wilson 1926, p.89-90).

Shaft No. 1, a few hundred feet south of the farm buildings, is 50 feet deep with 130 feet of drifting and crosscutting. Rock on the dump consists of mica schist, dolomite, some talc schist, and massive talc.

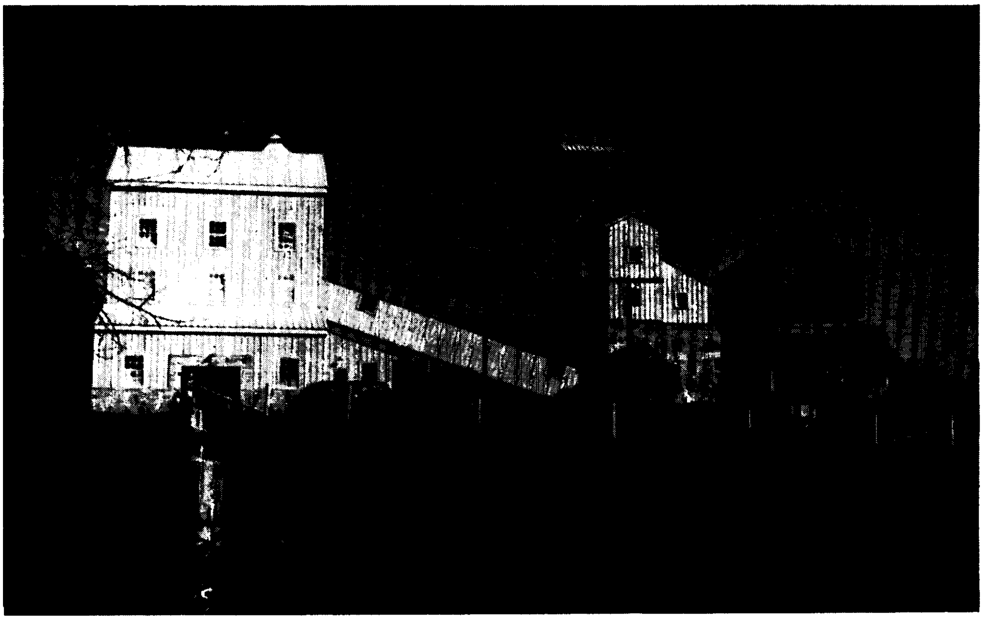
Shaft No. 2, near the west boundary of the lot, is reported to be 60 feet deep with 110 feet of drifting. The dump consists of talc-tremolite schist and dolomite.

Shaft No. 3, 70 feet northeast of shaft No. 1, is 25 feet deep, and the excavated material is grey to white talc schist.

CANADA TALC INDUSTRIES LIMITED

Canada Talc Industries Limited operates the Henderson (9) and Conley (8) talc mines at Madoc. Talc was discovered at Madoc in the 1880s, and in 1896 the first talc mine, the Henderson mine, was opened. It was operated by the A.H. Robbins Company of New York until 1904, and then by Cross and Wellington of Madoc, under contract with the Robbins Company, until 1918. In 1918 the property was purchased by the George H. Gillespie Company of Madoc. Henderson Mines Limited, a subsidiary of the George H. Gillespie Company, operated the mine until 1937, when it was taken over by Canada Talc Limited.

The Conley mine is on the northeastward extension of the Henderson orebody. It was discovered in 1911 by Henderson and Pitt, and development work was done on the property by the Hungerford Syndicate in 1912 and 1913. In 1915 the Anglo-American Talc Corporation took over the property and worked it until 1921, when Asbestos Pulp Company took over the operation. The company was re-organized as Canada Talc Company in 1929, and, on merger of the Henderson and Conley properties in 1937, the company was again re-organized as Canada Talc Limited. The company operated the Conley mine until 1951, when Canada Talc Limited was purchased by Canada Talc



ODM8109

Photo 7—Conley No. 3 shaft and mill, Canada Talc Industries.

ODM8110

Photo 8—Henderson No. 4 shaft, from open pit.

Industries Limited. Since 1937 Canada Talc Limited and Canada Talc Industries Limited have operated both the Henderson and Conley mines.

