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Preliminary report on Brochant - de Bonnard area, New Quebec

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PRELIMINARY REPORT

ON

BROCHANT - DE BONNARD AREA

NEW QUEBEC

BY

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NEW QUEBEC

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INTRODUCTION

Brochant-De Bonnard area, studied during the summer of 1956, encompasses approximately 400 square miles. It is bounded on the north by Payne river, on the east by Ungava bay, and on the south by an irregular line that begins at the shore of the bay and follows approximately along the 59°35' parallel of latitude westward to the 69°45' meridian of longitude, a distance of four miles. From this meridian the boundary line follows latitude 59°40', then it swings west to the 70°00' meridian, and thence on the west by a broken line that joins the 70°00' and 70°07'30" meridians of longitude. The outlet of Payne river lies approximately 145 miles northwest of Fort Chimo airport.

The geological map accompanying this report is divided into a north sheet and a south sheet.

Geologically, this area is in the "Labrador Trough", which is composed of sedimentary and volcanic rocks intruded by gabbro sills. This assemblage rests on a gneissic basement and has been highly folded and metamorphosed and, contrary to observations made to the south at the western margin of the geosyncline, the basement has been folded along with the geosynclinal rocks.

Topographically, the area is considered to be a coastal plain, and several raised beaches were seen. The mean elevation of this plain barely exceeds 250 feet above the shore. A few hills, or chains of hills, protrude here and there above the general level of the plain and the average elevation of their summits ranges between 550 and 600 feet above sea level. These hills represent granitic knobs or peaks of quartzite, iron formations or metamorphosed gabbro sills. The plain is dotted by numerous small, shallow lakes, few being suitable for float plane landings. Most of the drainage of the area is toward Ungava bay.

Almost the entire area is blanketed by a sheet of moraine. It is composed of poorly sorted material and includes blocks, boulders, and pebbles of all sizes held in a matrix of sand grains and clay particles. This material has been partly washed away and streams have developed in several shallow depressions of the expanses of sand and mud. The northwest corner of the area is characterized by a field of drumlins aligned in a N. 45°E. direction. These drumlins cover almost half of the surface of the ground where they are seen to occur. On the average, these drumlins are approximately two miles long and half a mile wide. They vary from 30 to 40 feet in height. The action of soli-

fluction is plainly visible on their flanks. Glaciers crossed this area in a N. 45°E. direction, as shown by the alignment of the drumlins.

During the summer, several portions of the area are accessible by float plane. In 1956, a plane base, large enough to accommodate DC-3's, was constructed near Hopes Advance bay, which lies about 30 miles southeast of the centre of the area. Payne bay is the best site for the construction of a port to accommodate sea-going vessels. The 36-foot water limit at ebb tide lies approximately 1,000 feet from shore in a few places. Several ships anchored close to shore during the summer of 1956.

GENERAL GEOLOGY

The oldest rocks of the area consist of gneisses which are unconformably overlain by the rocks of the Labrador Trough. The gneisses have taken part in the deformation and they have acquired a gneissic structure that conforms, for some distance away from the contact, with the schistosity developed in the younger formations.

The gneisses are abundantly exposed along the shore of Ungava bay, but elsewhere exposures are not abundant. Among the Trough formations, only the iron formation is widely exposed and this is adequate to unravel the local structure with reasonable accuracy.

The gneisses west and east of the Trough have different characteristics. They have, therefore, been divided into a Western complex and an Eastern complex.

Table of Formations

Pleistocene and Recent	Morainic deposits, drumlins, raised beaches, fluviatile deposits
Upper Precambrian	Metagabbro, metavolcanic and metasedimentary rocks
	Quartz-biotite-garnet-plagioclase schist; quartz-biotite-muscovite-plagioclase schist; mica schist; quartzite, conglomerate; a few lenses of iron formation
	Iron formation (Sokoman Formation)
	Quartzite, mica schist, garnetiferous mica schist
Unconformity	
Precambrian	Eastern Complex: grey quartz-plagioclase-biotite-muscovite gneiss; enclaves and dykes of amphibolites, pegmatites Western Complex: pink and grey granite gneiss, porphyritic granite, enclaves and dykes of amphibolites

Precambrian

Western Complex

The Archaean rocks that are exposed west of the Labrador Trough belong to the Western complex. The most abundant rock is a pink granite, locally grey, composed essentially of potassic feldspar, plagioclase, quartz, and biotite. The gneissic structure results from the parallel alignment of mica-rich lenses. Biotite paragneisses, porphyritic granites and inclusions and dykes of amphibolite are present within the granite and form part of the complex. Dykes or sills of fine- to medium-grained gabbro and pegmatite were seen to cut all these rocks.

