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Geological report, Portneuf and parts of St-Raymond and Lyster map-areas, Portneuf and Lotbinière counties

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MINISTÈRE
DE L'ÉNERGIE
ET DES RESSOURCES

DIRECTION GÉNÉRALE DE
L'EXPLORATION GÉOLOGIQUE
ET MINÉRALE

PORTNEUF AND PARTS OF ST-RAYMOND AND LYSTER MAP AREAS

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Geological Report

PORTNEUF AND PARTS OF
ST-RAYMOND AND LYSTER MAP-AREAS

PORTNEUF AND LOTBINIERE COUNTIES

by

PUBLIC

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Ministère des Richesses Naturelles, Québec
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INTRODUCTION

The Paleozoic rocks of the Portneuf map-area were mapped by T.H. Clark during the summers of 1944 and 1948. The Precambrian rocks were later mapped by F.F. Osborne in 1948. The area was revisited by Yvon Globensky during the summers of 1967 and 1968, and several exposures, mainly from newly dug agricultural ditches, were added to the original map. The mapping was done for the most part on enlargements of the Portneuf topographic map. Air photographs were available for the 1967 work and allowed the mapping in detail of the structures visible on the beach at low tide, permitting a better comprehension of the structural arrangement along the St. Lawrence river. The aeromagnetic and gravity maps of the area contributed to the recognition of normal faults in the area. The work done in the adjacent area to the east (St-Nicolas map-area) by Pierre St-Julien and F.F. Osborne, helped considerably in working out the rock distribution and structure in the southeastern corner of the present area. The mapping was extended to the north by Clark along Jacques Cartier river into the St-Raymond map-area as far as the Precambrian contact.

Location

The map-area straddles the river St. Lawrence just above Québec City; approximately one-third of its area lies to the north of the river, and two-thirds to the south. Its

Relapse Legend

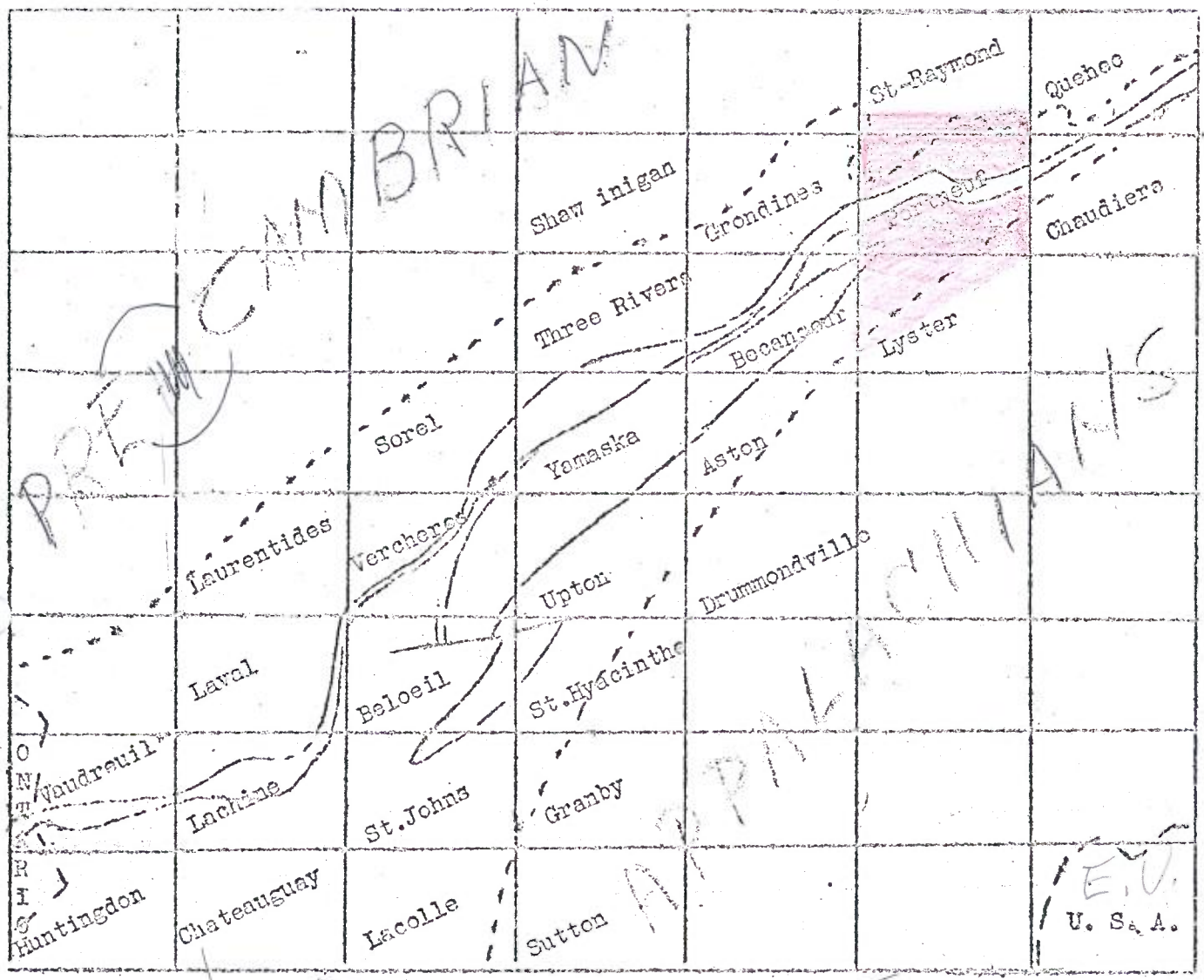


Figure 1: Index map of part of Quebec showing location of Portneuf map-area in relation to surrounding map-areas. Index map of part of Quebec, showing the map-areas covering the St. Lawrence lowland. Pre-Cambrian area to the northwest, the Appalachian mountain built terrane to the southeast.

Figure 1: Index map of the St. Lawrence lowlands, southwestern Québec, showing location of the Portneuf and parts of the St. Raymond and Lyster map-areas. Dotted lines indicate the limits of the St. Lawrence lowlands in Québec.

position with regard to the neighboring map-area is shown on the accompanying index map (Fig. 1). It is bounded by latitudes $46^{\circ}15'$ and $46^{\circ}50'$ and by longitudes $71^{\circ}30'$ and 72° W. Only the northwestern half of the Lyster map-area was mapped. The combined area covers approximately 728 squares miles.

Topography and Drainage

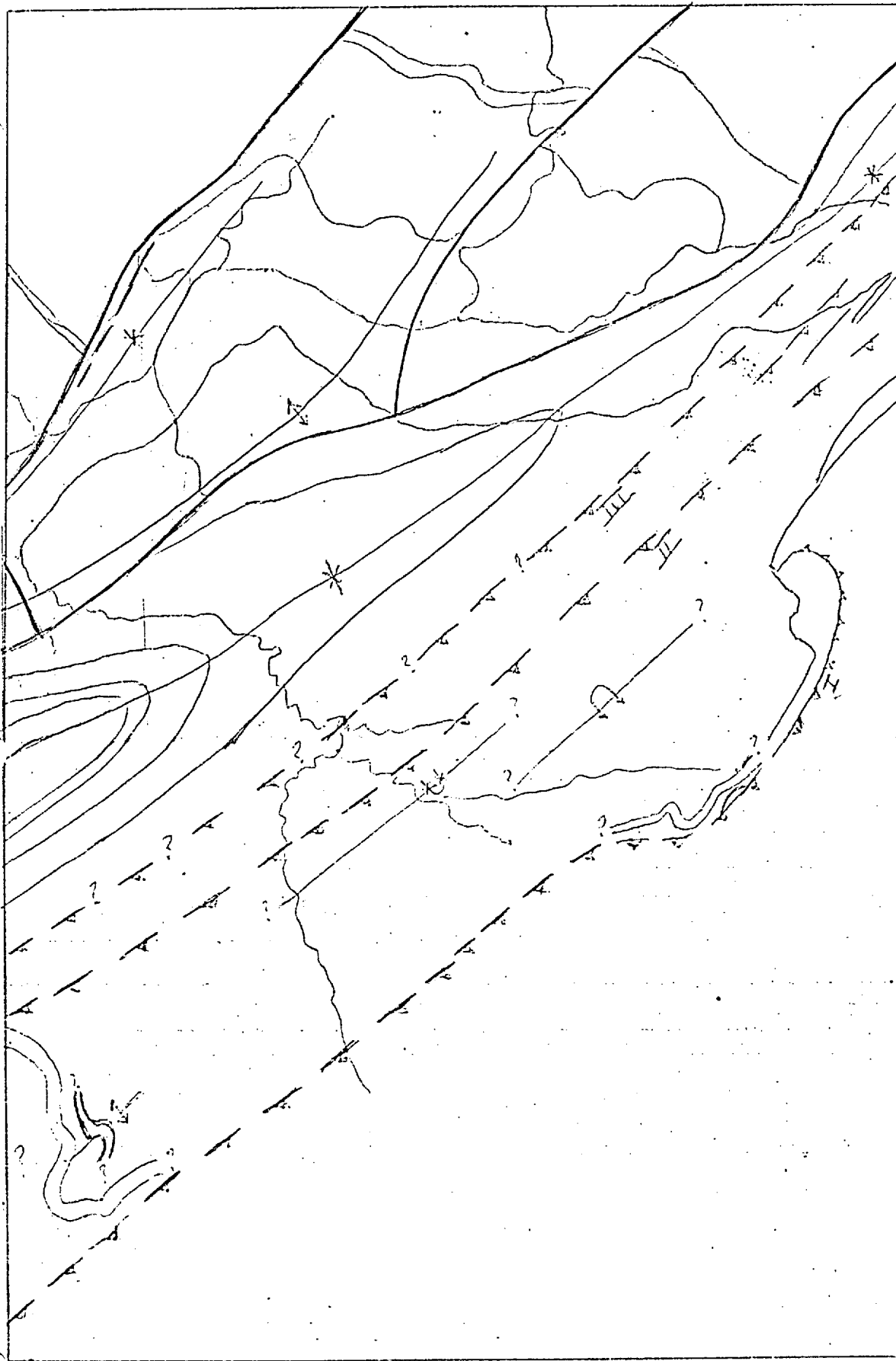
Area north of the St. Lawrence river

Except for two hilly areas near the northeastern and northwestern corners of the Portneuf map-area, the part here considered consists of a plain, gently sloping southward, and dropping from a maximum elevation of about 300 feet to the edge of the St. Lawrence, where it ends in an escarpment 100-200 feet high. Flat lands bordering the river are for the most part confined to a narrow marginal belt a few hundred feet wide; they are extensive only in the extreme eastern part of the area. The hilly regions referred to are underlain by Precambrian rocks. They rise to 450 and 500 feet respectively in the Portneuf area but are much higher in the St-Raymond area and, in an otherwise monotonous landscape, give an illusion of considerable relief. The Jacques Cartier river, the only large stream, flows for more than half its length through a gorge with precipitous sides up to 100 feet high. The Portneuf river, though much smaller, is important enough to provide power for two factories.

Area south of the St. Lawrence

Except for some irregularities near the eastern limits, this area is a plateau rising gently toward the southeast from the nearly sheer rivers side cliffs. The tops of the lowest cliffs, at Bois des Hurons, are about 100 feet above sealevel. Downstream the cliffs rise more and more until a fairly uniform elevation of about 200 feet is reached near Ste-Croix; and this cliff height is continued with some irregularity to the eastern border of the area. The highest part of the plateau proper, 475 feet above sealevel, is in the extreme southeast corner. However, a hill of igneous rock northeast of St-Flavien rises above the general surface of this plateau to about 580 feet above sealevel.

The main drainage channel is, of course, the St. Lawrence. The river is 2-3 miles wide at high tide, and contracts to from half a mile to $1\frac{1}{2}$ miles wide at low tide. The Grande Rivière du Chêne is the most important tributary stream traversing the area. It was used in the past as a waterway for logging operations. During the summer it is not navigable even by rowboats because of long shallow stretches and a boulder-strewn bed. Smaller streams abound, of which Rivière des Hurons and Bourret brook are the largest.



Beauceville⁻⁵⁻ River



Pontgrève River



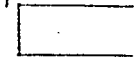
St-Hilaire



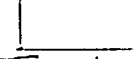
Chambly



Breault



Utica



Trenton



Black River



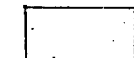
Precambrian



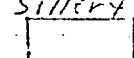
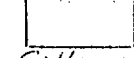
St. Flavien



Normanskill



Levis



Formation boundary



Normal fault



Thrust fault



Anticlinal axis



Synclinal axis



Figure 2. Generalized geological map of the Portneuf, southern portion of the St. Raymond and north-western half of the Lyster map-areas.

Culture, TransportationArea north of the St. Lawrence river

Mixed farming is widespread, although the soil is not rich enough to support a flourishing agricultural population. The chief town is Donnacona at the mouth of the Jacques Cartier river, with its extensive manufacture of wood products. Other lesser wood products plants are located along Portneuf river. The raw material for these factories is obtained mostly from the country surrounding the upper waters of these rivers to the north of the Portneuf map-area. There are minor factories in the smaller villages. Besides Donnacona, there are numerous settlements along the St. Lawrence, such as Neuville (formerly called Pointe aux Trembles), Les Ecureuils, Cap Santé, Portneuf, and Deschambault, all of which have developed a summer tourist and vacationist reputation. Inland there is no settlement of importance save Portneuf Station. Immediately north of the margin of this map-area on Portneuf river lies St-Basile; similarly, on Jacques Cartier river, there is Pont Rouge; both are small but important manufacturing centers. Quarries in the Trenton limestone have been opened near Neuville, at St-Basile, and west of Deschambault. However, owing to the shift of quarrying activity to St-Marc des Carrières, just west of the limits of the map-area, only three quarries are active in the present map-area today.

Route No. 2 follows north shore of the St. Lawrence, and leads northeastward to Québec City, and southwestward to

Trois Rivières and Montréal. A few other roads have been improved, and the process is continuing, but it cannot yet be said that the region is adequately provided with good roads, either as to quantity or quality. Both the Canadian Pacific and the Canadian National railways traverse the area. The abandoned trackway of the Transcontinental Railway is still easily followed.

Area south of the St. Lawrence river

Excellent market gardens abound along the Lotbinière road. On the whole, however, the soil here is not fertile enough to support a flourishing agricultural community. Nevertheless, farming is carried on by the majority of the population. Small mills and factories are located at Ste-Croix and at Leclercville (Ste-Emélie). The southwestern corner was largely controlled by the Lotbinière family interests and produced lumber and wood products, chiefly charcoal. In 1967 the estate was acquired by the Provincial Government to become a Forestry laboratory.

No metals occur here, though in a fruitless search for copper several trial pits and one 'mine' have been developed near St-Flavien. An asphalt-mix plant, using local sand and gravel, is in operation near St-Flavien opposite the St-Flavien quarry in the "Bois Franc de l'Ail" concession.

Route 3 follows the St. Lawrence shore through this area and is the chief through-going means of communication.

This road is constantly being improved and doubtless will always be an important highway link between Montréal and Lévis. The new Sir Wilfrid Laurier highway, Route 20, part of the Trans-Canada Highway, cuts across the southeastern corner of this area beside the Canadian National Railway main line. This highway carries fast traffic along the South Shore, but may never exert much influence upon the cultural development of this region. Good, poor, and indifferent roads criss-cross the rest of the area, but there are large areas of timbered land on both sides of Grande Rivière du Chêne and Rivière des Hurons which lack any types of roads.

Only one railroad serves this area. The main Canadian National Railway line from Montréal to Lévis passes through Laurier and St-Apollinaire. There is a hightide ferry service across the St. Lawrence from Lotbinière (Vieille Eglise) to Grondines Est.

GENERAL GEOLOGY

The two hilly areas in the northwest and northeast corners, and the extension of these areas in the St-Raymond area, are made up of Precambrian gneisses of the Canadian Shield. Elsewhere the area is underlain mainly by Ordovician sedimentary rocks (limestone, shale, sandstone) of the St. Lawrence Lowlands. In the extreme south there is a northwest-southeast zone 3-5 miles wide of moderately metamorphosed sedimentary rocks, with accompanying igneous rocks, that belongs mainly to the Appalachian Province.

However as a result of thrusts, this zone includes slices of Lowlands Province rocks. This zone marks the frontal thrust of the Appalachian mountains or Province - here called the Champlain Thrust but also referred to as the St. Lawrence and Champlain Fault or, more familiarly, as Logan's Line.

The border between the Precambrian gneisses and the sedimentary rocks of the St. Lawrence Lowlands is, in places, a fault; in other places the Trenton or Black River strata lie unconformably upon the older rocks. Except near faults the sedimentary rocks are approximately horizontal. Where they have been jammed against the Precambrian rocks, or against each other, they may be highly inclined, even vertical. The two hills of Precambrian rocks in the Portneuf area are bounded on their southeast sides by normal faults along which the Trenton limestone and the Utica shale (both of which doubtless originally covered the whole region) have been let down several hundred feet. The faults continue southwestward beyond the outcrop limits of the Precambrian rocks so that the Trenton limestone and the Utica shale are themselves in places in faulted contact. Minor normal faults affect both the St. Lawrence Lowlands and the Appalachian rocks, and all are affected by a series of thrust faults related to or identical with the Champlain fault. Only one fold of importance can be made out in the ^{southern} northern part of the area (Chambly-Fortierville syncline) though the gentle inclination of the sedimentary rocks result in flexuous contacts undulating across the area from east to west. Northwest of Neuville, along

Rivière à Matte, the beds form a syncline plunging gently southwest.

The three main controlling features of the area are the Chambly-Fortierville syncline, the Champlain fault zone, and the Precambrian basement. The northern extension of the axis of the Chambly-Fortierville syncline extends from the southwest corner of the area, northeastward to Ste-Croix and across the St. Lawrence to Neuville. This fold dominates the structure of the lowland south of the St. Lawrence. Parallel to this axis, and about 3 miles to the northwest, is the Leclercville (Ste-Émilie) anticlinal axis, plunging gently toward the southwest, as does also the main synclinal axis. The dips on the limbs of these folds are mostly low, 2° - 3° as a rule, although exceptionally they may reach 10° or even 20° . The southeastern part of the St. Lawrence Lowlands consists of very complexly faulted and folded allochthonous Utica and Lorraine rocks. These, plus Normanskill, rocks are the equivalent of the St-Germain Complex defined earlier by Clark, but which loses its value wherever its component part can be identified.

The Champlain fault zone in the southeastern part of the area is made up of at least three major faults (**I**, **II** and **III**). Southeast of Fault **I** the rocks consist of tightly folded slates and sandstone of the Sillery Group. Dolomitic mudstone and pure limestone conglomerate of the Lévis type occur to the north of St-Apollinaire. Between the latter place and St-Flavien an elliptical hill 2 miles across is underlain exclusively by a basic igneous rock, in part extrusive, in part intrusive. This rock contains sulfides in small amounts, and was once worked for

copper. Other exposures of the same kind of rock occur to the northward. Between Faults I and II the rocks consist of dark slates, mudstone and green chert of Normanskill age. Between Faults II and III, the rocks are allochthonous Lorraine beds consisting of very contorted sandy shale and sandstone.

