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PRELIMINARY REPORT, GEOLOGY OF THE SOUTHEAST QUARTER OF LANDRIENNE TOWNSHIP AND THE SOUTHWEST QUARTER OF BARRAUTE TOWNSHIP, ABITIBI-EAST COUNTY

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GEOLOGY
OF THE
SOUTHEAST QUARTER OF LANDRIENNE TOWNSHIP
AND THE
SOUTHWEST QUARTER OF BARRAUTE TOWNSHIP

ABITIBI-EAST COUNTY

PRELIMINARY REPORT

BY

RONALD DOIG



QUEBEC

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GEOLOGY
of the
SOUTHEAST QUARTER OF LANDRIENNE TOWNSHIP
and the
SOUTHWEST QUARTER OF BARRAUTE TOWNSHIP
ABITIBI-EAST COUNTY
Preliminary Report

by
Ronald Doig

INTRODUCTION

Location and Access

The 50-square-mile area mapped in 1961 covers the southeast quarter of Landrienne township and the southwest quarter of Barraute, both townships being located some 30 miles north of Val-d'Or. The area is serviced by the Canadian National Railways' transcontinental line and the Amos-Senneterre highway. The southeast quarter of Landrienne township is also crossed by a road and railway both running north-south and servicing the Quebec Lithium Corporation mine.

Topography

A broad northerly-trending sand ridge is the dominant topographical feature in Landrienne township; the remainder of the area is flat lying and shows a maximum relief of some 100 feet.

No large streams or lakes are present in the area, but numerous small streams flow radially from the sand ridge and from a central upland in Barraute township.

Surface deposits consist mainly of clays deposited in the glacial lake Barlow-Ojibway. Sand is abundant in the western half of the area.

Field Work

The area was mapped on a scale of 1,000 feet to the inch by pace and compass traverses with the aid of aerial photographs enlarged to this same scale. The railway, roads, and range lines were picketed and chained to serve as tie-in points for the traverses. Traverse spacing, determined by the probability of outcrop occurrence, ranged between 200 and 800 feet.

Available geophysical and diamond-drill data were checked and incorporated into the map.

An Askania magnetometer was used extensively to trace diabase dykes and to determine bedding trends in areas of sparse outcrop. Vertical electromagnetic equipment was used, with limited success, to trace graphitic sediments.

GENERAL GEOLOGY

The area is underlain by interbedded early Precambrian basic to intermediate lavas, acidic lavas, and bands of sedimentary rocks. These rocks are intruded by small sills and plugs ranging in composition from granite to peridotite. At least two diabase dykes cut the area in a northeasterly direction.

Table of Formations

CENOZOIC	Pleistocene	Till, sand, gravel, lacustrine clays
LATE PRECAMBRIAN	Keweenawan ?	Diabase dykes
EARLY PRECAMBRIAN	Intrusive Rocks	Granite, granodiorite Gabbro, peridotite
	Sedimentary and Volcanic Rocks	Conglomerate, quartzite, siltstone, greywacke
		Tuff and agglomerate
		Lavas: andesite, dacite and rhyolite

Volcanic and Sedimentary Rocks

Andesitic Lavas

A band of basic to intermediate lavas, with interbedded tuffs and greywacke-type sedimentary rocks, occupies the central two-thirds of the area. Another smaller band underlies the extreme southwest corner of the area. These rocks are almost everywhere schistose. Pillow structures are common and, in many cases, sufficiently well preserved to yield reliable top determinations.

Under the microscope, these rocks are seen to be composed of a fine-grained mixture of chlorite and muscovite. Fresher coarser-grained specimens contain altered feldspar, oligoclase or andesine, and pyroxene, partly altered to an amphibole or chlorite. Calcite and small amounts of quartz may occur.

Following the local usage, all these rocks have been termed andesite, although they include many rocks that are probably basaltic in composition.

Dacitic and Rhyolitic Lavas

Acidic lavas occur locally within the broad belt of basic lavas and form two distinct bands.

In the northern band, located in ranges IV and V of Barraute township, the rock is light green, fine to medium grained, and almost always pillowed. Thin-section examinations indicate an assemblage of lath-like, altered feldspar, muscovite, quartz, and some amphibole and chlorite.