Current production of talc by Canada Talc Industries amounts to about 8,000 tons per year. A substantial tonnage of white terrazzo chips is also produced. Total talc production from the Madoc deposits up to the end of 1965 amounted to 722,145 tons valued at $8,181,173.

Henderson Mine (9)

The talc deposit was first opened up on the Henderson property, lot 14, concession XIV, Huntingdon township, by open pit methods, and open pit mining continued until 1908. In 1908 a No. 1 shaft was sunk at the west end of the orebody. By 1911 No. 1 shaft was down to 185 feet with levels at 75, 120, and 185 feet. Mining was by square-set timbering on the upper levels, and by shrinkage stoping on the lower level. In 1912 a second shaft was put down, east of No. 1 shaft, toward the east end of the orebody, and in 1913 No. 1 shaft was abandoned owing to caving. A fourth level was established at 231 feet and mining continued. However, both No. 1 and No. 2 shafts were in the orebody, and as mining continued No. 2 shaft was also in danger of caving in the bad ground of the talc orebody. In 1920 No. 3 shaft was put down in the country rock between shafts No. 1 and No. 2, well to the north of the orebody, and this shaft, now known as No. 4 shaft of the combined Conley-Henderson property, is still in use as an escape-way. No. 1 and No. 2 shafts were lost when the ground caved, and the workings are now caved from the surface open pit to the fifth level (303 feet). By 1928 work was carried down to the sixth level (371 feet), and by 1933 drives had been carried out to the end of the ore both east and west of the shaft. In 1938 the shaft was deepened to 541 feet, and a level was cut at 443 feet. This level, the seventh, was developed in 1943, and work was carried out on this level for many years by Canada Talc Industries. At the present time (1966), a new and deeper level is being developed at the Henderson mine from a crosscut from the 3rd level (542 feet) at the Conley mine.

Conley Mine (8)

The Conley mine, situated on the west half of lot 15, concession XIV, Huntingdon township, was originally developed on the northeastward extension of the Henderson orebody. It did not outcrop, but was discovered by test pitting. In 1916 No. 1 shaft was sunk about 100 feet east of the Henderson line in the wallrock south of the ore zone. Levels were established at 65 and 130 feet. In 1919 No. 2 shaft was started 300 feet northeast of the main shaft. This shaft was carried to a depth of 168 feet where it was found that the ore had pinched out with depth in this northeast shaft. Subsequent work was carried out entirely from No. 1 shaft. By 1929 the orebody was traced to the sixth level at a depth of 390 feet. The vein was reported to average 15 feet wide, with a maximum width of 66 feet. The ore length on the first level was about 400 feet eastward from the Henderson line, but on the eighth level the

