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PRELIMINARY REPORT, GEOLOGY OF SAINT-PATRICE LAKE AND PORTAGE-DU-FORT AREAS

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MINES BRANCH

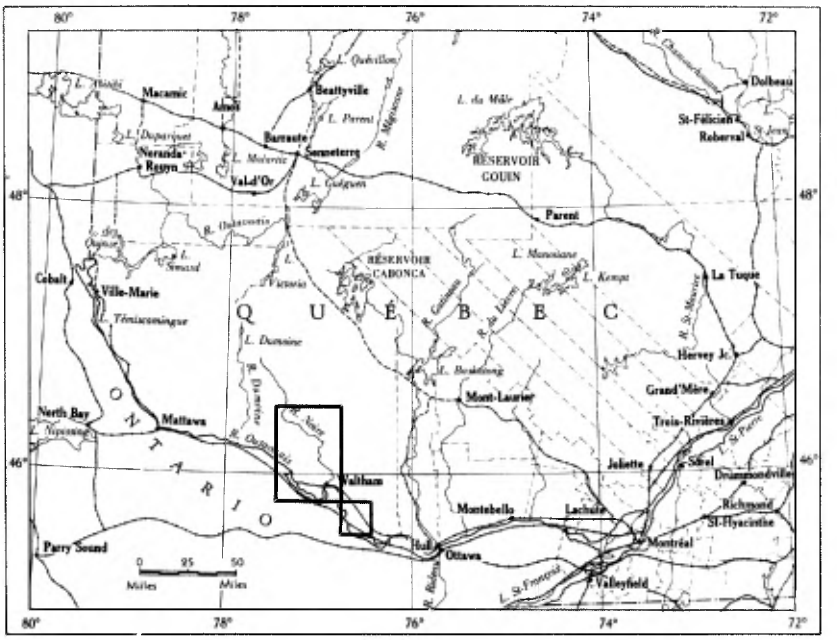
GEOLOGICAL EXPLORATION SERVICE

Geology of SAINT-PATRICE LAKE and PORTAGE-DU-FORT AREAS

PRELIMINARY REPORT

by

Michael Katz



QUÉBEC
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SAINT-PATRICE LAKE AREA

Pontiac County, Quebec

INTRODUCTION

The Saint-Patrice map-area lies between longitudes 76°45' and 77°30', and Outaouais (Ottawa) river and 46°30'; it thus makes up an area of about 1,600 square miles. The area, which is located in Pontiac county, contains all of the townships of Waltham, Île-des-Allumettes, Chichester, Sheen, Bryson, Auray, Esher, Brie, Croisille, Dulhut, Anjou, Forant, La Tourette, and parts of Mansfield, Pontefract, Gillies, Poitou, Flandre, Malakoff, Dontenwill, Provence, Marche, Rochefort and Gascogne. Several towns and villages border Outaouais river in this area. The most important town is Chapeau on Allumettes island. Other villages and settlements include Davidson, Waltham, Chichester, Sheenboro, Fort William and St. Josephs.

Champlain and his party explored this part of the Outaouais river in 1615 and the first settlers arrived in the early 1800's. The area lies about 100 miles northwest of Ottawa-Hull and the southern portion is accessible by means of Highway 8 and its secondary roads, and by train, as the C.P.R. has a branch line to Waltham. Logging roads, maintained by the many active lumbering companies, make most of the area to the north accessible by car and jeep. Access to Bryson lake in the extreme northeast was facilitated by float plane.

The area can be conveniently divided into two topographical divisions; the lowlands and highlands. The lowlands occupy the valley of Outaouais river and include Allumettes island, the lowlands to the northwest around Sheenboro and those to

the northeast near Davidson. The highland area covers most of the map-sheet lying north of the Outaouais River valley. Separating these two divisions is a conspicuous escarpment, which is thought to represent a fault bounding the north side of the Ottawa-Bonnechère graben structure (Kay, 1942). The greatest change in elevation is found along this escarpment, and at Dubé mountain the relief is 750 feet from the lowlands to the top of the mountain.

The valley of Outaouais river in this area is made up of deep and wide basins (Deep river, Allumettes lake and Coulonge lake), connected by restricted parts which are broken up by falls and swift rapids (Culbute rapids, Allumettes rapids and Paquette rapids). It is a post-glacial river system made up of bits and pieces of pre-gracial drainage patterns controlled by the graben structure, and post-glacial channels. Outaouais river flows between shield rocks northwest of Fort William and continues its flow southeast between large patches of Paleozoic sediments at Allumettes island. An abandoned channel of this river is found north of Fort William at Downey Bay and consists of a series of lakes and streams (Manny lake, McDonald lake) aligned in the southeast direction parallel to the escarpment.

The highland is typical shield country with rolling hills, numerous lakes and deranged drainage systems. This upland surface could be referred to as an ice-scoured plain with striated, grooved and polished surfaces, rock basins and rounded knobs interspersed with patches of glacial drift. The lithology and structure have controlled the erosion and in areas of massive rocks a local mammillated surface is developed. Where the rocks are layered and foliated, the glacial erosion has enhanced this feature, and, where the rocks are broken up by fault and joint patterns, the glaciation has preferentially plucked out the rocks along these lineaments to produce aligned and patterned drainage systems.

Less competent friable rocks such as marbles are also preferentially eroded in many places and underlie many river valleys. The most notable is the valley of Coulonge river from Bryson lake to below the Petits Devil rapids.

General Geology

The Precambrian rocks of the Grenville Group consist of quartzofeldspathic gneisses, amphibolites, charnockitic biotite and hornblende gneisses, garnet gneisses, and a metasedimentary formation with a characteristic marble member. The quartzofeldspathic gneisses occur associated with all the gneisses in the area and make up a large region around Lynch lake, where these rocks form the core of an antiform structure plunging southeast. The biotite gneisses are the most common rock unit and, along with similar hornblende gneisses, make up most of the west and north parts of the map-sheet. In many places these gneisses contain essential amounts of hypersthene and thus show definite charnockitic affinities. The garnet gneisses are found in the biotite and hornblende gneiss terrains and serve as marker beds to outline the structure. These gneisses are well exposed in the Schyan River area. The Marble Formation is found mainly in the east part of the region and it makes up a large southeast-plunging synform structure.

