

# RP 551(A)

PRELIMINARY REPORT, GEOLOGY OF THE NORTHEAST QUARTER OF MCKENZIE TOWNSHIP, ABITIBI-EAST COUNTY

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DEPARTMENT OF NATURAL RESOURCES

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Minister

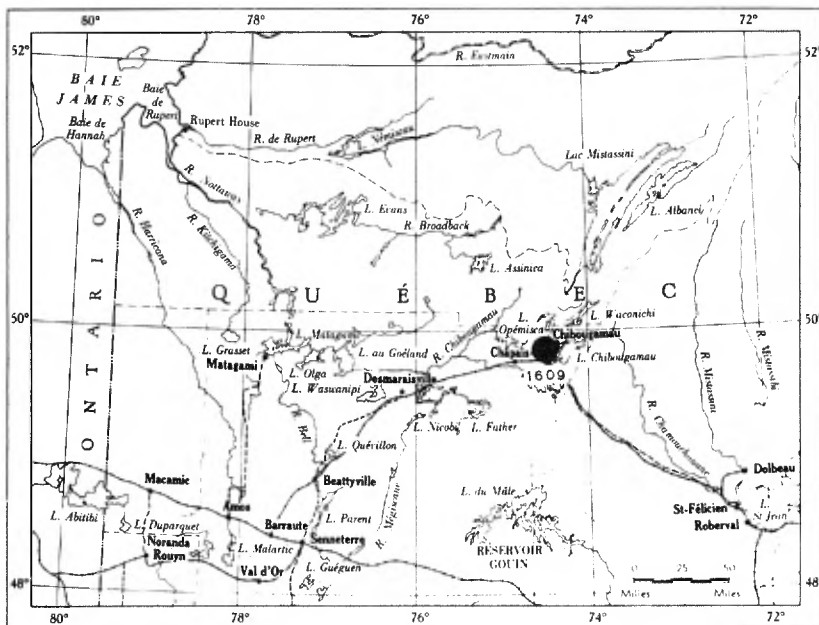
PAUL-EMILE AUGER  
Deputy Minister

# Geology of the NORTHEAST QUARTER OF MCKENZIE TOWNSHIP ABITIBI-EAST COUNTY

PRELIMINARY REPORT

by

Gilles Duquette and Arthur Mathieu



QUEBEC

1966



QUEBEC DEPARTMENT OF NATURAL RESOURCES

Honorable DANIEL JOHNSON

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PAUL-EMILE AUGER

Deputy Minister

MINERAL DEPOSITS SERVICE

ROBERT ASSAD, Director

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**Geology**  
**of the**  
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ABITIBI-EAST COUNTY

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Preliminary Report

on the

NORTHEAST QUARTER OF MCKENZIE TOWNSHIP

Abitibi-East County

by

Gilles Duquette and Arthur Mathieu

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INTRODUCTION

The northeast quarter of McKenzie township is located 4 1/2 miles northeast of the town of Chibougamau and 300 miles north of Montreal. It comprises an area of 25 square miles.

The southern part of the area is accessible by a gravel road from the town of Chibougamau. Access to the central and northern parts is gained by two lumber roads: one road following the north-south surveyed center line of the township and the other, north of Dufault and Bourbeau lakes, running in an easterly direction. The central and northeast parts can also be reached by water by following the shores of Bourbeau lake up to Anxiété bay.

The area was mapped during the summer of 1963\* at a scale of 500 feet to one inch. Traverses were spaced at

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\* Information on economic geology was brought up to date in 1965 by G. Duquette.

intervals of 500 feet between surveyed east-west range lines. Only outcrops seen along traverses were mapped.

### PHYSIOGRAPHY

The northeast quarter of McKenzie township has a varied topography. The northern part is a rolling lowland largely covered by drift, muskegs and small lakes and ponds. The southern part is of marked relief, being part of what Mawdsley and Norman(1)\* call the Bourbeau Lake belt of ridges. This belt consists of a series of ridges separated by valleys which follow the local structure in an easterly direction. Many of the hills rise 300 feet or more above the neighboring lowlands. The summit of the highest hill in the map-area is about 1,850 feet above sealevel and is situated east of Cran-Penché bay some 1,400 feet southeast of the Norbeau Mines shaft.

The whole area drains northward into James bay via Nottaway, Waswanipi, Chibougamau, and Faribault rivers. Waters from the northern lowland flow directly into Faribault river, whereas those from the southern hilly belt pass through Bourbeau and Dufault lakes before entering Faribault river. Noora lake, which has no visible outlet, is believed to drain into the same river.

