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PRELIMINARY REPORT, GEOLOGY OF COLOMB - CHABOULLIE - FABULET AREA, ABITIBI TERRITORY

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Énergie et Ressources naturelles
Québec

P.R. NO. 514

DEPARTMENT OF NATURAL RESOURCES

RENÉ LÉVESQUE, MINISTER

P.-E. AUGER, DEPUTY MINISTER

Geology

of

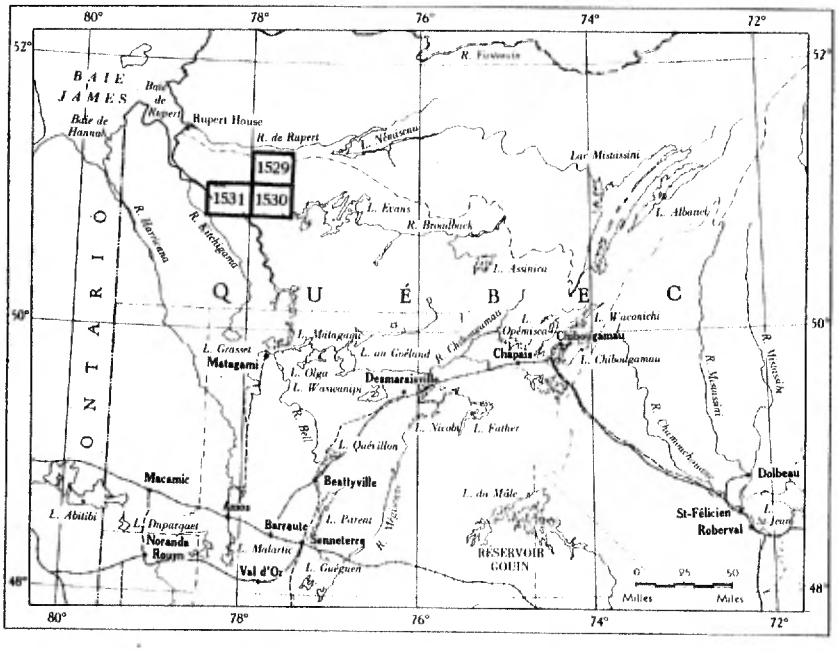
COLOMB-CHABOULLIÉ-FABULET AREA

ABITIBI TERRITORY

PRELIMINARY REPORT

by

Jerome H. Remick



QUEBEC

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GEOLOGICAL SURVEYS BRANCH

H. W. McGERRIGLE, CHIEF

GEOLOGY

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PRELIMINARY REPORT

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INTRODUCTION

The Colomb-Chaboullié-Fabulet area was geologically mapped during the summer of 1962. Traversing was shared by eight two-man teams which were transported to and from fly camps, and supplied, by a Bell Super-G helicopter. Abundant landing areas for the helicopter were provided by patches of muskeg and by the many lakes and ponds.

The area lies between latitudes 50°45' and 51°00' and longitudes 77°30' and 78°30' and, in the eastern part, between longitudes 77°30' and 78°00', extends north to latitude 51°15'. It covers approximately 1,200 square miles. The centre of the area is 165 miles north of Amos and 80 miles north-northwest of Mattagami townsite.

Access

Aviation companies with bases at Amos, La Sarre, Senneterre, Watson lake, and Moosonee provide transportation into the area.

Float planes can land on most of the lakes in the area and on several places on Nottaway and Broadback rivers. Boulders, low water, and discolouration of water by suspended sediment make landing hazardous on much of Nottaway river. Broadback river is deeper and clearer.

The central part of the area may be reached from Mattagami lake by canoe along Nottaway river. However, the trip is arduous owing to many rapids and falls.

Within the area, motor canoes may be used on Broadback and Nottaway rivers, although portaging is necessary around the occasional rapid or falls. Light canoes may be used on Quitchigama and Lepallier rivers and with considerable difficulty on Iroquois river.

Inhabitants

Although there are no settlements within the area, two Hudson Bay posts are only a short distance to the north. Némiscau post, with about 160 Cree Indians and a Hudson Bay store, is about 60 miles northeast of the centre of the area. Rupert House post, about 55 miles to the north-northwest, has about 500 Cree Indians, a Hudson Bay store, a canoe factory, two churches, a school, and an infirmary. It is serviced by plane from Moosonee three times a week, ~~and from Némiscau every few weeks~~. Trapping during the winter months provides the main income of the Indians. Potatoes and other hardy vegetables are successfully grown at Rupert House.

Topography

The surface of the area is a plain sloping gently towards James bay. It is covered by areas of muskeg and spruce with small hills, ridges and areas of rock rising to about 200 feet above the general level. Topography is gentle and geologically controlled for the most part. The courses of Nottaway and Broadback rivers and the elongation of Colomb lake parallel structural trends in the surrounding bedrock. The drainage is generally to the northwest, and all of it goes into Rupert bay.

The most prominent topographic feature is a band of hills of metasedimentary and volcanic rocks 1 mile to 2 miles wide that commences northwest of Chaboullié lake and continues northeasterly to the east boundary of the area. It passes about ¾ mile north of Colomb lake. The band is at its highest (about 200 feet) northeast of Chaboullié lake and diminishes gradually northeasterly. The hills generally have a steep to vertical north-facing slope and a gentle, south-facing, dip slope.

Outcrops are usually covered by vegetation even on the highest hills. The cover is thickest on outcrops in the Chaboullié Lake part of the area and thinnest north of Broadback river where large, bare, rounded hills of granite and biotite paragneiss are exposed.

Mapping ~~Mining~~ methods

Ground traverses were made at half-mile intervals over outcrop areas. Areas where no exposure was indicated either from aerial photographs or helicopter flights were not traversed. All outcrops on lake shores and in rivers and streams were examined.

Division of field work

In order to maintain continuity in mapping the senior geologists were each given areas to map and each submitted a report of his own. The areas of responsibility are roughly as mentioned below. Walter Peredery and Pierre Gillain mapped the Fabulet map-area. W.M. Atkins mapped the north part of the Chaboullié map-area and Jacques Doire, the south part. W.M. Atkins and Pierre Gillain mapped the north part of the Colomb map-area; J.H. Remick, the central part; and R. Bogosh, the south part. J.H. Remick supervised the project and was assisted generally by Pierre Gillain.