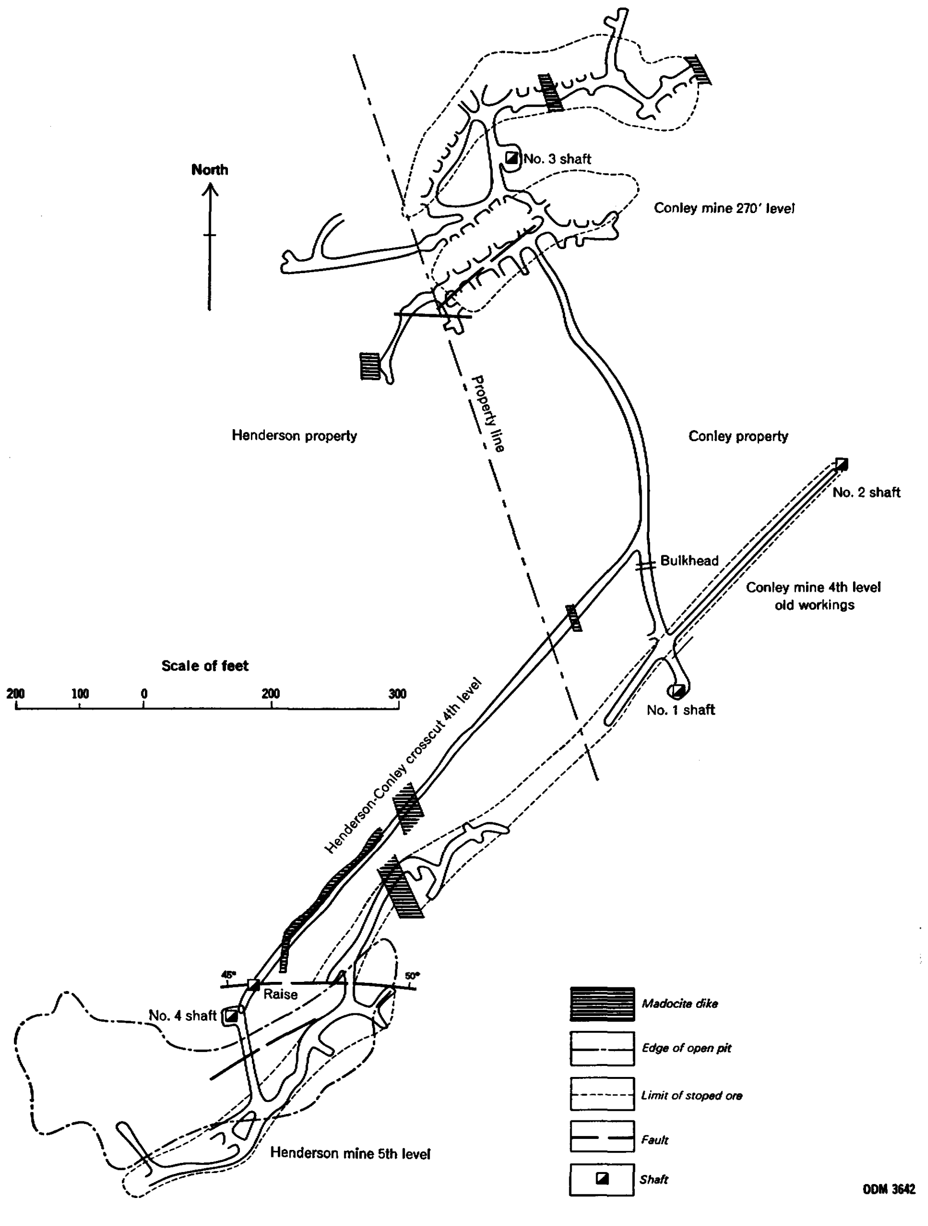


Figure 3—Composite plan of Henderson and Conley mines, Canada Talc Industries Limited.

ore extended only 150 feet east of the Henderson line. The seventh level was opened in 1933 at a depth of 437 feet. Subsequently, in 1934, the eighth level was opened at 470 feet by means of a winze in the ore from the seventh level at a point 20 feet east of the shaft. In 1934 a crosscut driven north on the fourth level intersected a new orebody, which was discovered by diamond-drilling, 650 feet north of the old No. 1 shaft. Some stoping was carried out.

In 1935 No. 3 shaft was sunk near the new orebody. The first level for No. 3 shaft was established at 270 feet. This level was connected to the workings at No. 1 shaft by a long crosscut that joined these workings at the fourth level.

In 1938, after the merger of the Conley and Henderson mines, the workings of these mines were joined by a crosscut from the 4th level of No. 1 shaft in the Conley mine. This reached the Henderson workings between the fourth and fifth levels, and is reached by a raise from the fifth level. In 1942 the Conley No. 3 shaft was deepened to 383 feet, and a second level was established at 370 feet. In 1964 the Conley No. 3 shaft was deepened to 611 feet. The third level was established at 542 feet, and a loading pocket was established at 584 feet. From the Conley third level at No. 3 shaft, a crosscut was run to intersect the Henderson orebody below the Henderson seventh level, and development on this new level was begun on the Henderson side. At the present time (1966), the main production of marble and talc is coming from the third level Conley mine and adjacent Henderson workings. The old Conley workings on No. 1 and No. 2 shafts are now sealed off.

General Geology

The talc orebodies occurred in Grenville crystalline dolomite of Precambrian age. The Grenville formations in the vicinity of the mine consist of tremolitic crystalline dolomite and dolomitic limestone, interbanded quartzite and crystalline dolomite, quartzite, and talc mica schist. The regional structure appears to be anticlinal (Sandomirsky 1954) with the anticline pitching steeply to the southwest. The west limb strikes N10°W to N20°W and dips vertically. The south limb strikes N70°E and dips vertically to overturned 70° to the north. Strong dragfolding and crenulation can be observed on both limbs of the fold. The crest of the fold appears to be just west of the open pit on the Henderson property.