### GENERAL GEOLOGY

The rocks of the area are all Precambrian in age. They have been divided into three formations. The oldest one, the Lac Waconichi Formation, comprises a thick sequence of chlorite-rich pyroclastic rocks. This formation is overlain by the Lac Gilman Formation, which is essentially made up of mafic lavas and which is in turn overlain by pyroclastic rocks and mafic lavas assigned to the Lac Blondeau Formation (2). All these formations generally strike easterly, dip steeply and appear to be conformable with gradational con-

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\* Numbers between brackets are to be found in the Bibliography at the end of the report.

Table of Formations

CENOZOIC	Recent and Pleistocene	Glacial drift: sand, and gravel	
Great unconformity			
EARLY  PRECAMBRIAN	Intrusive  Rocks	Ultramafic  Complex	Serpentinized dunite and peridotite Pyroxenite
		Mafic  Complex	Granophyre Quartz-chlorite-horn- blende-gabbro (Ventures-type gabbro) Gray and green diorites Pyroxenite-peridotite and pyroxenitic gabbro
	Volcanic  Rocks	Lac Blondeau Formation	Tuff, lapilli and agglomerate* Minor mafic lava
		Lac Gilman Formation	Andesite-basalt
		Lac Waconichi Formation	Tuff, lapilli tuff and agglomerate

\* In order to standardize the terminology, the authors have adopted the names tuff, lapilli tuff and agglomerate instead of volcanic siltstone, sandstone and conglomerate as used in the definition of the Lac Blondeau Formation (P.R. No. 513)



tacts. In many places, they have been invaded by sill-like bodies ranging in composition from mafic to ultramafic and assigned either to the Mafic or to the Ultramafic Complex.

The whole series of rocks has been folded into a major synclinal structure, the axial trace of which runs slightly north of east and crosses the line common to ranges VI and VII at Mile-post 2.

### Volcanic Rocks

#### Lac Waconichi Formation

The northwest quarter of the map-area is largely underlain by green and gray pyroclastic rocks which represent the southernmost part of a thick sequence of similar rocks exposed in Blaiklock(3), Richardson(4) and Bignell(5) townships. Because these rocks extend across the Waconichi Lake basin the writers propose to group them under the formational name of "Lac Waconichi".

This formation is essentially made up of felsic ejecta. If not repeated by folding or faulting, it would have a minimum thickness of 42,000 feet. Only the upper 5,000-foot section is exposed in the map-area.

According to grain size the rocks of that formation were mapped as tuff, lapilli tuff or agglomerate. The tuff is green on both fresh and weathered surfaces. It contains much sericite and chlorite and breaks characteristically along closely-spaced planes. Beds are a fraction of an inch thick and commonly grade into lapilli tuff and agglomerate layers. The lapilli tuff is intermediate between a crystal tuff and a lithic tuff. It contains variable amounts of quartz and feldspar crystals and subangular rock fragments set in a sericite- and chlorite-rich matrix. Although generally green on fresh surface, the lapilli tuff weathers white to very light green. The crystals and rock fragments locally attain the size of small pebbles and the rock may be easily mistaken for a sheared quartz-feldspar porphyry. Lenses of agglomerate were observed at a point 1,500 feet north of Mile-post 1, on the line common to ranges IX and X. This agglomerate carries bombs of rhyolite porphyry elongated parallel to the local schistosity. The bombs weather white and contrast sharply with the dark green matrix. Their size is extremely variable but the ratio of the long axis to the short one is of the order of 10 or more.

### Lac Gilman Formation

South of and overlying the Lac Waconichi Formation is a two-mile-thick and easterly-running band of mafic lava flows for which the formational name of "Lac Gilman" is proposed. This name is selected because these rocks were first studied(6) and are much better exposed in the area of Gilman lake.

Although the lavas are of various shades of green, no attempt has been made to map them separately. They range in composition from andesitic to basaltic and have been metamorphosed to the greenschist facies. As a rule, the rock from the upper two thirds and the extreme bottom of a flow is very fine grained; elsewhere the rock is granular. Structures such as amygdules, pillows, and flow lines are very common and generally well preserved. The lavas show locally a porous texture as a result of weathering of the amygdule fillings.

Field evidence clearly indicates that this sequence of mafic lavas rests conformably above the pyroclastic rocks of the Lac Waconichi Formation. The contact between these two formations is marked by a zone of interlayering of one rock-type with the other.

### Lac Blondeau Formation

In the map-area, the lava sequence is overlain to the south by a volcanic assemblage which represents the westerly extension of Duquette's(2) Lac Blondeau Formation.