A group of Precambrian rocks apparently intrusive into the Grenville Group, but of pre-tectonic age, are of gabbroic, pyroxenitic or volcanic (basaltic) composition. These rocks only make up an insignificant portion of the rocks exposed in the area but merit attention. The largest body of metagabbro is found east of Shennboro and metapyroxenites are well exposed on Highway 8, west of Waltham. An interesting pillow, metavolcanic sequence more than 50 feet thick, interlayered with normal gneiss, was observed on the north shore of Outaouais river, about 2 miles west of Chalk River, Ontario.

The post-tectonic intrusions consist of small massive granite and syenite bodies, locally found along the escarpment (e.g. Davidson and Devonshire Park) and in cores of folds (Gillies lake, McGillivray lake). Pegmatites and aplites are found intruding all the gneisses in the area and the aplite dikes are especially well developed in the area surrounding Saint-Patrice lake. East-west-trending diabase dikes and associated gabbroic bodies are found throughout the region.

The exposures of Paleozoic sedimentary rocks of Ordovician age are mainly confined to Allumettes and Morrison islands in Outaouais river. An unconformity between the Precambrian gneisses and the overlying Oxford Formation Dolomites is seen on Cotnam island, just south of Morrison island on the Ontario side of the river. These dolomites are also seen west of Chapeau and on the west side of Allumettes island. The Rockcliff Formation, consisting of shales and sandstones, overlies the Oxford Formation, although this contact is not observed

Table of Lithostratigraphic Units

Pleistocene			Till Moraine Deposits Sands Varved Clays
Paleozoic Ordovician		Black River	Ottawa Formation
		Chazy	Rockcliff Formation
		Beekmantown	Oxford Formation
PRECAMBRIAN	Post-Grenville Group	Post-tectonic	Diabase, Gabbro
			Aplite, Pegmatite
			Granite Syenite
		Pre-tectonic	Metagabbro Metapyroxenite Metavolcanic
	Grenville Group		Marble Formation: Sillimanite-garnet Gneiss
			Marble Formation: Hornblende Quartzofeldspathic Gneiss
			Marble Formation: Quartzite
			Marble Formation: Biotite Schist
			Marble Formation: Marble
			Garnet Gneiss
			Hornblende Gneiss
			Biotite Gneiss
			Amphibolite
			Quartzofeldspathic Gneiss

in the area. A 50-foot section is exposed at Morrison rapids and other outcrops of the Rockcliff Formation are found along the shores of Morrison and Allumettes islands. The contact between the Rockcliff Formation and the overlying limestones of the Ottawa Formation is observed on the south side of Allumettes island near the bridge. Good sections of the limestones are found on Morrison island, Allumettes island, and at Devonshire Park and Pointe Sèche on the north shore of Outaouais river.

Petrography

Grenville Group

Quartzofeldspathic Gneiss

These leucocratic, fine-medium grained, equigranular quartz-feldspar-rich rocks weather grayish-orange and are light red to pink on the fresh surface. In many places they are regularly interlayered with dark amphibolites and the alternating bands are several inches thick. The layers may be of variable thickness, and may also be undulose and discontinuous.

Under the microscope, the quartzofeldspathic gneisses consist of about 35% quartz and 60% microcline (microperthite), with or without associated oligoclase. Biotite, in places, altered to chlorite, and hornblende are the chief ferromagnesian minerals but never exceed 5% by volume. Sporadic amounts of small garnets are present in many places. Accessory minerals are magnetite-ilmenite, apatite, zircon and, in some instances, allanite.

With an increase in the ferromagnesian constituents, these quartzofeldspathic gneisses pass into biotite, hornblende and garnet gneisses.

Amphibolite

The amphibolites are dark greenish-gray to black, medium-grained, equigranular rocks which, in many places, weather a rusty colour. They may be massive, layered or foliated and some varieties display a vaguely discernible sub-ophitic texture.

The microscope reveals the rock to be composed of about equal amounts of dark olive-green hornblende and plagioclase (andesine-labradorite, in places antiperthitic). Both clinopyroxenes and orthopyroxenes have been noted as either relicts or more rarely in amounts exceeding the hornblende content, in which case the rock could be termed a pyriclasite.

Much of the secondary hornblende after pyroxene displays a myrmekite-like nature and is finely intergrown with plagioclase. Biotite, garnet and scapolite may also be present in amounts exceeding 5% and corona textures are common in the garnet-bearing varieties. Many of these rocks are masked by alteration, and chlorite, serpentine and carbonate are observed replacing the hornblende and plagioclase. Accessory minerals include ilmenite-magnetite, apatite, zircon, sphene, pyrite and, rarely, allanite.

Biotite and Hornblende Gneiss (Charnockitic)

Many of these fine-grained, equigranular rocks weather pale orange to yellowish gray; the fresh surface is grayish blue. The biotite gneisses are conspicuously laminated or finely interlayered with dark amphibolites and light quartzofeldspathic zones. Commonly they are veined, are injected by much pegmatitic material and display porphyroblastic textures. The hornblende gneisses are not usually laminated but are interlayered with amphibolites.

Red-brown strongly pleochroic biotite and dark green hornblende or both in amounts exceeding 10% by volume are found in a matrix of quartz and oligoclase with or without microcline (microperthite). When hornblende is in amounts exceeding biotite, the rock becomes a hornblende gneiss. All gradations between the two end members are noted. Depending on the composition, the biotite gneisses can contain essential amounts of garnet and sillimanite. Pyroxene-rich varieties contain both clinopyroxenes and orthopyroxenes and show definite charnockitic characteristics. Alteration products of the constituents are chlorite, carbonate and sericite. Accessories are ilmenite-magnetite (in essential amounts in places), sphene (much of it as coronas around the ilmenite-magnetite), apatite, allanite and pyrite, and,in the garnetiferous varieties,rutile.

