MINISTÈRE
DE L'ÉNERGIE
ET DES RESSOURCES

DIRECTION GÉNÉRALE DE
L'EXPLORATION GÉOLOGIQUE
ET MINÉRALE

LONG LAKE MAP AREA

J.P. Mills

1967

DP-141
GM-28515

OPEN-FILE MANUSCRIPT

Gouvernement du Québec

DEPARTMENT OF NATUREL RESOURCES

Mines Branch

Geological Exploration Service

Geology of the LONG LAKE MAP AREA New Quebec, QUEBEC

Preliminary Report

by

J.P. MILLS

Québec

1967

INTRODUCTION

Location and Accessibility:

The map area consist of about 166 square miles (432 km.^{2}) situated around Long Lake (central part of the map region) approximately 70 miles (113 km.) east of Fort George on the east coast of James Bay. It lies between latitudes 53° 30' and 53° 40' north and longitudes 77° 00' and 77° 30' west. Access to the area can be achieved by float plane from either Fort George or Chibougamau. Radio communications can be maintained most of the time with establishments at Fort George via several frequencies. The field work was done during the Summer of 1967 and is an extension westward of the mapping of two previous seasons.

Regional Features:

The region is well forested and lakes are numerous. Spruce and pine are the most plentiful tree types with birch and poplar predominating in some local areas. Long Lake and Alder Lake to the north are the largest lakes in the region. The area is drained by the Fort George River, to the north of the map area, which flows into James Bay at the town of Fort George.

Relief is less than 200 feet (62m.) and predominantly less than 50 feet (15m.). Relief features consist of low, wooded hills most often bound by irregular lakes and swamp areas.

Game is not plentiful in the region. Signs of bear, wolf, beaver, otter, geese and duck were found with beaver, otter, geese and duck being most conspicuous and plentiful. Fish, to some extent, can be found in most of the lakes and rivers.

TABLE OF FORMATIONS

PLEISTOCENE (RECENT)	Till and stream deposits; shoreline recession features; peat bog and swamp development; irregular drainage patterns; vegetation.

- UNCONFORMITY - - - - - - - - - -

---

	1. High angle faulting; diabase dike development.
	2. Tectonic activity; regional faulting and folding; granitic-dioritic intrusive activity; metamorphism.
EARLY PRECAMBRIAN (ARCHEAN)	3. Basaltic-dacitic-rhyolitic extrusives; volcanic breccia development; banded magnetic iron formation; granitic conglomerate.
	4. Tectonic activity; basaltic-gabbroic dike and sill development; interlayered basaltic and granitic material.
	5. Granitic and dioritic rocks.

GENERAL GEOLOGY

Pleistocene Geology:

The map area was glaciated during the last ice advance. Numerous glacial striations indicate a general northeast strike of ice movement. Unconsolidated till material constitutes numerous mounds and elongate ridges over the entire region. Boulders, gravel and sand are the major constituents of the till, however, some clay material exists in many of the low laying areas. Peat bogs are numerous and often constitute the shore line areas of the lakes. Local drainage appears to be controlled by till deposits and many of the lakes owe their shapes to the pattern of till distribution. Regional drainage is bedrock controlled.

Granitic Conglomerate:

Granitic conglomerate forms part of the island area at the east end of Long Lake (central part of the map area). The formation consists of granitic pebbles and cobbles embedded in a medium to coarse-grained, reddish, arkosic matrix. The cobbles and pebbles are randomly distributed, well rounded, and form an open-worked texture. The zone is at least as thick as the width of the island (about 1,000 feet or 305 m.). Exposures of the conglomerate have not been found in other parts of the map area.

Iron Formation:

The iron formation consists of very fine grained, light to dark grey siliceous material interbanded with dark grey, occasionally slightly reddish layers of iron rich material which is mostly highly magnetic. The bands vary from continuous layers to relatively short lenses a few mm. to several cm. wide. In some zones the iron formation is finely folded forming a distinct crenulated pattern. Also, some zones have a distinct fragmental structure formed by a mixture of laminated siliceous and iron rich material. In all occurrences observed the iron formation is associated with volcanic materials.

Volcanic Rocks:

RHYOLITE: The term is applied to a very fine grained purplish to reddish rock, occasionally light grey. The material is foliated to massive, weathers to a very light pinkish grey and is closely associated, in some areas, with zones of apparently fine fragmental material.

DACITE: The term dacite is applied to very fine grained, light to medium grey foliated material which often shows well developed colour banding. Also, clear ovoid to round quartz blebs several millimeters to about one centimeter in diameter exist in some zones. The dacite material is closely associated with the laminated greenstone and distinctions have been made purely on colour density in some areas.

GREENSTONE OR BASALTIC MATERIAL: There are two main varieties of greenstone: 1) a massive, occasionally slightly foliated, fine grained, dark grey to green material in the form of bands or dike-like structures; 2) well laminated or banded material, medium to dark grey-green, and containing fragmental zones and pillowed lavas.

The massive, dike-like features of greenstone are predominantly parallel to the regional structure of the surroundings and vary from a few centimeters to many meters in width. In all instances observed these features are highly inclined to vertical. Some of the bands contain numerous light grey to slightly pinkish feldspar grains which form up to about 25% of the rock volume in some instance. These grains vary in size from a few millimeters to two or three centimeters in diameter and are randomly distributed.

This variety of greenstone is not confined to any particular part of the map area, but, is most plentiful in the east part of the map area where it often forms an interpenetrating and interlayered complex with granitic materials (note groups 10 and 11 on the legend and map).

