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PRELIMINARY REPORT, GEOLOGY OF MOUNT RICHARDSON AREA, GASPE-NORTH COUNTY

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DEPARTMENT OF NATURAL RESOURCES

Honorable DANIEL JOHNSON
Minister

PAUL-EMILE AUGER
Deputy Minister

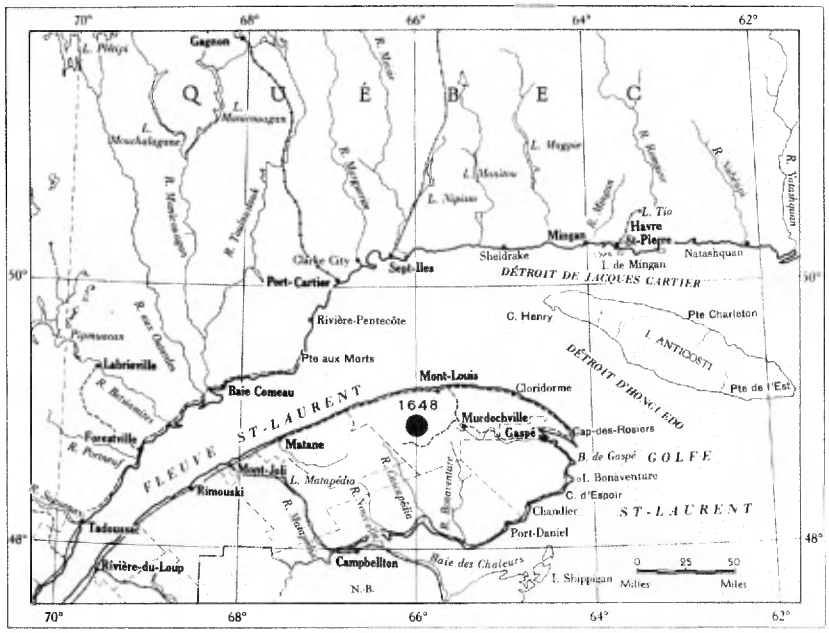
Geology
of
MOUNT RICHARDSON AREA

GASPÉ-NORTH COUNTY

PRELIMINARY REPORT

by

P. Girard



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QUEBEC DEPARTMENT OF NATURAL RESOURCES

Honorable DANIEL JOHNSON
Minister

PAUL-EMILE AUGER
Deputy Minister

MINERAL DEPOSITS SERVICE
ROBERT ASSAD, Director

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Preliminary Report

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Gaspé-North County

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P. Girard*

INTRODUCTION

During the summer of 1965, a geological map at the scale of 1,000 feet to the inch of the Mount Richardson area was prepared. This area had been mapped in 1926 by F.J. Alcock.

The area is located for the most part in La Potardière township; it also includes the north part of Lesseps township, the southwest corner of Boisbuisson township and the northwest corner of Deslandes township. The area is bounded by latitudes 48°54'00" and 49°00'00" and longitudes 66°00'00" and 66°07'30". The McGerrigle (Tabletop) mountains mark the eastern boundary, while, to the west, the Sainte-Anne river delimits the area up to the middle part of the map.

Easy access is provided by a network of haulage roads and the Trans-Gaspesian highway, which traverses the southwest corner of the area. The Mount Albert inn, property of the provincial government, borders the west side of the map-area.

* Translated from the French.

Mount Richardson area has an extremely rugged topography; the lowest altitude, some 700 feet, is found at the mouth of Sainte-Anne-Nord-Est river while Mount Richardson, at altitude 3,850 feet, dominates the region.

Four principal physiographic units can be defined:

1) The valley of Sainte-Anne-Nord-Est river in the northwest part of the map, where altitudes range from 700 to 2,350 feet; slopes are relatively moderate and the vegetation is thick.