This formation, approximately 5,000 feet thick, represents a synclinal belt of quartzo-feldspathic pyroclastic rocks interbedded with a few mafic lava flows. The pyroclastic rock is usually light gray and the size of the fragments is that of ash, lapilli or bombs.

The tuff and lapilli tuff are the most abundant rock types. Interbedding and complete gradation from one rock type to the other is very common. The tuff is generally thin-bedded and, in places, slightly graphitic. The lapilli tuff consists of subangular to rounded fragments of quartz, feldspar, and felsic rock enrobed in a very fine-grained sericitized matrix. Disseminated grains of pyrite, pyrrhotite, and, to a lesser extent, chalcopyrite are of common occurrence in the tuff and lapilli tuff.

Lenses of agglomerate containing subangular fragments of tuff and lapilli tuff, and rounded pebbles of rhyolite porphyry up to 6 inches in diameter, outcrop near the east boundary, along range-line VI-VII. The fragments are set at random in a gray tuffaceous matrix.

Two small bands of mafic lava are interlayered with the pyroclastic rocks of the Lac Blondeau Formation: one band extending easterly across the north tip of Anxiété bay and the other, roughly following the north shoreline of Bourbeau lake in range VII. They are composed of variolitic pillow-lava, andesitic to basaltic in composition, and metamorphosed to the greenschist facies. A few feet east of Anxiété bay, these lavas show well-preserved flow breccia textures.

Field evidence suggests that the Lac Blondeau and Lac Gilman formations are conformable, the latter grading upward into the former.

### Intrusive Rocks

The volcanic rocks, particularly those of the Lac Blondeau Formation, have been intruded by several sill-like bodies ranging in composition from felsic to ultramafic. Petrographically, these intrusive rocks can be grouped into a Mafic Complex and an Ultramafic Complex. The age relationship between these two complexes is not clear, but it appears that the Ultramafic Complex is younger.

### MAFIC COMPLEX

This complex groups sills generally of mafic composition. Several have differentiated members ranging from granophyre to pyroxenite or peridotite. Where this is the case, the succession of rock types is from ultramafic at the bottom to felsic at the top, tops and bottoms being indicated by primary structures in the volcanic wall rocks. The differentiation during crystallization is contended from the widespread occurrence of primary foliation and rhythmic layering.

The rock types of the complex are pyroxenite,

peridotite, pyroxenitic gabbro, gray and green diorites, quartz-chlorite-hornblende gabbro, and granophyre.

#### Pyroxenite-peridotite and Pyroxenitic Gabbro

The pyroxenite-peridotite and pyroxenitic gabbro occur only as basal members of differentiated sills. They constitute nowhere more than one tenth of the volume of the sill. The pyroxenite is generally black, fine- to medium-grained, and contains above 90% pyroxene. It weathers characteristically to a dull gray color. At a few localities, it is interlayered with serpentinized peridotite. The basal pyroxenite-peridotite member is, in places, overlain or replaced by pyroxenitic gabbro, a rock similar to pyroxenite but with higher feldspathic content.

#### Gray and Green Diorites

Dioritic rocks are of two types, both with equigranular texture: a gray type and a green one.

The gray diorite is fine- to medium-grained, and is gray on both fresh and weathered surfaces. It consists of plagioclase feldspar and greenish black hornblende. Quite commonly, it shows well-developed rhythmic layering with individual layers, 2 to 5 inches thick, characteristically pyroxene-rich and medium grained at the bottom and feldspar-rich and slightly finer grained at the top. Within a given layer, the passage from one rock-type to the other is gradational, whereas contacts between individual layers are rather sharp. Such layering is particularly widespread in the diorite east and west of Cran-Penché.

The green diorite, like the gray type, is fine- to medium-grained and gray on weathered surface. It is, however, yellowish green on fresh surface. This diorite is rarely seen as a member of differentiated sills. Instead, it occurs as individual bodies of various sizes. The hilly country southeast of Noora lake is largely underlain by this type of diorite.

#### Quartz-chlorite-hornblende Gabbro and Ventures' Type Gabbro

The upper member of all differentiated sills is a dark gray to green, fine- to very coarse-grained quartz-

chlorite-hornblende gabbro. Where very coarse grained, the rock bears a marked resemblance to the Ventures' gabbro(7) — the main ore-bearing formation at Opemiska Copper Mines, which is situated 25 miles to the southwest, in Lévy township. The Ventures' type gabbro contains black elongated prisms of hornblende, whitish laths of randomly-oriented plagioclase 1/4 to 3/4 inch in length and a minor amount of interstitial quartz. The finer-grained gabbro has a composition similar to that of the Ventures' type and very commonly grades into it. Quite commonly, however, one rock-type was seen intruded by the other or vice versa. Such relationships strongly suggest auto-injection phenomena.