A well-exposed, thick band of rhyolitic lavas is located in lots 32 to 38, range II, Landrienne township. Four distinct types of rocks can be recognized within this band. The most common type is a dense, usually well-sheared and otherwise featureless rock. Another type is a dense, hard, light grey rock, containing numerous fine flakes of biotite. The third type contains abundant oval-shaped quartz grains, which, in thin section, are seen to have been formed by recrystallization and accretion of the quartz fraction of the rock. The fourth type is a very continuous, narrow band of pillowed rhyolite. Although termed pillows, these structures are unique in that their long axis is many times the length of either of the shorter axes of the pillow.

Many flow contacts are marked by thin, very continuous bands of tuff. Volcanic bombs may occur within the flows.

Pyroclastic Volcanic Rocks: Tuff and Agglomerate

Tuffaceous sedimentaries and associated agglomerates are interbedded with all the rocks described thus far. They range from very dense, banded tuffs to rocks composed entirely of large volcanic bombs and blocks of rhyolite. Bedding is remarkably well preserved in many places.

The tuffaceous rocks in ranges I, II, and III in Barraute township are characterized by abundant quartz "eyes" of similar origin to those described in the preceding section. These rocks and the associated basic lavas are locally intensely sheared and carbonatized.

In thin section, nearly all the tuffs of the area are seen to contain, in addition to more or less recognizable pyroclastic fragments, a substantial amount of normal sedimentary material consisting mainly of sand and silt with local occurrences of large grains of detrital feldspar.

Sedimentary Deposits: Conglomerate, Quartzite, Siltstone, and Greywacke

A conglomerate, composed of a variety of fairly well-rounded pebbles in a matrix of micaceous sandstone, outcrops along the southern boundary of the area, at the junction of Landrienne and Barraute townships. Farther south, in Fiedmont township, the sedimentary series is well exposed and consists, from west to east, of conglomerate, greywacke (quartz-biotite schist), and a second band of conglomerate.

On the basis of varved siltstones lying just west of the centre line of Landrienne township, this band of sedimentary rocks is interpreted as extending to the west where, on lot 46, range I, Landrienne township, the sequence consists of a thinly-laminated siltstone with some conglomerate, tuff, and several small bands of graphitic sedimentary rock.

Intrusive Rocks

Gabbro and Peridotite

Several small bands of gabbroic rocks occur in range V, Barraute township, and in lot 55, range IV, Landrienne township. These are massive medium-grained rocks with indistinct grain boundaries. Contact relationships do not exclude the possibility that these rocks are very thick lava flows.

A wide band of altered gabbro outcrops in the southwestern corner of the map-area.

Under the microscope, these rocks are seen to contain from 30 to 50 per cent pyroxene, much of which has been

converted to an amphibole and chlorite, and highly-altered feldspar.

Two narrow bands of peridotite were intersected in drill holes, south of the gabbro in range I, Landrienne township. These rocks form part of a continuous belt of basic and ultrabasic rocks that crosses Figuery and Landrienne townships.

Granite and Granodiorite

An igneous body, the Mogador granodiorite, does not crop out in the area, but has been intersected in numerous drill holes in lots 28 to 31, range I, Barraute township. The rock has a variable composition ranging from granite to quartz diorite and contains at least one large inclusion of amphibolite.

A sill-like body of granite is exposed in lots 24 to 30, range III, Barraute township. The outcrop width of the sill varies uniformly from 350 feet at the western end to about 600 feet at the eastern end. Part of the northeastern contact was delineated with the magnetometer. The emplacement of the body seems to have been influenced by the synclinal axis to the south. The rock is fairly massive and weathers to a medium grey. It is composed of albite, quartz, muscovite, chlorite, and a micrographic intergrowth of quartz and albite. The chlorite occurs on the periphery of hornblende crystals as an alteration product and along minute shear zones in the crystals. In the last instance, the chlorite is associated with calcite and pyrite.

In lots 55 to 60, ranges I and II, Landrienne township, nearly all the lavas show some degree of granitization. The granitization ranges from the occurrence of isolated clots of quartz to the nearly complete replacement of the rock by quartz and fresh feldspar. In all thin sections examined, however, some trace of the original rock remained. Much of the quartz forms as much as 75 per cent of the rock. The rock is typically crushed and may contain abundant carbonate.