2) The McGerrigle (Tabletop) mountains at the east border of the map; this sector has an average altitude of 3,500 feet and is flanked by an abrupt escarpment, 1,000 to 1,500 feet high; vegetation is sparce, stunted and of the alpine type.

3) The Shickshock mountains, for the most part in the southwest quarter of the area; peaks, with a maximum elevation of 2,950 feet, remain pointed; mountain flanks are very steep along the Trans-Gaspesian highway. Much of this area was depredated by fire during the summer of 1965.

4) The valley of Sainte-Anne river in the southwest corner of the area; the river flows on a thick blanket of glacial till; however, 1,200 feet upstream from Mount Albert, the river cuts into rock and forms a waterfall, 20 to 30 feet high. The maximum width of the valley does not exceed a half mile.

The watershed divide follows the crests of the Shickshock mountains and McGerrigle mountains. North of the divide, drainage is provided by Sainte-Anne-Nord-Est river, which is located 1,000 feet west of the map boundary. The river flows north, emptying into the St. Lawrence, 26 miles downstream from the map-area.

GENERAL GEOLOGY

The bedrock of Mount Richardson is a northern segment of the Appalachians; the rocks are all of Lower Paleozoic age.

Rocks of the Shickshock Group outcrop in the south part of the area. Mainly metavolcanic, they are the oldest rocks of the area. However the scarcity of outcrops in the zone of contact with established Ordovician rocks makes it difficult

to determine whether these rocks belong to the Cambrian, the Ordovician, or to both. In the contact zone, the Shickshock Group comprises a band of volcanic rocks with thin horizons of tuff, which leads the author to think that there is no sharp demarcation between the Cambrian and the Ordovician rocks. According to some authors, a fault separates the Shickshock rocks from Ordovician rocks. A faulted contact on the Trans-Gaspesian route, some 500 feet south of the Mount Albert inn, was observed but no evidence was found to permit the extension of the fault along the contact. In keeping with Mattinson (1964), in the Mount Logan area to the west, the Shickshock rocks are being placed in the Cambro-Ordovician.

Except for a band some $\frac{1}{4}$ to $\frac{3}{4}$ mile wide along the east margin, which is underlain by the west flank of the McGerrigle mountains granitic intrusion, the area comprises phyllites, shales, quartzites, and, in minor quantity, beds of argillaceous limestone and lenticles of conglomerate. The rocks resemble those described by McGerrigle (1954) in a region to the west, where he considered them to be Lower Ordovician (Deepkill) or older. They are extremely folded and regional metamorphism decreases as one moves away from the contact with the Shickshock Group.

A part of the McGerrigle mountains granitic intrusion outcrops in the area. On sight the walls of the intrusion are vertical or strongly inclined towards the west. A marked zone of alteration, from a half to one mile wide, flanks the intrusion.

Basic dikes and some acid dikes invade the area and are particularly abundant in the northwest part.

The thickness of overburden varies with topography; it amounts to practically nothing on hill tops and steep slopes but reaches several feet and hampers mapping in the valleys and the central part of the area. The deposits consist mainly of glacial till. Boulders of granite, hornfels, and skarn are widespread but boulders of metavolcanic rocks of the Shickshock Group are rare outside the area of the Shickshock mountains. The presence of serpentine boulders (Mount Albert intrusion) is restricted to the west side of Sainte-Anne river. The glacial till, cirques and hanging valleys bordering McGerrigle mountains, as well as the presence on Mount Albert of a boulder of granite typical of that of the McGerrigle mountains, are indications of the glacial burial of the region.

Shickshock Group

The major part of the outcrops of the Shickshock Group are pale to dark green, generally massive, metavolcanic rocks. Composed mainly of chlorite, hornblende, quartz, epidote and carbonate, the metamorphic grade of the rocks corresponds to that of the greenschist facies. South of Mount Albert inn along the Trans-Gaspesian highway, slightly magnetic massive lavas, which contain traces of pyrite, alternate with pillowed lavas and thin beds of tuff.