Garnet Gneiss

The garnet gneisses are medium-grained, bluish-white weathering rocks which appear pale pink on the fresh surface and contain conspicuous crystals of very dark red garnet. Dark garnetiferous amphibolites are commonly associated with these gneisses.

Quartz makes up 30% by volume of this rock associated with microcline (microperthite) and oligoclase, which usually amounts to about 60% of the rock. Pale pink garnet is in amounts up to 20% and red-brown biotite is also usually present. Some sillimanite, hornblende or pyroxene minerals are present but do not exceed 5% by volume. Accessories are ilmenite-magnetite, sphene, zircon, allanite, apatite and rutile.

The affinity of the biotite, hornblende and garnet gneisses with higher grade granulites and charnockites is noted by the presence of elongated plates of quartz, the microperthitic nature of the potash feldspars, the appearance of hypersthene as a stable phase or as a relict, and the myrmekitic nature of the biotite and hornblende secondary after hypersthene.

Metasedimentary or Marble Formation

This formation consists of the characteristic marble member with associated gneisses, some of which are clearly of metasedimentary origins. The individual members are not of sufficient thickness or extent to be separated and treated as mappable units. As a result, the whole formation is treated as one mappable lithological unit and the members are listed in order of abundance.

Marble and Calc-silicate Rocks

The marbles are somewhat friable, medium-coarse grained rocks which vary in colour, depending on the mineral composition, and may be white, bluish gray, or orange pink. The darker constituents outline the compositional variations which appear as rough layering. The darker members are rich in calc-silicate minerals.

The marbles consist almost entirely of a mosaic aggregate of calcite, usually extremely well twinned. Impure marbles and calc-silicate rocks are diopside-rich and contain a variety of other minerals, depending on the composition such as plagioclase, scapolite, epidote, microcline, quartz, phlogopite and hornblende. The presence of grossularite and wollastonite are also noteworthy. Common accessories include graphite, sphene, apatite and zircon, and silica-deficient varieties contain spinel.

Biotite Schist

Many extremely friable, rusty-weathering, biotite-rich schistose rocks are associated with the marbles. These rocks contain over 30% biotite in a matrix of quartz, microcline (microperthite) and oligoclase. Sillimanite may be present in amounts exceeding 5% by volume. Pyrite is a notable accessory along with graphite and zircon.

Quartzite

Dense, fine-medium grained, bluish gray, quartz-rich rocks are usually of impure composition. Under the microscope, these rocks show a granoblastic texture in which quartz may have either an unstrained polygonal aspect or display strong undulatory extinction with a sutured fabric. Interstitial, altered microcline and plagioclase are in amounts less than 10% by volume. Other minerals which may be present in essential amounts are garnet and pyroxene. Accessories in these rocks are sphene, apatite and zircon.

Hornblende Quartzofeldspathic Gneiss

These unusual rocks are found spatially associated with the marbles and other metasedimentary members. They are medium-grained, inequigranular rocks which resemble the ordinary quartzofeldspathic gneiss. The fresh surface is grayish orange and the rocks weather pale reddish brown. They are conspicuous because of the dimensionally oriented hornblende porphyroblasts which make up at least 5% of the rock. In thin-section the rock consists essentially of a sericitized microcline-oligoclase aggregate traversed by lenses and plates of quartz. The dark green hornblende porphyroblasts are aligned parallel to the quartz lenses and are the chief dark mineral constituents. Accessories are ilmenite-magnetite and sphene.

Sillimanite-garnet Gneiss

Many of these friable, medium-grained rocks have a rusty-weathering surface, although some altered varieties take on a peculiar pale green colour. These gneisses are usually rich in quartz and contain garnet surrounded and intimately associated with sillimanite and lesser quantities of biotite. Microcline and oligoclase are present as interstitial pods or constitute essential components. The altered green variety has much serpentine, chlorite and carbonate as a matrix for the relatively fresh garnet with helicitic inclusions of sillimanite. Common accessories are graphite, ilmenite-magnetite, zircon, rutile and spinel.

Post-Grenville Intrusions

Pre-tectonic (Pre-metamorphic) Group

Metagabbro, Metapyroxenite, Metavolcanic

These are dark rocks, rich in ferromagnesian minerals, which display a conspicuous relict igneous or volcanic texture. The metagabbros and metapyroxenites are medium-coarse grained having a blasto-ophitic-pyroxenite texture with a strong foliated, metamorphic overprint. The metavolcanics still retain a relict pillow structure, now flattened and elongated parallel to the metamorphic foliation. Although these rocks are gabbroic, to pyroxenitic or basaltic in composition, the pyroxenes have all been progressively converted to hornblende and hornblende-biotite aggregates which show characteristic myrmekitic textures. The plagioclase is recrystallized into a polygonal mosaic, but still retains its overall lath-like form. Garnet, scapolite and rare epidote may also be present in essential amounts. These rocks are altered to varying degrees, and saussurite, chlorite and serpentine are common products. Accessories are apatite and ilmenite-magnetite and, in some places, sphene and pyrite.

Post-tectonic Group

Granite and Syenite

The granites are massive, medium-grained rocks, which weather gray and are light red or pink on the fresh surface. The syenites, on the other hand, weather bluish white and, on the fresh surface, are grayish blue. These rocks may show a slight metamorphic foliation and many contain innumerable inclusions of the surrounding country rocks. In thin-section, the granites consist of about 65% microcline and oligoclase and 30% quartz. Green biotite is the chief dark mineral and it is chloritized in places. Tremolite has also been observed in one section associated with the biotite. The syenite consists of oligoclase, a peculiar greenish-blue hornblende and biotite. Accessories present are ilmenite-magnetite, allanite, apatite and zircon.