Diabase

Two major diabase dykes cross the area in a northeasterly direction. The dykes are well exposed in lots 41 to 44, range II, Landrienne township. Numerous magnetometer traverses were made, and these, along with magnetic surveys conducted by several mining companies, made it possible to trace the dykes across the map-area.

The rock is massive, has a well-defined diabasic texture, and shows the usual grain gradation from the wall to the centre of the dyke. In thin section, the rock is seen to consist of about 50 per cent augite, slightly altered to chlorite, labradorite, and a few grains of micrographically-intergrown quartz and plagioclase and also some free quartz.

STRUCTURAL GEOLOGY

Folding

The well-preserved bedding in tuffaceous sediments and the abundant top determinations made it possible to trace the axis of a major syncline across Barraute township. The syncline is overturned to the south and plunges west-northwest. The nose of the fold is fairly well exposed in lots 25 and 29, range III, Barraute township.

A system of drag folds is very well exposed in lots 35 to 38, range II, Landrienne township.

The synclinal axis within the band of sedimentary rocks in range I of Landrienne township is based on some 40 top determinations made on cores of the siltstone sequence in lot 46, but this structure is probably only of local importance. Measures were taken to ensure that the core had been properly laid in the boxes.

Shearing and Faulting

Most of the rocks show some foliation or cleavage that strikes consistently to the west or northwest, and, where axes of folds are exposed, the cleavage direction cuts sharply across the bedding planes.

The lavas and tuffs have been intensely sheared and carbonatized in lots 59 and 60, range V, and in lots 55 and 59, range IV, Landrienne township, and in lots 9 to 17, ranges II and III, Barraute township. In most cases it is impossible to determine the original nature of the rock. In thin section, the rocks are seen to consist of variable amounts of carbonates, chlorite, muscovite, and quartz. The zones of carbonatization are irregular in shape and are not confined to one rock type.

ECONOMIC GEOLOGY

No mineral deposits of commercial size have been found in the map-area. Many of the gold and sulfide occurrences are associated with sheared and carbonatized pyroclastic volcanic rocks. The Barvue and Mogador zinc sulfide deposits lie immediately north and south of the area, respectively.

Gold Occurrences

Numerous sheared zones, which may or may not be carbonatized, contain quartz veins. The shear zones are indicated on the maps, and the more important occurrences are described below.

American Chibougamau Mines Ltd.

Ref. : G.S.C. Mem. 253, p. 89, 1950.

American Chibougamau Mines Ltd. holds lots 54 to 59, range IV, Landrienne township. This group of claims includes the workings of the original Randall Mines Corporation.

When the mine closed in 1938, the shaft on lot 55 had reached a depth of 600 feet and work had been carried out on four levels.

The rocks in the vicinity of the shaft are andesitic lavas with interbedded rhyolite and tuff. A sill of massive coarse-grained gabbro occurs 600 feet southwest of the shaft. The quartz veins occupy northwesterly-trending shear zones in carbonatized rocks. The main vein dips steeply northeast at the surface but gradually flattens out as it approaches the lava-gabbro contact. The higher-grade portions of the veins carried, on the average, less than 0.1 ounce of gold per ton over short distances and across widths of a foot or so.

In 1961, American Chibougamau Mines Ltd. completed some 3,000 feet of drilling, based on surface showings and a magnetometer survey. One hole intersected the strong shear zone exposed on lot-line 58-59, range IV, Landrienne townships. This shear lies in a narrow band of very acidic volcanic rock contained within basic lavas. The shear zone contains many parallel quartz veins and is heavily pyritized. There were no interesting gold or sulfide intersections.

Bar-Lan Gold Mines, Ltd.

Ref.: G.S.C. Mem. 166, p. 287,
G.S.C. Mem. 253, p. 96.

The property of Bar-Lan Gold Mines, formerly known as Venus Gold Mines, consists of lots 11 to 16, range II, and lots 14 to 17, range III, Barraute township.

Much work was done on the property from 1925 to 1932. Two mineralized zones were outlined: one near the railway line on lot 17, range III, and the other on lot 14, range II. A 225-foot shaft was sunk on each of the two zones to explore the quartz veins exposed at the surface. A total of 3,500 feet of drifting and crosscutting was done from the 200-foot levels of the shafts.