The talc occurs as tabular hydrothermal replacement bodies in crystalline dolomite. The Grenville metasediments are cut by basic dikes, which were named "madocite" by M.E. Wilson (1926). These dark-coloured dikes consist predominantly of brown tourmaline, amber mica, tremolite, and plagioclase, and minor amounts of pyrite, arsenopyrite, quartz, actinolite, titanite, apatite, and zircon. In places the madocite dikes appear to have chilled margins against the dolomite. These dikes are evidently pre-faulting because some of them are displaced by faulting, and they are folded in the general folding of the Grenville metasediments. The Grenville metasediments are also intruded by the Moira granite, a pink albitic granite, which outcrops southeast of No. 1 shaft on the Conley property. Wilson (1926) believes that the Moira granite was the source of the madocite dikes and the probable source of the hydrothermal solutions that formed the talc replacement bodies.

The orebodies lie within the crystalline dolomite formation, which consists of well-banded grey and white crystalline dolomite and tremolitic dolomite. Tremolite occurs in needles and blades distributed through the rock and in

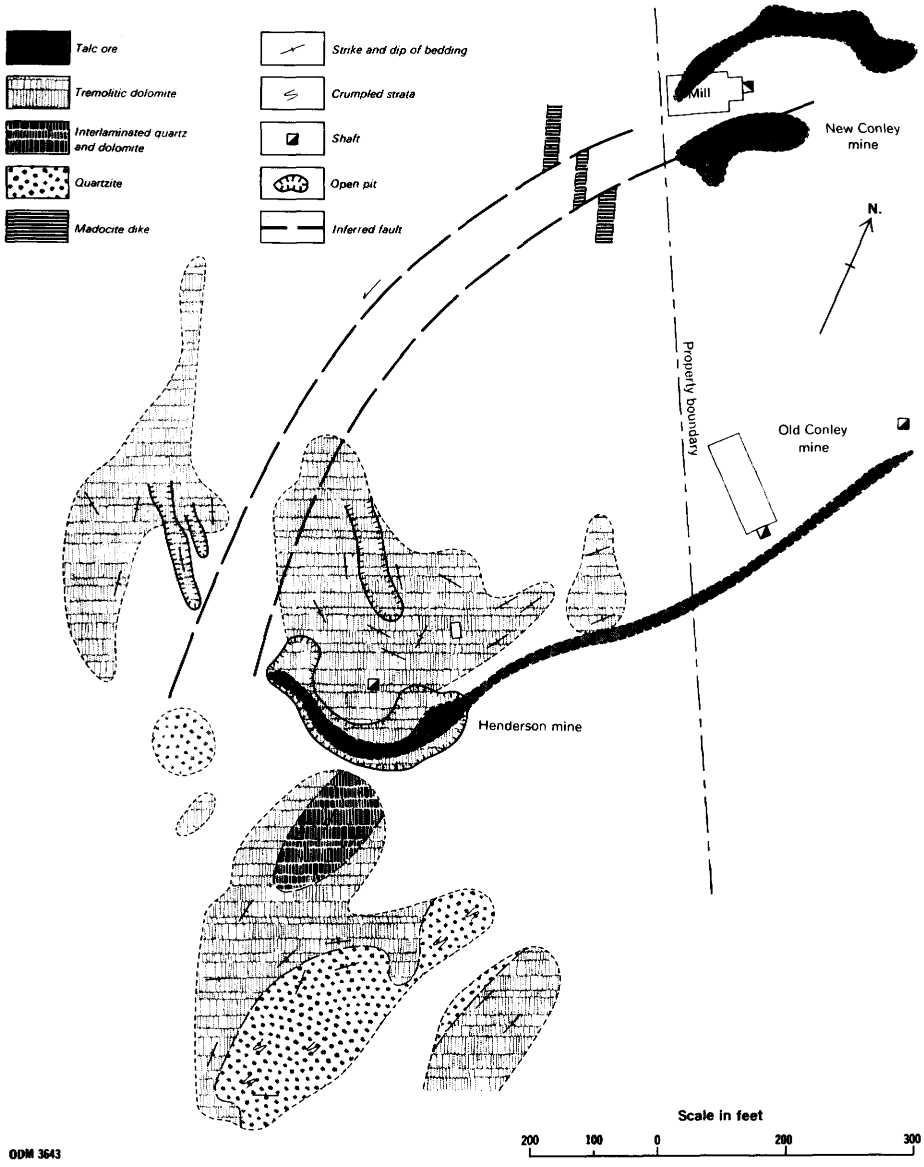


Figure 4–General geology of Canada Talc Industries property.