Pegmatites and Aplites

Medium-grained, equigranular, sugary-textured, pink to orange aplites and coarse to very coarse grained, gray

and orange pegmatites are common throughout the area. Some outcrops contain at least 50% of these rock types. Both the aplites and pegmatites are zoned, and reverse zoning was also observed. The pegmatites contain a more varied mineral content than the aplites and conspicuous amounts of hornblende, biotite, magnetite-ilmenite, allanite, tourmaline and garnet are noted.

Diabase, Gabbro, Pyroxenite

These rocks are dark, fine-medium grained and massive, and display primary diabasic-ophitic textures. The diabases are restricted to dikes of variable thickness and extent. The gabbros make up larger bodies and the pyroxenites are of uncertain dimensions. Rocks of anorthositic composition are rare. These rocks are of basic to ultra-basic composition and are characterized by their igneous textures and the presence of both clinopyroxenes and orthopyroxenes. The pyroxenes are of igneous type and display zoning, exsolution lamellae and schiller structure. Uralitic hornblende is interstitial to the pyroxenes. Calcic plagioclase, biotite and serpentine-carbonate pseudomorphs after pyroxene or olivine may be the other essential minerals present. Accessory minerals are ilmenite-magnetite, apatite and, in places, pyrite.

Paleozoic Rocks

Ordovician

Beekmantown

Oxford Formation

The Oxford Formation is a thick-bedded, yellowish gray weathering dolomite which, on the fresh surface, is light gray to a pale yellowish brown. Hard spherical masses, from 6 inches to 2 feet, that weather out as mound-like forms with concentric structures are common in this formation. They have been considered as either concretions or algal growths termed 'cryptozoan'. More shaly members are common at the top of the sequence and some of these beds contain rounded masses of more compact shale, also with a concentric structure. Where the Oxford Formation lies over the Precambrian, the dolomite contains pebbles of quartz as much as 5 inches across.

Chazy

Rockcliff Formation

The Rockcliff Formation consists of friable, thin-bedded shales and siltstones with thicker pockets and layers of sandstone. The shales and siltstones are dark greenish gray, in many places spotted or mixed with grayish-red purple. The sandstone is fine grained and light gray in colour and much of it is cross bedded. On the upper surfaces of the sandstones, siltstones and shales are found fucoid-like structures, 2-3 inches across. Under the microscope the greenish siltstones contain substantial amounts of glauconite. A 50-foot section at the rapids on the south part of Morrison island shows the relationship between the shales, siltstones and sandstones of the Rockcliff Formation.

Section South Part of Morrison Island

Top of formation (not more than 15 feet below overlying Ottawa Formation)	Thickness feet
Black shale, green siltstones sequence, top 3 feet in siltstones rich in fucoids ?	11.5
Gray sandstone with some shale and siltstone	1.2
Green and black shale	10.5
Crossbedded gray sandstone	3.6
Green shaly siltstone	2.4
Light gray sandstone with shaly partings, poorly developed crossbedding, basal 4 inches a quartz pebble conglomerate	2.5
Friable, finely laminated red siltstone	3.3
Massive red siltstone with shaly partings	0.9
Red and green silty shale	3.1
Red and green siltstone with shaly partings	4.3
Light gray sandstone	1.7
Green shale with fine layers of sandstone	1.4
Total thickness	46.4

Black River and Trenton

Ottawa Formation

The Ottawa Formation is a thick-bedded, medium-gray, fossiliferous limestone with some shaly partings. Some light olive-gray beds of dolomite are also noted. The limestone breaks with a conchoidal fracture and much of it contains vugs filled with calcite crystals. The paleontology of this formation has been studied in some detail and a full list of the fossils present in the various members can be found in Wilson (1946, '48, '51, '56, '61).

Pleistocene (see Gadd, 1962)

Most of the unconsolidated deposits covering the bedrock in the highland areas consist of glacial till. In some places the till is tough, compact gray sand, but usually one sees only a loose rubble, which is oxidized to a rusty brown colour. Glaciofluvial sediments are more striking and consist of moraines and eskers. A prominent moraine-like feature extends across Outaouais river south of Fort William to Indian Point at Petawawa, Ontario. Just to the southeast of this moraine, an esker, now made up of a series of islands in Outaouais river, extends to the west side of Allumettes island. A conspicuous stratified morainic ridge extends from Chichester east to Carroll on the north side of Highway 8 in the vicinity of Chapeau. A north-south-trending esker was also observed making up some of the shore and island features on the west side of Bryson lake.

Fluvial gravels are found along Outaouais river and its tributaries to the north. Fine-grained, laminated and varved sands form extensive plains covering much of Allumettes island and the regions around Davidson. Wells on Allumettes island show that these sands are over 200 feet thick in places. Similar sands are found occupying structural basins in the highland areas such as the region around Saint-Patrice lake. At the base of these sand deposits are usually found varved clays. Bog deposits occupy large and small depressions, are actively filling lakes and have developed most extensively in old abandoned channels such as the Manny Lake - McDonald Lake channel north of Fort William.

Structural Geology

There are two main structural trends noted in the folded rocks of the map-area:-

1) The older northeast-trending structures which are developed in the southwest portion of the map-area.

2) The more important northwest-trending structural elements which truncate, and therefore are younger than, the northeast structures.

As a result of the interplay of these two structural trends, a basin and dome tectonic style has been developed.

Northeast Structures

The most important unit of this structural type is the McGillivray Lake antiform-dome, the fold axis of which trends in the northeast direction. The south part of the structure is difficult to reconstruct because it is traversed by the fault escarpment separating the lowlands from the highlands. It is interesting to point out that, at the north part of this structure, the minor folds have axes that conform to the northwest direction. A similar tectonic style is apparent to the west around Schyan river and southeast around Dubé Mountain. Lineation data are scarce; however, in the southern part of this structure in the vicinity of the Culbute rapids, very strong lineations plunging to the east have been recorded.

Northwest Structures

These are well-defined structures that make up a series of plunging antiforms, synforms and basins whose fold axes trend in the northwest direction. A major fold axis passes through the Gillies Lake synform, the Schyan culmination and through the Saint-Patrice Lake basin, and parallel fold axes pass through the Lynch Lake antiform. Most of the lineations in this area are at moderate angles toward the southeast and, because the foliations dip toward the northeast, the folds are overturned toward the west.