In 1946 and 1947, Bar-Lan Gold Mines conducted geological and geophysical surveys on the property and did some diamond drilling.

The rocks of the north zone are basic lavas with interbedded tuffaceous sediments. The tuffaceous rocks are strongly sheared and contain numerous quartz "eyes". Carbonate is present in both the lavas and tuffs near the quartz veins. The quartz veins strike N.65°W, and dip at angles of 45° to 70° to the northeast and, as such, are parallel to the schistosity.

The south zone is similar but is characterized by intense carbonatization and by two important sets of quartz veins. These veins strike parallel to the schistosity and dip at an angle of 60° to the northeast or southwest.

Many of the individual veins referred to above are only a fraction of an inch thick. However, a large number of them may occur together in a zone that is several feet thick. The so-formed zones in many cases were found to persist to a depth of at least 200 feet.

North Half of Lot 9, Range II, Barraute Township

Ref.: G.S.C. Mem. 166, p. 286
G.S.C. Mem. 253, p. 101.

The zone of carbonatized rocks in the north half of lot 9, range II, Barraute township, is on the same stratigraphic horizon as the south zone of Bar-Lan Gold Mines to the east. Quartz lenses occur in a shear zone exposed in surface workings carried out by Continental Gold Mines Ltd. in 1927.

South Half of Lots 59-60, Range V, Landrienne Township

Ref.: G.S.C. Mem. 166, p. 284
G.S.C. Mem. 253, p. 99.

The shaft of the former Fisher-Quebec Gold Mines Company is located 650 feet north of the highway in the southeast corner of lot 59, range V, Landrienne township. The ground is currently held by Northern Quebec Explorers Ltd.

The shaft was sunk on a 100-foot-thick band of intensely crushed and carbonatized acidic rock that strikes about N.75°W. Irregular masses and veins of quartz and carbonates occur profusely throughout the zone. The carbonatization has penetrated the basic lavas to the south. Pyrite is common as large euhedral crystals.

Jilbie Mining Co.

Ref.: G.S.C. Mem. 253, p. 93.

Jilbie Mining Company holds lots 20 to 23, range IV, Barraute township. Two 600-foot holes were drilled in 1957 on the basis of a magnetic survey. One of these intersected the western end of the granite sill that outcrops to the east.

Lots 24 to 30, Range III, Barraute Township

A 300-foot-thick sill of granite is well exposed on lots 24 to 30, range III, Barraute township. Parts of this area were held by Oregon Quebec Gold Mines Ltd. and by The Consolidated Mining and Smelting Company of Canada Ltd. Development work consisted of trenching and a few short diamond-drill holes.

The granite exposed in lots 29 and 30 is massive and contains several widely-spaced, 1/2-inch quartz veins that generally strike east-west and dip at small angles to the south. The quartz is barren, but the rock immediately adjacent to the veins is chloritized and may contain large cubes of pyrite. Gold was reported from this pyritic material.

The rocks that outcrop in lot 24 are similar but are locally sheared and contain irregular stringers of quartz and disseminated carbonate, as well as several discrete quartz veins. At least one cross-fault was recognized. In this case also, the gold seems to be confined to the sparse cubes of pyrite.

Sulfide Occurrences

The first two occurrences to be described lie on the same horizon as the Mogador zinc sulfide deposit that is located to the southeast. These two descriptions are drawn from reports by M. Latulippe of the Department of Natural Resources.

Absam Mines Ltd.

The claim group of Absam Mines Ltd. covers the south halves of lots 21 to 26 and all of lot 27, range I, Barraute township.

The property is underlain by a sequence of interbedded basic lavas and tuffaceous rocks that is cut by small dykes and sills of the Mogador granodiorite that lies just southeast of the property.

In 1951, Tasmaque Gold Mines drilled 5 holes, for a total of 3,795 feet, following the completion of a magnetic survey. In 1954, Absam Mines drilled 7 holes on the south half of lot 27, for a total of 6,896 feet. One of the Absam holes, drilled vertically at a location 450 feet north and 50 feet west of the southeast corner of lot 27, cut a sulfide zone in tuffaceous rocks, which assayed 6.65 per cent Zn across 2.5 feet at a depth of 370 feet. At 870 feet in the same hole, a quartz-carbonate vein assayed 0.162 ounce of gold per ton across 2.0 feet.