Previous work

The area adjoining the west side of the Fabulet map-area was geologically mapped in 1961 (Remick, Gillain and Durden, 1963; Remick and Gillain, 1963). The other adjoining areas are unmapped. The only previous governmental geological mapping within the area consisted of reconnaissance surveys along Nottaway river (Bancroft, 1913) and Broadback river (Shaw, 1942a).

GENERAL GEOLOGY

All the consolidated rocks of the area are Precambrian in age. Unconsolidated sediments and muskeg peat are widespread.

Metavolcanics and gneissic metasedimentaries are the oldest rocks in the area and form several mappable zones. Meta-gabbro occurs in a long, narrow, concordant body that carries inclusions of metasedimentary rock and is intruded by muscovite pegmatite; its age relative to the granites is not known. In places, granitic rocks consisting of quartz, feldspar, biotite and/or hornblende have assimilated and intruded the metavolcanic and metasedimentary rocks, with resultant zones of lit-par-lit gneiss, granitic gneiss and granite with large inclusions of gneiss. Granitic dykes, syenite and pegmatite cut the granitic rocks. Dykes of gabbro and diabase appear to be the youngest rocks in the area.

Mineralization in the area may be subdivided as follows: chalcopyrite and pyrrhotite in small lenticular zones in the meta-gabbro; rusty zones in metavolcanic and metasedimentary rock containing small amounts of disseminated pyrite, pyrrhotite, or, in a few places, arsenopyrite; magnetite in quartz-magnetite rocks; and a few scattered beryl crystals in pegmatite. The first of these would seem to offer the best possibility.

Metamorphosed Volcanic Rocks

Parts of three zones of metavolcanic and metasedimentary rocks and some meta-gabbro outcrop within the area. They are the Frotet-Evans volcanic-sedimentary zone, the Obamska volcanic zone, and the Chaboullié-Montagnes volcanic-sedimentary zone. As

TABLE OF FORMATIONS

CENOZOIC	Recent	Muskeg peat
	Pleistocene	Marine clay, silt, sand, gravel, boulders Grey clay, silt, sand, boulders
UNCONFORMITY		
PRECAMBRIAN	Basic dykes	Gabbro, diabase
	Granitic Rocks	Muscovite pegmatite, muscovite granite, tourmaline granite, normal pegmatite Syenite Pink leucocratic granite with stained quartz Salmon granite Grey granite; pink granite, in places foliated Hornblende granite, diorite Granitic gneiss
	Metamorphosed Basic Intrusive Rocks	Meta-gabbro Anorthositic meta-gabbro
	Metamorphosed Sedimentary Rocks	Biotite and garnet-biotite paragneiss in places with concordant layers of granite Biotite and/or hornblende paragneiss Quartzite Quartz-magnetite rocks Tremolite schist
	Metamorphosed Volcanic Rocks	Pillowed and non-pillowed lava Amphibolite, amphibole rocks, hybrid diorite

Note: The rock units are grouped lithologically and not necessarily in the order of their age.

the rock assemblage and degree of metamorphism in the three zones are slightly different, the zones are discussed separately below.

Obamska volcanic zone

The eastern end of the Obamska volcanic zone strikes northerly across the west part of the Fabulet map-area. The zone continues into the adjoining area (Remick, Gillain and Durden, 1963) west-southwesterly for 18 miles and attains a maximum width of 10 miles. Active prospecting in that part of the zone west of Quitchigama river during the summer of 1962 resulted in the discovery of gold in quartz veins and several zones containing some chalcopyrite and minor sphalerite.

Outcrops in the Obamska volcanic zone west of Quitchigama river are very well exposed on rounded hills and consist of metamorphosed pillowed and non-pillowed lava with some meta-gabbro and thin layers of metasedimentary rock. Hybrid diorite occurs near the southern boundary of the zone a little west of Quitchigama river.

Pillowed lavas are greenish grey to black, weather dark green to black, and consist mainly of hornblende and plagioclase. Pillow structures are outlined by lighter or darker rims, many of which stand in relief. The pillows are 1 foot to 4 feet long and slightly elongated. Top and bottom characteristics are usually not well enough preserved for reliable determinations. Non-pillowed flows are similar in composition but slightly coarser in grain size.

The volcanic rocks in the northern part of the band, near Quitchigama river, are coarser in grain size, and, in places, are cut by narrow aplitic-like dykes. Muscovite granite and pegmatite intrude the lava here, and the result is a small area of intermixed outcrops of granite or of lava.

Layers of metasedimentary rock are typically greyish and consist of quartz, feldspar, biotite, hornblende and garnet in variable amounts. Thin layers of quartz-magnetite rocks occur in a few places west of Quitchigama river (Remick,Gillain and Durden 1963).

Hybrid diorite, intruded by masses of leucocratic granite and pegmatite, outcrops in a few places near the south contact of the Obamska volcanic zone in the Fabulet map-area. The rock is usually massive and consists of varying amounts of feldspar and hornblende, with the latter generally predominating. Hornblende ranges from 1/16 to $\frac{1}{4}$ inch long within a few feet in some outcrops.

The rock in the Obamska volcanic zone east of Quitchigama river is mostly amphibolite. Small masses of white granite and pegmatite form 5-10% of the zone. Several small intrusive zones of meta-anorthositic gabbro were noted.

The fresh and weathered surfaces of the amphibolite show a fine "salt and pepper" appearance, owing to the homogeneous

intermixture of plagioclase and hornblende. The rock is dark grey, light grey weathering, well foliated, and slabby. Although rusty in places, no concentrations of sulphide minerals were noted. Here and there a higher degree of recrystallization has produced lenses, lenticular layers, "knotty" lenses, and lines containing a higher percentage of coarser hornblende and up to 20% reddish brown garnet. Pillow rims $\frac{1}{4}$ to 1 inch wide are present in some places and consist of more resistant, darker, and more coarsely crystallized rock. They have an inner layer of feldspar with a little hornblende and an outer layer of hornblende. Top determinations are difficult to make.