Faults

Mention has already been made of the fault escarpment that exists between the lowland and the highland area that forms the north part of the Ottawa-Bonnechère graben structure, termed the Coulonge Fault. According to Kay (1942, p. 612), it is a normal fault with a displacement in the order of 800 feet. Subsidiary faults have also been recognized along the north shore of the Culbute channel, along Noire (Black) river between Vert (Green) lake and Gruice lake and at Devonshire Park where the Paleozoic-Ottawa Formation is disturbed and is in fault contact with the Precambrian. An additional fault lies along the lower portion of Noire river and extends in the

southwest direction through Allumettes island and eventually joins up with the Garde Pied fault in Ontario, described by Kay (1942). A zone of alteration possibly related to a major fault or shear was observed on Noire river, just east of Schyan.

Metamorphism

All the metamorphic rocks in the area are the result of high-grade regional metamorphism. A zone of granulite facies rocks found in the northwest and the isograd extends from Schyan point depot on the north shore of Outaouais river, northeast to Bryson lake. The isograd is characterized by the appearance of hypersthene in rocks of appropriate composition. Because hornblende and biotite are also stable in many of these rocks the metamorphism is of the hornblende granulite subfacies. It is noteworthy to point out that this granulite facies area is in a region where biotite, hornblende and garnet gneisses are predominant and thus may be in part controlled by compositional changes. To the southeast the mineral assemblages are characteristic of the upper-amphibolite facies.

Economic Geology

Beside the deposits of economic interest mentioned in previous references (Logan, 1847; Ells, 1907; Cirkel, 1909; and Retty, 1933), none of which are in operation today, very few new occurrences were observed, although many properties were visited. At present there are no prospecting activities or ground staking being carried out in the area.

Iron Ore

Cirkel (1907, p. 96-97, 100) mentions the occurrence of iron ore deposits and one of these localities, the Giroux property near Truite (Trout) lake in Sheen township, was visited. Several old pits reveal magnetite ore as disseminated or interstitial pods up to a few inches across in a pegmatite-like rock. Another deposit of magnetite is found in Waltham township, 2½ miles north of Waltham, along Noire river. The Lynch Lake area, in Forant and Rochefort townships, which in the past was prospected and staked, contains many magnetite-bearing pegmatites.

Base Metals

Logan (1846) mentions the occurrence of galena and ocher at Noire River falls in Waltham township. An occurrence of chalcopyrite stained with malachite is found in a small vein in the marbles lying along Highway 8, about 2 miles northwest of Davidson, in Mansfield township. This occurrence can be traced about a ½ mile south to a railway cut near Outaouais river.

Graphite

Retty (1933, p. 115) mentions a graphite showing, near the town of Waltham, in Waltham township.

Radioactive Deposits

A radiometric survey of all the main roads in the region was taken and the most interesting anomaly was a moderately strong radioactive zone along the north side of Highway 8, immediately across from the town of Waltham, in Waltham township. The eastern contact of a 5-foot-wide pegmatite intruding a rusty-weathering biotite schist marks the zone of radioactivity. Sporadic occurrences of moderately radioactive zones occur along Highway 8, apparently related to the fault zone which parallels this road along most of its length. Elsewhere, many zones of radioactivity are localized along prominent joints, such as south of Gillies lake on the Jim Lake road, in Bryson township, and in certain pegmatites such as are found around Summerville Lake in Croisille township. At Ragged Rapids, just east of Galarneau lake, in Pontefract township, the gneisses have pegmatitic zones very rich in allanite.

Non-metallic Deposits

Spence (1929, p. 66-67) mentions occurrences of mica, in Waltham township, near the town of Waltham, and Retty (1933, p. 144) mentions the occurrence of feldspar at the Libby prospect, also near the town of Waltham.

Construction Material

The limestones of Pointe Seche and Devonshire Park in Mansfield township have been quarried in the past for construction stone. There are many sand and gravel pits on Allumettes island and in the morainic ridge in the vicinity of Chichester and Chapeau.

References

Cirkel, F. (1909) - Report on the iron deposits along the Ottawa (Quebec side) and Gatineau Rivers; Can. Dept. Mines Publication No. 23.

Ells, R.W. (1907) - Report on the geology and natural resources of the area included in the northwest quarter sheet, number 122 of the counties of Pontiac, Carleton and Renfrew; Geol. Surv. Canada. separate report No. 977.

Gadd, N.R. (1962) - Surficial geology, Chalk River, Ontario and Quebec; Geol. Surv. Canada Map 1132A.

Kay, G.M. (1942) - Ottawa-Bonnechère graben and Lake Ontario homocline; Geol. Soc. America, Bull. vol. 53, p. 586.

Logan, W.E. (1847) - On the topography and geology of the Ottawa river and some of its tributaries with notes on economic minerals; Geol. Surv. Canada, Report of Progress 1845-1846, pt. a.

Logan, W.E. (1863) - Geology of Canada.

Retty, J.A. (1933) - Geology of the valleys of the Coulonge and Black rivers, Pontiac county; Que. Dept. Mines, Ann. Report, 1932, p. 91-118.

Spence, H.S. (1929) - Mica, Dept. of Mines Publication No 701.

Vennor, H.G. (1878) - Progress report of explorations and surveys made during the years 1875-1876, in the counties of Renfrew, Pontiac and Ottawa; Geol. Surv. Can., Rept. of Progress 1876-1877, pt. x.

Wilson, A.E. (1946) - Geology of the Ottawa - St. Lawrence Lowlands, Ontario and Quebec; Geol. Surv. Canada Memoir 241.

Wilson, A.E. (1946, '48, '51, '56, '61) - Papers on the paleontology of the Ottawa Formation; Geol. Surv. Canada, Bull. Nos. 8, 11, 17, 28, 67.