P. D'Aragon supervised both drilling programs.

Belfort Mines Ltd.

The Belfort Mines property includes, within the map-area, lots 28 to 31, range I, Barraute township.

This property is underlain by dominantly tuffaceous sedimentary rocks and by two bands of basic lava. The Mogador granodiorite plug occupies the southern third of the property. Forty-three diamond-drill holes, totalling about 36,500 feet, were drilled by the various owners over the period from 1949 to 1958.

A sulfide zone was discovered at the south end of lot 28, lying at a depth of from 450 to 700 feet. Company engineers estimated from the drilling that the deposit contains at least 250,000 tons at 7 per cent zinc, 0.21 per cent copper, 0.12 per cent lead, 0.01 ounce of gold and 0.61 ounce of silver per ton.

Nine holes were drilled across a 3,000-foot length of the north contact zone of the granodiorite plug. Five of these gave an average of 0.41 ounce of gold over an average width of 1.4 feet.

The drilling programs were supervised by P.R. Geoffroy.

Locations of the holes and details of the rocks encountered are shown on the maps.

Canadian Shield Mining Corp.

The holdings of Canadian Shield Mining are as follows:

South half of lots	51 to 56,	range III,	Landrienne township,
" " " "	57 to 62,	" II,	" "
North half " "	57 to 62,	" I,	" "
" " " "	1 to 3,	" I,	Barraute township,
South " " "	1 to 3,	" II,	" "

The southern group is underlain by rocks described earlier as a sequence of granitized acidic and basic volcanic rocks. Three holes were drilled in 1960, for a total of 1,775 feet, one in each of lots 57 and 58, range II, and lot 57, range I, Landrienne township. These, as well as three earlier holes drilled in 1955 by Donaldda Mines Ltd., cut rocks that had been variously affected by the introduction of granitic material. No interesting gold or sulfide intersections were reported.

East Sullivan Mines Ltd.

East Sullivan Mines Ltd. held lots 40 to 45, range II, Landrienne township. The company drilled 7 holes in

1954, totalling 3,884 feet to explore several magnetic anomalies. The property is underlain by rhyolitic and dacitic lavas, with interbedded tuffs and basic lavas. Two diabase dykes cross the claim group.

Several zones of pyrrhotite were intersected by the drill holes, and these coincided for the most part with the magnetic anomalies. Most of these zones assayed up to 0.2 per cent copper and 0.3 ounce of silver per ton over widths of from 2 to 7 feet.

There are two surface showings exposed in trenches on lots 40 to 41, respectively 550 and 1250 feet north of range-line I-II. The rock is a very dense rhyolite that has been brecciated and intruded by quartz and barren sulfides.

Lots 32 to 37, Range II, Landrienne Township

Small amounts of pyrite occur in broad west-northwesterly-trending shear zones throughout the large outcrop area on lots 32 to 37, range II, Landrienne township. The largest zone is at the north end of lots 34 and 35. Some of the smaller shear zones also contain numerous quartz veins. Most of these zones have been indicated on the map.

In 1953, Lamaque Gold Mines Ltd. drilled 4 short holes, totalling 500 feet, and did not report any interesting mineralization.

New Laguerre Mines Ltd.

The property of New Laguerre Mines consisted of lots 46 to 49, ranges I and II, Landrienne township. In 1955, the company conducted a magnetic survey and drilled 7 holes, 5 of which gave a complete section across the south half of range I, on lot-line 46-47. The rocks encountered from north to south were; a sequence of siltstones and conglomerates with minor amounts of tuff, basic lava and graphitic sediments, followed by a thick band of acidic volcanic rocks, and, finally, south of the township line, altered basic lava and gabbro.

The magnetic anomalies drilled on lots 47 and 49, range II, were found to be due to a carbonate sediment containing euhedral magnetite and several zones of pyrrhotite.

Triform Explorations Ltd.

Triform Explorations Ltd. holds lots 4 to 11, range V, Barraute township. Magnetic and electromagnetic surveys were carried out in 1961. One outcome of the magnetic survey was the location of a diabase dyke occupying a depression between outcrops of basic volcanic rocks.