clots, knots, and bands in irregular segregations in the dolomite. The banding is from 2 to 6 inches wide, and is moderately persistent. Some of the tremolitic dolomite also contains talc and white mica. North of the ore zone in the Henderson mine there is a band of mottled brecciated dolomite consisting of fine-grained dark-grey dolomite in a matrix of white tremolitic dolomite. This appears to be incipient hydrothermal alteration of brecciated dolomite to tremolite, and probably was the initial step in the dolomite-tremolite-talc hydrothermal alteration. Other lithologic types noted in the mine workings include dense fine-grained apple-green steatite, plums of good quality, pure-white foliated talc, and zones of rather hard mica-talc schist. Pyrite crystals are found scattered through the various rock types.

Bands of grey-white fine-grained quartzite are in the mine workings. On the surface south of the main pit, outcrops of well-bedded quartzite in 1-inch to 3-inch beds are exposed. The beds of quartzite are strongly crumpled and folded, and in places they are brecciated. Interlaminated tremolitic crystalline dolomite and quartzite occurred in narrow alternating bands, which weather on outcrop to give a distinctive ribbed appearance. Some quartz stringers or mobilized quartzite cut the dolomite.

Remnants of Paleozoic conglomerate rest with unconformity on the Precambrian metasediments.

Structure

The general structure of the area is not well-known owing to lack of outcrop, but, as previously mentioned, the major structure appears to be anticlinal with the Henderson and old Conley orebodies occurring on the south limb of an anticline pitching to the southwest. There is strong dragfolding and crenulation on both arms of the fold. The detailed structure within the mine workings is not well-known because the workings were not mapped during development, and most of them are now inaccessible.

There is a considerable amount of faulting, although the fault pattern has not been worked out. Wilson (1926) notes that, on the fourth level of the Henderson mine, the talc orebody is cut by an overthrust fault about 50 feet west of the No. 2 shaft. This fault strikes roughly east-west and dips about 45° to 50° north. On the fourth level, there is an apparent horizontal displacement of about 50 feet. This displacement is reported to fade out toward the surface into an open fold. This fault zone also appears on the fifth and sixth levels of the Henderson mine. What may be a subsidiary fault, striking somewhat south of west and dipping vertically, can be seen just north of the ore zone on the seventh level of the Henderson mine. Zones of faulting are also seen in the Henderson-Conley crosscut and in the Conley workings at No. 3 shaft, but no data on these faults are available.

Orebodies

The Henderson orebody consisted of a tabular sheet of pure-white foliated talc, with some impurities of calcite, dolomite, pyrite, and tremolite. This talc body lies on the south limb of the major anticline near its crest. The west end of the orebody appears to occupy the crest of the fold, and at the west end of the orebody the ore pitches to the southwest. The ore sheet appeared to have its maximum extent on the fifth level where the workings extended east-west for over 700 feet.

Wilson (1926) describes the orebody as resembling an interrogation mark lying with its top to the west and open to the north. The orebody pitches to the southwest at its west end, but dips north toward its east end. Hence the south limb of the anticline is slightly overturned toward the north. The orebody extends downward to the new Conley third level, a depth of 540 feet. The width ranges from a few feet to 65 feet. On the seventh level the ore zone consists of a folded band of steatite and talc schist containing some plums of white foliated talc. The large body of pure foliated talc mined on the upper levels has apparently changed in character on the lower levels, and it is represented by more tremolitic dolomitic material. Toward the east end of the orebody, strong folding, faulting, and intrusion of madocite dikes complicate the picture.