PORTAGE-DU-FORT AREA

Pontiac County, Quebec

INTRODUCTION

The Portage-du-Fort (Clarendon) area lies between latitudes 45°30' and 45°45' and longitudes 76°30' to about 76°40' and makes a surface of about 100 square miles. It is located in Pontiac county and lies mostly in Clarendon township, except for a strip to the north of Portage-du-Fort which lies in Litchfield township. The most important towns in the region are Shawville, Portage-du-Fort, Bryson, and Campbell's Bay. Other villages and settlements include Starks Corners, Clarendon, Sand Bay, Radford, Murrell, Lawn and Morehead.

The region, which has been a relatively well-settled area since early times, lies about 60 miles northwest of Ottawa-Hull. Access is provided by means of Highway 8 and its many secondary roads connect the entire region. The C.P.R. has a line through Shawville and Campbell's Bay and the C.N.R. serves Starks Corners and Portage-du-Fort.

Geological mapping and investigations commenced at an early date with the surveys of Logan (1847, 1863) and Vennor (1878). Ells (1907) was the first to publish a geological map and further studies were made by Cirkel (1909). The northwest part of the area has already been mapped by Osborne (1944).

The map-sheet can be divided into three main topographical divisions: a lowland area bordering Outaouais river, an upper plain west of Shawville, and a highland northeast of Bryson. The lowlands lie on the shores of Outaouais river and include the areas to the north and east below the 400-foot contour line. Outaouais river in this area flows north-south, across the regional structure, and is restricted by many rapids and rocky islands. When it takes on its normal east-west course, the river becomes more tranquil. A large proportion of the bedrock exposed in this map-area is found in the lowland, which is relatively flat and thinly veneered by recent deposits. The upper plain is found between the 400-foot and the 600-foot contour lines and consists mainly of a thick deposit of sand. The highland is located above the 600-foot contour line and knobs of bedrock are found protruding through the otherwise flat sandy plains. The actual highland area lies at the extreme northeast corner where the extension of the Eardley escarpment to the east traverses the region.

General Geology

In the lowlands near Portage-du-Fort, marbles are the most common rock type. These marbles can be traced to the north as far as Campbell's Bay and trend east-west to slightly northeast until they disappear under the sand plains, east of Starks Corners. An outcrop of quartzofeldspathic gneiss occupies the peninsula south of Sandy Bay and similar gneisses interlayered with amphibolites are found associated with marbles in the vicinity of Starks Corners and elsewhere. The highland to the north consists mainly of quartzofeldspathic gneisses, with amphibolite bands associated with biotite gneisses containing much granitic injection material. These gneisses trend northwest and dip at moderate angles to the northeast. A rather large body of massive gabbro intrudes the marbles north of Portage-du-Fort and covers an area from Starks Corners to Portage-du-Fort station and north to Murrell. A similar body of gabbro is seen in the vicinity of the Cheneaux power dam and it is considered to be part of the large gabbroic intrusion on the Ontario side, west and south of Cheneaux.

Only one outcrop of rocks of Paleozoic age was observed in this area. A flat-lying exposure of Beekmantown dolomite, somewhat conglomeratic in nature, was found about 1 mile east of Portage-du-Fort. This outlier is surrounded by marbles and the contact relationships between these rocks were not observed. No evidence of rocks of Paleozoic age, between Portage-du-Fort and Bryson, as described by Ells (1907, p. 15), was observed.

Lithostratigraphic Units

	Pleistocene		Till, sands, varved clays
	Peleozoic Ordovician	Beekmantown	Oxford Formation
PRECAMBRIAN	Post-Grenville Group		(Meta) Gabbro
PRECAMBRIAN	Grenville Group		Marble
PRECAMBRIAN	Grenville Group		Biotite Gneiss
PRECAMBRIAN	Grenville Group		Quartzofeldspathic Gneiss and Amphibolite

Petrography

Precambrian

Grenville Group

Quartzofeldspathic Gneiss

The quartzofeldspathic gneisses are fine-medium grained rocks which weather gray and are pink to light red on the fresh surface. These gneisses are usually interlayered with dark amphibolites, and the amphibolite bands are in the order of several inches thick.

In thin-section, the quartzofeldspathic gneisses contain about 60% microcline with or without associated oligoclase and about 35% quartz. Biotite, hornblende and garnet are the chief dark minerals present but never exceed 5% by volume. A little chlorite is usually secondary after biotite. Accessory minerals present are magnetite-ilmenite, apatite, zircon and allanite.

Amphibolite

The amphibolites are dark, fine-medium grained, equigranular rocks which may be massive, layered or foliated, and some varieties show a vague sub-ophitic texture.

Under the microscope, the rock is composed of about equal amounts of dark green hornblende and calcic plagioclase (in places antiperthitic). Both clinopyroxenes and orthopyroxenes have been noted as relicts or more rarely in amounts exceeding the hornblende content. Biotite, garnet and scapolite may also be present in amounts exceeding 5%. Many of these rocks are altered to chlorite, serpentine and carbonate. Accessory minerals are ilmenite-magnetite, apatite, zircon, sphene and pyrite.

Biotite Gneiss

The biotite gneisses are fine-grained rocks which weather yellowish gray with a grayish blue to pink fresh surface. These gneisses are laminated and some are finely interlayered with amphibolites and light quartzofeldspathic zones. They are commonly veined, are injected by much pegmatitic material and display porphyroblastic textures.

The rock consists of about 50% oligoclase, with or without microcline, 30% quartz and about 10% strongly pleochroic, red-brown biotite. Garnetiferous varieties are common. Accessories present are ilmenite-magnetite, sphene, apatite and allanite.

Marbles and Calc-silicate Rocks

Both magnesian and calcium marbles are found in the area. The marbles are somewhat friable, medium-coarse grained and vary in colour depending on the composition. The magnesian marbles are of a peculiar snow-white colour and the calcium marbles have a bluish tint, though some are pure white and hardly distinguishable from the magnesian varieties with which they are associated. In general the magnesian marbles have less impurities than the calcium marbles and are almost monomineralic in composition. A peculiar feature of this white magnesian marble is that, when it is struck with a hammer, it gives off a noticeable odor of hydrogen sulfide. Impure calc-silicate varieties are of a dark colour.