The Frotet-Evans volcanic-sedimentary zone

The western end of the Frotet-Evans volcanic-sedimentary zone extends northwesterly along the northeast side of Nottaway river and terminates a little west of the south end of Interdite island. It lenses out just west of Davoust lake near the south boundary of the Chaboullié map-area, but reappears some 5 miles farther southeast outside the area.

The zone is narrow and partly engulfed or in places cut off by granite. Outcrops occur as scattered hills elongated parallel to the strike of the zone and are heavily covered with vegetation. Amphibolite and paragneisses are the main rock types. A layer of finely banded amphibole-quartz-magnetite rock about 20 feet thick crops out on the east bank of Nottaway river about 3 miles south of Interdite island.

Amphibolite outcrops near the north end of the zone and in a few places at the south end, near Nottaway river. The rock is homogeneous, fine to medium grained, and foliated but not layered. Hornblende predominates over plagioclase. No features diagnostic of volcanic rocks were noted, but it is possible that at least some of the amphibolite may be of volcanic origin.

Chaboullié-Montagnes volcanic-sedimentary zone

The Chaboullié-Montagnes volcanic-sedimentary zone extends from about 2 miles west of Chaboullié lake northeasterly to the east boundary of the Colomb map-area. A thin zone of biotite and/or hornblende paragneiss lies against the northern contact of the volcanic rocks north of Colomb lake and forms the northern part of a prominent band of ridges. This zone of paragneiss and volcanic rock may continue northeasterly across Némiscau lake to join with the zone of paragneiss and amphibolite mapped in the Montagnes Lake area (Valiquette, 1963).

The volcanic zone consists of pillowed and non-pillowed lava, amphibolite, meta-gabbro, a few layers of feldspathic metasedimentary rock and some pegmatite dykes. The lava is schistose but less altered than other lavas in the area. Its weathered surface is greenish or, in areas having a higher degree of metamorphism, bluish. Pillow outlines are commonly present but satisfactory top determinations could not be made. Reddish brown

garnet occurs in the more recrystallized lava and in lenses and "knotty" lines of coarser black hornblende.

Amphibole rock

An outcrop of amphibole rock occurs south of the long east-west stretch of Nottaway river in the north part of the Fabulet map-area. The rock is massive, coarse grained, and consists almost entirely of equant, dark, hornblende grains.

Metamorphosed Sedimentary Rock

Biotite paragneiss and garnet-biotite paragneiss with concordant layers of granite

Biotite and garnet-biotite paragneisses, usually with concordant layers of biotite granite, outcrop in the north of all the map-areas. Except for a few outcrops of diabase, no other rock type was noted in this zone.

Some of the biotite paragneiss and other rock types that outcrop south of, and along, Nottaway river contain a little hornblende. Hornblende was not noted in the outcrops in the large area of biotite paragneiss north of Nottaway and Broadback rivers.

The biotite paragneiss is usually fine grained, but medium-grained types occur abundantly in the northeast corner of the Fabulet map-area and in the northwest corner of the Chaboullié map-area. It is a homogeneous foliated rock that lacks relict sedimentary bedding. Straight layering with a slight pinch and swell structure occurs only in areas of lit-par-lit granite and gneiss. Some of the weathered surface is slightly rusty.

The rock commonly consists of quartz, white feldspar, and 5-15% biotite. It contains garnet in some areas and fairly large, scattered flakes of muscovite occur with biotite in a few outcrops a little north of Chaboullié lake.

Much of the biotite paragneiss contains usually concordant lenses or thin layers of quartz that stand above the weathered surface; in a few places they cut across the foliation at a small angle. Granite, either leucocratic or with small amounts of biotite, also occurs concordantly as small lenses or layers, as in the northern part of the Chaboullié and Colomb map-areas, or, it may occur in large masses, the largest being shown separately on the map. A few pegmatite dykes cut the foliation of the biotite paragneiss.

Interesting features were noted where the biotite paragneiss and granite occur in lit-par-lit arrangement. Paper-thin schlieren of biotite with some quartzofeldspathic material occur within the granite in a coarser state than in the paragneiss. Here and there a thin layer of coarse biotite occurs at the granite-gneiss contact. Garnet is best developed in the granite or

in the paragneiss near the granite contact and was only rarely observed where granite is absent. A gradation from granite with included schlieren, lenses, layers and blocks of biotite paragneiss to lit-par-lit gneiss and granite was noted from south to north in the Colomb Lake map-area (except in the northeast and northwest corners where granite is the main rock type).

The zone of biotite paragneiss and granite along Nottaway river is not as homogeneous as that just discussed to the north. It includes an assemblage of biotite paragneiss with thick concordant layers of granite and pegmatite on the northeast side grading southwestward into a predominantly granitic area with large inclusions of biotite paragneiss. The contact with the granite to the south is gradational and small inclusions of biotite paragneiss occur in the granite. A few outcrops along Nottaway river consist of very finely interlayered biotite paragneiss and granite; however, most outcrops along the river consist of fairly thick layers of biotite paragneiss and fairly thick concordant layers or, in places, masses of granite. A garnet zone was noted in one locality. Parts of a few outcrops of biotite paragneiss in contact with pegmatite are recrystallized to a medium-grained hornblende-biotite granitic gneiss. Layers or lenses of amphibolite occur in a few places along the Nottaway.

Biotite-hornblende and hornblende paragneiss

Biotite-hornblende and hornblende paragneiss outcrop in a long narrow zone adjacent to the north contact of the volcanic zone just north of Colomb lake. It is possible that this zone continues, perhaps intermittently, northeasterly to join with that mapped in the Montagnes Lake area (Valiquette, 1963).

The presence of hornblende, the finer grain size of the minerals (especially the biotite), and the general absence of concordant layers of granite distinguish the rock in this zone from the biotite paragneiss to the north.