The Precambrian basement exposed in the northern part of the area is broken by normal faults which extend into the Paleozoic rocks of the Lowlands.

Résumé of Earlier work

The first serious mention of the rocks of this region was by Logan in 1854, and he summed up his observations in his epoch-making "Geology of Canada, 1863" (pp. 152-156). He gave a remarkably clear account of the distribution of the Trenton and Utica formations. Though he regarded the two tongues of Precambrian rocks to be expressions of anticlinal structures; he recognized dislocations of the rocks on the southeast side of each "anticlinal". And, he clearly showed the faults on a map which he prepared but which was never published -- and which was later used by Ellis with very few changes. Also (pp. 202-203), he gave details of the distribution and character of the Utica shale, and concluded that the 'Hudson River' (now called Lorraine) lay in a synclinal axis near Cap Santé. Until the publication of the detailed work of Laverdière (1935), no improvement upon Logan's descriptions were made.

Following Logan's retirement in 1869, his successor A. R. C. Selwyn commissioned R. W. Ells to resurvey that part of Québec bordered on the east and west by longitudes 69° and $74^{\circ}15'$, on the north by latitudes 47° N. (all figures approximate). Ell's researches relating to the Portneuf area were published in 1888. He described the Utica and Trenton along the St. Lawrence shore from Donnacona eastward, adding little to Logan's observations and failing to record the faulted nature of the Trenton-Utica contact at Neuville.

A. P. Low (1892) restated the course of the Precambrian-Paleozoic boundary as it crosses this map-area, and gave some details regarding the surface of the Precambrian rocks in Trenton time. He also gave details of the faults bounding the Deschambault and Neuville spurs of Precambrian rock, though he was of the opinion that these spurs were high-standing at the time of faulting. Like his predecessors he assumed that the structure at Neuville was essentially anticlinal, though he supposed that the Utica had been thrust to the northwest over the Trenton. In his description he leaned heavily upon Logan, but brought out much that was new.

Kindle and Burling (1915) referred to the two conspicuous tongues of Archean which indent the Ordovician east and west of Jacques Cartier river without, however, recognizing the faulted nature of one side of each of these tongues. Keele (1915) published some details regarding the utilization of the Utica shale in brickmaking.

Subsequently nothing but casual references occur in the literature until 1930 and 1931, when Parks published two reports dealing with the oil and gas resources of the St. Lawrence Lowland. Most of the material in the earlier publication was repeated in the later one. In the latter he included information on a few wells in Portneuf County. He recognized the Neuville fault, but referred erroneously to the Deschambault anticline. He inserted a non-existent fault east of Deschambault and missed the fault along the west side of the lower Jacques Cartier river.

Laverdière (1935) reported on the Deschambault area, all of which, except the western corner, lies in the Portneuf map-area. For the first time what, in this present report, is called the Deschambault fault was recognized, correctly mapped, and briefly described. The characteristics and faunas of both the Trenton limestone and the Utica shale are given in some detail.

Gouge (1935) gave details of limestone quarries, and analyses of Trenton limestones from this area.

In 1944, Clark contributed the chapter on the Lowlands for the Geology of Québec, Vol. II (Dresser and Denis), in which there were only generalities based upon previous work. A short regional review of the St. Lawrence Lowland was given by Clark (1947). Clark (1949) reviewed the whole Portneuf map-area, giving some of the salient features of the present report.

In 1954-1955, H. C. Cooke mapped for the Québec Department of Mines the East-half of the Lyster map-area but the report has not been published. In this report the Normanskill beds were referred to as Utica.

Acknowledgments

The southern part of the area was mapped in 1944 with the assistance of Jean Préfontaine, and the northern part in 1948 with the assistance of H. G. Bassett and Rev. Fr. Roland Sanschagrín O.M.I., Clark being in charge of the work in both years. The ~~north-~~
~~ern~~ part was carefully checked during the 1967 and 1968 seasons by the junior author.

In 1967, the then recently excavated bed of Bourret brook was mapped by F. F. Osborne and assistants. The geology of the southern part of the map-areas was revised by the junior author with the welcome comments of Pierre St-Julien, whose work for the Department on adjacent map-areas to the east helped in dividing the rocks of the present area into their component parts. To John Riva of Université Laval our thanks are due for the identification of several collections of graptolites, without which it would have been well nigh impossible to distinguish between Appalachian and Lowland facies.

PRECAMBRIAN ROCKS IN THE AREA

by F. F. Osborne

Note: This description is based on mapping done during parts of May and September, 1948, and laboratory work done during

the winter 1948-49 by S. J. Melihercsik under the supervision of F. F. Osborne at Université Laval.

Gray Gneisses

Most of the rocks exposed within the Precambrian part of the map-area are gray gneisses having the composition of granitic rocks. They were referred to as "Laurentian" on the general map (No. 375) of the region issued in 1890 by the Geological Survey of Canada. "Laurentian" has passed out of use as a formation name, and "gray gneisses" is used here because of the color and the prevalent gneissic structures.

Structures of the gray gneisses

Where the gray gneisses are well exposed (e.g.) in railway cuts, layering is conspicuous. This structure occurs in several scales. In some places, layers of gneiss of uniform character and several feet thick alternate with gneisses of slightly different appearance. Similar layering is present but not easily seen in weathered exposures. On a smaller scale layers of gneiss rich in light colored constituents alternate with thinner layers rich in dark minerals to give "layer-cake" gneiss. In some of the darker colored gneisses, light colored layers up to $\frac{1}{4}$ inch thick may be seen, and where these are numerous a typical lit-par-lit gneiss results.

In many of the gneisses clotting of constituents is found. In this structure aggregates, richer than the bulk of the rock in either light or dark minerals, form streaks on the exposed surfaces. The streaks are sections of lens-shaped masses, and the greater dimensions of the lenses are parallel to the layers.

The greater dimensions of the inequant minerals, particularly biotite and hornblende, tend to be parallel to the layers and streaks. The strike and dip symbols on the map refer to the attitude of all three structures which, being in any one specimen parallel to one another, may be used interchangeably for structural determination.

Petrography

Most of the gneisses are gray and medium grained. Some varieties show a greenish cast although they are predominantly gray. On the weathered surface the general tone is brownish, and there is some etching out of the bands richer in dark minerals.

Practically all the specimens of gneiss show 15%-30% quartz. The tenor of biotite and hornblende together has about the same range as quartz. A striated feldspar, which is white or slightly greenish, is the most abundant mineral.

Under the petrographic microscope the rocks show a typical metamorphic fabric. The parallel arrangement of mica and hornblende is conspicuous. The quartz and feldspar of many specimens show evidence of breaking after crystallization, but the effects are not conspicuous enough for the rocks to be called cataclastic gneisses.

A noteworthy feature of the gneisses is the calcicity (An₂₈₋₃₃) of the plagioclase. Potassic feldspar (commonly microcline) does not exceed 8% in common varieties of the gneisses and is absent in many. Where layers and streaks of light colored minerals are abundant, particularly if they are pink, the plagioclase is less calcic, and more potassic feldspar is present than in the normal gneisses. In some thin-sections, the plagioclase contains teardrop-shaped grains of quartz which forms myrmekite. The biotite is a normal variety and in a few specimens it is sufficiently abundant to warrant the term biotite schist. Hornblende of the ordinary variety with a large optic axial angle is found in most of the gneisses. It is accompanied by another amphibole with a much smaller optic axial angle. This amphibole has been referred to as hastingsite, but the optic axial angle is larger and the birefringence higher than the mineral originally described under that name from Ontario. This amphibole, which has been found at many localities in Québec, appears to have formed where there has been metasomatism either in contact zones or in the marginal facies of granites.

The accessory minerals are apatite, sphene, zircon and magnetite. Allanite occurs sparingly and is but slightly radioactive as judged by the alteration around it.

Metasomatism

A coarse and glistening black biotite occurs in layers and veins in the gneisses. From its mode of occurrence and

association with pegmatite minerals, it is believed to be the result of metasomatism long after the gneisses were first metamorphosed.

Origin of the gray gneisses

In the foregoing description, the heterogeneity of the gray gneisses from layer to layer, and within many of the layers, has been emphasized. It is believed that the variation in composition is too great for the gneisses to be deformed plutonic rocks. Some of the more uniform and thicker layers are almost certainly sills of igneous rock that were injected into an older rock, and the two were deformed together. The thin layers of pink granite gneiss in the "layer-cake" and lit-par-lit injection gneisses are certainly of igneous origin. The contrast in color enables their intrusive relationship to the darker gray gneisses to be seen. Furthermore, porphyroblasts of pink microcline are developed in the gray gneisses near some injections and, at some localities, pink gneiss forms masses that are of considerable dimensions although too small to be shown separately on the map. It may be estimated that one-third of the gray gneisses is of plutonic origin.

The ultimate origin of the remaining two-thirds of the gray gneisses is not clear. It is believed, on the evidence of the common occurrence of lenses of light or dark constituents, that part of the series is derived from bedded rocks, in other words the present rocks are largely paragneisses. In the Laurentian region from Gatineau river on the west to Saguenay river on the east, only

one paragneiss-bearing series, the Grenville, has been recognized. In mapping near Shawinigan Falls, I (Osborne, F. Fitz, 1936) found gneisses that are in many respects similar to the Portneuf rocks. They are below the garnetiferous gneisses, quartzites and limestones of the normal Grenville series, and were called "lower Grenville" to distinguish them from the more characteristic facies of Grenville rocks. The rocks of the lower Grenville at Shawinigan Falls are somewhat more basic than the Portneuf gneisses, but the difference may be result of injection of igneous material into, and metasomatism of, the latter. The presence of the amphibole of low optic axial angle and of myrmekite suggest metasomatism in the Portneuf region.

Part of the Grondines map-area, which joins the west side of the Portneuf map-area, was mapped in 1948. A greater variety of gneisses is exposed there than in the Portneuf area, and include gneisses that resemble the gray gneisses of Portneuf. They appear to underlie normal paragneisses of the Grenville series containing lenses of quartzite, sillimanite, garnet gneisses and limestone. Farther west in the Grondines area gray gneisses are exposed at the rapids on Batiscan river above St-Narcisse dam. Here an old structure, apparently derived from original beds, is cut by gneissic igneous material.

The balance of evidence indicates that a large part of the gray gneisses at Portneuf are of para origin and derived from rocks equivalent to those lying below the normal Grenville facies at Shawinigan Falls and in the Grondines area. The old bedding structures in these rocks formed some of the layers. Considerable

material was introduced into the Portneuf rocks both as magma and by metasomatizing solutions. Similar rocks have been called "granitized sediments" or "migmatites", but it is felt that, until further evidence is available, the conventional nomenclature and explanation of origin of the complex should be adopted.

Gabbro

A dike of gabbro 25' thick and exposed for 100' occurs north-northeast of Neuville. The dike is dark green and weathers rusty. The microscope shows that it was originally composed of plagioclase feldspar (An₄₇₋₅₄) contained within augite. The augite has been much altered to carbonate.

Pegmatite dikes

Dikes and sills of pegmatite are common throughout the Precambrian here. Few of them are large, and none of the very coarse-grained, segregated type of pegmatite was seen. In many localities the pegmatites appear to be associated with a metasomatism of the gneisses that produced abundant, coarse-grained biotite. In some places the feldspars actually appear to have developed in the aggregate of biotite.

The pegmatites contain both white and pink feldspar. In some the pink feldspar is dominant. The plagioclase, which is near oligoclase, is commonly white; in some rocks it is clear and colorless. Muscovite, biotite, and quartz are the other common minerals.

Apatite, sphene, zircon and allanite have been identified as accessories and accessory minerals. Molybdenite is found in some places and, at a locality along the abandoned railway line, pits have been sunk to exploit the molybdenite that occurs in pegmatite with biotite.

Pink granite

Pink granite is mapped as a separate unit north of Portneuf Station at the north limit of the map-area. This is an even-grained, pink rock with biotite and hornblende. North of St-Casimir, in the next map-area to the west, a larger mass of this rock has an alaskitic aspect. The rock forms sills that inject and entrain fragments of the older formations.

PALEOZOIC STRATIGRAPHY

Nomenclature of the stratigraphic units

For nearly a hundred years it has been the custom to refer to the dominant sedimentary rocks found in this area as Black River and Trenton limestones, Utica shale, and Lorraine shaly sandstones (formerly "Hudson River beds"). The succession of Black River, Trenton, Utica, and Lorraine is a common one in the Ordovician of northeastern North America, and at the beginning of this century those terms would have been generally acceptable. However, so finely have they been divided, and so assiduously and in general successfully have means for the correlation of their component parts been sought, that it is no longer adequate to use those terms alone. They were at first considered to be formations, i.e. sedimentary

rock units more or less lithologically homogeneous. But they are all known now to embrace, within rather narrow limits, a considerable variety of rock types and faunal assemblages. Thus it is proper to think of and to discuss both the changing sedimentation and the ebb and flow of life during Trenton (e.g.) time, and to consider the rocks concerned not as a uniform limestone formation but as the Trenton Group of related constituent parts, the more important of which are today called formations. An acceptable usage was summarized by Kay (1937).

Similarly, the Utica shale has been subdivided and, remarkably enough, in part correlated with upper Trenton limestones. Lastly, the Lorraine, studied by Foerste (1916), offers little difficulty locally. In the accompanying Table of Formations, both the older names in general use (now group terms) and the newer formational names (see Clark, T. H., 1947) are given. Until the newer names shall have gained wide enough acceptance, the older designations will doubtless continue in vogue.

In addition to numerous outcrops there are the logs of 7 deep wells upon which to base details of stratigraphic succession and thicknesses of formations. The logs of these wells are recorded in Québec Department of Natural Resources Publications S-75 Part II (1964), and their locations are shown by red circles on the map accompanying that report. Their names, numbers, and the pages upon which their logs may be found are as follows:

au nord-ouest de la zone de faille de Champlain
 Formations northwest of the Champlain fault zone
 (St. Lawrence Lowlands region)
 Région des Basses-Terres du St-Laurent

à l'intérieur et au sud-est de la zone de faille de Champlain
 Formations within and southeast of the Champlain fault zone (Appalachian terrain)
 (Terrain appalachien)

SYSTEM <i>Période</i>	SERIES <i>Séries</i>	GROUP <i>Groupe</i>	FORMATIONS MEMBERS <i>membres</i> ZONES	THICK- NESS	STRATIGRAPHIC equivalents elsewhere in North America	STAGE <i>Stage</i>	GROUP	FORMATIONS	
O R D O V I C I A N	C I N C I N N A T I A N	RICH- MOND	Bécancour River Formation Pontgravé River Formation	2000' T 164'	Queenston Waynesville				
		L O R R A I N E	Nicolet River Formation <i>Formation de rivière Nicolet</i>	2491'					
			St-Niltaire Member <i>de</i> <u>Pholadomorpha zone</u>	591'	Pulaski				
			Chambly Member <u>Proetus-Leptaena zone</u>	380'					
				Broault Member <u>Cryptolithus zone</u>	1020'	Frankfort Eden			
			UTICA	Lotbinière Formation <i>de</i> Delisle Member	400'	UTICA			
	C H A M P L A I N	T R E M P T O N	Neuville Formation	432'			H O R M A N S K I L L	L A U R I E R	<i>Basalts et gabbros de St-Flavien</i> St-Flavien basalts and gabbros (Normanskill <i>ou plus jeune</i> or younger)
			Grondeins Member <u>Rafinesquina deltoidea zone</u> <u>Cryptolithus lorettensis zone</u>	256'	Cobourg	C A R A D O C			<i>non observé</i> contact not seen
			St-Casimir Member	176'	Sherman Fall				
			Deschambault Formation	92'	Hull				
Pont Rouge Formation <i>de</i>		30'-40'	Rockland		Aubin Formation <i>de</i> Bourret Formation <i>de</i> <i>au sud de l'unité</i> fault contact				
	BLACK RIVER	Leray Formation Lowville Formation	20'-25'		LLANVIRN ARENIG	DE E P K I L L	LEVIS	Murette Formation <i>de</i> fault contact	
	C A M B R I A N ←	T L O R A I N E O R W A U C O B A I E	<i>Discordance angulaire</i> Angular unconformity				SILBERRY	St-Nicolas and St-Foy Formations undifferenti- ated <i>non différenciés</i>	
	← P R E C A M B R I A N		GRENVILLE SUB-PROVINCE <i>Sous province de Grenville</i>						

No.

9 Bald Mountain - Cap Santé No. 1	Page 9
10 Bald Mountain - Cap Santé No. 2	10
15 Bald Mountain - Portneuf No. 1	15
16 Bald Mountain - Portneuf No. 2	16
51 Fortierville No. 1	51
69 Imperial Lowlands No. 1 (Leclercville)	69
72 Imperial Lowlands No. 4 Lotbinière	72

Summary logs of these wells are given in Appendix I of this report, and the complete logs in Appendix II. In the present report the wells will be referred to by the numbers (left column) listed above. Figure 3 is a correlation chart showing the relationships of the various stratigraphic units. Well No. 51 is not included in Fig. 3 because it was too shallow to reach the Trenton.