The quartz-chlorite-hornblende gabbro also occurs as individual sills. Such is the case east of Anxiété bay.

### Granophyre

Two small outcrops of a light gray granophyric rock occur in range VII, 1/2 mile east of Dufault lake. The average composition of this rock is as follows: feldspar, 80%; quartz, 15%; and chloritized mafic minerals, 5%. In the map-area, the granophyre represents the upper marginal phase of a large differentiated sill, since it grades downward into a quartz-chlorite-hornblende gabbro.

## ULTRAMAFIC COMPLEX

In this complex are classed all sills of ultramafic composition. They are generally not homogeneous; most of them are made up of various ultramafic rock-types and could be called composite. Some of the mineralogical variations, however, appear to be the result of differentiation during crystallization.

### Pyroxenite

The pyroxenite can be gray, green, or black and has a medium- to coarse-grained texture. It most commonly

occurs as tabular bodies bordered by larger masses of serpentized peridotite and dunite.

### Serpentinized Dunite and Peridotite

These rock types make up the greater part of all sills of the Ultramafic Complex. They underlie part of the hills southeast of Dufault lake, the low terranes south of Sullivan bay of Bourbeau lake, and a small area east of Ross lake in range VIII. From ground(8) and airborne(9) magnetometric surveys, it is inferred that similar rocks underlie the heavy drift-covered area across the northwest half of Dufault lake. This band of ultramafic rocks would be from 1,000 to 2,000 feet thick and would extend northeasterly from the western boundary up to the north half of range VIII.

The serpentized dunite is, in places, inter-layered with peridotite, most commonly with gradational contacts. At several localities, brittle fiber asbestos was noted along slip planes in serpentized dunite or peridotite. An occurrence of silky fiber asbestos is described under Economic Geology (see Campbell Chibougamau Mines).

## STRUCTURAL GEOLOGY

### Folding

All rock units are steeply inclined. The general strike changes from easterly in the southeast corner to northeasterly in the northwest corner of the map-area. The axial trace of a major synclinal structure trends slightly north of east, crossing range-line VI-VII at Mile-post 2. This fold, which extends east into Roy township(2), is roughly symmetrical and plunges gently east.

### Schistosity

The volcanic rocks, particularly those of the Lac Waconichi and Lac Blondeau formations, show a well-developed schistosity parallel to the local bedding. The schistosity strikes east to northeast and dips steeply north or south.

### Shearing

Shearing occurs in all rock types, the most prevalent direction being, as in the case of schistosity, parallel to the layering of the rocks. Three important shear zones were examined during the course of mapping.

The largest one occurs in range VI on a group of claims held by F.X. Godin. It lies 600 feet north of the outlet of Bourbeau lake, along the contact of a basal pyroxenite and a band of pyroclastic rocks. It strikes easterly and dips steeply to the north. Within this zone, which extends for a minimum length of 12,000 feet and is 50 to 100 feet wide, both the pyroxenite and the pyroclastic rocks have been largely to completely replaced by ferruginous carbonate and white to black quartz. Owing to the presence of carbonate, the shear is marked on surface by a thick gossan. Quartz occurs as irregular veinlets in carbonate and carries disseminated grains of pyrite but no gold. Movement along the shear is evidenced by drag-folds in the pyroclastic rocks and slickensides in the metapyroxenite. It appears that the south wall moved westerly in relation to the north wall, along a line plunging some 15 degrees east.

The two other shear zones are also in range VI: one being exposed about 1,500 feet southeast of the Norbeau Mines shaft and the other, some 2,000 feet farther east. Both of them strike easterly and dip from steeply south to vertical. They are characterized by moderate shearing and by the presence of discontinuous secondary quartz veins accompanied by a minor amount of carbonate, pyrite and gold. The westernmost zone, generally known as the "No. 2 vein" is approximately 1,300 feet long and lies in gray diorite. The other zone, known as the "Sharpe or International vein" occurs in quartz-chlorite-hornblende-gabbro. It has been traced by trenching and drilling over a distance of 1,600 feet.

### Faulting

According to regional mapping, the Campbell Lake - Gwillim Lake fault would extend across the northwest half of the map-area. The existence of this northeasterly-trending fault was first recognized in Lévy township(10), where it appears to have genetic relationship with the ore-bearing structures of Opemiska Copper Mines. Direct evidence for the presence of this major fault in the map-area is lacking. It can only be said that its assumed location

coincides with a drift-covered region north and west of Noora lake.