The rock is fine grained ($\frac{1}{2}$ to 1 mm.) and much of it is slabby. It is not noticeably layered, but lenticular layers, more resistant and a little richer in hornblende, occur in places. The rocks in this zone consist of various proportions of hornblende and biotite with feldspar and a little quartz. Porphyroblasts of garnet up to 1 inch in diameter with inclusions of feldspar occur in some of the biotite paragneiss. Generally, the total of dark minerals present is less than 20%. Hornblende is the predominant dark mineral in some rocks, and these break with an uneven fracture. Where biotite is the predominant mafic, as it is in many outcrops, the rock breaks into slabs and has a "sand paper" feel on the weathered surface. Small aligned hornblende crystals occur in a few outcrops of biotite paragneiss.

One or more narrow, concordant, lenticular, quartz veins about $\frac{1}{2}$ inch wide and up to 6 inches long occur in places along strike. A long, thick, concordant, tabular body of muscovite-biotite pegmatite was noted northeast of Colomb lake, and

there are small masses of granite and pegmatite in the zone just east and west of Colomb river.

Another zone of scattered biotite-hornblende and hornblende paragneiss is present just north of Chaboullié lake. The rocks consist of varying amounts of hornblende and/or biotite, feldspar, quartz and, locally, garnet. A few outcrops of biotite paragneiss are found near the west end of the zone and there are amphibolites with a high percentage of hornblende near the northeast end. Some quartzite also is present within the zone.

Porphyroblastic hornblende, biotite-hornblende and biotite gneiss

Exposures of porphyroblastic hornblende, biotite-hornblende and biotite gneiss occur in a few places in the Fabulet and Chaboullié map-areas but are too limited to be separated from the surrounding granite and gneiss. The best exposures are along and to the west of Nottaway river and on an island at the south end of Rodayer lake.

The microcline porphyroblasts on the island in Rodayer lake constitute 60-70% of the rock; are from ½ inch to 3 inches long, and up to ½ inch wide; and occur in a matrix of dark green amphibole with about 1% sphene. The microcline porphyroblasts along and near Nottaway river occur in biotite paragneiss and constitute up to 10% of the rock.

Plagioclase porphyroblasts occurring in a matrix of biotite, hornblende, and a little quartz constitute 45-70% of the rock on some small islands in Nottaway river near the south boundary of the area and also occur in amounts up to 5% in a few outcrops elsewhere on Nottaway river.

Quartzite

Quartzite occurs east and west of the north end of Chaboullié lake, and in one outcrop on the east shore of Nottaway river in the west part of the Fabulet map-area.

The rock is medium to coarse grained, massive and either white or stained with rust. Some irregular areas and lenses of green amphibole, pyrrhotite and cubical pyrite were noted. Magnetite is present in the outcrop a little west of Chaboullié lake.

Quartz-magnetite rocks

Quartz-magnetite rock was noted at several places along and near the east shore of Nottaway river about 3 miles south of Interdite island. The formation is 10-20 feet thick and consists of fine alternating laminae 1-2 mm. thick of quartz with some magnetite; magnetite;quartz,green amphibole and magnetite;and quartz. Magnetite is in small octahedral crystals. The amphibole is less resistant and leaves narrow lenticular voids on the weathered surface. Disseminated cubical pyrite occurs here and there.

Magnetite and, more locally, medium- to coarse-grained green amphibole were seen in medium-grained quartzite a few miles west of the north part of Chaboullié lake. The magnetic attraction in this area is quite high.

Thin layers of quartz-magnetite rocks occur as inclusions in several places within the Colomb Lake meta-gabbro, about 5 miles southwest of the west end of Colomb lake. The formation was stripped for about 12 feet across strike in one place, and there consists of alternating layers rich in octahedral magnetite or quartz.

Tremolite schist

A few small outcrops of tremolite schist were noted on the southern shore of Tremolite lake near the southern end of the zone of meta-gabbro. The rock is grey, weathers white, and consists of quartz, feldspar, needles of tremolite 1-4 mm. long, and, here and there, small amounts of disseminated octahedral magnetite and biotite.

Metamorphosed Basic Intrusive Rocks

Meta-gabbro

Meta-gabbro crops out mainly as a series of hills in a long, lenticular, concordant zone commencing just east of Chaboullié lake and continuing northeasterly for 24 miles to the east boundary of the Colomb map-area. A few outcrops were noted several miles north of Chaboullié lake. The meta-gabbro crops out in rounded hills, some of which display fairly high joint-controlled cliffs. It intrudes a zone of metasedimentary rock, as evidenced by layers of the latter in some outcrops. Dykes of muscovite pegmatite cut the meta-gabbro; these carry tourmaline and garnet locally.

The rock varies in grain size and mineral content within the same outcrop and from one outcrop to another. In grain size it ranges between fine and pegmatitic, and is generally coarse. Pegmatitic gabbro carrying feathery crystals of hornblende up to 2 inches long was noted in an outcrop on the south shore of Colomb lake. The rock is composed of hornblende and plagioclase. The hornblende content ranges between 10% and 90%, but in many outcrops it is between 35% and 50%. Small patches of rock rich in hornblende and patches of almost pure plagioclase were noted in some outcrops. The hornblende is more resistant and gives the rock a very rough, dark green weathered surface.

The meta-gabbro appears massive at first sight but close inspection shows much of it to be slightly schistose. Some primary mineral alignment and separation into mafic and non-mafic layers were noted. An important zone of shearing may exist near the south part of the body, southwest of Colomb lake, for several small shear zones are present here. Rusty, unsheared quartz veins cut the shear zones.

Chalcopyrite and pyrrhotite occur in small patches and lenses in outcrops on the south side of the body and in adjacent sedimentary rocks.

The meta-gabbro may be contemporaneous in age with the metamorphosed basic intrusive rocks in the Montagnes Lake area (Valiquette, 1963).

Small concordant bodies of meta-gabbro occur within the volcanics, and are most common at the west end of the Chaboullié-Colomb volcanic zone. This rock differs from the meta-gabbro mentioned above in that it is medium grained and uniform in composition within any outcrop.

Anorthositic meta-gabbro

Several small lenticular crosscutting bodies up to several hundred feet thick of anorthositic meta-gabbro occur in the northerly trending part of the Obamska volcanic zone in the west part of the Fabulet map-area. One body is exposed for about a half-mile-along strike.