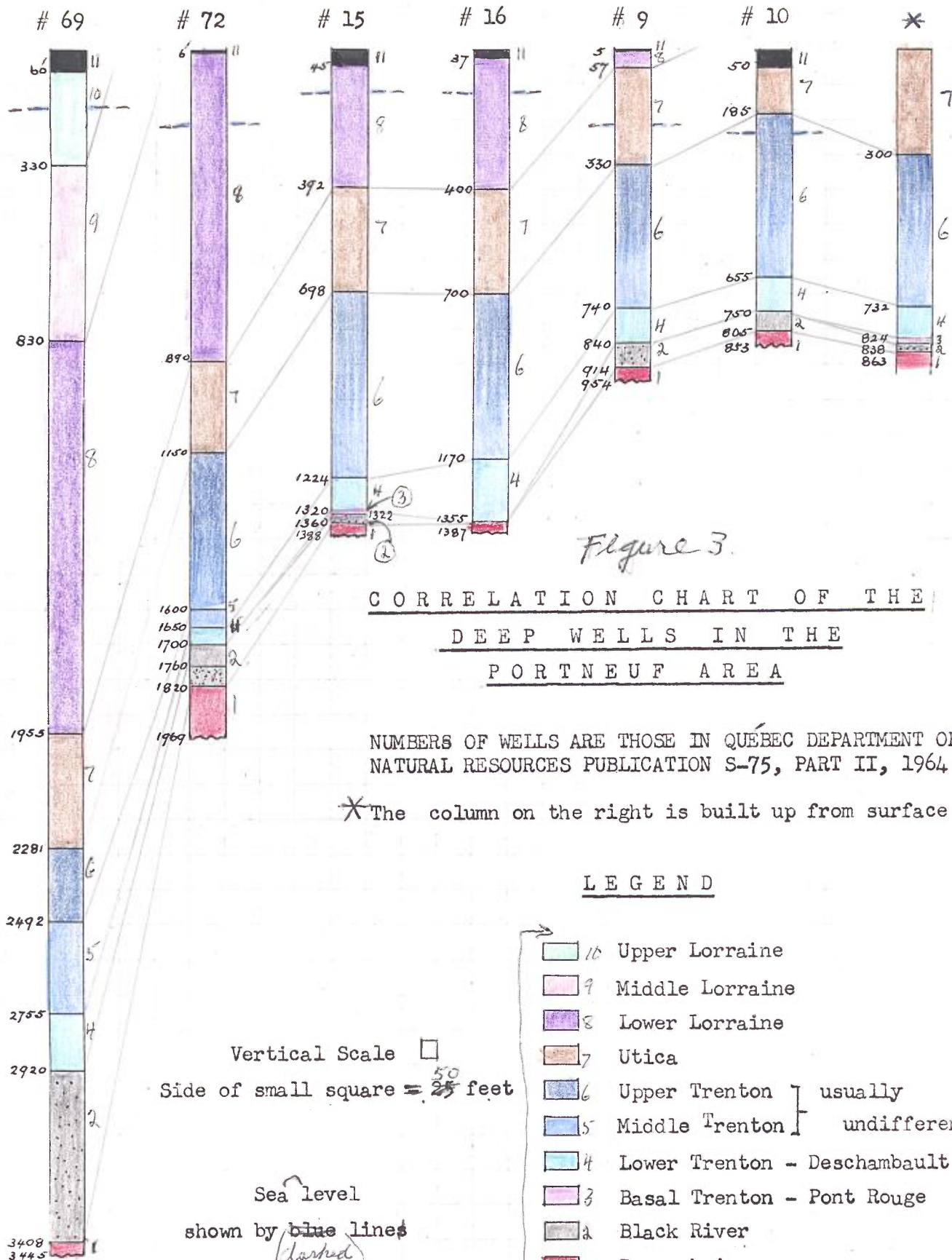
FORMATIONS NORTHWEST OF THE CHAMPLAIN FAULT ZONE

THE BLACK RIVER GROUP

Black River Group rocks are not known within the Portneuf map-area, but good exposures are found in the southern part of the St-Raymond map-area to the north, along Jacques Cartier river. The outcrops begin on the left bank of the river about 1,000' due north-east of the eastern end of the Canadian Pacific Railway bridge at Pont Rouge. Here, there are discontinuous cliff exposures and, at low water, there is a flat as far as midstream composed of calcareous sandstone. The undulations of the beds on the flat prevent reliable measurements, but along the shore the following section can be built up:-

1 page
2 versions

75-224
944



R. 9. 148

Figure 3.

CORRELATION CHART OF THE
DEEP WELLS IN THE
PORTNEUF AREA

NUMBERS OF WELLS ARE THOSE IN QUÉBEC DEPARTMENT OF
NATURAL RESOURCES PUBLICATION S-75, PART II, 1964

*The column on the right is built up from surface data

Error: Well # 9 should show
0' - 5' Overburden
5' - 57' Lower Lorraine

T. H. C.
December, 1968

could use numbers, instead of colors

Top of section along cliffs and on adjacent river flat

- 2' 0" Dark, dense limestone, massive above, thin-bedded below.
- 1' 6" Dark, dense limestone in 4"-6" beds.
- 1' 2" Bed of dark, dense limestone
- 1' 3" Dark gray sandy and shaly limestone
- 10" Off-white, pale yellow weathering, semi-lithographic limestone
- 4" Pinkish to purplish semi-lithographic limestone
- 2' 0" Dark, dense limestone, thin bedded. Ostracods and small gastropods common
- 6" White sandstone, prominent
- 6" Poorly consolidated shaly sandstone
- 6" White sandstone, prominent
- 1' 9" Sandstone, light gray, poorly consolidated
- 6" Sandstone, dark gray, shaly
- 10" Dark gray, shaly sandstone with vertical, finger size burrows.
- 2' 0" Sandstone, light gray, surface rough with molds of burrows. One 2" bed with large brachiopods which could not be broken out of the rock.
- 8" Light gray, yellow weathering, semi-lithographic limestone. This is beneath normal water level in the summer, and can be seen where the sandstone has been worn away along joints. Even in such cases the limestone may not be visible because its bed has been recessed by solution. Contains large, ramose Tetradium.
- 1' 6" Dark, fine-grained, calcareous sandstone, massive. Probably much of the flat is made up of this bed. Base of observable section.
- 17' 10" Total thickness.

Of the above section the Tetradium-bearing semi-lithographic limestone appears to be of Lowville age. Carter (1957, p. 291), however, assigns the ostracods seven feet higher in the section to the Leray. It is possible that the sandstone is Lowville and that the overlying limestone is Leray. Because of the uncertainties involved these rocks will be referred to as Black River (Leray and Lowville).

On the right bank of the river, outcrops begin about 1,000 feet above the railway bridge. Black River limestone makes up the lowest 1'10" of observable rock, all subjacent beds lying hidden below lowest water level. The section follows:

Unconformity with basal Trenton stratum

- 10" Medium gray, very finely crystalline limestone. Cherty stringers present. Ostracods very abundant.
- 1' 0" Light gray, yellow weathering, semi-lithographic limestone. Cherty stringers in topmost inch only.

Cameroceeras alternatum at base of layer.

Because no sandstone is known on the right bank the beds there exposed probably lie above those on the left bank. If so the total thickness exposed is 19'8". How much, if any, lies between the base of the section on the right bank and the top of the section on the left bank is unknown, but the total thickness given above should not be increased more than a foot or two. Precambrian rocks outcrop less than $\frac{1}{2}$ -mile upstream, and the intervening space is doubtless occupied by both Precambrian gneiss and Black River sandstone.

A few feet at the most of sandstone should be expected. The total Black River thickness should, therefore, not exceed 25 feet.

The fauna of these beds is composed almost entirely of ^{a very large one in terms of} ~~number of species but only the bryozoa and ostracods~~ ~~ostracoda.~~ ~~Tetradium, Batostoma, Phylloporina, and Cameroceras are~~ ~~are numerous as individuals.~~ ~~the only other genera.~~ The list follows:

COELENTERATA

Tetradium sp.

BRYOZOA

Batostoma winchelli

B. fertile

Phylloporina sublaxa

CEPHALOPODA

Cameroceras alternatum

OSTRACODA

Eoleperditia fabulites

E. louckina

Briartina modesta

Anisochilina sp.

Leperditella ornata

L. rex

Aparchites pembertonensis

A. trentonensis

A. sp., of. A. ellipticus

E. reticulata

Euprimitia macropuncta

Dicranella sp.

Drausella arcuata

Bythocypris cylindrica

*voir liste
page suivante
78A*

Black River rocks are recorded in the logs of 5 of the 6 deep wells. In all 5 cases the basal bed resting on the Precambrian is a typical orthoquartzite. In wells 9, 10, 15, and 72 limestone inter-venes between the basal sandstone and the Deschambault limestone above. It is not possible to be absolutely sure that this intervening limestone belongs to the Black River Group; it might be part of the Pont Rouge or an equivalent formation. Because the latter type is spottily developed in the lowlands, and the Black

The fauna of the Black River beds on both sides of the Jacques Cartier river is as follows:

ALGAE

- Buthotrepsis sp., cf. B. succulus
- Solenopora compacta

PORIFERA

- Receptaculites occidentalis

COELENTERATA

- Foerstephyllum halli
- Lambeophyllum profundum
- Conularia trentonensis
- Metaconularia sp., cf. M. ulrichi

BRYOZOA

- Corynotrypa sp., cf. C. abrupta
- Prasopora constrictus
- P. sp., cf. P. simulatrix
- P. sp., cf. P. contigua
- Batostoma fertile
- B. Canadensis
- B. winchelli
- Monotrypa sp., cf. M. magna
- Phylloporina sublaxa
- Subretopora sp. cf. S. reticulata
- Stictoporella angularis
- Rhinidictya exigua
- R. mutabilis

BRACHIOPODA

- Lingula briseis
- L. sp., cf. L. crassa
- L. rectilateralis major
- Hesperorthis sp., cf. H. disparilis
- H. tricenaria
- Dinorthis pectinella
- Oniella paquettensis
- Opikina wagneri
- O. transitionalis
- Sowerbyella curdsvillensis
- 31 S. punctostriata
- S. youngi
- Strophomena filitexta
- Rafinesquina alternata
- R. prestonensis
- R. sp. cf. R. carlottina
- Parastrophina amoena
- P. champlainensis
- Zygospira recurvirostris

GASTROPODA

- Bucania punctifrons
- Cyclonema hageri
- C. montrealensis
- Hormotoma gracilis
- Lophospira sp., cf. L. milleri
- Phragmolites compressus
- Trochonema umbilicatum

CEPHALOPODA

- Cameroceras alternatum
- Beloitoceras agaricus
- B. cartierense
- B. imitans
- Cyrtorhizoceras rougense
- Oncoceras minor
- O. orthodomum
- Zitteloceras sp., cf. Z. clarkeanum

TRILOBITA

- Eoharpes sp., cf. E. ottawensis
- Ceraurus pleurexanthemus
- Encrinurus sp., cf. E. cybeleformis
- Flexicalymene senaria
- Calliops sp., cf. C. brevis

OSTRACODA

- Eoleperditia fabulites
- E. louckiana
- Briartina modesta
- Bollia simplex
- Leperditella ornata
- L. rex
- Aparchites pembertonensis
- A. trentonensis
- A. sp., cf. A. ellipticus
- Eurychilina reticulata
- Euprimitia macropuncta
- Krausella arcuata
- Bythocypris cylindrica

31 CYSTOIDEA

- Glyptocystites grandis
- Amecystis cordiformis

CRINOIDEA

- Carabocrinus sp., cf. C. radiatus
- Cupulocrinus grandis
- Cremacrinus sp., cf. C. inaequalis

River widespread, affiliation of these sub-Deschambault limestone units with the Black River Group is the more logical choice. As explained ^{above} below, the sub-Deschambault limestone cuttings in the log of well 16 (1275' - 1315') could as well be Black River as the equivalent of the Pont Rouge, leaving the basal 40' of sandstone to be correlated with the Black River sandstone at Pont Rouge.

THE TRENTON GROUP

General Description

The limestones of the Trenton Group are everywhere easy to recognize. Though there are many different petrographic types, an overall similarity allows them to be distinguished from the other sedimentary rocks of Ordovician age. They are almost everywhere dark gray on the fresh surface, with commonly a bluish tint; the lower limestones are more likely to be lighter in color, and some have a yellowish or brownish cast. They weather to gray, buff or yellowish gray, or more rarely to dove-blue. Here, also, the lower beds are exceptional in that they alone are characteristically light gray on the weathered surface. In grain, they range from almost lithographic to coarse, the latter type being common in the lower beds and upper parts. (It should be noted here that unless initial capitals are used the terms "upper", "middle", and "lower" have no precise stratigraphic meaning). In the lower part the beds are apt to be thick, (more than 4 inches), whereas in the middle and upper parts of the group thin-beddedness is the rule, and beds

of 2"-4" predominate. Shale partings, rarely more than an inch thick, are more abundant in the upper parts of the section. In the lowest part, shaly limestone beds up to 6" thick are thickly strewn with bryozoa. The shale partings rarely yield fossils, contrary to the usual rule.

Chert is common in the upper part of the group as discrete particules from about $\frac{1}{2}$ " in diameter to 1' across, and as nearly continuous masses making virtually a bed of chert. It also occurs as finely disseminated grains, for the most part sub-macroscopic. These grains though they may not be easily visible, betray their presence by imparting a hardness and a toughness to the limestone which it would not otherwise possess. One tendency of the middle and upper beds is to weather into a rubbly mass, so that individual beds appear to be broken up into 'pebbles'; thus, many exposures look superficially like limestone conglomerate. True limestone conglomerate layers of sedimentary origin are rare.

The limestones of the entire group are petroliferous to some extent. Almost any sample yields an oily odor when freshly broken and, especially in the lower part of the section, actual droplets of petroleum may be freed from the rock by breaking it. Numerous black seams, not necessarily related to bedding, are interpreted as hardened petroleum residues.

Fossils are commonest in the lowest beds. Bryozoan mats in the 6-inch shaly limestone beds have already been referred to. In the middle and upper parts of the section most of the beds are barren or practically so. Here and there a layer, thick or thin, may be

crowded with fossils, almost all of which belong to a few species of brachiopods.

Distribution

Although the limestones of the Trenton Group are exposed in wide areas near Deschambault and continuously along the shore at Neuville, and also along the banks of Jacques Cartier river, nowhere is there a continuous section of this group from its base on the Precambrian to its contact with the Utica. The gaps in the section are particularly marked in the lower part. In the Deschambault area, except for a few scattered outcrops along Lachevrotière river, only the lower part of the Trenton Group is exposed. Along Jacques Cartier river the lower and upper parts are well shown but are in fault contact, with the intervening parts of the section eliminated. The Neuville area provides the best information on the Trenton Group in the map-area.

The Neuville Exposures

Two miles northeast of Neuville village there are numerous exposures of lower Trenton beds in pastures and woods, and also in highway and railway (C.N.R.) cuts. Along the St. Lawrence shore for a mile upstream and a mile downstream from Neuville, practically continuous exposures of limestone can be followed and provide an excellent section of the upper two-thirds of the Trenton Group.

Deschambault Formation. Half a mile northeast of the old Neuville station (C.N.R.) there is a $\frac{1}{2}$ -mile cut in Trenton limestones. Northwest of its northeastern end, and beginning about $\frac{1}{4}$ -mile from the track, there are many low exposures of limestone in fields and woods, in general dipping toward, and below, the southeastern end of the cut. Precambrian rocks outcrop a few tens of feet farther north.

These lowest (locally) Trenton beds are coarsely crystalline, fragmental, cross-bedded limestones, light gray, where fresh or weathered, and with a faint brownish streak. They emit an oily odor when freshly broken. These are the characteristics of the limestones of the Deschambault Formation of Early Trenton age, so well displayed in several quarries at St-Marc des Carrières, formerly a part of Deschambault village.

The thickness of the beds exposed in the fields, measured along a line from close to the supposed Precambrian boundary to the northeastern end of the cut, and based upon prevailing dips and strikes, is 63'-74' (the average, 68', is used below). Rocks identical, lithologically and faunally, to those in the pastures make up the lowest part (24') of the cut (see Correlation Chart, p. 33), and there may well be no stratigraphic gap between the two developments. In that case the thickness of this limestone formation is 92 feet.

Although no contact with the Precambrian rocks was seen an outlier of Precambrian granite-gneiss occurs within the area of Deschambault limestone just beyond the border of the woods. This is the only such occurrence observed along the Precambrian-Paleozoic boundary in the area.

The local fauna of this limestone is not extensive, but is quite characteristic, and consists of the following:

BRYOZOA

Pachydictya acuta
P. elegans
P. sp., cf. P. triserialis
Frasopora simulatrix
P. simulatrix var. orientalis
P. insularis
Hallopora splendens
Hallopora subplana
Rhinidictya mutabilis
Batostoma sp. cf. B. winchelli

BRACHIOPODA

Sowerbyella sericea
Ptychoglyptus sp.
Leptaena sp., cf. L. affinis
Rafinesquina alternata
Dalmanella rogata
Parastrophia hemiplicata
Triplesia nucleus
Rhynchotrema sp.
Zygospira recurvirostris

GASTROPODA

Phragmolites compressus
Homotoma sp., cf. H. gracilis

CEPHALOPODA

Oncoceras? sp.

ANNELIDA

Serpulites sp.

TRILOBITA

Flexicalymene senaria

OSTRACODA

Leperditella ornata
Krausella arcuata

non
 listed
 p. 33A

Neuville Formation. Above the Deschambault limestone the Trenton falls into a fairly consistent pattern of thin- to thick-bedded ($\frac{1}{2}$ "-6") limestone beds separated by relatively thin shale interbeds. The limestone is for the most part dense (in the lower part semi-lithographic) with only a few crystalline beds. On the whole the formation is poor in fossils though here and there individual beds carry great numbers, particularly trilobites and brachiopods. Displayed in small part in the railway cut and in large part along the Neuville shore, the name of the formation is most appropriately chosen.

The Neuville Formation is here divided into two members, the Grondines above and the St-Casimir below. The Grondines includes the limestone on the St. Lawrence shore upstream from the Neuville

BRYOZOA

Pachydictya acuta
P. elegans
P. sp., cf. P. triserialis
Prasopora simulatrix
P. simulatrix var. orientalis
P. insularis
Hallopora splendens
H. subplana
Rhindiactya mutabilis
Batostoma sp., cf. B. winchelli

BRACHIOPODA

Sowerbyella sericea
Leptaena sp., cf. L. affinis
Rafinesquina alternata
Dalmanella rogata
Parastrophia hemiplicata
Triplesia nucleus
Zygospira recurvirostris

3) GASTROPODA

Phragmolites compressus
Hornotoma sp., cf. H. gracilis

CEPHALOPODA

Oncoceras sp.

ANNELIDA

Serpulites sp.

TRILOBITA

Flexicalymen senaria

OSTRACODA

Briartina modesta
Boilia subaequata
Jonesella obscura
Eurychilina reticulata
Ceratopsis milleri
Tetradella lunatifera
Leperditella ornata
Hallatia particylindrica
Schmidtella latimarginata
S. incompta
S. umbonata
Aparchites trentonensis
A. mundulus
Primitia sp. cf. P. obesa Thorslund
Krausella sp., cf. K. arcuata
Bythocypris cylindrica
B? granti

wharf, and is characterized by a greater amount of shale in the interbeds. The St-Casimir includes the rocks along the Neuville shore downstream from the wharf and the Neuville Formation rocks in the C.N.R. railway cut (Fig. 4). It is characterized by its greater content of semi-lithographic limestone. (The actual contact is about 600' downstream (east) from the wharf). Both member names are taken from localities in the adjacent map-area to the west. The complete tabulation of the Trenton rocks in the Neuville area is as follows:

Correlation Chart: Local Trenton Units

GROUP <i>Groupe</i>	<i>Equivalents approximatifs</i> APPROXIMATE EQUIVALENTS		<i>unités locales</i> LOCAL UNITS	THICKNESS (in feet) <i>(en pieds)</i>		Emplacements LOCATIONS
	NEW YORK	MONTREAL	FORMATIONS MEMBERS Zones			
T R E N T O N			NEUVILLE	432	432	<i>Rivage de Neuville</i> Neuville shore
			GRONDINES	256	256	
	COBOURG	TERREBONNE	<u>Rafinesquina</u> <u>deltoides</u>			
	SHERMAN FALL	MONTREAL	<u>Cryptolithus</u> <u>lorettensis</u>			
	-	-	ST-CASIMIR	176	109 67	Neuville shore Railway cut <i>Coupe de chemin de fer</i>
HULL	MILE END	DESCHAMBAULT	92	24 68	Railway cut Fields and woods <i>champs et bois</i>	

St-Casimir Member. Lying upon the uppermost beds of the Deschambault Formation and occupying the remainder of the railway cut is a succession of 67' of limestone, which, unlike the Deschambault, is thinly bedded, rarely crossbedded, and very rarely coarsely crystalline. Several beds approach lithographic limestone in texture.