Five minor faults striking N.30°E. with left-hand strike separation were mapped in range VI, in the vicinity of Cran-Penché bay. In one of them, an important gold-bearing quartz vein was discovered in 1930. This vein, known today as the "Norbeau vein", lies 1,500 feet east of the head of Cran-Penché bay and has been followed for a distance of nearly 1,700 feet (see Economic Geology - Norbeau Mines). It is interesting to note that the quartz vein itself dips 45 degrees to the southeast, whereas shearing, in the wall rock, dips in the same direction but at a much steeper angle. This structural relationship suggests that the Norbeau vein fracture could represent the locus of a thrust fault.

The presence of the four other faults is suggested by offsets in the band of pyroclastic rocks between Sullivan and Cran-Penché bays. One of them lies 2,500 feet west of the Norbeau quartz vein, the three others being located respectively 1,200, 1,650, and 2,700 feet east of the same vein. All four fractures would be a few hundred feet long.

### ECONOMIC GEOLOGY

A considerable amount of exploration work, dating back to the turn of the twentieth century, has been done in this area. The early work is described by Barlow et al. (1911)(11) and the later work by Mawdsley and Norman(1). Since 1950, exploration has been undertaken at an increasing pace with peak activities during the 1956-1960 period.

The presence of a gold orebody (Norbeau Mines) in the map-area emphasizes the opportunity of prospecting for gold. However, the possibility of finding economic concentration of copper in the volcanic rocks should not be overlooked. Support to this contention is given by the recent copper finds made by Bruneau Mines in McKenzie township.

The areas underlain by rocks of the Ultramafic Complex are favorable for asbestos. The drift-covered band of ultramafic rocks at Dufault lake appears particularly attractive since it has never been tested by drilling. It may be mentioned here that a few years ago(12) important asbestos



deposits were found in similar rocks at Lac Roberge in McCorkill township, some 10 miles east of the area. A thorough drill test of these deposits is presently being carried out by McAdam Mining Corp. Ltd. Production is contemplated for the near future.

### MINING PROPERTIES

#### Amalgamated Beau-Belle Mines Ltd.

Amalgamated Beau-Belle Mines Ltd. owns a block of 38 surveyed claims, formerly known as the "Belle" group, centred on the southwest corner of the map-area. Only 13 claims are within the area under study. They are numbered as follows: CG-725, claims 1 and 2; C-7334 and C-7335, claims 1 to 5; and C-24377, claim 1.

These claims are underlain by pyroclastic rocks of the Lac Blondeau Formation intruded by a large differentiated sill of the Mafic Complex. Disseminated grains of pyrite and pyrrhotite with traces of copper occur sporadically in the clastic rocks south of the sill. The total amount of sulfides nowhere exceeds 5%. These claims were surveyed geologically, magnetically, and electromagnetically in 1960. During the summer of 1965, some surface trenching was done with a bulldozer over an area located due west of Cran-Penché bay. It is reported that this work will be followed by drilling. More details concerning this group are given by Smith(6) (pp. 31-34) in his report on the geology of the south half of McKenzie township.

#### Bourbeau Lake Mines Ltd.

A block of 20 claims, at the east end of Bourbeau lake in range VI, is held by Bourbeau Lake Mines Ltd. The claims are numbered Q-14224 to Q-14233 and Q-17057 to Q-17066 inclusive.

The northern half of the group is underlain by pyroclastic rocks of the Lac Blondeau Formation, and the other half, by igneous concordant bodies of the Mafic and Ultramafic Complexes.

A quartz vein 6 feet thick and almost 100 feet

long was exposed, in 1935, a little north of range-line VI-VII, 700 feet west of the Roy-McKenzie township line. The vein follows the contact of agglomerate and graphitic tuff of the Lac Blondeau Formation. It carries a few grains of pyrite but no gold. In that same year, Bourbeau Lake Chibougamau Mines Ltd. drilled nine holes for a total of 2,305 feet through the ice at Sullivan bay, in an attempt to find the eastward extension of the "Sharpe" vein (see Norbeau Mines) which crops out on the adjacent Norbeau Mines property. It is reported that several holes intersected a quartz vein carrying substantial gold values(13). On the assumption that this new vein was running easterly, the company decided to do some trenching east of Sullivan bay. This work led to the discovery of a small and northeasterly-trending quartz vein, about 350 feet south of the east end of Bourbeau lake. No gold values were obtained from that vein.