The rock consists of 80-90% slightly rounded plagioclase grains with 10-20% interstitial hornblende and, in a few places, accessory secondary biotite. The plagioclase grains are 1 inch to 6 inches in diameter but most range between 1 inch and 2 inches. Near their contacts with the volcanic rock the grains are $\frac{1}{2}$ to 1 inch in diameter. The weathered surface of the plagioclase is white; the fresh surface is usually light green and commonly shows a few, widely separated, polysynthetic twin striations. The range in composition is between calcic labradorite and sodic bytownite (An_{67} to An_{73}).

The rock is massive and jointed. It is cut by pegmatite, granite and quartz veins and contains lenses of the surrounding amphibolite. It is very similar in appearance to the anorthositic meta-gabbro mapped north of Opawica river (Remick, 1957) and Lessard (now termed Piron) lake (Shaw, 1940). It is also similar to parts of the Chibougamau anorthosite complex.

Granitic Rocks

General statement

Granitic rocks closely related mineralogically, texturally, structurally and probably in age underlie much of the area and resemble the granitic rocks to the west (Remick, Gillain and Durden, 1963). In some parts, one type of granite may predominate, but usually several types are found together, are gradational or occur nearby. No distinct granitic pluton was noted. The subdivisions of the various types of granite discussed in this section were made mainly to bring out certain small differences that were noted in the field. Assimilation, in part or complete, of the wall rock by granitic material has produced local small structural or mineralogical differences in some of the granitic rocks. Schlieren,

lenses and larger inclusions of biotite paragneiss and, in a few places, amphibolite occur in some outcrops.

Granitic gneiss

A zone of granitic biotite gneiss with some granitic hornblende gneiss, amphibolite, granite and pegmatite has been outlined in the Fabulet and Colomb map-areas, and this zone continues northwesterly along Nottaway river to the mouth of Rupert bay. The best exposures are along Nottaway river at Interdite island, in the northwest corner of the Fabulet map-area, and beyond the area on the islands near the mouth of Rupert bay.

Several of the rock types commonly occur together in ill-defined layers, many of which are swirly and gradational. The granite is well jointed in contrast to the poorly jointed gneissic rocks. The outcrops within this zone consist of granitic and gneissic rocks varying in structure, texture, colour and percentage of minerals present. The main minerals are quartz, feldspar and biotite. Hornblende is present in places and garnet is found in only a few large remnants of biotite paragneiss.

The strike of foliation is usually variable within any outcrop. All the rock types are concordant, but some pegmatite (commonly a pink pegmatite with quartz cores) and some quartz veins cut across the foliation.

Granitic hornblende gneiss occurs here and there usually as smaller parts of an outcrop and is not so common as the granitic biotite gneiss. It occurs as thin lenses, either individually or in series, that contain 5-20% hornblende on the average and, in places, biotite; richer portions contain up to 60% hornblende. Granitic layers are present between some of the hornblende-rich layers.

Amphibolite occurs in a few places in rounded masses or lenticular layers of nearly pure black hornblende.

Granitic biotite gneiss may appear as large blocks or lenses in granite. Generally it contains up to 5% biotite. The rock is not layered but it is foliated, and much of the foliation is gently curved. By itself, much of the rock resembles a foliated biotite granite.

Pink aphanitic feldspar and, more rarely, epidote fill some joints and fractures in all rock types.

Hornblende granite, diorite

The area between Rodayer lake and Colomb lake and some of the area south of Rodayer lake are underlain by granites rich in hornblende with some related hornblende-biotite granite, biotite granite and hornblende diorite. Thick layers and masses of biotite and/or hornblende schist occur in some outcrops, as well as various hybrid hornblende and feldspar rocks. The scarcity of

outcrop between Colomb and Rodayer lakes makes it difficult to separate the various rock types. Rare outcrops of hornblende granite and diorite were noted in a few other places in the area.

The hornblende granite near Rodayer lake is massive, medium grained and equigranular, and has a pitted weathered surface where biotite is present. The rock consists of 5-15% hornblende, up to 5% biotite, 10-25% quartz and white feldspar. Accessory amounts of magnetite, epidote, pyrite and/or sphene occur in some outcrops.

Light pink and grey granite; grey granite

Light pink and grey, or grey to white, granites occur abundantly throughout the area. Two main types can be distinguished on the basis of colour and granularity and, to some extent, of occurrence. These are a generally coarse-grained grey to white granite (occurring as concordant layers within the biotite paragneiss and as the greater part of the large masses in the Colomb map-area and in the very north parts of the Chaboullié and Fabulet map-area), and a medium-grained, pink and grey granite that appears throughout the present area and also the area to the west (Remick, Gillain and Durden, 1963).

The first type of granite consists of quartz, plagioclase, potash feldspar, and a small amount of biotite and, in places, pink garnet. Some is almost leucocratic. Large, well developed laths of feldspar up to ¾ inch long are developed in some of the larger outcrops, and there are some gradational areas of white pegmatite with feldspars up to 3 inches long. Schlieren and narrow layers of biotite assimilated from the biotite paragneiss occur in some outcrops. The second type of granite occurs in places in some of the large masses in the northern part of the Colomb map-area, as well as much of the granite elsewhere. It is medium grained, pink or grey and consists of quartz, plagioclase and potash feldspar, biotite and, in some outcrops, accessory magnetite and pyrite. The biotite content, with many flakes about 1 mm. in diameter, is generally 0.5%-3%.

A brick-red colour was noted in some of the outcrops near and along the shore of the north-south part of Broadback river. The biotite is chloritized and the feldspar in a few places epidotized. The rock is sheared and fractured in places. The material causing the brick-red colour appears to have infiltrated along closely spaced fractures and joints and along cleavage planes in feldspar and to have emigrated outward into the rock.

Fluorite was noted in a pink feldspar-filled fracture in granite a few miles north of the east part of Colomb lake.

Salmon granite

Salmon granite outcrops in a limited area for a few miles east and west of the northerly trending part of Broadback river in

the northwest part of the Colomb map-area. The rock is in large, individual masses or, more commonly, is associated with the pink and grey granite just described. It was not noted in the granitic layers in biotite paragneiss. Curved schlieren and larger inclusions of biotite paragneiss are present here and there.