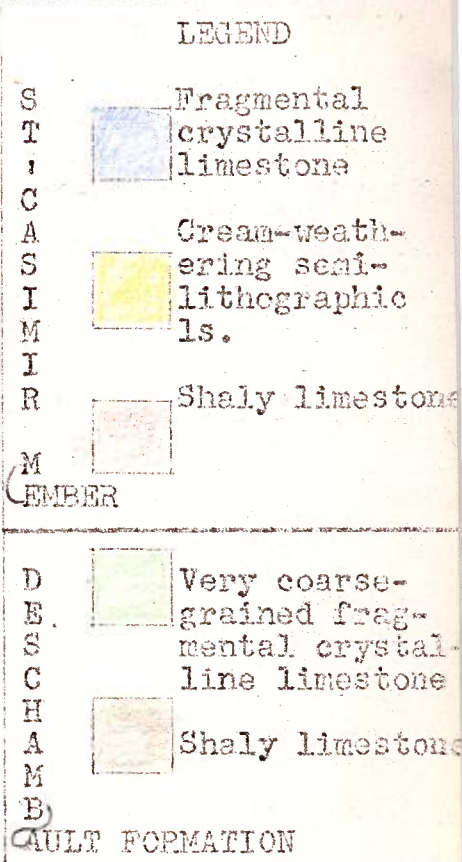
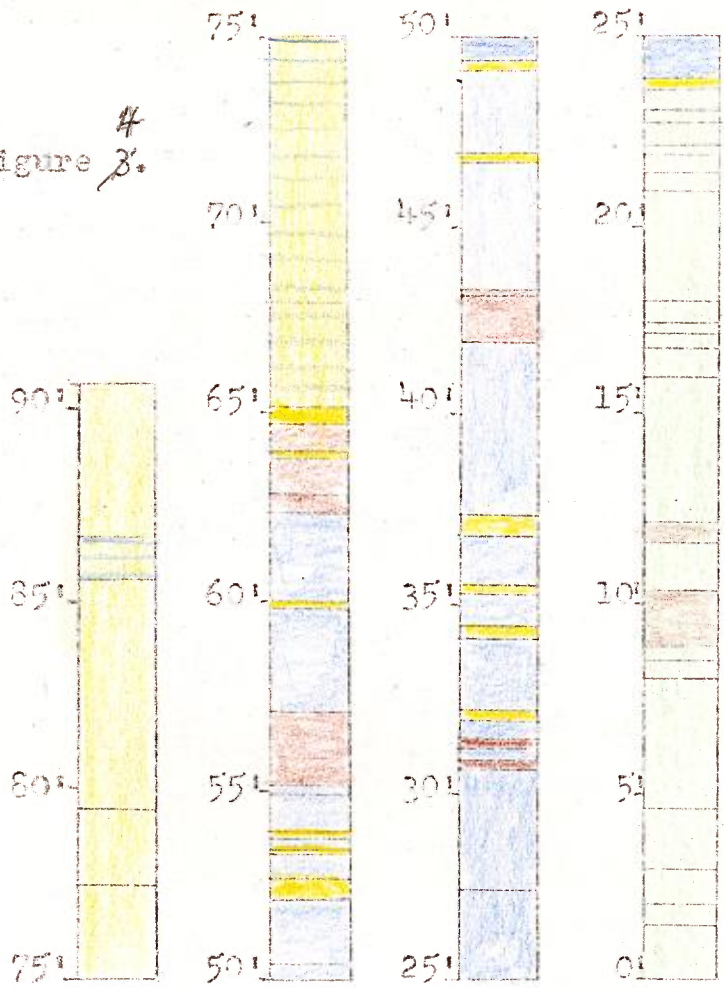
Although there is a regional dip to the southwest the dips are not constant, and the beds undulate in places. Moreover, the beds dip away from the railway slightly on both sides, so that the track runs along the axis of a minor anticline. A bed by bed description of the entire section shown in the cut follows:

<u>Ft.</u>	<u>in.</u>	<u>Ft.</u>	<u>in.</u>	Top of section. Southwestern end of cut.
90	9	4	0	Cream-weathering, very fine-grained, almost lithographic limestone, very finely bedded, and in places crossbedded. Shale partings common. The individual beds are rarely more than 4" thick. In the descriptions given below this type will be called cream-weathering semi-lithographic limestone, or, in short c.w.s.l.l.s.
86	9	1	0	Crystalline limestone alternating with the c.w.s.l.l.s. Crinoidal and other fossils common. Huge <u>Isotelus</u> and translucent rods, common on the Neuville shore, are present here.
85	9	10	9	c.w.s.l.l.s. with shale partings.
75	0	7	0	c.w.s.l.l.s. alternating with crystalline fragmental rock. Minor unconformities occur almost every inch.
69	0	2	9	Irregularly bedded, fine-grained, crystalline, fragmental limestone, interbedded with c.w.s.l.l.s. Above this horizon the latter type predominates.
64	0	5	9	Medium- to fine-grained crystalline limestone in beds 1"-2" thick with $\frac{1}{4}$ "- $\frac{1}{2}$ " shale partings. One 1" bed of c.w.s.l.l.s.
57	3	2	0	Unevenly bedded miscellaneous types of limestone.
55	3	11	9	Fragmental crystalline limestone interbedded with lesser amounts of c.w.s.l.l.s., the latter never more than 6" thick.
43	6	1	6	Fine-grained and muddy limestone, in 1"-2" beds.
42	0	4	6	Coarsely crystalline limestone, crossbedded. <u>Prasopora</u> and crinoids at 40'.
37	6	6	0	Crystalline limestone and c.w.s.l.l.s. interbedded.
31	6		9	Finely and evenly bedded limestone and medium-grained crystalline limestone interbedded.
30	9	6	9	Medium- and coarse-grained limestone, crossbedded.
24	0		3	Lowest c.w.s.l.l.s. Base St-Casimir Member, Neuville Formation. Top of Deschambault Formation.

See 3 figs
over 1 page
2 versions

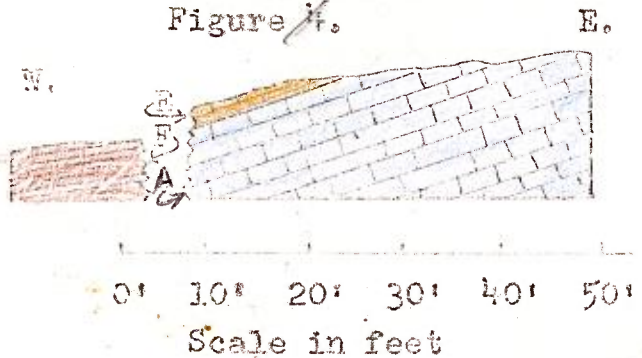
35 20
36

Figure 4
3.



Columnar section of the beds exposed along the railroad cut ^{1.5} miles and a half northeast of Neuville wharf.

Figure 5



Sketches of two roadside cuts on the north side of Highway # 2, 1.3 miles west of Neuville wharf.

The gap is approximately 1000' long
See Figure 6 for legend (also p. 60 of text)

E.



Scale in feet

<u>Ft.</u>	<u>in.</u>	<u>Ft.</u>	<u>in.</u>	
24	2	11	3	cal. East coast of A.S.
23	9	11	6	Fine-, medium-, and coarse-grained crystalline limestone, Crossbedded.
12	3		6	Very fine-grained limestone.
11	9	1	3	Very coarse-grained crystalline limestone, crossbedded. <u>Prasopora</u> and <u>Rafinesquina</u> very common.
10	6	1	6	Very finely bedded, fine-grained limestone in beds up to 1" thick.
9	0	9	0	Coarse- and fine-grained crystalline limestone. <u>Prasopora</u> common. Base of exposed section.

Explanation of Figure 6

Figure 6. Section on east side of Jacques Cartier river about 2,000' south (downstream) from end of trail opposite power-house at lower end of horse-shoe bend just south of the northern margin of the map-area.

- F -- 20' - The lowest part of the Utica shale in continuous section. Buff-weathering limestone beds present.
- E -- 2'6" - Alternating beds of brown shale and continuous 2" beds of gray, almost lithographic limestone, yellowish-weathering. Utica formation.
- D -- 3' - Trenton limestone in 2" beds separated by 1"-2" beds of shale. The limestone beds are broken as if by weathering.
- C -- 2'6" - Typical heavy-bedded Trenton limestone with shale partings 1"-2" thick.

B -- 1'6" - Very dark brown shale, weathering light brown.
One buff-weathering bed. Utica fossils.

A - Top of continuous section of Trenton Limestone.

Between the western end of the railway cut and the beach at Neuville there are numerous exposures of yellowish-weathering dense limestone, separated, however, by such distances that, in the absence of consistent dips, no section can be built up of them. Continuous exposures begin on the Neuville shore about $\frac{1}{2}$ mile east of the Neuville wharf, but in their eastern part, where they are close to the Neuville fault, they are so much contorted that no reliable section can be built up. There are no great difficulties in constructing a section if one starts at a point near sealevel about 1,700' east of the wharf and proceeds upstream. The western end of the railroad cut is just about 250' above sealevel. The distance between the two points in a straight line is approximately 6,500', and this measurement is almost exactly along the direction of dip. These controls indicate a dip of 2.2° , which is in harmony with the average of the dip measurements made on the abundant gutter exposures along the highway between the cut and the Neuville wharf. With some reservations with regard to accuracy in detail, we may therefore assume that the highest bed of the railroad cut and the lowest bed of the measured section along the Neuville shore are at approximately the same horizon stratigraphically.

Faune du membre de St-Casimir

Fauna of the St-Casimir Member

Partie inférieure le long de la voie ferrée

Lower part, along the railway cut

Partie supérieure le long de la voie ferrée

Upper part, along the Neuville shore.COELENTERATA Conularia sp.Prasopora simulatrixBRYOZOAPrasopora simulatrixP. simulatrix var. orientalisP. simulatrix var. orientalisRhinidictya mutabilisLingula trentonensisBRACHIOPODAConotreta rustiTrematis terminalisTrematis terminalisDalmanella rogataDalmanella rogataDinorthis pectinellaSowerbyella sericeaSowerbyella sericeaRafinesquina alternataRafinesquina alternataTriplesia nucleusTriplesia nucleusRhynchotrema increbescensRhynchotrema increbescensZygospira recurvirostrisZygospira recurvirostrisHormotoma gracilisBASTROPODAHormotoma gracilisTRILOBITARemopleurides sp.Isotelus sp., large var.Isotelus lowensisIsotelus sp., large var.Bumastus milleriFlexicalymene senariaFlexicalymene senariaCeraurus pleurexanthemusCeraurus pleurexanthemusOdontopleura sp.OSTRACODASchmidtella incomptaKrausella sp., cf. K. arcuataBythocypris cylindricaB.? granti

Plagues de cystides

Cystid plates

Tiges translucides

Translucent rods

ECHINODERMATALepidocoleus jamesi

Cystid plates

INCERTAE SEDIS

Plagues de cystides

Tiges translucides

Translucent rods

The following species do not appear in the overlying member:
 Les espèces suivantes n'apparaissent pas dans le membre supérieur:

Corynotrypa ulrichiPrasopora neuvillensisP. simulatrixLingula trentonensisConotreta rustiDinorthis pectinellaBumastus milleriUlrichia binodosaSchmidtella incomptaRemopleurides sp.

Grondines Member. With the exception of 47 feet of brownish semi-lithographic limestone immediately east of the Neuville wharf, the whole section of Trenton rocks exposed along the Neuville shore belongs to the upper or Grondines Member of the Neuville Formation. This consists of dark gray limestone, for the most part dense with both semi-lithographic and crystalline textures comparatively rare, and abundant shale interbeds. Much of the dense limestone is referred to in the accompanying stratigraphic analysis as chemical; this is an interpretation based upon its uniformly fine-grained texture, but it is quite possibly an extremely finely divided granular rock. Wherever subaerial weathering is effective the rock breaks down into a rubbly mass resulting from a partial separation of the limestone layers into small blocks which give the appearance of pebbles. This is the characteristic appearance of this member inland. Pale blue or gray chert is disseminated throughout practically the entire section, particularly toward the top. The topmost few inches, in contact with the Utica shale, contain abundant finger-size fragments of a straight cephalopod, unidentifiable because in practically all cases only the living chamber and, at the most, three camerae are preserved. This peculiar occurrence is characteristic of the top of the Trenton elsewhere in this and adjacent map-areas.

The Grondines Member can be correlated with the Montréal and Tétreauville Formations of the Montréal area, and also with the Sherman Fall and Cobourg elsewhere. It is impossible at present to determine where to draw the line between the equivalents of the Montréal and the Tétreauville Formations. Certainly the Cryptolithus lorettensis zone -

10'-20' above the base of the Grondines Member- is to be correlated with the Montréal Formation. Rafinesquina deltoidea, a species elsewhere characteristic of Cobourg rocks, begins here ~~114'~~ above the base of the

35
40
41

first appears a few tens of feet above the Cryptolithus zone and has been identified as high as 160 feet above that zone. In the adjacent Grondines area R. deltoidea and Cryptolithus lorettensis occur in the same bed, and R. deltoidea occurs throughout most of the overlying Trenton. The Trenton limestone section at Neuville is formally identical to the Upper Trenton (Cobourg) of the Trenton type section of Trenton Falls New York except that the Neuville section contained an abundance of a new form of Cryptolithus, C. lorettensis which is morphologically more advanced and thence is younger than C. tesselatus. C. tesselatus is the characteristic Trilobite of the basal Trenton of New York, base of the Sherman Fall limestone to which it is also restricted. C. tesselatus is absent from the Neuville section but C. lorettensis is very common in the Lower Cobourg up to now, C. lorettensis is known to be common only in the Upper Trenton of the St. Lawrence Lowlands in the areas close to Quebec City (Wittington, 1968).

The Sherman Fall limestone appears in respect to the New York section, to be reduced in thickness considerably.

<u>Trenton Fall Section</u>	<u>Neuville Section</u>
<u>New York</u>	<u>Quebec</u>
Cobourg Ls.	Cobourg Ls.
<u>(Rafinesquina deltoidea)</u>	<u>(Rafinesquina deltoidea)</u>
ShermannFall Ls	<u>Cryptolithus Lorettensis</u>
<u>(Prasopora)</u>	Sherman Fall Ls <u>(Propora)</u>
<u>(Cryptolithus Tesselatus)</u>	

<u>Ft.</u>	<u>in.</u>	<u>Ft.</u>	<u>in.</u>	
284	0	3	10	Rubbly weathering limestone, in beds up to 2".
280	2		2	Light gray, coarsely crystalline limestone.
280	0	4	2	Dark crystalline rubbly-weathering limestone, both thick- and thin-bedded.
275	10	14	4	Impure limestone, weathering to a very rough surface. <u>Rafinesquina deltoidea</u> common.
261	6		6	Pure chemical limestone in beds of 1"-1½".
261	0	5	3	Impure limestone in beds 2"-6" thick.
255	9	2	3	Dark limestone weathering to very rough surface.
253	6			Thick-bedded limestone, beds up to 8", shale partings inconspicuous.
247	0	15	3	Shaly limestone with thin beds of shale. Pure limestone beds rare. The wide flat with the bathing float is at the top of this thickness.
231	9	8	9	Chiefly chemical limestone. with some rubbly weathering impure limestone forming small cliff. This latter contains one single 21" bed.
223	0	9	0	Chiefly chemical limestone. This forms the flat in front of the hotel.
214	0	16	0	Thick- and thin-bedded limestone, with shale partings up to 3". Becomes somewhat more thin-bedded toward the top, with shale partings rarer. Burrows common. <u>Rafinesquina deltoidea</u> and <u>R. alternata</u> very common in some beds. Neither chemical nor pure crystalline types noticeable. This forms a prominent 15' cliff.
198	0	23	6	Mostly thin-bedded limestone, poorly exposed on the beach.
174	6	1	0	Brecciated layer. Beds above and below unaffected.
173	6	6	6	Nearly pure chemical limestone, with thin shale partings. Very wide surface at top, sloping west.
167	0	4	6	Impure crystalline limestone, shaly, flaky weathering.

<u>Ft.</u>	<u>in.</u>	<u>Ft.</u>	<u>in.</u>	
162	6	10	0	Almost pure chemical limestone, with a few shale partings.
152	6		9	Dark gray lithographic limestone.
151	9	10	9	Impure limestones in 2"-3" beds, with brown-weathering 2" shale partings.
141	0	3	0	Hard cherty limestone, splintery fracture.
138	0	4	2	Hard cherty limestone in 2"-3" beds; one 6" shale bed.
133	10	3	6	Rubbly-weathering impure limestone with 1"-2" shale partings.
130	4	2	9	Dark, impure, very fine-grained, rubbly-weathering limestone in 2" beds. Very fossiliferous. Well exposed at top of beach at low tide. Not well seen where washed by tide. <u>Cryptolithus</u> and <u>Ceraurus</u> especially abundant.
127	7	3	1	Heavy-bedded limestone in 6" beds. Rubbly appearance probably due to original deposition.
124	6	3	8	Almost lithographic limestone in 2"-3" beds with 1"-2" shale partings.
120	10	1	2	Shale limestone with <u>Cryptolithus</u> . Base of the <u>Cryptolithus lorettensis</u> zone of the Grondines member.
119	8	1	0	Missing.
118	8	2	5	Thin-bedded, finely crystalline gray limestone.
116	3	1	3	Coarsely crystalline gray, fossiliferous, thick-bedded limestone.
115	0	3	0	Missing
112	0	1	8	Dark gray, crystalline, rubbly-weathering limestone.
110	4	1	7	Missing
108	9	1	8	Missing

<u>Ft.</u>	<u>in.</u>	<u>Ft.</u>	<u>in.</u>	
107	1	19	1	Brownish lithographic limestone, with very thin shaly partings. Here and there thin crystalline beds with fossils.
88	0			Base of section west of wharf. Top of section east of wharf.
88	0	4	3	Medium to dark gray chemical limestone.
83	9	5	3	Thick -(6") and thin-bedded (2") shale limestones with shale partings. Some lithographic beds here.
78	6	2	6	Dark shaly and crystalline limestones.
76	0	7	0	Same, with interbedded lithographic and fine-grained limestones.
69	0	9	0	Heavy beds of fine-grained limestone.
60	0	8	0	Thin-bedded limestone, deeply weathered.
52	6	11	0	Heavy-bedded limestone.
41	0	1	10	Alternating limestone and brown shale in beds 2"-8" thick. Base of Grondines Member. Top of St-Casimir Member.
39	2	7	2	Mostly dark gray, fine-grained, crystalline limestone, with lesser amounts of brownish limestone.
32	0	1	11	Dark gray, impure, fine-grained limestone, crystalline.
30	1	6	8	Almost lithographic limestone, with a few $\frac{1}{2}$ " bands of crystalline limestone.
23	5	8	11	Dark, very fine-grained crystalline limestone, with a few beds of lithographic limestone.
14	6	2	0	Lithographic limestone with a few shale partings.
12	6	12	6	Dark, fine-grained, crystalline limestone.
0	0	0	0	Base of measured section. 1,700' E. of Neuville wharf.