The south or original orebody on the Conley property was the eastward extension of the Henderson orebody, and it consisted of foliated white talc with some impurities of calcite, tremolite, and dolomite. Laterally it had a maximum length on the third (190-foot) level of about 400 feet east from the Henderson line. The ore pitched to the west and only 150 feet of ore extended eastward from the Henderson line on the bottom (eighth) level at 470 feet. The width of the ore zone averaged 15 feet with a maximum of 60 feet. Between the fourth and fifth levels, a wide madocite dike cuts through the orebody, making mining of this stope area difficult. The talc ore sheet is closely folded and some variation in width of the ore zone is undoubtedly due to flowage of the soft talc between more competent bands of tremolitic dolomite. Along the margins and extremities of the ore zone, the foliated talc schist gives way to a fine-grained massive grey to apple-green steatite rock containing patches of foliated talc.

The north workings of the Conley mine, centred about No. 3 shaft, have yielded most of the production from the property for the past 10 years. This ore consists of a talcose tremolitic dolomite, often containing less than 30 percent talc. The dolomite in this area is highly contorted and frequently discoloured red, grey, or black. Stoping has been carried out both north and south of the shaft, and the ore appears to consist of irregular talc-tremolite replacement in crystalline white dolomite. Development had been carried out largely on the first level at 270 feet, but recent work has been concentrated on the third level at 542 feet.

Origin of the Talc. The best explanation as to the origin of these talc deposits is that of Wilson (1926) who regarded them as hydrothermal replacement deposits. Conformable sheet-like bodies of talc were developed from the Grenville dolomite by the introduction of hydrothermal solutions that probably originated from the neighbouring Moira granite. These hot-water silica-bearing solutions ascended fractures and faults on the south limb of the anticline and altered the dolomite first to tremolite and then to talc. Evidence of this dolomite-tremolite-talc transition can be seen in thin sections of the rocks from the deposit. Subsequent folding and faulting is responsible for the crenulation, thickening, and offsetting of the talc ore sheets. The madocite dikes and the hydrothermal solutions probably had a common origin in the Moira granite magma. The talc does not appear to be particularly associated genetically or spatially with the dikes themselves.

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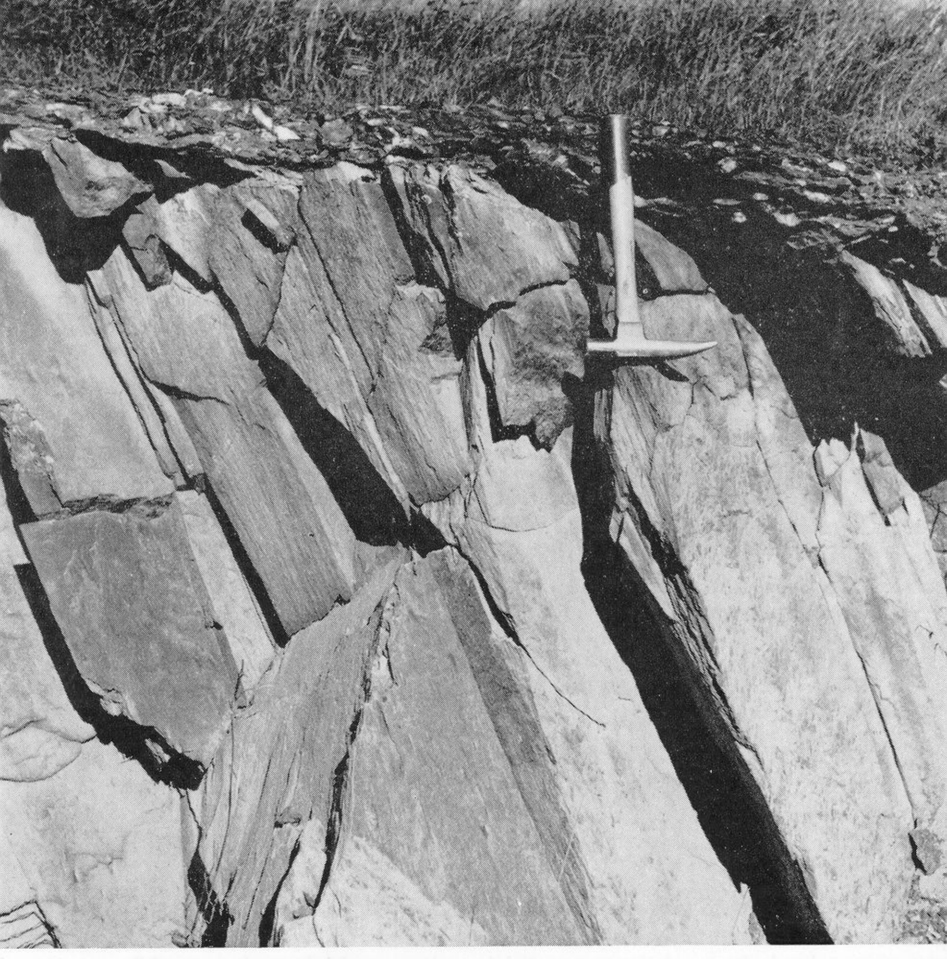
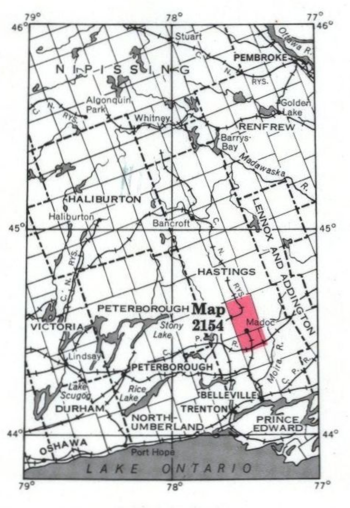