Volcanic rocks, transformed into massive amphibolites, garnetiferous amphibolites, muscovite-biotite schists and two-mica garnetiferous schists, are encountered in the valley of Diable brook. The metamorphism is probably caused by an intrusion of serpentinized peridotite which, presumably, forms the bedrock of the un-mapped area in the southwest corner of the region.

With the exception of a few, small isolated areas to the southwest, the metasedimentary rocks occur on the south border of the Ordovician series. They consist mainly of phyllites but red slates are encountered also at several places. The phyllites are similar to those of the Ordovician series immediately to the north; they are pale to dark gray, intensely plicated and transected by numerous veins of quartz and calcite. Some of the rocks mapped as red slate might well be hematitic tuffs. A bed of highly recrystallized quartzite outcrops along the transmission line, approximately 5,000 feet south of Sainte-Anne-Nord-Est river. Near the summit of a hill, immediately west of Castor lakes, a conglomerate containing very coarse pebbles of quartz and foliated feldspathic quartzite (or gneiss?) in a chloritic matrix was observed. Other outcrops of the sedimentary rocks are quartz-chlorite schists which are intimately associated with the volcanic rocks.

Ordovician Rocks

The Ordovician rocks comprise mainly phyllites, quartzites, shales and argillaceous limestone.

The absence of fossils and the scarcity of outcrops made it difficult to establish the stratigraphic order or thicknesses of different units. Thus, descriptions will not follow stratigraphic position.

The phyllites, dark gray in color, are characterized by a multitude of small compact plications and veinlets of quartz and calcite which occupy schistosity and fracture planes. The attitude of small stringers of bluish calcite, considered to be the expression of thin beds of recrystallized limestone, was used to determine the attitude of bedding in certain cases.

The quartzites are massive, medium-grained, slightly feldspathic, strongly recrystallized and cut by a multitude of small quartz veinlets. Color varies from gray to white on fresh surfaces, and from beige to brown on altered surfaces. However, on the east side of Sainte-Anne-Nord-Est river, in contact with red shales, the quartzite is rose-colored due to the presence of small hematite grains. Where the bedding can be observed, beds are from 2 to 3 feet thick and are separated by very thin beds of black shale; the beds become thinner near contacts with surrounding rocks. According to J. Béland (personal communication) these quartzites are similar to those of Kamouraska.

The most abundant Ordovician rocks are black, green, and red shales; the red variety is less abundant than the others. Black shales are most abundant immediately north of the phyllites. North of these there are sufficient red shales to allow mapping of two distinct bands where they constitute the main rock type. Predominantly green shales occur further to the north. These green shales contain horizons of black shale, a few beds of sandstone, lenticles of conglomerate, and a sequence of shale and of calcareous and dolomitic siltstones. The outcrops of conglomerate exibit pebbles of quartzite and red shale or pebbles of limestone. Within the sequence bedding is very thin, generally between $\frac{1}{4}$ to $\frac{3}{4}$ of an inch and never exceeding 2 inches.

A horizon of finely-bedded argillaceous limestone forms the north border of the southern band of red shale. This horizon contains limestone-pebble conglomerates and a sequence of shale and of calcareous and dolomitic siltstones. The limestone is quite fractured and the weathered surfaces easily disaggregate. The rock is slightly recrystallized in places.

A second horizon of limestone, more massive than the other, outcrops in the valley of Porc-Epic brook. It is violet to black in color and is interbedded with slightly calcareous shales.

Alteration Zone

The Ordovician rocks at the contact of the McGerrigle mountains granite have been metamorphosed into hornfels and skarn.

Hornfels constitute the most abundant of the metamorphic rocks. They are very fine grained, hard, massive and generally rusty on weathered surfaces owing to the oxidation of the pyrite they contain. Quartz and mica are the main constituents. North of Americains lake, hornfels are dark brown, and, in places, slightly magnetic. Only a few horizons have a reddish color, notably those found in the extension of the zone of red shales. The facies most remote from the intrusion contain small nodules which probably are cordierite. South of Americains lake, the dark hornfels are accompanied by hornfels showing black and white bands. These are massive, fine grained and more abundant than the dark hornfels.