Fauna of the member of Grandines. Rivage de Neuville.
Fauna of the Grandines Member. Neuville shore

BRYOZOA

Prasopora simulatrix
P. simulatrix var. orientalis
P. insularis
Arthrostylus obliquus
Mitoclemella mundulum
Nematopora ovalis

BRACHIOPODA

Lingula sp., cf. L. affinis
L. riciniiformis
Conotreta rusti
Trematis terminalis
Delmanella rogata
D. whittakeri
Triplesia nucleus
T. cuspidata
Sowerbyella sericea
S. punctostriata
Rafinesquina alternata
R. deltoidea
R. mucronata
R. spp., geniculate types
Leptaena rhomboidalis
Rhynchotrema increbescens
Zygospira recurvirostris

GASTROPODA

Sinuities cancellatus
Archinacella sp.

ANNELIDA

Arabellites hamatus

CEPHALOPODA

Eudoceras proteiforme

TRILOBITA

Remopleurides canadensis
Isotelus gigas
I. iowensis
Bumastus milleri
Cryptolithus lorettensis
Ceraurus pleurexanthemus

Flexicalymene senaria
Diacanthaspis sp.

OSTRACODA

Aparchites trentonensis
A. sp., cf. A. ellipticus
Tetradella lunatifera
Bythocypris cylindrica

ECHINODERMATA

Lepidocoleus jamesi

GRAPTOLITHINA

Climacograptus sp.

INCERTAE SEDIS

Tripes translucescens
Translucent rods

Jacques Cartier River Exposures

The Trenton section here is not nearly as continuous as at Neuville but it includes a formation (Pont Rouge) lower than the Deschambault. The Pont Rouge begins at the top of the Black River beds described above, and continues downstream for about 800' to the Canadian Pacific Railroad bridge where it is overlain by the Deschambault Formation. The latter formation continues downstream around the horseshoe bend to the lower powerhouse where it is in faulted contact with the upper beds of the Neuville Formation. The Neuville is succeeded by the Utica Shale.

Pont Rouge Formation. From 800' above the C.P.R. bridge at Pont Rouge to just below the bridge, steplike exposures of Pont Rouge limestone are well shown along the right bank of Jacques Cartier river (the section on the left bank is almost inaccessible). The

dips are almost in complete harmony with the gradient of the stream.
The section is as follows:

Top of section, below railroad bridge.

- 1'6" Gray weathering, crystalline and dense limestone beds, largely obscured by sewage.
- 3'7" Mostly fine-grained, crystalline limestone with minor amounts of shaly limestone. Bedding irregular. Fossils abundant, especially Receptaculites.
- 4'2" Alternating, fine-grained, crystalline limestone, and off-white, semi-lithographic limestone (the latter 2"-3" thick). One 3" layer can be followed practically the whole length of the outcrop. Some of the semi-lithographic beds are crowded with fossils, and most of these beds are covered by a 1/8" layer of shale.
- 8" Light to medium gray, partly crystalline limestone in thin (2"±) beds. A large block of Precambrian granite-gneiss rests with its base within this limestone.
- 1'3" Light greenish gray, fine-grained crystalline limestone. Cherty stringers abundant and irregular.
- 1'5" Medium gray, faintly greenish, fine-grained crystalline limestone. Cherty stringers closely follow the bedding. Unconformable contact with Black River beds.
- 13'7" Total thickness

Sinclair (1945) collected extensively from these beds, and after an analysis of the fauna concluded that they were of earliest Trenton Rockland age; in this Flower (1945) concurred after a study

of the cephalopods. Interestingly enough, in five localities limited developments of basal Trenton limestone occur below the Deschambault and rest upon Black River formations: viz. here at Pont Rouge; in the Ste-Anne beds on Ste-Anne river; in Fontaine beds on au Lard river northeast of Trois Rivières; in the Ouareau Formation near Joliette; and, in an unnamed, 10', unfossiliferous development at Montréal. These are listed and discussed by Clark (1959, pp. 16-17).

Deschambault Formation. The beds resting directly upon the Pont Rouge Formation are exposed discontinuously as far as the northern border of the Portneuf area, where exposures on both sides of the river extend down to the White bridge which spans the stream in the middle of the sharp horseshoe bend, and thence as far downstream as the powerhouse at the end of the bend. The Deschambault beds, which maintain much the same characteristics throughout this stretch, are here cut off by a fault (Plate XIX B), and are brought up against the uppermost 93' of Trenton of Cobourg age. Between this fault and the northern border of the map-area about 70' of beds can be measured foot by foot, which, together with an estimated thickness of 16' of inaccessible beds along the lower part of the gorge, makes a total thickness of 36'. This corresponds well with that of 92' at Neuville and indicates that very few feet of this formation have been cut out by faulting.

Throughout this stretch the limestone is crystalline, fragmental, crossbedded, with a faint brownish cast (more marked in the streak than on a fresh surface), and with a distinctly oily odor when broken open. The uppermost beds are well supplied with bryozoan

mats up to 6" thick made up of a complex of Hallopora splendens var. clarki set in a somewhat shaly matrix. These mats are separated by their own thickness, more or less, of normal, gray, crystalline limestone.

Jacques Cartier river is no exception to the general rule that rivers cut steep-sided gorges in the Deschambault limestone wherever possible, forming spectacular dalles along the belt of outcrop of the formation from Joliette to Neuville. This feature can be well seen from White bridge. A path down the steep left bank reaches the river exactly opposite the lower powerhouse, and within a thousand feet of this spot the dalles, the upper part of the Deschambault Formation and also of the Grondines Member, the fault separating these two units, and the basal Utica beds are all splendidly displayed.

The fauna of the available part of the Deschambault limestone along this river is as follows:

COELENTERATAConularia sp.Rafinesquina alternataR. geniculataParastrophia hemiplicataTriplesia nucleusRhynchotrema increbescensZygospira recurvirostrisBRYOZOAArthrostylus obliquusPrasopora simulatrixP. simulatrix var. orientalisP. constrictusHallopora splendensH. subplanaPachydictya sp. cf. P. triseriatusGASTROPODAPhragmolites compressusTRILOBITABumastus milleriCalyptaulax calderiFlexicalymene senariaCeraurus pleurexanthemusOdontopleura sp.BRACHIOPODALingula sp., cf. L. cobourgensisPrematis terminalisPlatystrophia amoenaDalmanella rogataDinorthis browniD. pectinellaSowerbyella sericeaOSTRACODALeperditia ornataTetradella sp.Bythocypris cylindrica

The abundance of Parastrophia hemiplicata, together with the presence of Phragmolites compressus and Bumastus milleri, indicates a close faunal relationship with the Deschambault beds of the Neuville railway-cut section.

South of the fault at the lower powerhouse the beds are almost all thick-bedded chemical limestones, in which fossils are very scarce. In the 93' exposed, the following species occur:

BRACHIOPODAPlatystrophia amoenaDalmanella rogataSowerbyella sericeaRafinesquina sp., cf. R. deltoideaCyclospira bisulcataZygospira recurvirostrisCEPHALOPODA"Orthoceras" sp.

TRILOBITAIsotelus gigasOSTRACODALeperditella sp.Primitia sp., cf. P. obesaPallinella sp.Primitiella ulrichiBythocypris cylindrica

Of this list, Rafinesquina sp., cf. R. deltoidea and Cyclospira bisulcata are indicative of an upper (Grondines Member) horizon in the Neuville Formation. These 93' of limestone lie directly under the Utica shale, and details of the contact (Plate VII-A) between the two types are deferred until the latter is described.

Deschambault Exposures

North and west of Deschambault, Trenton limestone is widely exposed in pastures and woods. No section is more than 10' thick, and no means are available for building up one continuous section. On the southeast, these beds butt against the Deschambault fault and are in many places brecciated along the contact (details of this are given under Structure).

With hardly an exception the beds exposed here belong to the crystalline Deschambault Formation. Shale partings and interbeds are common, and are in most places thickly studded with a ramose bryozoan, probably Hallopora splendens var. Clarki. Fossils abound in the limestone but the fauna is not abundant in number of species. Parastrophia hemiplicata is the most characteristic element, and it is abundant. The complete list follows:

PORIFERAReceptaculites oweniBRYOZOAPrasopora simulatrixPachydictya acutaBRACHIOPODAOrbiculoidea sp.Platystrophia amoenaDalmanella rogataPlaesiomys iphigeniaDinorthis pectinellaSowerbyella sericeaRafinesquina alternataTrigrammaria trigonalis var.Parastrophia hemiplicataRhynchotrema increbescensZygospira recurvirostrisGASTROPODACyrtolitidina sp.TRILOBITAFlexicalymene senariaCeraurus dentatusOSTRACODALeperditella ornataSchmidtella incomptaAparchites mundulusPrimitia obesaKrausella arcuata

These beds are everywhere petroliferous to some degree. In some, oily matter oozes out of cavities in the freshly broken rock, and many seams and fossil cavities are filled with a black bituminous petroleum residue. Most beds have an oily odor when struck, whether they show traces of petroleum or not.

St-Casimir Member. Somewhat farther southwest than the area occupied by the bulk of these rocks there are two localities where limestones of a less characteristically crystalline variety may be seen. First, along the new road leading from Paré to St-Marc, and about $\frac{1}{2}$ -mile from Route 2, there are low roadcuts of cream-weathering, almost lithographic limestone with shale partings. Fossils are few, but include Dalmanella rogata, Prasopora simulatrix, Platystrophia amoena, and abundant crinoid stems. It is entirely likely that these beds are to be correlated with the upper beds of the railroad cut at Neuville (St-Casimir Member, Neuville Formation). Second, along La Chevrotière river, limestones are exposed immediately below the wooden dam less than $\frac{1}{2}$ -mile above the highway. These are thin-bedded, fine-grained and crystalline, with interbeds of shale rich in bryozoa. Immediately below the dam, fossils are more abundant, Prasopora, Sowerbyella, Dalmanella, and Isotelus being common. Still higher upstream, where a sharp bend brings the river within 500' of the road, 7' of limestone, in beds up to 6" with shale partings up to 1" thick, are poorly exposed. Of these beds along the river, the bryozoan beds probably are to be correlated with the Deschambault Formation, whereas those farther upstream probably belong to the St-Casimir Member. The strata are much disturbed along the lower part of La Chevrotière river (dips up to 37° and strikes boxing the compass) so that their apparent anomalous position can be assigned to structural complications.

Still farther to the southwest, in the extreme corner of the map-area, there are a few exposures of limestone which are in effect the beginning of almost continuous roadside exposures that

stretch for miles along the road to Grondines in the Grondines map-area. Fossils are very scarce, but every indication suggests that these beds belong to the upper part of the St-Casimir Member, and the lithology is similar to that along the Neuville shore.

One interesting detail of sedimentation deserves to be mentioned. The Deschambault Formation limestone about 3/4-mile north of Paré is exposed in a series of small mounds up to 100' across (most are much less) and a few feet high (rarely 6', usually 2'-4'). Sub-soil drainage runnels radiate outward from their summits. Although there are fossils in this limestone (particularly a large pelecypod too poorly preserved to be collected) there is nothing that can be interpreted as a reef structure. The mounds are too regular to be erosional remnants, nor is there any evidence of any form of erosion which could isolate the thickly crowded humps. It is probable that they are the result of some selective localization of limestone deposition not understood. Sauvageau's quarry was developed almost entirely in one of these mounds. The composing rock is in no way different from that of the normal Deschambault.

Miscellaneous Localities

A few outcrops of Trenton rocks occur near St-Basile railroad station, chiefly along Portneuf river. These beds belong to the base of the Grondines Member, as suggested by their abundant and characteristic fauna, listed below. The best places to see these strata are in the quarry of "Ciment Québec Inc." and on Portneuf river immediately below the highway bridge on the road leading

Paragraph the demand appears after p. 51 went to p. 52

southeastward out of St-Basile village, which is in the St-Raymond map-area. At the top of the section in the quarry of Ciment Québec Inc. there is a considerable increase of shale beds, which may indicate an approach to the top of the Neuville Formation and to the Trenton-Utica boundary. *The formation is also cut in wells*

9, 15, 16, and 69

BRYOZOA

Mitoclema mundulum
Prasopora simulatrix

BRACHIOPODA

Trematis terminalis
Platystrophia amoera
Dalmanella rogata
Dinorthis pectinella
Sowerbyella sericea
Rafinesquina alternata
R. subtrigonalis
Triplecia nucleus
Rhynchotrema increbescens
Zygospira recurvirostris

TRILOBITA

Cryptolithus lorettensis
Remopleurides sp.
Isotelus iowensis
Flexicalymene senaria
Ceraurus pleurexanthemus
Odontopleura sp.

OSTRACODA

Primitia sp.
Dicranella sp.
Tetradella lunatifera
Ctenobolbina sp.
Ceratopsis milleri
Bythocypris cylindrica

GRAFTOLITHINA

Diplograptus sp.

INCERTAE SEDIS

Trises translucida
Translucent rods

A further exposure^f on the same river, but within the St. Raymond map-area, contains abundant Rafinesquina deltoidea.

About 1½ miles north of Neuville village, and along a poor road to Pont Rouge, a small stream has been dredged to provide better drainage. The rock thrown up by the dredge is, in places, exceedingly fossiliferous, and belongs to the base of the Grondines Member (as shown by Cryptolithus). Rafinesquina deltoidea is extraordinarily abundant in the higher beds, and Ceraurus is common throughout. These beds are geographically and structurally in the correct position, for the Cryptolithus horizon on the Neuville shore should appear on the plateau above Neuville at, or a little to the east of, the southern end of the poor road to Pont Rouge (see above). Thence, the normal northwest strike would bring the Cryptolithus horizon to the dredged stream. The fauna from this locality follows:

PORIFERA

Sponge spicules

BRYOZOA

Mitoclema mundulum
Prasopora simulatrix
Arthrostylus obliquus
Nematophora ovalis

BRACHIOPODA

Pholidops sp.
Dalmanella rogata
Sowerbyella sericea
Rafinesquina alternata
Rafinesquina deltoidea
Triplecia nucleus
Zyrospira recurvirostris

CEPHALOPODAOrthoceras sp.TRILOBITACryptolithus tessellatusIsotelus sp.Flexicalymene senariaCeraurus pleurexanthemusECHINODERMATA

Cystid plates

Crinoid remains

Daedalocrinus sp.INCERTAE SEDIS*Trage translucides*

Transparent rods

The only other places of any importance where the limestone of the Trenton Group may be seen are along the southeast side of the northern part of the Deschambault fault. Between Portneuf and Deschambault stations, railroad cuts along the abandoned Transcontinental Railway and stream exposures show this rock in a few patches. West of Portneuf Station and also at Deschambault Station it was once quarried for lime.

Paleontology

The entire fauna of the rocks of the Trenton Group is fairly large. Nevertheless, a few species predominate. In the Deschambault beds Parastrophia is everywhere common. In the St-Casimir Member Prasopora is characteristic, and is abundant in places. In the Grondines Member Ceraurus, Flexicalymene, Leptaena, Triplecia, Rafinesquina and Sowerbyella occur in most exposures.

In the upper part of the Grondines ^{Member} Sowerbyella is the only common species.

Subsurface distribution. Each of the six deep wells gives a complete section of the rocks of the Trenton Group. In well 16 the Trenton rests on the Precambrian, but its development probably is complete. Along the Neuville shore the separation of Upper from Middle Trenton is difficult even with the help of fossils, and in well cores and cuttings this difficulty is much greater. Hence, only in well 69 was such a subdivision made. The Lower Trenton Deschambault Formation is fairly easily recognized, and though outcrop measurements show it to maintain a fairly constant thickness of 90', the thickness in the logs, in numerical order, is 100', 95', 96', 185', 165' and 50'. A check of the logs of wells 69 and 72 reveals no reason to change the record. Well 16, however, shows typical Deschambault cuttings down to 1,275', i.e. a thickness of 105', which is "normal" for the formation. From 1,275' to 1,315' the limestone is in part dense, gray rather than buff, and should more properly be considered sub-Deschambault. Whether this limestone belongs more properly with the Pont Rouge Formation or the Black River Group cannot, in the absence of diagnostic fossils, be determined, but, the Pont Rouge Formation does not have the widespread extent of the Black River beds, and a tentative alignment of this 40-foot thickness of limestone with the Black River Group is preferred. Below 1,315' increasing percentages of sandstone occur along with the limestone, and suggest the limestone-sandstone interbedding of the Black River beds at Pont Rouge.

Correlation

Enough has been said already to indicate the equivalency of the Deschambault Formation, as well as the Neuville Formation with its St-Casimir and Grondines Members, with the subdivisions of the standard Trenton section. There remain two observations. -First, with regard to the upper part of the Grondines Member (Rafinesquina deltoidea), its relation to and correlation with parts of the Utica Group will be discussed after the Utica has been considered below. Second, within the Portneuf map-area there is no representative of the Rockland (basal) Formation of the Trenton, but on Jacques Cartier river, within the St-Raymond area the Pont Rouge Formation is correlated with reasonable certainty with the Rockland beds of the Ottawa area (see Table of Formation p. 23).

UTICA GROUP

Lotbinière Formation

Distribution. From Pointe à Delisle just west of Neuville village westward to half-way between Jacques Cartier and Portneuf rivers, the St. Lawrence shore is almost continuously bordered by flats and cliffs of Utica shale. East of Neuville it occupies the shore for about $\frac{1}{2}$ -mile (but is highly disturbed) before giving way to the shales and sandstones of the Lower Lorraine Formation toward the eastern margin of the map-area. Inland from the shore the shale can be seen along many streams, and particularly well along Jacques Cartier river where several miles of cliffs nearly 100' high are

made up wholly of this rock. There are a few exposures along Portneuf river and its tributaries. Immediately east of both the Neuville and the Deschambault faults this shale, highly disturbed in many places, can be seen in contact, or nearly so, with Precambrian or with Trenton rocks. Its stratigraphic contact with the Trenton limestone can be seen very well at two exposures near Neuville, and also on Jacques Cartier river.

South of the St. Lawrence, the Utica shale is confined to an area roughly approximating a segment of a circle with Pointe Platon as the center and with a 4-mile radius. From Pointe Platon westward the shale is magnificently displayed in nearly vertical cliffs mostly more than 100' high, along which the entire formation except, perhaps the lower 50' or less can be examined inch by inch. We propose the term Lotbinière Formation for this development and the Lotbinière shore as the type section.