The marbles consist almost entirely of a mosaic aggregate of calcite and/or dolomite. The calcium marbles may also contain small amounts of quartz, diopside phlogopite and graphite. The calc-silicate rocks are rich in diopside and also contain a variety of other minerals such as plagioclase, scapolite, microcline, quartz, graphite, sphene, apatite, pyrite, zircon and spinel.

Post-Grenville Intrusions

Gabbro and Metagabbro

These rocks are dark, medium grained and rich in ferromagnesian minerals, and display a conspicuous primary or relict ophitic texture. The gabbros are massive and the

metagabbros have a foliated metamorphic overprint. Some fine-grained varieties have a recognizable porphyritic texture.

The gabbros are characterized by their igneous textures and the presence of both clinopyroxenes and orthopyroxenes of the igneous type displaying zonation, exsolution lamellae and schiller structure. In the metagabbros these pyroxenes have been converted to hornblende and biotite which show characteristic myrmekitic textures. The lath-like form of the plagioclase is still retained, even though the rock has been completely recrystallized. These rocks are altered in many places, and saussurite, chlorite and serpentine are common products of the alteration. Accessory minerals present are ilmenite-magnetite and apatite.

Paleozoic

Ordovician

Beekmantown

Oxford Formation

The only outcrop of the Oxford Formation is observed about 1 mile east of Portage-du-Fort on the road to Starks Corners. This rock is a thick-bedded, brownish conglomeratic dolomite. Pebbles of quartz, quartzite, jasper and other rocks are found throughout the formation.

Pleistocene

Glacial till is found covering the bedrock throughout the area and fluvial gravels are found along Outaouais river. The most conspicuous feature is the thick sand plain that covers most of the region around Shawville. A terrace extending southeast from Starks Corners is thought to represent an old shoreline of the Champlain Sea, and recent streams have cut small nicks all along its length.

Structural Geology

The main structural control in the area seems to be the gabbro intrusion which occupies a large area north of Portage-du-Fort. The surrounding gneisses are conformable to the outline of the gabbro, and this may account for the change in the direction of trends from the south part to the

north section. In the south, the marbles and associated rocks trend northeast, as does the gabbro body. The relationship between the marbles and the gneisses to the north are concealed under the sand plains. The gneisses in the north strike northwest and are also conformable to the outline of the gabbro.

Faults

According to Kay (1942), two main east-west-trending faults traverse the area. The extension of the Eardley fault escarpment to the east passes through the area northeast of Campbell's Bay and another fault bisects the map by following Wilson Creek, which is south of Bryson. This latter feature is supposed to be part of a fault that passes through the Rocher Fendu south of Grand Calumet island.

Economic Geology

Deposits of economic interest have been mentioned in the earlier references concerning the geology of the area (Logan, 1847; Ells, 1907; Cirkel, 1909; Osborne, 1944; and Gouge, 1962). Most of the important deposits have been connected with the exploitation of the marble occurrences constituting the main rock type in the south part of the map-area.

Marbles

Several quarries in the marbles are found in the map-area and the stone was until recent years used for building purposes and the production of lime (see Gouge, 1962, p. 133-140).

Carswell Quarry, Bryson - A large deposit of very coarse-grained marble has been quarried 75 feet across a width of 40 feet. Another quarry in a more magnesian-rich marble is 35 feet northeast and an analysis of this stone is as follows:-

SiO_2	2.09
Fe_2O_3	0.21
Al_2O_3	0.36
P_2O_5	0.01
CaO	34.65
MgO	21.93
H_2O	8.23
CO_2	31.70

White Grit Company, Portage-du-Fort - This company is quarrying and crushing white magnesian marble 1 mile north of Portage-du-Fort. The quarry is 200 feet long and 80 feet wide and has been worked to a depth of 55 feet. Immediately to the south is an abandoned quarry 200 feet long, 50 feet wide and 10 feet deep. The crushing plant produces five sizes of stone used for surfacing driveways, stucco dash, terrazzo, poultry grit, artificial stone, asphalt filler and magnesite floors.

Smaller deposits and quarries are located north of Campbell's Bay, in Portage-du-Fort (including a small quarry in the Beekmantown dolomite east of the town), Starks Corners, and Clarendon.

Magnesia

Magnesite has been found in association with the magnesian marbles near Portage-du-Fort and the Dominion Magnesium Company has done some work in this area. Brucite has also been found in the marbles in the vicinity of Bryson (Osborne, 1944, p. 26).

Other Minerals of Economic Interest

A small pit was found about 1 mile east of Portage-du-Fort in a highly pyritiferous member of the marbles.

Construction Material

There are many sand and gravel pits along most of the roads, and a large pit is found just north of Campbell's Bay.

Geochemical Prospecting

During the field season, samples of stream sediments were collected. The samples were analysed for copper, lead, zinc, nickel, molybdenum and uranium. The results are listed in tables at the end of the report and shown on the accompanying map.