Skarn (a slightly calcareous rock containing quartz, diopside, garnet and chlorite) characterizes the immediate surroundings of Mount Richardson. This rock forms a band which extends over a length of nearly 2 miles and for an average width of 2,000 feet. Grouped with the skarns, are some pale green to light gray rocks, rich in diopside, quartz and wollastonite, which at some places are calcareous but do not contain garnet.

Intrusive Rocks

The granite of McGerrigle mountains is generally coarse grained and pink to red in color. It contains 10% to 30% quartz and little more than 5% dark minerals, mainly biotite. Inclusions of partially transformed sedimentary rocks occur in the area of the contact. The dip of the contact is almost vertical.

Dioritic masses, colored dark green and sometimes with porphyritic textures, occur on the south flank of the valley of Americains lake.

South of Mount Richardson, several granitic apophyses penetrate as dikes into the hornfels.

Numerous diabase dikes, some of porphyritic texture, cut the Ordovician formations. They are 5 to 15 feet wide and of seemingly variable length. The dikes form a set striking northwest to southeast in the northwest sector of the area.

STRUCTURAL GEOLOGY

The deformation of the region is marked by two schistosities. The first, striking east-west and dipping an average of 70° southward, coincides with the axial planes of major folds in the northwest sector of the area. To the west of the head of Portage brook, within the Shickshock Group, this schistosity deviates abruptly to the south. The second schistosity, striking approximately S.30°E. and generally dipping steeply southward, is clearly visible in the Ordovician phyllites to the south of Coté lake and in the phyllites associated with the metavolcanic rocks of the Shickshock Group. This schistosity is later than the first.

The folds of the Ordovician rocks in the northwest sector of the area are compact and slightly overturned towards the north. The attitude of quartzite horizons indicates that the folds are en échelon.

Rocks in the alteration zone of McGerrigle mountains are extremely fractured; the joints there have attitudes identical to those cutting the granite.

A vertical fault, with horizontal displacement, marks the contact between the Shickshock Group and the Ordovician rocks, some 500 feet south of Mount Albert inn. A few minor faults, with small displacements and oriented approximately north-south, occur in the northwest corner of the area. Those which are clearly established are indicated on the map.

The abrupt transition between phyllites and shales in the area of Ordovician rocks in the west part of the map-area suggests the possible existence of a fault between the two lithologies; this is all the more likely as the shales clearly trace out a folded structure.

It should be noted that the lack of outcrop and marker horizons in the highly folded and faulted Ordovician sequence makes a definitive structural interpretation very

difficult. Our interpretation depends largely on the relative position and form of the quartzite beds which have been followed on the ground.

ECONOMIC GEOLOGY

The areas of mineralization encountered during the geological mapping will be described in the following paragraphs. The mineralization occurs in the areas of Castor lakes and Porc-Epic brook.

Castor Lakes

Metallic mineralization consisting of grains of chalcopyrite and pyrite occurs some 200 feet south of the largest of the Castor lakes. The mineralization rests mainly in joints which are parallel to small aplitic dikes invading metavolcanic rocks of the Shickshock Group.

A horizon of rusted, fractured skarn, located approximately 2,000 feet east of the north shore of the smallest of the Castor lakes, contains nearly 10% of sulfides, either disseminated in the rock or concentrated in joint planes. This horizon, in the midst of hornfels, outcrops over a length of 15 feet. Pyrite and pyrrhotite are the most common sulfides. An assay of two grab samples yielded 0.2% copper, 0.83% zinc and traces of nickel.

Porc-Epic Brook

Two mineralized showings were encountered south of Porc-Epic brook.