Lithology. Most of the Lotbinière Formation is dark brown or dark gray (rarely black) shale. There are some beds of fine sandy material especially in the upper part. It is petroliferous almost throughout, some beds emitting a much stronger odor when first broken than do any of the Trenton limestones. Here and there, with no special stratigraphic horizon, there is dark brown, bituminous shale, lighter in weight and less obviously stratified than the rest of the formation. The normal shale weathers to some shade of light gray, whereas the bituminous rock weathers to a dull, light to medium brown. Throughout, the formation contains medium gray, dense limestone beds, up to 10" thick, which weather pale

yellow or pale orange. They are usually made up of a series of beds 2"-3" thick, closely associated, and separated by normal argillaceous shale. A peculiar development at the base of the formation is described below.

The basal part of the Lotbinière Formation is best seen where it is in contact with Trenton limestone 1,000' or so below the powerhouse at the lower end of the horseshoe bend in Jacques Cartier river just south of the northern margin of the map-area. There, Trenton limestones can be followed along the bank of the river downstream from a point opposite the powerhouse at the foot of a path descending the river bank. 93' of these limestones can be measured (Fig. 6A,C,D), the upper part of the section forming a prominent bench (Fig. 6C). Below the bench, and usually covered by water, there is irregular layer of brown-weathering shale (Fig. 6B), ranging in thickness from 6" to 5'. The shale is almost black where fresh, and does not break readily along the bedding planes. It contains thin, buff-weathering limestone beds, and yields a few graptolites referable to the lower Utica of New York. However, it is succeeded by 30" of typical, heavy-bedded, Trenton limestone (Fig. 6C) with a characteristic shelly fauna, and this in turn by 36" of Trenton limestone in 2" beds separated by 1"-2" of shale (Fig. 6D). Weathering has separated the last-mentioned limestone beds so that they have the appearance of boulders in a conglomerate, and no layer is continuous along the bedding plane, as exposed, for more than 6". The shale interbeds yield a small graptolite fauna, and the limestones contain a few Trenton fossils. Above this thin-bedded Trenton comes the Utica, but not in its characteristic

development at the base. This consists of about 30" (Fig. 6E) of alternating brown shale and 2"-beds of pure gray, almost lithographic, yellowish weathering limestone. This zone contains sparse, characteristic Lower Utica fossils. Above it lies the normal Utica shale, - thin-bedded, fissile, dark gray where fresh, light brownish gray weathering, and with thin beds of buff-weathering limestone (Fig. 6F). These shales are here exceedingly fossiliferous, as they are in the two other places (see below) where the basal portion of the Utica can be examined.

At the two localities near Neuville the Trenton-Utica passage is somewhat different. First, at the west side of Delisle point, and second, in the road cut on Route 2, 1.3 miles west of Neuville wharf (Fig. 5). At both localities the uppermost Trenton limestone is rubbly weathering and full of cephalopod fragments 2"-4" long. This is succeeded by 5'-6' of the basal Utica gray platy limestone in continuous beds separated by shale interbeds (Fig. 5 E). This is followed by typical Utica shale (Fig. 5F). Buff-weathering limestone beds occur within the Utica shale at irregular intervals. In fact, the shore west from the point showing the contact is characterized by 20 or so small points, well shown at low tide, each of which is held up by a buff-weathering limestone band in the otherwise easily weathered Lotbinière shale.

We propose to call the basal few feet of the Lotbinière Formation, consisting of platy limestone beds with shale interbeds, the Delisle Member, taking the name from Delisle point on the St. Lawrence shore a mile upstream from the Neuville wharf, where

the member is well shown. It is equally well exposed at the two other localities referred to.

On the south side of the St. Lawrence, from Lotbinière village to Point Platon, and to a lesser degree for some distance downstream, there are practically continuous exposures of a soft, shaly rock ranging from a nearly pure "claystone" to siltstone. Nowhere in this succession are there any typical sandstones. The "claystones" are, of course, without apparent grain, and disintegrate readily into platy fragments $\frac{1}{2}$ " or more across. These fragments rain constantly from the cliff face, offering, however, no menace to the observer. The siltstones are obviously micaceous, but no other mineral grains can be seen even with a strong lens. The presence of abundant quartz is indicated by the fact that much of this rock will scratch steel. Whereas the "claystones" are typically almost devoid of bedding planes, the siltstones are everywhere finely bedded in layers 1 mm. or more thick of various textures and shades of gray and purplish gray. It was this characteristic which earned these beds the field designation of 'variegated beds'. Associated with these ordinary types are two remarkably different ones. First, apparently grading into the argillaceous types there are several horizons of dark brown, bituminous shale. Second, interstratified throughout the whole formation there are, at intervals of 5'-25' or more, beds of buff- to orange-weathering, fine-grained, magnesian limestone, in some of which there is so much fine-grained quartz sand as to justify the designation calcareous sandstone. These stand out sharply wherever the formation

page 2 revisions

Figure ^{7a} ~~7a~~. Plan of part of the Lotbinière shore showing trends of buff-weathering beds across the river flat, with a cross-section in which the dips are both exaggerated and assumed similar. This section appears reversed from that seen looking shoreward from the St. Lawrence.

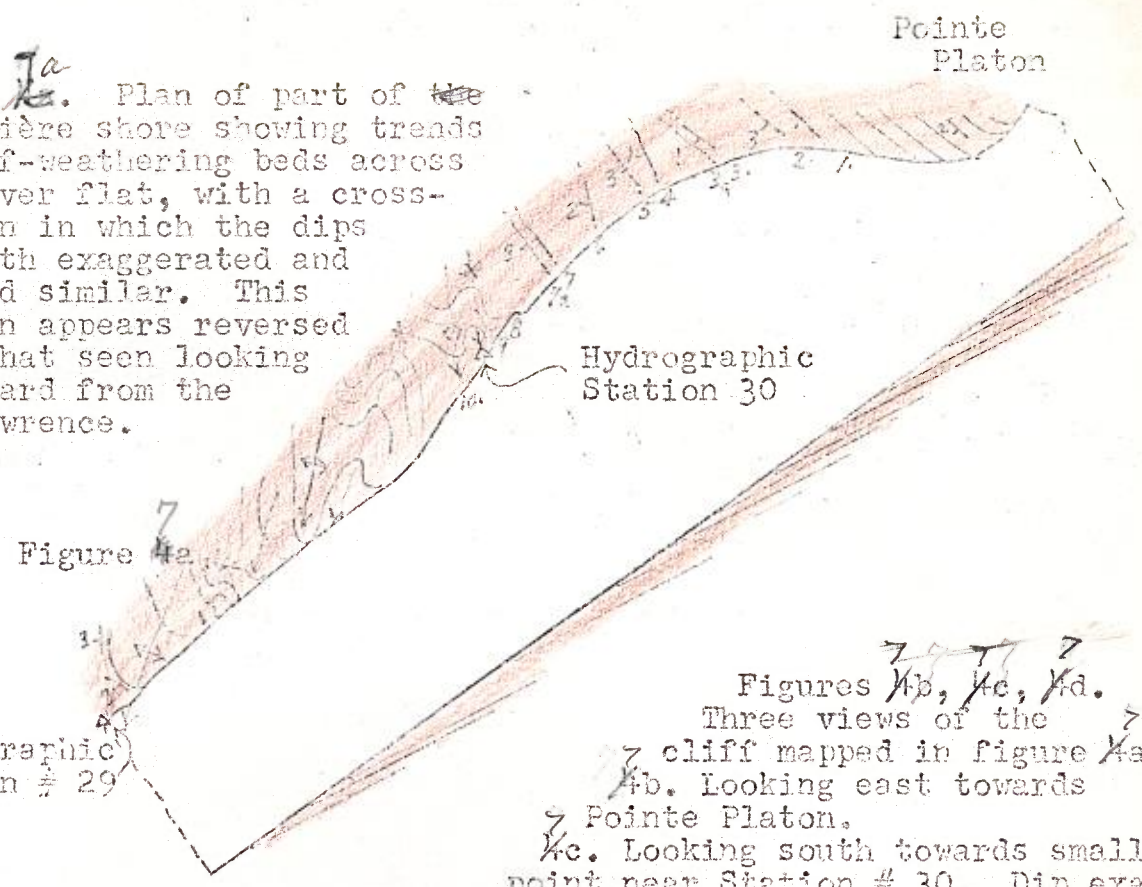


Figure ^{7a} ~~7a~~
Hydrographic Station # 29

Figures ^{7b, 7c, 7d} ~~7b, 7c, 7d~~. Three views of the cliff mapped in figure ⁷ ~~7a~~.
 7b. Looking east towards Pointe Platon.
 7c. Looking south towards small point near Station # 30. Dip exaggerated.
 7d. Looking southeast at a place ^{to} where the beds ~~are~~ ^{nearly} horizontally prevail.

Vertical scale 1" = 100'

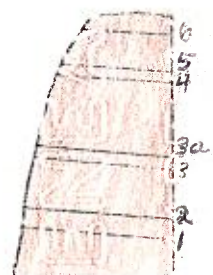


Figure ^{7b} ~~7b~~

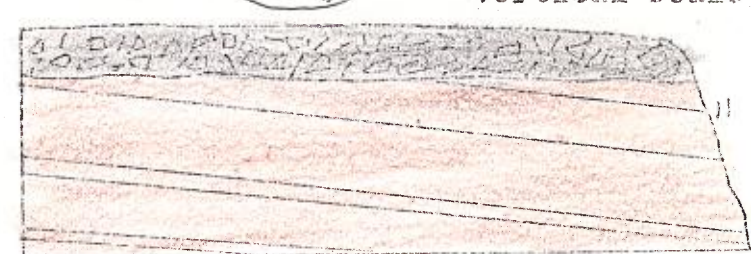


Figure ^{7c} ~~7c~~

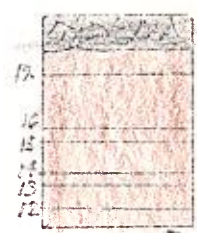





Figure ^{7d} ~~7d~~

Figure ^{7e} ~~7e~~. Map of part of the Portneuf map-area showing by broken lines the expected trends on the western limb of the main syncline, and by dotted lines the actual trends.

-  Glacial deposits
-  Utica
-  Utica-Lorraine

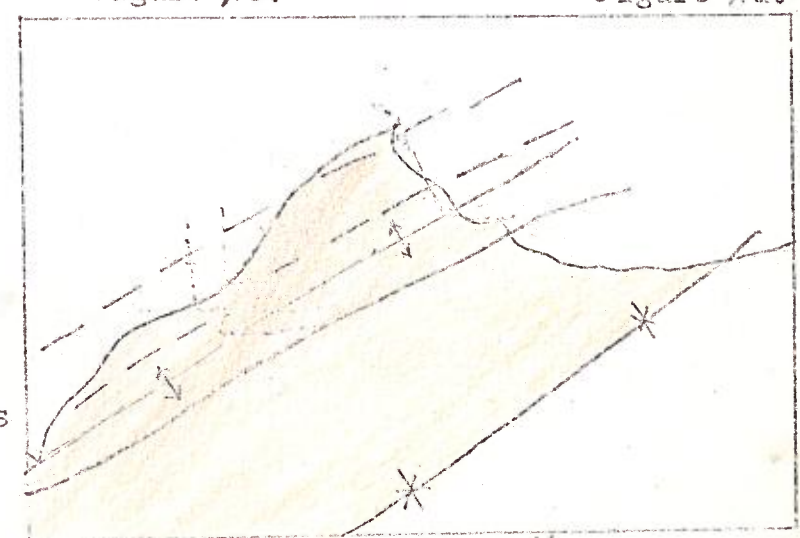


Figure ^{7e} ~~7e~~

74-7-148

is exposed on a cliff or beach. The minimum number of these sandstone beds can be seen from a section of the cliff face from Point Platon to Hydrographic Station # 29, as shown in Fig. 7 A. Flattened, circular, calcareous concretions up to 3' diameter and 1' thick are common in a few horizons high up in the formation.

The Lotbinière Formation is in discontinuous exposures from Point Platon downstream toward Ste-Croix. Inland, the streams at, north, and south of La Ferme cut through these rocks. Several folds, some of which are overturned, and thrust or low angle reverse faults characterize the structure of this area.

Thickness. Fortunately four of the deep wells penetrated the entire thickness of the Lotbinière shale. The correlation chart (page 25) shows a considerable variability in the thickness of this formation, ranging from 334' in well, 69 to 260' in well 72. That this formation, which transgressed and replaced the Trenton limestone, should be irregular in thickness is to be expected. In the five Bald Mountain - Batiscan wells (Nos. 3, 4, 5, 6, and 7 in S-75), 30 miles west-southwest of well 9, the thickness ranges from 330 to 355 feet. Thus, the local logs suggest that the Lotbinière Formation is 300' thick on the average.

The situation along the Lotbinière shore southwest from Point Platon is shown in Fig. 7 a-d. The interbedded magnesian limestone layers were numbered and their thicknesses as well as those of the shales were measured or estimated, with the result shown below. Trigonometric calculations involving distances and dip angles are not wholly reliable, partly because

of variations of the strikes and of the low-angle dips.

Buff-weathering
limestone beds

Estimated or measured
thickness of inter-
vening shale

No.

	8
17	25
16	5
15	15
14	6
13	12
12	30
11	35
10	30
9	6
8	30
7	15
6	20
5	5
4	40
3	28
2	8
1	

20

330'	Total thickness of shale.
	Total thickness of limestone
<u>12'</u>	beds: average thickness
	8"-9".
350'	Total thickness of Lotbinière
	Formation along measured
	section.

The 30'-40' of fossiliferous shale at the base of the formation as seen on the north shore, do not show in the section

along the Lotbinière shore, and should lie below the lowest shales exposed at Point Platon. Hence the figure of 350' worked out as the thickness of the shale along the Lotbinière shore is a minimum, and it should be increased by 30'-40'.

Nevertheless, 380'-390' is too great a thickness to be compatible with that shown by the well logs. The thicknesses of many of the shale beds were estimated in cases where inaccessibility made such a course necessary. Also, no account could be taken of the effect of ever-present folding, shown by the pattern of outcrop at low tide (Fig. 7 A), few of which complications show in the vertical cliffs, yet their effect must be to exaggerate the thickness as given. Hence, 380'-390' must be considered too high, and a thickness of 300'-350' is more in accord with reality.

Paleontology

Fossils are abundant, and consist essentially of graptolites. The only common inarticulate brachiopod is Leptobolus insignis. Triarthrus sp. is also common. The buff-weathering limestones are well provided with graptolites (Climacograptus typicalis and C. spiniferous), and the bituminous shales contain, in addition to all of the above forms, Dicranograptus sp., cf. D. nicholsoni and Geisonoceras. The graptolites are abundant in exposures of the Lotbinière Formation on both sides of the St. Lawrence. In outcrops and in well cores the lowest bed of shale is in most cases composed of a mass of fossil fragments ("debris bed" of our field notes).

A complete list from the formation on both shores of the St. Lawrence follows:

COELENTERATA

Glyptoconularia splendens (Hall)

BEYOZOA

Atactopora maculata

BRACHIOPODA

Pholidops sp.

Leptobolus insignis

Trematis ottawensis

Lingula sp.

Dalmanella sp.

Sowerbyella sericea

Rafinesquina ulrichi

Camarotoechia sp.

GASTROPODA

Archinacella sp., cf. A. patelliformis

Oxydiscus sp.

CEPHALOPODA

Geisonoceras tenuistriatum

Brevicone cephalopod

ANNELIDA

Serpulites angustifolius

TRILOBITA

Triarthrus eatoni

Odontopleura sp.

Flexicalymene? senaria

Isotelus sp.

Ceraurus pleurexanthemus

OSTRACODA

Bythocypris cylindrica

Primitiella unicornis

P. ulrichi

Ctenobolbina sp.

MEROSTOMATAEurypterid fragmentGRAPTOLITHINADicranograptus sp. cf. D. nicholsoniOrthograptus amplexicaulisO. quadrimucronatusO. ruedemanniClimacograptus typicalisC. pygmaeusC. spiniferusINCERTAE SEDISCornulites sp.

With the exception of the graptolites, Leptobolus insignis, and Geisonoceras tenuistriatum, all of the above were collected exclusively from the basal beds within 30'-40' of the Trenton. At least half of these are identical with, or very closely related to, species common in the underlying Trenton. It is as if the incoming mud eliminated most of the life forms of the Trenton sea, but a few hardier ones survived long enough to be represented in the lower Utica shales. Most of the hangovers from the Trenton are dwarf forms, though some, like Camarotoecchia and Isotelus, are fully as large as their Trenton predecessors.

East of St-Antoine-de-Lotbinière, in the zone of complexly folded and faulted Utica-Lorraine rocks, the following graptolites were recovered from Utica-like lithology and are of Lower Utica age (identified by J. Riva, 1967, personal communication):-

GRAPTOLITHINADicranograptus sp., cf. D. nicholsoniClimacograptus typicalisOrthograptus quadrimucronatusClimacograptus spiniferus?Correlation

The presence of Dicranograptus sp., cf. D. nicholsoni in fair abundance in the basal beds on the Neuville shore indicates that the beds containing it are Lower Utica. Also, the general fauna points to an affinity with the lower part of the Utica shale of New York. This has its implications with regard to the classification of the Trenton formations. Except in a very few places the replacement of limestone by mud did not begin until Upper Trenton (Cobourg) time. Hence it is appropriate to assign the uppermost part of the Trenton, of uncertain thickness, to the lower part of Cobourg time. The presence of Rafinesquina deltoidea and Cryptolithus lorettensis in the Neuville shore rocks and Cyclospira bisulcata in the uppermost beds of Trenton age in the Jacques Cartier gorge is the only available faunal evidence corroborating this conclusion.

Page 2 revisions

Figure 8



2000 Feet

Figure 8a. Map of stream at La Ferme, above Highway # 3. Stratigraphic trends in ~~Utica~~ shale indicated. Lotbinière



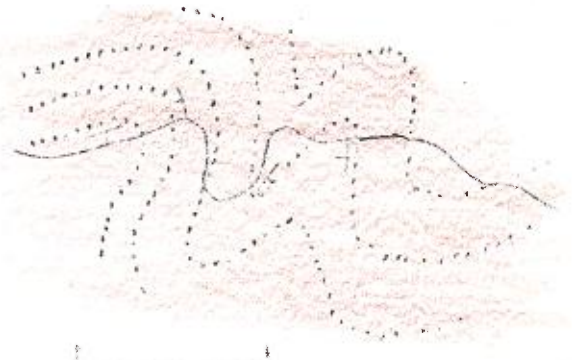
1000 Feet

Figure 8b. Map of lower part of the stream entering the St. Lawrence north of La Ferme. ~~Utica~~ shale. Lotbinière



1000 Feet

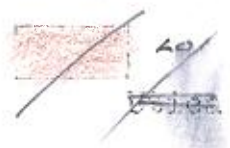
Figure 8c. Same stream as in figure 8b, but 1 1/2 miles above its mouth. All ~~Utica~~ shale. Lotbinière



500 Feet

Figure 8d. Exposures along stream of figure 8b, and immediately upstream, showing gentle complications in ~~Utica~~ shale. Lotbinière

Figure 8. Illustrations of exposures of Lotbinière the ~~Utica~~ shale showing gentle folds (undulations).