Map 2154
Madoc Township



Scale 1 inch to 50 miles

N.T.S. reference 31C/5, 31C/6, 31C/11, 31C/12

LEGEND

CENOZOIC*

PLEISTOCENE

Till, sand, gravel, clay, marl.

UNCONFORMITY

PALEOZOIC

ORDOVICIAN

11 *Black River limestone.*
11a *Basal conglomerate.*

UNCONFORMITY

PRECAMBRIAN**

PLUTONIC ROCKS

10 *Diabase.*

9 *Granite and syenite undifferentiated.*
9a *Granite.*
9b *Syenite.*

8 *Grey granodiorite.*

7 *Diorite and gabbro undifferentiated.*
7a *Gabbro.*

INTRUSIVE CONTACT

METASEDIMENTS AND METAVOLCANICS

METASEDIMENTS

6 *Quartzite and quartzo-feldspathic rocks.*
6a *Felsite.*

5 *Pelitic rocks.*
5a *Argillite, greywacke.*
5b *Paragneiss.*
5c *Schist.*
5d *Conglomerate.*

4 *Marble undifferentiated.*
4a *Dolomitic marble.*
4b *Calcitic marble.*
4c *Lime silicate rock.*
4d *Limestone conglomerate.*

3 *Para-amphibolite.*
3a *Garnet amphibolite.*

METAVOLCANICS

Basic Metavolcanics

2 *Undifferentiated.*
2a *Amphibolite, amphibolite schist.*
2b *Massive andesite.*
2c *Agglomerate.*
2d *Tuff.*
2e *Pillow lava.*

Acid Metavolcanics

1 *Rhyolite.*
1a *Rhyolite tuff.*
1b *Felsite.*
1c *Felsite breccia.*
1d *Rhyolite breccia.*

Au	*Gold.*
ba	*Barite.*
Cu	*Copper.*
Fe	*Iron.*
fl	*Fluorite.*
mb	*Marble.*
Pb	*Lead.*
py	*Pyrite.*
sl	*Slate.*
st	*Stone.*
talc	*Talc.*

**Unconsolidated deposits. Cenozoic deposits are represented by the lighter coloured and uncoloured parts of the map.*

***Bedrock geology. Outcrops and inferred extensions of each rock map unit are shown respectively in deep and light tones of the same colour. Where in places a formation is too narrow to show colour and must be represented in black, a short black bar appears in the appropriate block.*