Results of analyses in p.p.m

Sample No. on the map	Code No. of sample in files of Dept.	Cu	Zn	Pb	Mo	Ni	U		
1	224	20	90	10	0	13	-		
2	421	2	20	10	0	8	-		
3	223	2	40	16	0	10	0.5		
4	422	4	20	10	0	10	1		
5	317	6	40	16	0	-	-		
6	318	4	75	30	0	-	-		
7	420	6	50	30	-	-	-		
8	114	20	90	16	0	-	3		
9	121	2	60	16	0	-	0.5		
10	423	-	40	175	-	8	-		
11	314	2	15	6	0	0	0.5		
12	120	24	150	30	2	-	-		
13	313	4	15	10	0	8	-		
14	312	4	20	10	0	-	-		
15	119	4	110	10	0	8	0.5		
16	227	16	40	16	-	170	-		
17	311	10	40	20	3	25	2		
18	228	6	15	16	0	33	-		
19	319	4	20	16	1	10	-		
20	117	2	80	10	0	10	-		
21	118	16	125	20	0	25	0.5		
22	305	10	15	16	0	23	0.5		
23	308	8	20	10	0	13	-		
24	24	20	50	24	0	-	-		
25	21	30	125	70	0	28	-		
26	315	4	25	20	-	16	-		
27	220	8	25	2	0	8	0		
28	23	4	25	16	0	13	-		
29	309	6	15	16	0	10	0.5		
30	306	6	15	20	0	13	0.5		
31	307	4	20	16	0	13	0.5		
32	221	36	110	10	0	-	0.5		
33	222	50	250	70	0	130	-		
34	22	6	90	20	-	-	-		
35	108	16	25	4	0	13	2		
36	107	24	25	4	0	5	0.5		
37	413	-	-	-	-	-	-		
38	406	10	40	6	1	20	0.5		
39	409	0	25	2	0	3	0.5		
40	112	16	140	50	0.8	25	0.5		
41	106	20	40	2	0	4	0.5		

Results of analyses in p.p.m.

Sample No. on the map	Code No. of sample in files of Dept.	Cu	Zn	Pb	Mo	Ni	U		
42	216	-	-	-	-	-	0		
43	225	2	90	10	0	16	-		
44	404	50	90	10	0	2.5	5		
45	316	10	90	10	0	45	-		
46	215	16	15	2	0	3	0		
47	218	6	15	4	0	8	0		
48	410	6	25	4	0	7	0		
49	226	20	40	20	0	13	-		
50	122	4	125	16	0	-	0.5		
51	419	4	15	6	0	8	1		
52	418	6	20	10	0	13	1		
53	417	20	60	10	-	26	-		
54	411	4	40	4	0	5	1		
55	412	10	60	4	0	8	4		
56	219	10	40	4	0	5	5		
57	303	4	15	16	0	13	0		
58	304	10	50	30	-	-	-		
59	105	24	90	6	0.5	6	2		
60	214	20	90	24	0	28	2		
61	301	4	15	24	-	10	-		
62	302	10	25	16	3	13	4		
63	104	16	40	2	0	4	0		
64	405	10	40	4	0	15	2		
65	403	30	90	20	-	-	4		
66	402	-	-	-	-	-	0.5		
67	401	10	40	2	0	6	0		
68	229	6	10	10	0	8	0.5		
69	231	2	25	10	0	13	1		
70	310	8	40	16	0	20	0.5		
71	320	6	15	10	0	15	1		
72	111	10	90	20	0	13	1		
73	109	6	60	2	0	15	0.5		
74	110	16	110	24	0	35	1		
75	321	6	20	16	0	13	0.5		
76	101	16	40	2	0	10	0		
77	102	10	25	4	0	8	0.5		
78	103	10	25	4	0	7	0		
79	206	-	-	-	-	-	-		
80	204	70	125	24	0	3	4		
81	205	50	140	16	-	-	5		
82	203	36	60	4	2	3	2		

Results of analyses in p.p.m

Sample No. on the map	Code No. of sample in files of Dept.	Cu	Zn	Pb	Mo	Ni	U
83	20	30	125	4	0	25	5
84	212	16	50	4	0	18	0
85	213	16	40	2	0	2	0
86	18	4	25	2	0	13	0
87	202	36	140	4	2	15	4
88	19	6	25	2	0	15	0
89	17	8	90	2	-	16	0.5
90	16	10	40	4	0	10	0.5
91	15	8	40	4	0	12	1
92	14	16	75	2	-	-	1
93	13	-	-	-	-	-	5
94	12	16	90	4	0	17	1
95	11	24	90	2	0	20	4
96	10	4	40	4	0	8	0
97	9	6	25	2	0	8	0

N.B. Dashes indicate the absence of results for the element concerned.

Results of analyses in p.p.m.

Sample No. on the map	Code No. of sample in files of Dept.	Cu	Zn	Pb	Mo	Ni	U
98	8	6	40	2	0	18	0
99	7	-	-	-	-	-	1
100	6	6	40	2	0	18	0
101	201	16	60	2	0	8	1
102	116	140	125	20	0	36	-
103	115	128	140	30	0	45	-
104	5	10	50	4	0	28	1
105	4	6	40	2	0	4	0.5
106	211	10	40	2	0	10	0.5
107	210	10	25	2	0	10	0
108	2	6	50	2	-	14	0.5
109	3	10	60	2	0	35	0.5
110	1	10	40	4	0	15	0.5
111	208	8	40	2	0	10	0
112	207	20	90	16	-	-	0.5

References

Cirkel, F. (1909) - Report on the iron deposits along the Ottawa (Quebec side) and Gatineau rivers; Can. Dept. Mines Publication No. 23.

Ells, R.W. (1907) - Report on the geology and natural resources of the area included in the northwest quarter sheet, number 122 of the counties of Pontiac, Carleton and Renfrew; Geol. Surv. Canada, separate report No. 977.

Gouge, M.F. (1962) - Limestones of Canada; pt. 3 - Quebec, Mines Branch, Dept. Mines Tech. Surv. No. 755.

Kay, G.M. (1942) - Ottawa-Bonnechère graben and Lake Ontario homocline; Geol. Soc. America, Bull. vol. 53, p. 585-646.

Logan, W.E. (1847) - On the topography and geology of the Ottawa river and some of its tributaries with notes on economic minerals; Geol. Surv. Canada, Report of Progress 1845-1846, pt. a.

Logan, W.E. (1863) - Geology of Canada.

Osborne, F. Fitz (1944) - Calumet Island area, Pontiac county; Quebec Dept. Mines, G.R. 18.

Vennor, H.G. (1878) - Progress report of explorations and surveys made during the years 1875-1876, in the counties of Renfrew, Pontiac and Ottawa; Geol. Surv. Canada, Rept. of Progress 1876-1877, pt. x.