An unconformity forms the contact between the rocks of the Western complex and those of the Labrador Trough. The strike of the gneissic structure is parallel to the strike of the Trough rocks but the dips are discordant. The metasedimentary rocks that rest on the gneisses nowhere exhibit contact metamorphic effects and not a single pegmatite dyke was seen to cut across the contact.

Eastern Complex

The gneissic rocks, along with amphibolites and associated pegmatites, that are exposed east of a northsouth thrust fault that cuts across the central part of the area belong to the Eastern complex. The main rock type is a quartz-plagioclase-biotite-muscovite gneiss. It is normally grey and possesses a generally undisturbed or even layering, which, however, is commonly strongly folded. This structure is the result of alternating quartz-plagioclase-rich layers ranging in thickness from one-eighth to one-quarter of an inch and thin sheets of mica. The average mineralogical composition of the rock is as follows: 45 to 50 per cent quartz, 35 to 40 per cent plagioclase, 10 to 15 per cent biotite and muscovite. The composition of this rock, together with its appearance in the field, suggests that it is in all probability a paragneiss.

This paragneiss locally encloses numerous enclaves of black, massive to slightly schistose amphibolites. It is believed that these amphibolites are of igneous origin and are intrusive into the paragneisses. They are composed mainly of 60 to 70 per cent hornblende and 30 to 40 per cent plagioclase. Pegmatites and aplites cut these rocks along the shore of Ungava bay. The pegmatites are composed mainly of intergrowths of quartz and potassic feldspar, which enclose tiny, sparsely distributed biotite flakes. Accessories are garnet, magnetite, and epidote. The quartz and feldspar crystals are from one to two inches in length. In several localities, the pegmatite was seen to grade into an aplite.

Field relationships indicate that the rocks of the Eastern complex constitute the basement upon which the Labrador Trough sediments were deposited in this part of the area.

Upper Precambrian

The Upper Precambrian may be divided into four formations.

The Lower Formation is composed mainly of quartzite beds with a total thickness of 20 to 50 feet commonly sandwiched between thin layers of mica schist, commonly garnetiferous. The quartzites are missing in the eastern portion of the area.

The quartzite is generally white but it is locally yellowish, grey, brownish, or even black. The rock is composed entirely of grains of glassy quartz varying from 1 to 3 millimeters long. The finer constituents that produce the colour in the rock are pink or brownich garnet, iron amphiboles, chlorites, magnetite, or hematite. In a few localities, the quartzite contains up to 20 per cent hematite or magnetite.

The basal mica schist is composed mainly of biotite, muscovite, quartz, and chlorite. It is dark grey to black in colour. Near the contact with

the underlying gneisses, this rock contains stringers or lenticles of quartz along the schistosity planes or in fractures perpendicular to the schistosity. The mica schist overlying the quartzite and, in turn, overlain by the second formation, the iron formation, consists mainly of biotite, quartz, garnet, and magnetite. Up to 25 per cent magnetite is present in several localities and the contact with the upper formation is gradual.

The Iron Formation is equivalent in age and stratigraphic position to the Sokoman formation that outcrops abundantly in the Schefferville area, where it was first described. This formation has been traced from that locality into the present area without any major interruption.

South of Payne river, the iron formation is normally composed of three principal members. The lowermost member is essentially a cherty quartzite rich in hematite; the other minerals include iron amphiboles, grunerite and actinolite mainly, chlorites, and, rarely, garnet. The amphiboles are normally sparsely distributed in the rock, but, locally, lenticles of these minerals are interstratified with cherty quartzite.