Examination of the company's drill logs, maps and reports available in the files of the Quebec Department of Natural Resources has led the writers to believe that the gold-bearing quartz vein intersected by drilling through the ice at Sullivan bay does not necessarily run easterly. In order to test this hypothesis, a magnetometer survey and nine short holes were completed during the winter of 1964-1965 from the ice of Sullivan bay. Drilling results were reported to be quite deceiving.

#### Cameron, Gordon

Twenty claims numbered C-216719 to C-216722, claims 1 to 5, and situated northeast of Bourbeau lake have been staked recently. This ground was held in 1956 by Gibson Chibougamau Mines Ltd. and covered by magnetometer and resistivity surveys. The work was followed by the drilling of three holes. Two of them are 1,000 feet north of a small lake situated 1/2 mile east of Anxiété bay and the other one is near the northwest shore of the same lake. Some graphite-rich, pyroclastic rocks were transected in each hole. During the winter of 1964-65, magnetic and electromagnetic surveys were performed on the whole claims group.

#### Campbell Chibougamau Mines Ltd.

Campbell Chibougamau Mines Ltd. owns three blocks of claims in range VI. One group is actually a single claim, numbered Q-14001 and located immediately north of Cran-

Penché bay. A second group, made up of three claims, numbered Q-14002, Q-14048 and Q-14049, lies 1/2 mile farther east. The third group comprises two claims, numbered C-193322, claims 2 and 5, and covering part of Sullivan bay.

The first two groups, although drift- and water-covered, are believed to be wholly underlain by pyroclastic rocks of Lac Blondeau Formation. In 1956, three holes, totaling 1,261 feet, were drilled on the second group, one hole having been collared by mistake a few hundred feet west of Campbell's property. Only pyroclastic rocks were intersected. In 1960, both groups were covered by magnetic and electromagnetic surveys.

On the third group, the bedrock consists of a thin band of pyroclastic rocks conformably intruded by mafic and ultramafic bodies. Along the township center-line, about 900 feet west of Mile-post 4, an 1/8-inch veinlet of cross-fiber asbestos was seen by Arthur Mathieu in a piece of black serpentinized dunite blasted off during the construction of a transmission line by the R.C.A.F. During the winter of 1964-65, water depth and induced polarization surveys were conducted over each one of three groups of claims.

#### Godin, F.X.,

Mr. F.X. Godin owns nine contiguous claims immediately south of range-line VI-VII, at the western tip of Bourbeau lake. The claims have the following numbers: C-199436, claims 1 to 5, and C-204494, claims 1 to 4.

The property is underlain by pyroclastic rocks of the Lac Blondeau Formation and younger igneous masses of the Mafic and Ultramafic Complexes.

The east boundary of the property adjoins a sulfide zone described under "Mann, Joe".

In the central part of the property a geological survey, done in 1947 by Fernand Malartic Mining Syndicate, outlined a carbonate shear zone, 600 feet north of the outlet of Bourbeau lake. This zone has been described in a previous chapter dealing with "Shearing".

The carbonate shear zone and its vicinity were further explored in 1960 by Northeast Exploration Ltd. An electromagnetic survey was conducted, followed by some trenching and diamond drilling. Three holes were completed

for a total of 1,256 feet. One hole intersected the carbonate zone from which all quartz-rich sections were assayed for gold, but assay results were disappointing. The two other holes tested conductor zones which were found to be graphite-rich clastic rocks.

Mann, Joe

In August 1964, a block of 43 claims was staked in the central part of the map-area, including claims numbered C-212332, C-212333, C-212334, C-212335, C-212348, C-219163, C-219164 and C-219165, claims 1 to 5 each; and C-215365, claims 1, 2 and 3. Most of this ground had been held previously by Rosario Explorations Ltd.

The group is underlain by pyroclastic rocks and mafic lavas of the Lac Blondeau Formation largely intruded by concordant bodies of the Mafic Complex.

In 1956 and 1959, magnetic, electromagnetic and geological surveys were run over the northern half of the property by McKenzie Chibougamau Mines Ltd. to explore occurrences of pyrite in pyroclastic rocks.

In the southern half of the property, a program of cross-sectional drilling was initiated in 1947 and completed in 1956 by Normandy Gold Mines Ltd., later called Normandy Chibougamau Mines Ltd. Seven holes were drilled for a total of 3,778 feet.

Near the shoreline of Bourbeau lake, on C-199431, claim 1, a sulfide zone was uncovered during the summer of 1929. It is approximately 1,000 feet long and extends westerly into the ground held by F.X. Godin. Mineralization consists almost entirely of pyrite with some pyrrhotite and chalcopyrite in tightly-folded pyroclastic rocks of the Lac Blondeau Formation. Although the zone is on the average 20 feet thick, it shows a massive to semi-massive type of replacement across a width of only a few inches. In 1934, the showing was thoroughly trenched by Consolidated Goldfields. More recently, Norbeau Mines Ltd. drilled three short holes. In both cases, assay values in precious metals and copper were apparently quite low.