The rock is characterized by light salmon-pink feldspars and by common small clots of biotite associated with garnet. Some of the weathered surface is bleached white. The rock is massive, medium grained and homogeneous, and is made up of quartz, plagioclase and potash feldspar, biotite, and garnet. It is fairly well jointed.

Pink, leucocratic granite with stained quartz

Widely separated outcrops of pink, leucocratic granite with stained quartz were noted on and near Chaboullié lake, southward to Davoust lake, and southeastward to Rodayer lake. Pink pegmatite is gradational with this granite in many outcrops. It occurs with older granitic and gneissic rocks in many places and does not form a distinct pluton.

The rock is massive and medium grained, and consists of about 30% quartz, plagioclase and potash feldspar, and accessory amounts of biotite and hornblende. Hematite films colour some of the quartz.

Syenite

Two occurrences of almost leucocratic syenite were noted south and southeast of Richerville lake. The syenite south of the lake occurs as a dyke intrusive into granite. It is pink, massive and medium grained, and is composed of pink and white feldspar with accessory green amphibole and epidote.

Augite-syenite outcrops on a small island near the south end of Chaboullié lake. The rock is light pink on both fresh and weathered surfaces, massive, medium grained, homogeneous and almost equigranular. A thin section shows plagioclase (An_{24}), microcline, augite, and small amounts of quartz, sphene, magnetite and zircon. Plagioclase constitutes slightly more than 1/3 of the total feldspar. In hand specimen the pyroxene is bright green and the feldspar light pink. Sphene occurs in brownish, elongated, diamond-shaped crystals up to 2 mm. long and magnetite in octahedra about 0.5mm. in diameter.

Pegmatite

General statement

Lithologically and on the basis of occurrence, the pegmatites of the area may be classified as muscovite and normal types. Pegmatites containing muscovite are restricted to three zones, whereas the normal pegmatites occur throughout the area although not generally associated with the muscovite pegmatites.

Muscovite pegmatites have the following characteristics: 1) the presence of muscovite; a few contain biotite and muscovite; 2) many contain tourmaline, pink garnet and/or beryl; 3) absence of magnetite; 4) white in all cases; 5) many are in large masses or in dykes; in general are larger than most of the normal pegmatite occurrences; 6) usually crosscut the host rock.

Normal pegmatites have the following characteristics: 1) absence of muscovite; may or may not contain biotite; 2) absence of tourmaline or beryl but may contain pink garnet; 3) some contain magnetite; 4) usually pink, but some are grey or white; 5) usually in small tabular or irregular masses; 6) many are concordant with the surrounding host rock especially if the latter has a strong primary foliation.

Muscovite pegmatite

White pegmatite, in places associated with white granite containing muscovite, tourmaline, garnet and/or beryl, outcrops in three zones within the area. The largest zone trends northeasterly from Chaboullié lake to the east boundary of the Colomb Lake map-area. A narrower zone lies along the northwesterly part of Nottaway river and a third zone is just east and west of Quitchigama river at the north contact of the Obamska volcanic zone.

Lepallier-Chaboullié-Colomb zone. - This zone has a maximum width of about 4 miles. It consists of muscovite pegmatite with local garnet, tourmaline and/or beryl, muscovite granite, and tourmaline granite. The northern part of the zone is made up of small pegmatitic bodies cutting paragneiss, volcanic rock, and meta-gabbro. Fairly large masses of muscovite pegmatite and granite were separated in the south part of the zone.

Besides quartz and feldspar, the pegmatite usually contains 1-3% muscovite, about 1% tourmaline and, in places, accessory amounts of pink garnet. Tournaline is in black, prismatic crystals commonly 1/8- 3/8 inch across and up to 1 inch long, but crystals $\frac{1}{2}$- $\frac{3}{4}$ inch across and $\frac{1}{2}$ inch to 3 inches long were noted about 2 miles northeast of Chaboullié lake a few hundred feet west of the west end of the volcanic zone. Much of the tourmaline is concentrated in small areas within the pegmatite rather than being disseminated evenly throughout, and appears to be limited in occurrence to pegmatite and associated granite within the Lepallier-Chaboullié-Colomb zone. One white pegmatite about 2 miles north of Chaboullié lake contained biotite instead of muscovite in addition to tourmaline and pink garnet.

Nottaway River zone.- White pegmatite and associated white granite occur in places in the zone of biotite paragneiss along and near Nottaway river. Small crystals of pink garnet and muscovite flakes were noted in both rock types.

Quitchigama River area.- Fairly large outcrops of white muscovite pegmatite and granite occur just east and west of Quitchigama

river at the north contact with the Obamska volcanic zone. Pink garnet is present in several places in both rock types. Biotite was noted in a few pegmatites. A few remnants of hornblende schist occur in the pegmatite.

Normal pegmatite

These pegmatites occur throughout the area in small tabular or irregular masses that usually are concordant with the host-rock foliation, where present. Some of the largest outcrops are along Nottaway river in biotite paragneiss. Thin dykes and veins of medium-grained, leucocratic granite occur in some of the pegmatites.

The pegmatite is light pink or, in places, grey to white. It consists of quartz, feldspar and, in some bodies, biotite, garnet and/or magnetite. Many of the pegmatites do not contain any mica and only a few contain magnetite. Garnet is usually present only with biotite. Tourmaline and muscovite are absent.

The few and scattered magnetite-bearing pegmatites contain several per cent magnetite in concentrations of grains, 1/8-1 inch in diameter, many of which have good octahedral parting. Quartz and feldspar are usually the only other minerals present.

Pink or grey, quartz-feldspar pegmatites, containing 2% or less biotite in some places, are best developed in the biotite paragneiss along Nottaway river. Some are 100 feet wide, but most are 10 feet or less. Large blocks of potash feldspar, up to 4 feet in diameter, occur in some pegmatites. Parts or all of a single fragment may show graphic texture made up of thin rods of quartz in parallel orientation each about 2 inches long and 1/8 inch in diameter. Quartz cores and schlieren of biotite occur in a few pegmatites. Biotite is more abundant in the grey pegmatite and occurs in booklets ½ inch to 2 inches in diameter.