The middle member is a magnetite-hematite quartzite containing from 5 to 15 per cent grunerite and actinolite. The iron oxide content is variable and, when it reaches 40 per cent, the rock becomes an ore of iron of low tenor. In this area, magnetite is normally more abundant than specular hematite. South of Morgan lake, the ore consists of approximately 30 per cent magnetite and 10 per cent hematite. This magnetite-hematite quartzite is usually massive with a metallic aspect and black or dark grey in colour. As the content of iron amphiboles exceeds 15 per cent, the rock becomes slightly schistose.

The upper member, another quartzite, is composed of quartz grains surrounded by bundles or rosettes of grunerite and actinolite and containing many lenticles of these two minerals. In several localities this member is missing and the top of the formation is represented by the metallic quartzite.

The Third Formation includes those metasedimentary rocks resting on the ferriferous formation that are earlier than the first lava flow or that are found to overlie the lowermost gabbro sill in the stratigraphic column. This unit is composed of a wide variety of rocks and its thickness ranges from only a few feet up to several hundreds of feet. The main types of rock are biotite-muscovite schists, quartz-biotite-muscovite-plagioclase schists, and quartz-biotite-muscovite schists. All these rocks locally contain garnets. North and east of Joubin lake are quartzites and conglomerates containing a few thin lenticles of iron formation.

The Upper Formation is composed of the same sedimentary rocks as those that are described in the preceding paragraph and are present as bands ranging from a few inches to several tens of feet in thickness and occurring within the sequence of volcanic rocks and altered gabbro sills.

The volcanic rocks are generally present as fine-grained hornblende schists. Locally, these schists retain highly deformed pillow structures. The gabbros have been modified to medium- to coarse-grained amphibolites, which locally possess a very faint schistosity. The weathered surfaces of these rocks are generally green, whereas those of the hornblende schists are more often black. The thickness of this formation is certainly greater than 2,000 feet.

STRUCTURE

A north-south-striking thrust fault divides the area into two more or less equal parts. The western portion is characterized by a series of narrow synclines and anticlines tranding S. 45°E. and plunging to the southeast. The dips are normally steep, and, in general, the east limbs of the anticlines are either overturned to the southwest or vertical. South of Morgan lake, the dip of the iron formation ranges from 15 to 25 degrees. The presence of the anticline south of Slush lake is suspected from the aerial photographs.

The quartz-plagioclase gneisses underlie the greater part of the eastern zone. North of Bonnard river, Labrador Trough rocks occupy the space between the thrust fault and the gneisses. South of this river, the gneisses are found to occur as two bands separated by a strip of Trough rocks and the thrust fault is displaced to the west by a horizontal displacement of almost two miles. The band of Trough rocks outcrops as a semi-circle that cuts the south shore of Bonnard bay. These rocks appear again on the second point north of the bay, where they have been folded into a tight syncline. Assuming that the gneisses on both sides of the band are identical, it seems as though the Proterozoic rocks were in-folded into the gneisses.

In addition to the prominent thrust fault, a few longitudinal and transverse faults have been shown on the maps that accompany this report. A detailed examination of this area would doubtless reveal the presence of a very large number of these faults.

ECONOMIC GEOLOGY

Two companies have holdings in the area. Premium Iron Ore, Limited, retains claims that straddle the northeast limb of Morgan lake syncline, as well as a portion of the southwest limb lying north of the lake and also east of its south end. Oceanic Iron Ore (Quebec), Limited, holds a license for nimeral exploration on two blocks of claims covering the greater part of the western half of the area.

The iron formation always represents a potential source of low-grade iron ore provided that the iron content approaches 30 per cent and that the thickness of the formation is sufficient for open-pit mining. Up to the present time, Oceanic Iron Ore (Quebec), Limited, has proved at least 275 million tons of low-grade iron ore in the Morgan crest that stretches from Morgan lake to a point approximately 12 miles southeast of the lake. The company has also begun a diamond-drilling programme in a zone of iron formation that outcrops on the south bank of Payne river. Premium Iron Ore, Limited, has completed a geologic study of its holdings, but no drilling has yet been attempted.