The 18 claims south of range-line VII-VIII were optioned in March 1965 by Texas Kidd Ltd. This company agreed to have the area studied with magnetometer and electromagnetometer surveys. Four holes were drilled in April 1965 to test several conductors. The first two holes intersected a

layer of graphite-bearing pyroclastic rocks along the south boundary of the property. The other holes explored similar rock types, one near the northeast corner of C-212332, claim 1, and the other in the northwest corner of C-212348, claim 5.

McKenzie Chibougamau Mines Ltd.

McKenzie Chibougamau Mines Ltd. has the mining rights of C-132140, claim 5, one mile west of the McKenzie-Roy township line, in range VIII.

The claim is underlain by pyroclastic rocks of the Lac Blondeau Formation.

The property was covered in 1956 by electromagnetic and magnetic surveys.

Mid-Chibougamau Mines Ltd.

Mid-Chibougamau Mines Ltd. owns the mining rights on a block of eight claims at the north end of Anxiété bay. They are numbered C-106560, claims 1 to 5, and C-106561, claims 1 to 3.

The property is underlain by pyroclastic rocks and interbedded lava flows of the Lac Blondeau Formation intruded by concordant bodies of the Mafic and Ultramafic Complexes.

In 1956, the group was covered by geological, magnetic and resistivity surveys. One year later, eight holes were drilled in order to test magnetic and resistivity anomalies, for a total of 3,170 feet. Disseminated to nearly massive sulfides were noted in each hole. Mineralization is largely of the replacement type, and consists of pyrite, pyrrhotite, chalcopyrite and sphalerite. Sulfides occur in a band of interbedded agglomerate and tuff near its contact with a mafic lava flow. A 37-foot intersection assayed 0.14% copper. A thin body of peridotite carrying a small amount of asbestos was intersected in a hole drilled southeasterly, approximately 1,800 feet west of the Roy-McKenzie township line. Some asbestos was also observed in the core of another hole collared 600 feet farther to the northwest.

Norbeau Mines (Quebec) Ltd.

Norbeau Mines holds a block of 25 claims in the east-central part of McKenzie township on the south shore of Bourbeau lake, between Cran-Penché and Sullivan bays. Only 21 claims are wholly or partly within the map-area. They are numbered Q-10459 to Q-10465, Q-12649, Q-13758 to Q-13760, Q-14018 to Q-14022, Q-12648, Q-12650 to Q-12652, and Q-12657.

The property is underlain by felsic pyroclastic rocks of the Lac Blondeau Formation largely intruded by concordant igneous bodies of the Mafic and Ultramafic Complexes. All rock units face north, trend easterly, and dip steeply to the north. From north to south, the section is as follows: pyroclastic rocks, mafic sill (well differentiated), pyroclastic rocks, quartz-chlorite-hornblende gabbro and ultramafic intrusions. Evidence of faulting in a northeasterly direction is clearly shown by the step-like offsets displayed by the central band of pyroclastic rocks.

During the 1929-1934 period, three important gold-bearing quartz veins were discovered on the Norbeau Mines property.

Shortly after the first discovery, the property was optioned by Noranda Mines Limited. This company discovered a gold orebody by systematic trenching and drilling on one of those veins known to-day as the "Norbeau vein". In 1935, the vein was tested by more than 15,000 feet of drilling. In 1947, Noranda Mines exercised its option and formed the present company. Twelve years later, Norbeau Mines sold its controlling interest to Little Long Lac Gold Mines Ltd. Exploration on the Norbeau vein was then resumed with a drilling program of 27,000 feet in 34 holes. Moreover, an adit was driven along the vein for 1,018 feet. In the summer of 1964, the decision to bring the property into production was reached. The first brick of gold was poured in September of that year. Ore reserves were then estimated at 400,000 tons containing better than 0.4 ounce of gold a ton. The current rate of mining is 205 tons a day.

The Norbeau vein which lies some 1,500 feet east of the head of the Cran-Penché bay strikes N.30°E. and dips 45 degrees to the southeast. It is essentially in a carbonate shear zone, about 150 feet wide. A quartz vein 2.5 to 8 feet wide and almost 1,700 feet long was introduced along the upper part of the zone. It consists of well-fractured

bluish-white quartz carrying disseminated pyrite and, in places, chalcopyrite, pyrrhotite and arsenopyrite. The sheared wall-rock is a quartz-chlorite-hornblende gabbro in the northern part of the vein and a gray diorite in the southern part. Both rock units represent differentiates of a single intrusion.