Quartz veins

Quartz veins cut all rock types in the area except the diabase and gabbro dykes. Rusty, non-fractured quartz veins cut a shear zone in the meta-gabbro southwest of Colomb lake. The veins are usually barren; arsenopyrite was noted in one.

Basic Dykes

Diabase, gabbro

Dykes of diabase or gabbro crop out in three main zones in the area, as follows: a north-northwesterly striking zone in the west part of the Fabulet map-area; a northwesterly striking zone in the east part of the Fabulet map-area south of the west end of Lepallier lake and the west part of the Chaboullié map-area; and an east-west zone in the southeast corner of the Chaboullié map-area on the shore of De Sorsons lake.

The dykes in the first-mentioned zone are nearly 100 feet wide, and are accompanied here and there by narrow satellitic dykes. The grey to black colour of the large dykes, and the fact that they may rise to 15 feet above the surrounding granite, makes them conspicuous from the air.

The rock is massive and medium grained, and breaks into large joint blocks. The best developed set of joints is normal to the strike of the dyke and another less well developed set is parallel to this strike. The dykes are chilled against the granite, and the chilled zone is similar in appearance to the narrow satellitic dykes that occur nearby in some places. The rock is gabbroic in composition and has a fair diabasic texture. It consists of augite, plagioclase, accessory magnetite and rare pyrite.

The dykes on the shore of De Sorsons lake in the Chaboullié map-area range from a few inches to 100 feet wide. The rock is exposed only along the shore-line and in low outcrops. Most of the dykes are narrow, aphanitic or fine grained and black, and contain small phenocrysts of green pyroxene. The largest dyke is medium grained and consists of plagioclase, pyroxene, and a few grains of pyrite.

STRUCTURAL GEOLOGY

Apart from the usual and approximately east-west regional structural trend, a northeasterly and a northwesterly trend occur in separate parts of the area and join just west of Chaboullié lake. Several other structural trends exist within small areas.

The northeasterly trend commences a little west of Chaboullié lake, continues through the Colomb map-area and on through Némiscau lake to Montagnes lake at latitude 51°37' (Valiquette, 1963). The biotite paragneiss zone in the north part of the Colomb map-area strikes more easterly than the volcanic zone and the zone of biotite and/or hornblende paragneiss to the south. However, the dips from the north part of the Colomb map-area to the south shore of Colomb lake are to the south. An area of northerly dipping paragneiss lies adjacent to a zone of southerly dipping volcanic rock just north of Chaboullié lake.

A northwest structural trend commences in the Frotet-Evans sedimentary volcanic zone about 10 miles south of the Chaboullié map-area. This zone crosses the area parallel to the trend of Nottaway river and extends as far as Rupert bay. The almost northerly structural trend in the volcanic zone of the west part of the Fabulet map-area swings northwesterly near the northwest corner of that map-area to merge with the northwesterly trend along Nottaway river.

A northerly trend is shown by the biotite paragneiss in the northernmost part of the Fabulet map-area.

PLEISTOCENE AND RECENT

Glacial striae

The direction of glacial striae in the area may be subdivided into four groups as follows: 1) S.15°W. to S.50°W. (average noted = S.20°W. to S.30°W.); 2) S.15°E. to S.45°E. (average noted = S.15°E. to S.30°E.); 3) S.65°E. to S.75°E.; 4) East to N.80°E.

The first two groups of striae have the same direction as those southwest of the Labrador centre and southeast of the Keewatin centre of glaciation. The third and fourth groups occur locally southeast of Rupert bay. The first group, which strikes roughly southwesterly, extends from northeast Quebec southwesterly through the Chibougamau-Mistassini region as far westward as Quitchigama river. The second group, striking southeasterly, extends from James bay and Hannah bay across the western part of Quebec as far east as Nottaway river. The area between Quitchigama and Nottaway rivers is an approximate divide between the southeasterly and southwesterly groups.

The striae in the third and fourth groups occur along Nottaway river, Colomb lake, and Quitchigama river in the area and, west of the area, along Missisicabi and Harricana rivers (Remick, Gillain and Durden,1963). To date the striae in the third and fourth groups have been noted only between the north part of Rupert bay and latitude 50°48' (Remick and Gillain,1963).

Small slabs and boulders of Paleozoic rock, perhaps derived from the area of Paleozoic rock near Rupert bay, were noted on the shores of Colomb lake.

Small areas of granitic and gneissic boulders were noted in the Fabulet map-area and just north of Colomb lake. The Colomb Lake boulders were slightly south, and those in the Fabulet map-area were slightly south or west, of their respective sources.

Sediments

Muskeg peat covers much of the area and overlies detrital sediments of Pleistocene and Recent ages.

Reworked silts containing some clay form moderately high banks in some of the westerly flowing parts of Broadback river.

Boulders are present along the shores of some lakes and along parts of the larger rivers. A boulder pavement was noted on the west shore of Nottaway river just south of Interdite island.

Clay, visible at low water in a few places on Nottaway river and in Colomb lake, appears to be in its original site of deposition and is usually overlain by muskeg peat. A fairly

long exposure of clay overlain by about 10 feet of muskeg peat was noted along the east shore of Nottaway river near the junction of the Fabulet and Chaboullié map-area.

About 8 feet of muskeg peat overlies grey, layered clay at the east end of Colomb lake. The formation consists of layers of more resistant, medium grey clay $\frac{3}{4}$-1 inch thick alternating with slightly lighter grey layers 1/8-1/4 inch thick. The layers break cleanly, but there is only a slight colour contrast and the layering is only apparent on the eroded edge facing the lake. Rock particles, from 1/8 inch to 6 inches in diameter (averaging 1/8-1 inch in diameter), make up less than 1% of the clay.

Layered clay overlain by reworked detrital sediments outcrops on the west shore of Nottaway river about $\frac{1}{2}$ mile south of Interdite island. The clay consists of very fine-grained, slightly darker layers about 6mm. thick alternating with slightly lighter grey and somewhat coarser-grained layers about 4mm. thick. The layers break cleanly but the colour contrast is slight. No pebbles were noted.