SYMBOLS

- *Small bedrock outcrop.*
- *Area of bedrock outcrop.*
- *Bedding, top unknown; (inclined, vertical).*
- *Lava flow; top (arrow) from pillows shape and packing.*
- *Schistosity; (horizontal, inclined, vertical).*
- *Gneissosity, (horizontal, inclined, vertical).*
- *Lineation with plunge.*
- *Geological boundary, observed.*
- *Geological boundary, position interpreted.*
- *Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.*
- *Drag folds with plunge.*
- *Muskeg or swamp.*
- *Motor road. Provincial highway number encircled where applicable.*
- *Other road.*
- *Trail, portage, winter road.*
- *Building.*
- *Built up area.*
- *Shaft; depth in feet.*
- *Township boundary, approximate position only.*
- *Location of mining property and occurrence. See list of mines, properties and occurrences.*

LIST OF MINES, PROPERTIES AND OCCURRENCES

1. *Bailey mine (Mrs. S. D. Vale).*
2. *Bannockburn mine.*
3. *Bannockburn pyrite mine.*
4. *Blakely fluorspar mine (Stoklosar Marble Quarries).*
5. *Blakely pyrite mine (Earl Sager).*
6. *Brennan mine.*
7. *Cameron mine.*
8. *Canada Talc Industries Ltd.—Conley mine.*
9. *Canada Talc Industries Ltd.—Henderson mine.*
10. *Canadian Sulphur Ore Company (Earl Sager).*
11. *Cook mine.*
12. *Dufferin mine (Bruce C. Robson).*
13. *Eldorado copper mine (Coe iron mine).*
14. *Eldorado talc mine.*
15. *Forty-Nine Acre mine (Bruce C. Robson).*
16. *Grenville Aggregate Specialities Ltd.*
17. *Herrington South mine.*
18. *Hill occurrence.*
19. *Hollandia mine.*

Huntingdon Fluorspar Mines Ltd.

20. *Coe mine.*
21. *Howard (Hill) mine.*
22. *Johnston mine.*
23. *Kilpatrick (Detomac) mine.*
24. *Lee Senior mine.*
25. *McIlroy mine.*
26. *Noyes mine.*
27. *Perry mine.*
28. *Perry Lake mine.*
29. *Rogers mine.*
30. *International Pulp Company occurrence.*
31. *Jones mine.*
32. *Keene mine.*
33. *Lee Junior mine (Philip Morris).*
34. *McBeath occurrence.*
35. *Miller mine.*
36. *Minnesota Minerals Ltd.*
37. *Palmateer mine.*
38. *Plain occurrence.*
39. *Ponton mine.*
40. *Price mine.*
41. *Reynolds mine (Mrs. A. Symon).*
42. *Reynolds North occurrence.*
43. *Reynolds South mine.*
44. *Richardson mine.*
45. *Rooks mine.*
46. *Sager, Earl.*
47. *Sexsmith mine.*
48. *Seymour mine (Mrs. Lura E. Baalim).*
49. *Sophia (Diamond) mine (Earl Sager).*
50. *St. Charles mine.*
51. *Stewart occurrence.*
52. *Stoklosar Marble Quarries.*
53. *Wallbridge iron mine.*
54. *Wallbridge fluorspar mine.*
55. *Wright occurrence (Mrs. A. Symon).*

ONTARIO
DEPARTMENT OF MINES
HON. ALLAN F. LAWRENCE, *Minister of Mines*
D. P. Douglass, *Deputy Minister* J. E. Thomson, *Director, Geological Branch*

Map 2154

MADOC TOWNSHIP
AND PART OF HUNTINGDON TOWNSHIP

HASTINGS COUNTY

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1 2 Miles
Metres 1000 0 1 2 3 Kilometres
Feet 1000 0 5,000 10,000 Feet

SOURCES OF INFORMATION

Geology by D. F. Hewitt, 1964, E. C. Appleyard and G. R. Guillet, 1966.
Geology is not tied to surveyed lines.

Additional information from maps by M. E. Wilson, 1939, A. K. Saha, 1957, and I. Bain, 1960.

Geological Survey of Canada aeromagnetic maps 13G, 14G, 95G.

Preliminary maps P. 368 and P. 369 Madoc Township, scale 1 inch to ¼ mile, issued 1966.

Cartography by R. Glover, D. W. Robeson, Ontario Department of Mines, 1967.

Base map derived from maps of the Forest Resources Inventory, Ontario Department of Lands and Forests, and uncontrolled mosaics.

Magnetic declination in the area was 10°W., 1965.

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