R-1148

LORRAINE GROUPNicolet River Formation

In 1916, Foerste divided the rocks of the Lorraine Group into a number of zones on the basis of their faunal content as follows: Pholadomorpha, Proetus, Leptaena, and Cryptolithus zones. In general terms, the first represents the Upper Lorraine, the middle two the Middle Lorraine, and the lowest the Lower Lorraine. A more complete discussion of this question is given by Clark (1964) for the Yamaska-Aston Area where the name "Nicolet River Formation" is given to the entire Lorraine development, divided into the St-Hilaire, Chambly, and Breault Members and corresponding very closely to the faunal grouping given above. In the present area, all the Lorraine belongs to the Breault Member except for a few Chambly Member exposures along Grande Rivière du Chêne, and in a cliff about a mile east of Ste-Croix on the St. Lawrence shore. The rocks of the Breault consist mainly of soft, thin-bedded shales with some limestone and sandstone, and are at least 1,000' thick.

Chambly Member (Proetus and Leptaena Zones)

Exposures of this member occur in two localities. The first is along Grande Rivière du Chêne from 3 miles below to a mile above the mouth of Bois Clair river. The exposures farthest upstream can be seen immediately above and below a steel bridge (Pont Noir) 2 miles southwest of Bois Clair. There a series of soft clay shales, sandy shales and sandstones, with a few thin

beds of limestone, appears along the right bank of the river. The sandstone is very irregularly bedded, and many layers are marked with both fine and coarse ripples. The lower surfaces of many of the thicker beds of sandstone show, in reverse, the structures or irregularities usually referred to as current mark, flute casts, etc. These indicate long periods of quiet mud deposition interrupted occasionally by strong current disturbances during which the upper surface of the mud was deformed, and then covered by sand. The latter preserves, vicariously, a record of the irregularities that affected the mud layer. This exposure is easily reached, and for that reason it is unfortunate that its dip is anomalous. All of the exposures farther downstream have a southerly dip in accordance with their position on the northwestern limb of a southwesterly plunging syncline. The beds visible from the bridge all dip to the north, an aberration due no doubt to a local disturbance of the otherwise orderly arrangement of the beds. Fossils are common in some layers; the composite list for this locality follows:

	Trenton	Utica	Lorraine			Rich- mond
			B.	Ch.	St. H.	
<u>BRACHIOPODA</u>						
<u>Sowerbyella sericea</u>	T					R
<u>Rafinesquina alternata</u>	T					R
<u>Strophomena cf. planumbona</u>			Ch.			R
<u>BRYOZOA</u>						
Numerous spp.	T					R
<u>PELECYPODA</u>						
<u>Cuneamya scapha brevior</u>			? Ch.	St. H.		
<u>Ctenodonta borealis</u>			B	St. H.		
<u>Whitella cf. obliquata</u>			?	?		R
<u>Byssonychia radiata</u>			B			R
<u>Lyrodesma sp.</u>						
<u>Colpomya faba pussila</u>			B	Ch.		
<u>Modiodesma modiolare var.</u>			?	?		
<u>GASTROFODA</u>						
<u>Clathrospira subconica</u>	T					R
<u>Lophospira sp.</u>						
<u>TRILOBITA</u>						
<u>Isotelus sp.</u>						
<u>Proetus fragments</u>						
<u>INCERTAE SEDIS</u>						
<u>Cornulites sp.</u>						

Most of these species are fairly long ranging ones, yet the emphasis falls upon the Proetus zone of the Chambly Member. Although the numerical preponderance of Proetus Zone species is slight, the absence of Cryptolithus, Triarthrus, and Leptaena rule

out the possibility that these beds are in the Cryptolithus zone or even the lower part of the Proetus zone. Similarly, because the common and easily distinguished species Pholadomorpha pholadiformis is absent, these beds are probably not as high as the zone of that name. Proetus itself is present only as fragments, and for great thicknesses absent altogether. In sum, a position in the middle or upper part of the Chambly Member is indicated.

Half a mile downstream, small and poor exposures of sandstone with abundant Whitella sp., preserved only as fillings of the interior, occur on the right bank. Still farther downstream, immediately below the mouth of Bois Clair river, other exposures of shale and sandstone yield no definite information as to the exact age of the beds. However, about a mile below the Bois Clair river, cliff exposures begin along the right bank and extend for about $\frac{1}{2}$ -mile. They contain the following fauna:

	Trenton	Utica	Lorraine				Rich- mond
			B.	Ch.	St.	H.	
<u>BRYOZOA</u>							
Bryozoa, ^{blutau} several spp.							
<u>BRACHIOFODA</u>							
<u>Sowerbyella sericea</u>	T						R
<u>Dalmanella</u> sp.							
<u>Catazyga</u> sp.							
<u>PELECYPODA</u>							
<u>Ctenodonta borealis</u>			B		St.	H.	
<u>Cymatonota recta</u>				Ch.			R
<u>GASTROPODA</u>							
<u>Lophospira</u> sp.							
<u>Pterotheca pentagona</u>				Ch.			
<u>ANNELIDA</u>							
<u>Serpulites</u> sp.							
<u>INCERTAE SEDIS</u>							
<u>Cornulites</u> sp.							

Here, also, the evidence favors a position within the Proetus zone. No other fossiliferous exposures occur until near the seigniorial mill bridge, 2 miles above Ste-Emélie. Here the rocks all belong to the Cryptolithus zone.

The second locality where fossils characteristic of the Chambly Member occur is in a cliff exposure about a mile east of Ste-Croix along the St. Lawrence. There, for about $\frac{1}{2}$ mile, sandstone beds identical with those along Grande Rivière du Chêne abound with fossils, mostly, however, not helpfully diagnostic because poorly preserved. A list of those identified follows:

	Trenton	Utica	Lorraine		Richmond
			B. Ch.	St. H.	
<u>BRACHIOPODA</u>					
<u>Dalmanella</u> sp.					
<u>Leptaena moniquensis</u>			B. Ch.		
<u>Rafinesquina alternata</u>	T		-----		R
<u>Sowerbyella sericea</u>	T		-----		R
<u>Catazyga</u> sp.					
<u>PELECYPODA</u>					
<u>Byssonychia radiata</u>			B.-----		R
<u>Modiolopsis anodontoides</u>			Ch.		
<u>Modiodesma modiolare</u>			? ?		
<u>Orthodesma pulaskiensis</u>			Ch.		

Again, the evidence for a Chambly Member age is convincing, and it would appear that, as with the beds under Pont Noir, the number of forms found in the Cryptolithus zone indicates that the lower part of the Chambly Member is here represented. The structural implications inherent in the recognition of these Ste-Croix beds as belonging to a horizon higher than the Cryptolithus zone is discussed below under "Structure". In passing, it may be noted that both east and west of these sandstones exposures there are shales with Cryptolithus, thereby indicating a synclinal structure along the shore east of Ste-Croix.

Breault Member (Cryptolithus zone)

Apparently the rocks of this zone grade upward into the Chambly Member of the Nicolet River Formation, from which they are distinguished lithologically by the absence of an abundance of thick sandstone beds, and faunally by the presence of Cryptolithus and

Triarthrus, and also by an abundance of Dalmanella. From the underlying Lotbinière Formation, into which they also grade, they may be distinguished lithologically by their higher sand content and the absence of the buff-weathering calcareous beds so characteristic of the latter.

They can be readily recognized in only two places. First, along Grande Rivière du Chêne from just above the seigniorial mill bridge, downstream to the mouth of the river, and along the shore of the St. Lawrence to Lotbinière village. The second locality is along the St. Lawrence shore for a mile or so east and west of Ste-Croix. Between St-Antoine Est and the eastern edge of the map-area, the highly folded and faulted rocks along the St. Lawrence shore and along Méthot brook belong in part to the Breault Member, and in part to the Lotbinière Formation.

Near Ste-Croix, both east and west of beds of the Chambly Member referred to above, there are strata containing the normal meager fauna of the Cryptolithus zone. A composite list of the species identified from exposures $1\frac{1}{2}$ miles west, and $2\frac{1}{2}$ miles east, of Ste-Croix follows:

	Trenton	Utica	Lorraine				Rich- mond
			Br.	Ch.	St.	H.	
<u>BRYOZOA</u>							
Bryozoa, several spp.							
<u>BRACHIOPODA</u>							
<u>Lingula</u> sp.							
<u>Leptaena moniquensis</u>			B	---	C		
<u>Dalmanella</u> sp.							
<u>Catazyga</u> sp.							
<u>PELECYPODA</u>							
<u>Clidophorus praevolutus</u>					C		
<u>C. planulatus</u>			B	-----	St.	H.	
<u>Byssonychia hyacinthensis</u>			B				
<u>Cymatonotus pholadis</u>			B	-----	St.	H.	
<u>Orthodesma pulaskiensis</u>			?		?		
<u>GASTROPODA</u>							
<u>Liospira micula</u>	T						R
<u>Sinuities cancellatus</u>	T						R
<u>Bellerophon</u> sp.							
<u>TRILOBITA</u>							
<u>Cryptolithus bellulus</u>			B				
<u>Triarthrus huguesensis</u>			B				
<u>Ceraurus pleurexanthemus</u>	T						R
<u>Flexicalymene</u> sp.							

Thus, with the exception of one pelecypod, all the identified species fit into the Cryptolithus zone. However, several species persist into the higher Lorraine, and even into the Richmond. Similar beds, with a smaller but similar fauna and including Cryptolithus, occur along the stream bed one mile east of Joly.

The other main locality for these rocks is from a mile above the seigniorial mill bridge on Grande Rivière du Chêne

downstream to Leclercville (Ste-Emélie), and along the south shore of the St. Lawrence downstream to Lotbinière. A note regarding the inclusion of these beds within the Nicolet River Formation is pertinent here. Within the Portneuf map-area, the lowest part of the Nicolet River Formation is a group of shales and sandstones, usually devoid of the thick "clean" sandstone beds which characterize the rest of the Nicolet River Formation. These beds (containing graptolites, Triarthrus, Chonetoides) are virtually devoid of Cryptolithus and were previously separated from the Nicolet River Formation and named the Leclercville Formation. Subsequent investigation, however, has shown that this separation is not justified, and that these so-called Leclercville beds are actually the lower part of the Breault Member and possess the physical and faunal characteristics given above. Lacking both the thin "clean" sandstone beds of the upper part of the Breault Member, and the buff-weathering calcareous beds of the underlying Lotbinière Formation, these lower Breault beds present a monotonous series of thin-bedded shaly sandstones and sandy shales. Like the underlying Lotbinière beds, they disintegrate readily upon exposure. This is not a characteristic of the rest of the Breault or of the Chambly Member.

The rocks exposed along Grande Rivière du Chêne between the mill bridge and the mouth (Fig. 9) have the characteristics given above. Peculiarly enough, the only graptolites found (about half-way between the two bridges) were in thin-bedded sandstones, -not in shales as is usually the case. According to the structural interpretation of the observed attitudes the width of outcrop of the beds exposed along the river here is 3,432', which, with an assumed

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Bridge over Highway # 3.



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Lower Lorraine

Scale in miles



near

9
 Figure 2. Map of Lower part of Grande Rivière du Chêne from mouth to point 2 1/2 miles (straight line) upstream. Shows the gentle undulations indicative of the Leclercville axis.
 CAP SANTE

average dip of 3° , gives a thickness of 180 feet.

Throughout the exposures along Grande Rivière du Chêne fossils are exceedingly rare and poorly preserved. They included graptolites and fragments of brachiopods (probably Dalmanella).

Downstream along the St. Lawrence from Leclercville (St-Émilie), shales and shaly sandstones outcrop along the beach at Bois des Hurons, but except for fragments of Dalmanella, these beds yielded no fossils. Similar unsatisfactory traces occur in the sandy shales in the stream bed southwest of Vieille Eglise. From the latter locality, exposures are almost unbroken along the shore to Lotbinière village, and consist of shales and thin-bedded sandstones with a few thick sandstone beds. The last, near Lotbinière church, carry current markings, flute casts, burrows, etc., and a fragment of Cryptolithus. The only places where these rocks are obviously fossiliferous are 2,500' to 4,000' below the beacon at Vieille Eglise, where limestones and slabby sandy shales contain the following:

	Trenton	Utica	Lorraine				Rich- mond
			Br.	Ch.	St.	H.	
<u>BRACHIOPODA</u>							
<u>Hafinesquina alternata</u>	T						B
<u>Dalmanella</u> sp.							
<u>Sowerbyella sericea</u>	T						B
<u>Leptaena moniquensis</u>			B	C			
<u>Platystrophia</u> sp.							
<u>Catazyga</u> sp.							
<u>GASTROPODA</u>							
<u>Sinuities cancellatus</u>	T						B
<u>TRILOBITA</u>							
<u>Cryptolithus bellulus</u>			B				

Except for the Cryptolithus such a fauna might be found at any horizon within either the Chambly Member or the Breault. This is one of the pieces of evidence hinted at by Foerste, who suggested that the Lorraine fauna was being held in readiness in some nearby basin and was fed out to this region wherever the environmental conditions allowed and supported it. Not until Chambly time did this fauna as a whole become well established.

In the eastern part of the map-area north of the St. Lawrence, shaly rocks are exposed here and there along the shore from Neuville eastward. At about $1\frac{1}{2}$ miles in a straight line from Neuville wharf these shaly rocks are identical with the Lorraine on the south side of the St. Lawrence. The exposures along Roches river belong also to the Lorraine Group. The shales in the railroad cut half-a-mile east of Les Ecureuils station are more sandy than usual but not enough to make one suspicious of their Lorraine affinities.

The shales along the shore are dark, micaceous, and contain thin, sandy layers; the shaly sandstones are less dark, and contain small bits (1-3mm.) of various kinds of shaly rocks, together with greenish fragments of unknown affinities. Fragments of a plicated articulate brachiopod are abundant in some layers and also some brims of Cryptolithus. The same kind of lithology is abundant along the St-Antoine shore and in creeks that there drain into the St. Lawrence. The exposures along Roches river and the other river to the southeast, show only sandy shales. The fair degree of folding suffered by the beds along the shore and Roches river, with dips up to 22° , indicates that the Lorraine was depressed

along open synclinal axes in many places. To the east, beyond the limits of this map-area, Lorraine beds are common. In conformity with the succession on the south shore of the St. Lawrence, these Lorraine strata belong to the Breault Member of the Nicolet River Formation.

RICHMOND GROUP

Bécancour River Formation

Although the Queenston shale is shown as occurring in the southwest corner of the map-area, no exposures have been seen. Because of the known distribution of the Queenston and lower formations in adjacent parts of the Bécancour and Lyster map-areas, and its recognition in the core of Fortierville well no. 1 (no. 51 in S-75), the probability of its presence in the Portneuf map-area is of a high order.

Pontgravé River Formation

As with the Queenston, there are no exposures of the Richmond here, though its presence as a band within the Chambly-Fortierville syncline is called for by the regional stratigraphic sequence.

Formations Southeast of the Champlain Fault

Sillery Group

Sillery Slates and Sandstones

Scattered irregularly around and between St-Apollinaire and St-Flavien, there are exposures of purple, red, gray, green, and black slates and shales, together with gray sandstones of various grain sizes. These, on the basis of lithology, presumably belong to the Sillery Group so extensively developed a few miles to the northeast in the Chaudière map-area. No fossils were discovered in these rocks in the Fortneuf area, though 10 miles northeast the characteristic Sillery brachiopod, Botsfordia pretiosa, is common in black and gray shales. Some good roadcuts were made along Route 20 in 1943, and were mapped then; most are now covered.

The slate is, in most exposures, red; black and gray colors are next in importance. Very rarely can the original bedding be seen, except at contacts between slate and sandstone.

The Sillery sandstone presents a great variety of expressions. It ranges from black through green and gray to white, and from fine to coarse and even to conglomeratic. Nevertheless it is everywhere quartzose, and dominantly so in the fine-grained varieties. Mica and some sort of a ferro-magnesian mineral are to be seen in most specimens but feldspar is rare. One mile northeast of St-Flavien hill there is a reddish sandstone made up largely of decomposed feldspar and some quartz. Flakes of slate occur in some fine-grained sandstones, but are more common in the

coarse-grained rocks. Most of the sandstones consist of quartz grains so closely packed together that there is little room for matrix. None of the sandstone is calcareous. Clear quartz makes up the bulk of the rock, though milky quartz grains occur in places in equal quantities.

The coarser sandstones and fine-grained conglomerates are not common. They can best be seen in parts of an extensive exposure near the four corners a mile south of Marigot. Quartz grains and pebbles up to $\frac{1}{2}$ " in diameter make up about half of the visible fragments. The rest is composed of pieces of slate, cherty material and, rarely, limestone. This type is essentially the same as that used in the walls of Québec.

One mile west-northwest of St-Apollinaire and immediately south of the road, a fine-grained sandstone is in contact with basic intrusives. The sedimentary rock here has been metamorphosed so as to resemble fine-grained marble, though its peculiar appearance may be due in part to weathering.

Lévis Group

Hurette Formation

North of St-Apollinaire a half-oval area about 2 square miles in extent rises from the general plateau level of 300' to a height of more than 400 feet. Within this area the rocks are notably different from the Sillery described above. They consist of gray shales and greenish gray mudstones. (for the most part dolomitic, buff-weathering, and sandy) with interbeds of sandstone and black

shale. Though these rocks show cleavage it is not so dominant as in the red and black Sillery shales and slates. Like the latter rocks, these dolomitic rocks dip southeast. On both sides of the road one mile northeast of Hurette, on land belonging to Albert Moreau, loose blocks of limestone conglomerate occur in abundance sufficient to indicate the truth of Mr. Moreau's contention that limestone forms the bedrock at this place. In fact, he stated that his well penetrated 55 feet of pure limestone. Also, $1\frac{1}{2}$ miles north-northeast of this spot there is a small but prominent hillock where limestone was once quarried for lime, but where no exposure can be seen today. Three-quarters of a mile to the northeast, about 1,000' beyond the N.W.-W.E. road, there is a spot on the southeast slope of the hill where limestone and limestone conglomerate boulders are abundant. The pebbles range up to 2" in diameter, and none was observed to be fossiliferous. No actual exposure was seen here.

These three occurrences presumably betray the presence in situ of the Hurette Formation, and calcareous shales are likely to be the accompanying rock. A thorough search of these rocks failed to yield any fossils, except the one mentioned below, although Ellis, in his Northeast Quarter map (1888), shows the symbol for fossils where these calcareous rocks occur. He does not record what fossils were found, nor the exact locality.