It is interesting to note that, while engaged in shaft-sinking, Norbeau Mines intersected a new ore zone on the fourth level. This orebody, called the No. 4 vein, strikes roughly north-south and dips 60 degrees east. Width and mineralogy of this new zone are similar to those of the upper (No.1) vein, although the grade of the former is reported to be better than 0.8 ounce of gold a ton.

The two other quartz veins are respectively 1,500 feet and 2,000 feet east of the Norbeau vein and are respectively known as the "No.2 vein" and the "Sharpe" or "International vein". Both veins strike east-west, almost in line with one another, and dip from steeply south to vertical. In all megascopic characters they are similar to the Norbeau vein (see chapter titled "Shearing"). Much trenching was done over these veins in 1934 and free gold in arsenopyrite and quartz was seen at that time by Mawdsley and Norman(1) (p.68) in the western part of the Sharpe vein. Testing the strike continuity and the gold content of each vein, Noranda Mines did 3,700 feet of drilling in 21 holes in 1939. Results were reported to be disappointing. Since then, no exploration work has been carried out.

About 500 feet south of and parallel to the Sharpe vein, a vein of black and highly fractured quartz which carries low gold values is bordered by a slightly sheared and carbonated diorite.

Approximately 1,000 feet south of the Sharpe vein center point, trenching has exposed a 400-foot band of pyroclastic rocks mineralized with disseminated pyrite and pyrrhotite, and minor chalcopyrite. Sulfides represent up to 25% of the rock by volume. Mineralization is confined to the upper 75-foot section of that band.

In order to assess fully the ore potentiality of its whole property, Norbeau Mines initiated, late in July 1965, an exploration program consisting of a minimum of 9,000 feet of surface diamond drilling. The present 850-foot shaft will also be deepened in order to open up four new levels. This work is scheduled to start early in the fall of 1965.

Normandy Chibougamau Mines Ltd.

Normandy Chibougamau Mines Ltd. holds a block of 15 claims in the east-central part of McKenzie township, south and west of Cran-Penché bay. Only four claims are within the map-area: C-3551, claims 1 and 2, and C-3552, claims 1 and 2.

To the south, the property is underlain by fine-grained clastic rocks of the Lac Blondeau Formation and to the north by a large and well-differentiated sill of the Mafic Complex.

Exploration work carried out on these claims includes geological mapping, in 1947, and 2,850 feet of drilling in five holes, in 1957. No intersections of interest were reported.

Ran Lux Mines Ltd.

Ran Lux Mines Ltd. acquired, at the end of 1964, a block of three claims adjacent and southeast of the Norbeau Mines property. The block was formerly held by J.O. Sabourin "In Trust". Claim numbers are as follows: C-193323, claim 1; C-193324, claim 1; and C-193327, claim 1.

Except for a thin band of bedded volcanic rocks on C-193324, the bedrock is everywhere of intrusive nature and of mafic to ultramafic composition.

Two holes were drilled by Normandy Chibougamau Mines Limited: one in 1947, and the other in 1956 and 1957, a few feet north of the band of pyroclastic rocks. Disseminated grains of pyrite, pyrrhotite and minor chalcopyrite were found in the core of each hole. A 228-foot hole was drilled by Sabourin "In Trust" in October 1964 from a point 600 feet southwest of the northeast corner of the property. Drilled in a southerly direction, it intersected diorite and tuffaceous rocks.

Rex Chibougamau Mines Ltd.

The northern boundary of a block of 10 claims held by Rex Chibougamau Mines Ltd. traverses the Roy-McKenzie



township line, a little north of the southeast corner of the map-region. Only the northern portion of the three claims numbered Q-28007, Q-28008 and Q-28009 is within the map-area.

In 1956, the property, then held by Consolidated Quebec Yellowknife Mines Ltd., was covered by resistivity and magnetic surveys. The latter survey clearly indicates that the claims located in the map-area are underlain by ultramafic rocks.

#### Taché Lake Mines Ltd.

A large block of claims in the west-central part of McKenzie township is held by Taché Lake Mines Ltd. Only the two easternmost claims fall within the map-area. They are numbered C-74572, claim 1, and C-74574, claim 1. The claims are underlain by pyroclastic rocks and metagabbro.

A full description of exploration work done on this property is given in Smith's report(6) (pp. 37-38).

#### Other Properties

No work is reported on claims held by C. Asselin, Black Bay Uranium Ltd., Canex Minerals Limited and Texas Kidd Mining Corp. Ltd.

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