The well banded or laminated variety of greenstone often has zones of fragmental material in which the fragments consist of material which appears to be the same as the rest of the greenstone. In some zones highly siliceous layers, several millimeters to several centimeters thick, form part of the layered sequence. In addition these banded zones are often highly contorted and folded. Well developed pillowed lavas exist in several localities. The banded,

fragmental greenstone zones are most plentiful around Long Lake and to the south of the lake where the sequence has been intruded by dioritic materials.

VOLCANIC BRECCIA: The term is applied to a material which consists of coarse, rounded to angular fragments in a fine grained, medium to dark green matrix material. The fragments consist of volcanic and coarse grained granitic material randomly distributed. In one well exposed contact area the contact zone consists of a transition from clustered dioritic fragments, each surrounded by fine green matrix material, to fractured dioritic rock in which the fractures are filled with fine green matrix material amounting to about 10% of the rock. Exposures of the breccia have been found only in the south-central part of the map area.

Granitic and Dioritic Rocks:

GRANITIC MATERIAL: These rocks exist in several modes; 1) as massive to slightly foliated units; 2) as fine to medium grained dike features; 3) as material interlayered with greenstone; 4) as an interlayered and interpenetrating complex with greenstone material. Banding has been formed in some granitic zones through variation in the mafic mineral content. Mafic minerals are mainly biotite and chlorite with amphibole predominating in some zones. Pinkish feldspar exists in many parts of the granitic rock. It has the form of grains, clots and occasionally thin lenses. The pinkish feldspar occurrences are not confined to any

particular mode of occurrence of the granitic and is also found in the dioritic rocks. Irregular clots and angular, fragmental appearing bodies of mafic mineral concentrations form inclusions in some regions of the granitic rocks.

DIORITIC MATERIAL: The distinction between dioritic and granitic rock is based on the lack of visible quartz and a higher content of mafic mineral (amphibole and chlorite). Observed contact areas with granitic rock were found to be gradational over several score of meters. Inclusions of mafic mineral concentrations are numerous. Many show reaction rims several mm. wide in which mafic mineral is more concentrated. Examples in which massive dioritic material has truncated banding in greenstone materials are numerous indicating a definite intrusive relationship with the latter.

Metamorphism:

Regional metamorphism of the green schist facies and locally, the epidote-amphibolite facies characterises the area. The green-schist facies is indicated by the widespread occurrence of chlorite. Amphibolite and epidote exist in some zones as dispersed mafic minerals. Pseudomorphs of chlorite after pre-existing mafic mineral grains exist in some areas. Many inclusions in the dioritic material have undergone partial to almost complete alteration. Secondary feldspar developments and reaction rims consisting of dark mafic mineral concentrations are common features among the

altered inclusions.

Structural Geology:

FAULTING: Two main trends of regional faulting appear to be present: 1) trends striking at about 065° and, 2) trends striking at about 110°. These trends are most noticeable through analysis of regional topographic maps. The main fault zone in the map area appears to be a zone striking at about 110° which includes the Long Lake area. Right lateral movement may be a significant aspect of this fault zone. It is also suggested that this fault zone may, in part at least, consist of an unconformity. Shearing is a common feature over the whole map area. In some areas shearing definitely cuts across formation boundaries of both granitic and greenstone materials.

ECONOMIC GEOLOGY

Sulphide Mineralization: Sulphide mineralization occurs in several areas all of which are associated with the volcanic rocks. Locally, the sulphide zones appear to be discordant with foliation and banding. Pypite is the major sulphide mineral, however, in the mineralized zone at the central part of Long Lake the main sulphide mineral is chalcopyrite. In this locality the zone of highest mineralization is a zone of brecciation in the host rock (intermediate or dacitic volcanics). The sulphide exists here as dissiminated material and as massive, coarse clots or blebs up to several centimeters in diameter. Some of the fragments associated with the sulphide are very dark grey to black and very fine grained looking much like pieces of mudstone or shale.

Iron Formation:

The most extensive development of banded iron formation occurs in the south-central part of the area. A distinct magnetic anomaly exists (according to compas traversing) which is about 40 yards (38m.) wide and strikes at about 030° for several hundred yards. Several exposures in the area show a well banded, crenulated material, highly magnetic and, inclined steeply to the northwest.

Iron Oxide Veining:

Throughout the entire map area, particularly in association with the granitic and dioritic rocks, randomly oriented veinlets of reddish iron oxide have been observed. These veinlets vary from about 1 millimeter in width to several millimeters and rarely up to 1 and 2 centimeters in width. These veinlets are present as fracture fillings and occasionally as small clusters. They always form a minor percentage of the outcrop concerned. This reddish iron oxide material seems to be the same material which causes the reddish color on much of the feldspar through the granitic and dioritic rocks. There does not seem to be any relationship between these veinlets and the banded quartz iron formation or the discordant sulfide mineralization regions.

Aeromagnetic Anomalies:

Recent maps compiled from aeromagnetic survey work indicate the presence of several (at least 20) magnetic anomalies in the area. Some of these are readily associated with certain rock types, however, some are in covered areas. Those numbered 7, 12 and 13 are in the general area

of what appears to be a regional fault zone which also contains sulphide mineralization. In addition this zone constitutes a contact area between basic and more acidic volcanics.

Covered or Regolith Areas:

The wide expanse of covered area through the central part of the map area should be considered as a region deserving more intensive geological work for at least three reasons:

1) The area parallels the proposed fault zone which includes the Long Lake area immediately to the north. It is possible that this area may be part of the same fault zone, or several fault zones.

2) The area contains "magnetic highs". In addition, it should be noted that the strong sulphide (chalcopyrite) showing immediately adjacent to this covered area on Long Lake is not a magnetic high.

3) The covered zone may contain more zones of interlayered acidic to basic volcanics. The contact areas of such volcanic sequences are sites of several producing mines in the Canadian Shield.