ECONOMIC GEOLOGY

Prospecting Activity in the Area

The first major prospecting in the area was done by prospectors working for Noranda Exploration Company Limited. Their first work was along that part of the Frotet-Evans volcanic-sedimentary zone south of Dana lake, and the zone was followed northwesterly to its termination a few miles south of the area. Work was then started around Rodayer lake and later extended to Chaboullié lake where sulphide mineralization was noted late in the summer of 1956. An exploration program in conjunction with N.A. Timmins (1938) Ltd. was then initiated over 475 square miles following the northeasterly trending zone of volcanic, metasedimentary and meta-gabbroic rocks north of Chaboullié lake to a small distance east of the Colomb Lake map-area. The program included airborne and ground geophysical surveys, prospection, geological mapping, and packsack drilling. Small areas containing chalcopyrite and pyrrhotite were uncovered and drilled in the zone of meta-gabbro.Sections from core samples from these areas gave encouraging assays for copper and nickel with traces of gold and silver. Claims are still held over parts of the zone of meta-gabbro and further work may be done in the area.

A small area was staked in the Frotet-Evans volcanic sedimentary zone just east of Nottaway river at latitude 50°50' in 1957 for New Athena Mines Ltd. and the H. Philippon interests. Small amounts of pyrite, pyrrhotite, arsenopyrite, and chalcopyrite were noted in two showings less than a mile apart in fine-grained hornblende-plagioclase gneiss, biotite gneiss and iron-bearing rock. Assays showed very small amounts of gold, silver and copper. The claims were allowed to lapse.

Prospectors Airways Ltd.,in the summer of 1958, examined and mapped some of the Frotet-Evans volcanic-sedimentary zone along Nottaway river and some of the area around Chaboullié lake.

Types of Mineralization in the Area

Mineralization in the area may be divided into four types: a) chalcopyrite and pyrrhotite in small lenticular areas in the zone of meta-gabbro; b) numerous small rusty zones in the meta-volcanic and metasedimentary rocks just north of Chaboullié and Colomb lakes containing disseminated pyrrhotite, pyrite, and, in a few places, arsenopyrite; c) magnetite in quartz-magnetite rocks; and d) scattered light green crystals of beryl in small pegmatites.

It is possible that economic concentrations of copper with nickel, silver, and gold may be present in the zone of meta-gabbro. No sulphide mineralization was noted in the granite and biotite paragneiss that underlie more than 90% of the area.

Chalcopyrite and pyrrhotite in the zone of meta-gabbro

Chalcopyrite, pyrrhotite, and, locally, a little pyrite occur in small rusty areas in the zone of meta-gabbro and in the metasedimentary rocks intruded by the meta-gabbro. Sulphide minerals were not noted in the dykes of tourmaline-muscovite pegmatite that intrude the meta-gabbro.

The rusty zones are 10-40 feet wide and up to 100 feet long. The sulphide minerals occur in small widely separated lenses or patches several inches to a foot long within these zones. Sulphide minerals, occurring along small poorly defined micro-fractures and as thin replacement lenses, make up 1-15% of the zones. Four samples, each taken from better mineralized parts of four rusty patches, assayed 0.00-0.007 ounce gold per ton; 0.075-0.265 ounce silver per ton; 0.37-0.98% copper; 0.05-0.30% nickel; and 0.01-0.10% zinc. The samples indicated that areas rich in copper were richest in silver and gold. The amount of nickel was relatively constant.

Rusty zones in metamorphosed volcanic and sedimentary rocks

Small amounts of sulphide minerals occur here and there in the volcanic zone and in the narrow zone of hornblende and/or biotite paragneiss just north of Chaboullié and Colomb lakes. Assays give traces of copper, silver, and gold. Pyrite and/or pyrrhotite are usually present; arsenopyrite is present locally; magnetite occurs with the sulphide minerals in a few outcrops of metasedimentary rock north and west of Chaboullié lake.

The zones are usually 20-100 feet wide and from 100 to many hundred feet long. One zone north of the east end of Colomb lake occurs intermittently along strike for several miles.

Magnetite in quartz-magnetite rocks

Layers of quartz-magnetite rocks up to 20 feet wide and magnetite in quartzite occur in several places in the area. The deposits seen are too small for economic exploitation. Because they produce a moderate local magnetic anomaly, their locations are indicated on the accompanying maps.

Beryl in pegmatite

Small crystals of beryl are disseminated in several small pegmatites throughout the area. The amount of beryl is less than 1% in all cases noted. The largest crystals seen are 1/8-3/8 inch in diameter, 1 inch long, and occur in a muscovite-biotite pegmatite in the biotite and hornblende paragneiss just north of the east end of Colomb lake.

RECONNAISSANCE WORK SOUTH OF THE AREA

A rapid examination of the extension of the Frotet-Evans volcanic-sedimentary zone south of the present area was made during the summer of 1962 (Remick and Gillain,1963). The zone widens gradually southward. About 4 miles southeast of the southern boundary of the area, the zone is exposed in a prominent ridge that rises to 250 feet above the surrounding ground and continues for several miles before swinging eastward towards Ouagama lake in a wider series of round, bare hills.

The ridge consists of finely drag-folded chlorite schist and hornblende schist or gneiss with some lightly schistose bodies 20-70 feet wide of medium-grained meta-gabbro. Thin, lenticular, concordant bodies of aplitic rocks with small disseminated pink garnets are common.

Well preserved, lightly schistose, greenish pillowed and non-pillowed lava; coarse-grained meta-gabbro; biotite paragneiss; and quartz-magnetite rocks, all cut by large masses and dykes of tourmaline-muscovite pegmatite, were noted on some of the rounded hills of the easterly trending part of the zone. A few large rusty zones were seen, one of which is at least 1,000 feet long and consists of lenses rich in pyrite in a quartz vein; pyrrhotite was noted in the adjacent wall rock. One outcrop of meta-gabbro contains a small pocket of chalcopyrite and pyrrhotite; about 1% molybdenite was noted in a small brecciated pegmatite nearby.

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