The first occurs some 500 feet upstream from the mouth of the brook. It consists of a quartz vein, 6 to 12 inches thick, which is very strongly mineralized with argentiferous galena, sphalerite, chalcopyrite, and pyrite. Assays reveal a small amount of gold. The vein outcrops in the brook, but recent development work has covered the outcrops so that during the mapping it was impossible to determine the precise

strike of the vein. The host rock is a shale with thin beds of siltstone. The mineralization is related to that described in the following paragraph.

The second showing is located 2,750 feet to the west of the first, on ground once held by the company "Les Mines Bern-Or". Two trenches, separated by some 75 feet, reveal galena, pale yellow sphalerite, and pyrite mineralization in quartz veins from 5 to 6 inches wide. The northern trench exhibits traces of malachite in a bed of calcareous sandstone two feet thick at the contact of a diabase dike. The vein set seems to be related to a flowage fold.

In addition to a detailed geological survey, trenching, and a magnetometer survey, the Bern-Or company drilled 10 holes, for a total length of 2,933 feet, during 1963 and 1964. The cores examined by the author at the property did not reveal much as the mineralized sections were missing. However, the drill logs indicate that the best intersection, a length of 5 feet, contained 1.2% lead, 0.93% zinc and 0.16 ounce of silver per ton. The host rock consists of a sequence of finely bedded argillaceous limestone, shale, and calcareous siltstone interbedded with shale. A dike of diabase, striking northwest, cuts this sequence. Indications of a minor fault, with small displacements in an east-west direction, were found in the southern trench.

Farther to the north, in the Shickshock Group, an outcrop near the head of Portage brook contains almost 10% specular hematite and fissures filled with quartz and calcite. In the valley of the first tributary to the west of the same brook, traces of malachite were found.

Unconsolidated Deposits

A deposit of sand and gravel of glacial origin, situated 1,200 feet east of the Mount Albert inn, provided construction material for the Trans-Gaspesian highway.

Geochemistry

Five major brooks, small tributaries of the east side of Sainte-Anne-Nord-Est river, and the vicinity of Castor lakes were systematically sampled. Along the stream courses,

samples were taken at intervals of 1,000 feet, at the rate of two per station: one in the bed of the stream and the other 2 or 3 feet from the side of the channel. The laboratories of the Department of Natural Resources made 110 determinations for copper, zinc, lead and molybdenum. Results are shown on the map.

The arithmetic mean of the contents in p.p.m. were calculated after excluding concentrations above 80 p.p.m. for copper, 120 p.p.m. for zinc, 30 p.p.m. for lead and 10 p.p.m. for molybdenum.

The arithmetic mean for copper is 34 p.p.m. More than 70% of the results are between 20 and 50 p.p.m. At the head of the smaller of the Castor lakes one determination was 4 times higher than the arithmetic mean. The sample was taken 600 feet south of the rusted zone described previously in this report. Another interesting result, equivalent to twice the arithmetic mean, was found at the head of Portes-de-l'Enfer brook in the drainage basin of a zone of rusty hornfels situated immediately to the east.

The mean for zinc is 76 p.p.m. About 65% of the results are between 60 and 90 p.p.m. A value equal to 3 times the mean was found 3,200 feet to the east of the mouth of Americains brook; no indication of mineralization is apparent in this area. A similar situation exists for a value equal to twice the mean on the course of Portage brook, 2,200 feet east of the point of intersection of the road that leads to Americains lake. Another ancmalous result was obtained for a sample taken in the mineralized area 200 feet east of the larger of the Castor lakes.

The mean for lead is 15 p.p.m. About 65% of the results fall between 10 and 20 p.p.m. The area of Castor lakes shows three results equal to 3 times the mean. One other anomalous value occurs along the central tributary of Porc-Epic brook.

The mean for molybdenum is 3 p.p.m. All the results between 4 and 8 times the mean occur a short distance from granite. Except for a single one at the head of Americains brook all these high values are found in the area of Castor lakes.

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