Only one fossil was discovered. -On the Moreau property one piece of limestone has large Maclurea logani, which is

characteristic of the Corey Formation limestone of the Philipsburg section. This formation is considered to be the equivalent of the upper part of the Lévis Group.

Normanskill - Correlative

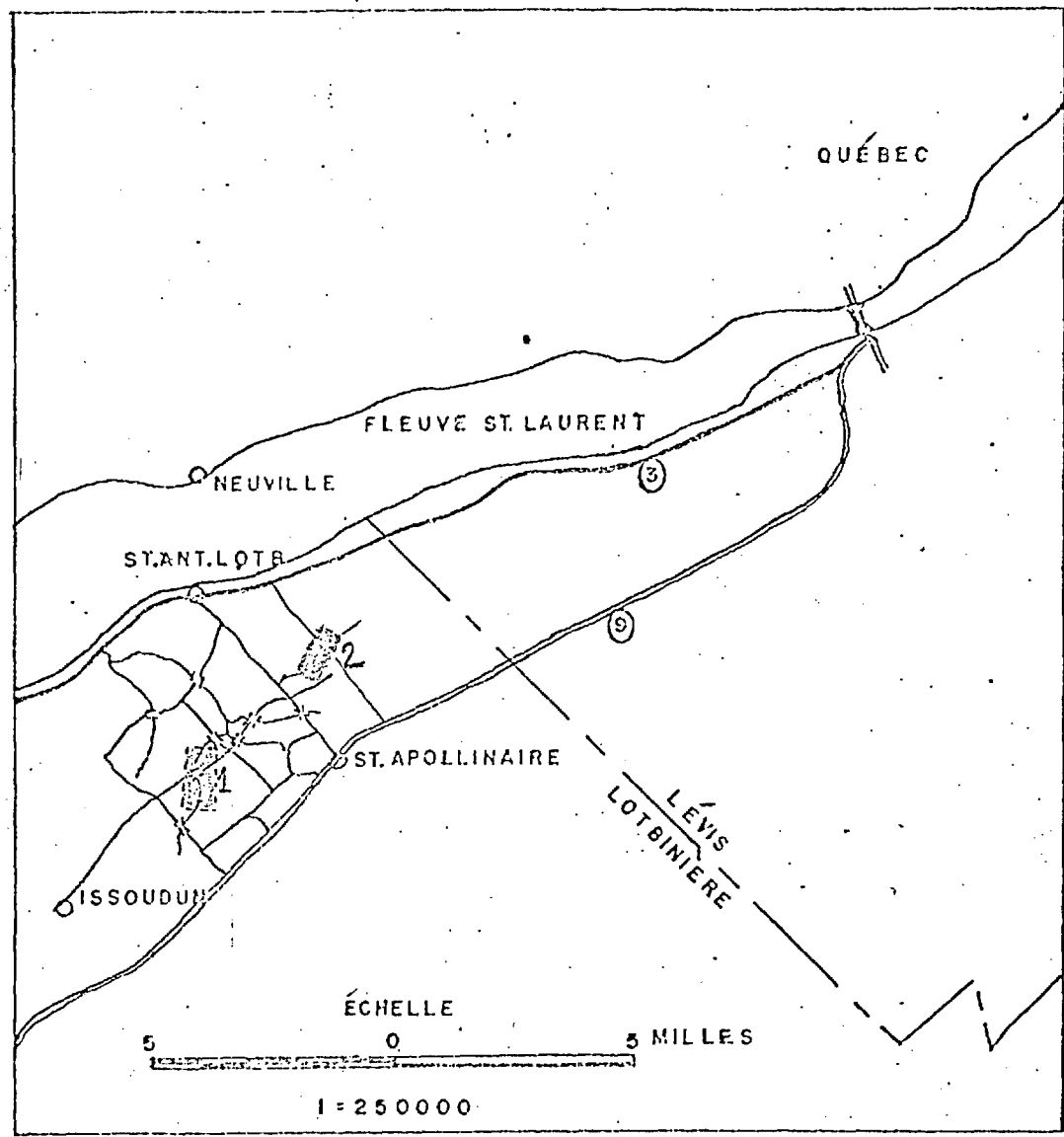
LAURIER GROUP

Bourret Formation

The Bourret Formation of the area is composed of three distinguishable units: - Unit #1, -black shales or slates with interbeds of buff-weathered, bituminous, argillaceous limestones; ochre-weathering dolomite and sandstones; and local beds of limestone conglomerate; Unit #2, -black, sooty, green, gray, and brownish red shales or slates and mudstones with interbeds of dense rusty-brown and orange dolomite and limestone; and Unit #3, thick sandstone beds interstratified with black shale and breccia. Rocks of Unit #1 are best exposed on Bourret brook, about 4 miles northwest of St-Apollinaire (Fig. 10), and from this section the name of the formation is derived. A detailed description of this section (see map #2 in pocket) was made by M. L'Heureux and J. Tessier, in 1966. It is well exposed also at Issoudun, Laurier Station, on branches of Huron river about a mile north of Laurier Station, and on aux Ormes river. Unit #2 is best seen on one branch of Bourret brook, about 3 miles northwest of St-Apollinaire, and on Bourret brook itself but much farther upstream at about $1\frac{1}{2}$ miles northwest of St-Apollinaire. It is also present on the shore of the St. Lawrence

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Figure 10 . Locations of ~~the~~ ^B Bourret Brook section (1) and of Lambert Quarry (2).

~~see page 88~~

near the eastern edge of the map-area. Generally the rocks of the Bourret Formation have been considerably deformed, and particularly those of Unit #2.

Rocks of Unit #3 are best exposed in the Léon Lambert Quarry, on the southwest flank of a hill 2 miles north of St-Apollinaire. It is composed mainly of sandstone in beds up to 6' thick (Plate XVI-A) with interlayers of sedimentary breccia and of black shale. The sandstone is generally coarse grained, medium gray to greenish buff, and composed largely of quartz with fragments of other rocks the commonest of which is a green shale. The shale contains Normanskill graptolites, is thinly bedded and black and, in places, carries thin (1mm.), brown-weathering, white, siliceous beds. Its lower contact indicates a reasonable continuity of deposition with that of the sandstone, but its upper boundaries are usually unconformable. One characteristic of this sandstone which sets it apart from the Sillery sandstone is its calcareous cement. A fine-grained calcareous sandstone is widely distributed over the hill carrying the quarry.

Aubin Formation

The Aubin Formation is composed of hard, green, cherty beds (silicified siltstone or tuff) and is exposed on the southern St. Lawrence shore at the eastern edge of the map-area. It forms a point on which the cherty beds are well exposed.

Paleontology

The only fossils recovered from the Bourret Formation are graptolites. A careful examination of the fauna by ^JL. Riva (1967, personal communication) revealed that it contains Appalachian forms, -quite different from those of the Lowlands. Moreover, the lithology and the degree of deformation of the rocks are characteristic of the Appalachian terrane. Therefore, the Bourret Formation most probably is part of the Appalachian Province.

On Bourret brook, the graptolites are all of Normanskill age (see Osborne & Riva, 1966) and consist of:

Climacograptus modestus
Climacograptus cf. C. exirmius
Climacograptus cf. C. scharenbergi
Climacograptus sp.,
Cryptograptus tricornis
Dicellograptus gurleyi
Dicellograptus sextans var. exilis
Dicranograptus sp., cf. D. rectus
Glyptograptus euglyphus
Leptograptus flaccidus mut. trentonensis
Nemagraptus exilis
Orthograptus calcaratus var. incisus
Retiograptus geinitzianus

At Laurier Station, from new ditches near Highway 20, the following excellent Normanskill fauna was found:

Climacograptus bicornis
Dicranograptus rectus
Cryptograptus tricornis
Dicellograptus sextans
Dicranograptus ramosus
Pseudoclimacograptus modestus
Lesiograptus mucronatus

On des Ormes river, graptolites were found at two localities. The first, about ¼-mile west from the intersection

of the river with Highway 20 gave the following Normanskill graptolites:

Climacograptus caudatus
Orthograptus calcaratus

Orthograptus calcaratus is an Appalachian form. Climacograptus caudatus is found both in the Appalachians and in the Lowlands.

The second locality, on the same river but about 3 miles west from Highway 20 gave the following Appalachian graptolites:

Cryptograptus tricornis
Dicellograptus sp.
Climacograptus sp.
Pseudoclimacograptus sp.

Among the graptolites taken from the Lambert quarry, Pseudoclimacograptus parvus is common, and one branch of a Dicranograptus was also found. These suggest a Normanskill age.

Igneous Rocks

In many places in the southeast corner of the map-area, southeast of the Champlain Fault, there are dark, basic, igneous rocks. These are in part extrusive, in part intrusive. They may stand in bold relief, as in the ridge one mile north of St-Apollinaire or they may be inconspicuous, as in low roadcuts along Highway 20. The best development of these rocks is 3 miles northeast of St-Flavien, where an oval hill, a mile more or less long and wide, is thickly strewn with exposures and boulders of a basic rock showing many extrusive characteristics, and which has been mined

for copper. None of these igneous rocks is known northwest of the Champlain Fault.

St-Flavien Volcanics

Many of the exposures on the St-Flavien hill are obviously of volcanic origin. The southernmost of these occurs behind a schoolhouse at a road corner 2 miles east-northeast of St-Flavien. The rock is a dark gray (almost black), amygdaloidal and porphyritic, basaltic type. The phenocrysts are mostly of augite, up to 2 mm. across; the amygdules are of calcite and range up to 8 mm. in diameter. The groundmass consists of finely crystallized black minerals which cannot be differentiated in the hand specimen. On the hill proper a variety of rock types occurs. Near the old mine there is much quartzose and cherty rock, together with some crystalline limestones. Chalcopyrite and copper carbonate are common on the mine dump. A quarter-mile southwest of the mine normal types of igneous rocks are exposed. Here the calcite-filled amygdules are so closely spaced as to make up at least one quarter of the surface area of the rock. The rock is too finely crystalline for the identification of minerals without the microscope. It is dark to almost black with, in places, a reddish cast. Effervescence under hydrochloric acid is general throughout. At several places, especially $\frac{1}{2}$ to $\frac{1}{2}$ mile southwest of the old mine, pillow lava structure is well developed. The rock of the pillows is a finely crystalline, dark greenish gray diabase; ophitic texture is plainly

shown on the weathered surfaces. In this type of rock St-Flavien Quarry Inc. was in operation (800 tons/day) until November, 1967. During the summer of 1968 all the machinery was dismantled and the quarry closed.

Logan's description of these rocks is worth repeating (1863, pp. 241-242). "...at St-Flavien, ...red shales occur, underlaid by a band of amygdaloidal diorite, ...(which is) between a quarter and half a mile wide, and limestone occur both at the summit and at the base of the band, which in those parts appears to be of a concretionary or conglomerate and brecciated character, being composed, particularly at the base, of rounded and angular masses of amygdaloidal diorite, varying in diameter from two inches to two feet. Many of these appear to be calcareous, and much of the rock is red. The interstices among the masses are filled with calcspar, which is transversely fibrous toward the walls, and incloses crystallized quartz in the centre. This band is highly cupriferous, and ores of copper occur both in the beds, and in veins or lodes which cut them; the bearing of the veins, however, being with the strike. The ore in the beds is copper pyrites, large masses of which have been met with associated with the limestone at the top. The veins, in addition to copper pyrites, hold the variegated and vitreous sulphurets. In one spot, native copper occurs in small masses in the conglomerate at the base of the diorite, and the whole band has a striking resemblance to some of the rocks of the upper copper-bearing series of Lake Superior."

Elsewhere, the igneous rock appears only as actual or presumed dikes. They are everywhere crystalline and usually ophitic; nowhere are they vesicular or pillowed. In many places they have obviously metamorphosed the adjacent sedimentary rocks as can be well seen a mile northwest of St-Apollinaire. It is fair to assume, therefore, that these rocks are all intrusive (for details of intrusive contact, see Fig. 11c-1). One of the most interesting exposures is in a long ridge that extends for more than $\frac{1}{2}$ -mile southwestward from the border of the map-area about 2 miles north-northeast of St-Apollinaire (Fig. 11b). In this ridge the rock is an ophitic diabase, with a grain ranging from almost aphanitic to a facies with crystals nearly $\frac{1}{2}$ -inch long. Field identification of plagioclase, hornblende, and augite can be made almost throughout. No sulfides were noticed except for inconspicuous and minute masses of pyrite. Northwest of St-Apollinaire there are three exposures of the same sort of rock (Fig. 11a). It is very likely that these are, in fact, parts of the dike that upholds the ridge just described; only one small offset would be demanded to allow this. Another offset would link up the three hillocks of diabase just west of the new boulevard $1\frac{1}{2}$ miles southwest of St-Apollinaire. One of the coarsest-grained examples of these rocks is in a group of exposures $1\frac{1}{2}$ miles northwest of the St-Flavien hill. Here the rock is composed dominantly of augite.

Age. The St-Flavien igneous rocks are found close to Sillery rocks or in contact with Normanskill mudstones or slates at Drummondville, Plessisville, southwest of Princeville, southwest

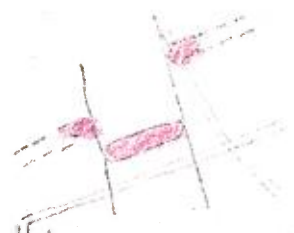


Figure 7a. Plan of ~~the~~ exposures of ~~the~~ diorite dike near ~~the~~ road intersection one mile N.W. of St-Apollinaire, showing dislocations by faults.



Figure 7e.

Figure 7f.

Northeasternmost of three knobs of diorite on northern side of Highway #20, 1 1/2 miles S.W. of St-Apollinaire, showing (e) an inclusion of Sillery slate in the diorite, and (f) the slate-diorite contact.



Figure 7b. Plan of exposures of 3/4-mile-long ridge upheld by diorite dike 30' thick. ~~This dike, is~~ cut by faults, so as to appear en echelon.



Figure 7g. Brecciated contact between Sillery slate and diorite south of Highway #20, 2 miles S.W. of St-Apollinaire.

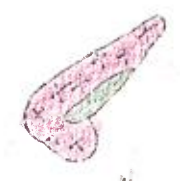


Figure 7h. Detail of contact showing inclusion of Sillery slate in diorite. 1 mile due north of St-Apollinaire.



Figure 7c. Two views of the diorite-slate contact along east side of dike 1 1/2 miles north of St-Apollinaire.



Figure 7d.



Figure 7i. Intrusive contact between diorite and Sillery slate on bank of Bourret Brook one mile W.N.W. of St-Apollinaire.

Figure 7. Illustrations of exposures of the St-Flavien igneous rocks, showing ~~their~~ faulting and intrusive contacts.

Legend: Sillery slate (green box), Intrusives (pink box)

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of Ste-Agathe, at St-Apollinaire and at St-Malachie. Closely identical rocks overlie the Sillery at Acton Vale, probably with an angular unconformity. At Drummondville, volcanics are interbedded with dark slates containing numerous graptolites of Normanskill age (Middle Ordovician). Hence a Middle Ordovician or later age is indicated here.

Doig and Barton (1968) give the age of the intrusives at Notre Dame du Bon Conseil, presumably part of the St-Flavien series (see Clark, 1964, p. 75), as $428 (10)^6$ years, -that is, late Ordovician.

STRUCTURAL GEOLOGY

General

Three main structural features dominate rock distribution in the area. First, the Paleozoic-Precambrian contact; second, the northern continuation of the Chambly-Fortierville syncline; and third, the zone of thrusts forming the western boundary of the folded rocks of the Appalachian mountain-built terrane. The thrust zone, variously known as "Logan's Line", the "Champlain" fault or thrust, the "St. Lawrence and Champlain" fault, the "Appalachian" or the "frontal" thrust, is here termed the Champlain Thrust. In this area, it is a series of small thrust faults. It is of fundamental importance, because the rocks northwest and southeast of it are totally different, both lithologically and structurally.

Paleozoic - Precambrian Contact

The structural arrangement of the rocks near the northern part of the Portneuf map-area is, on the whole, fairly simple. A series of sedimentary rocks, 900'-1,000' thick, rests unconformably upon the Precambrian basement. They have been deformed by gentle folding, and in one or two very restricted areas by severe crumpling. In addition to their sedimentary contact with the Precambrian, they have been faulted down against the older rocks along two major breaks, involving displacements of several hundred feet. In a few places the sedimentaries have been faulted within themselves, independently of the Precambrian basement, at least as far as surface indications are concerned.

Although these two groups of rocks are presumably in sedimentary contact northwest of both the Deschambault and the Neuville faults, only in the latter case do exposures indicate it. North of Deschambault there is a broad area of Precambrian flanked on the southwest by nearly flat Lower Trenton beds. Presumably these Trenton strata lie upon the Precambrian but the closest the two series come is 2,500' (Deschambault Station). Moreover, the distributional pattern of the exposures in this region indicates only in a most general way the direction of the contact. The relationship is clearer in the fields northeast of the old Neuville Station and northwest of the Neuville fault. There, the proximity and distribution of Precambrian and Lower Trenton outcrops, the latter essentially flat-lying, show that the contact runs north-westerly from near the railroad track. Nowhere, however, can the

actual contact be seen. Within the largest exposure of the Deschambault limestone in this locality there is a small boss of Precambrian, which indicates that the old Precambrian surface was at least somewhat irregular. This is the only Precambrian outlier so far found in this map-area.

From a regional point of view, the sedimentary contact between Precambrian and Paleozoic rocks should be more or less parallel to the St. Lawrence. However, it is approximately at right angles to the expected trend. A rough survey of the southern part of the St-Raymond map-area showed that the contact toward the west is arcuate, and curves around into the valley of Jacques Cartier river, returning to a more or less normal direction on the western side of that river. The same relationships probably exist along the course of Ste-Anne river in the Grondines map-area, and in the area to the north. These irregularities in the course of the contact may be a reflection of an irregular topography at the beginning of Trenton time. Not until these basal irregularities, with a relief of a few tens to possibly 200 feet, had been eliminated by filling up of low areas so that an even sea floor resulted, could the beds become more nearly horizontal and continuous. This theory has interesting physiographic implications. One logical conclusion would be that both Jacques Cartier and Ste-Anne rivers are located upon initial embayments in the old, early Trenton shore line. However, it is more probable, that the pre-Trenton surface was approximately flat, sloping southeastward slightly, but that the Deschambault and Neuville faults tilted this surface so that it sloped slightly down to the southwest.

Faults

Both normal and thrust faults are present in the area, - the normals mainly north of the St. Lawrence, and the thrusts r restricted to the southeastern part of the map-area.

Normal faults

The two most prominent normal faults (the Deschambault and the Neuville) are north of the St. Lawrence. They are essentially similar in attitude and development, -both trend more or less northeast-southwest, along both the southeast side dropped down several hundred feet, and both have about the same dip. Several minor dislocations also are present, most of which are d described below.

The Neuville Fault

From the point where Roches river enters the map-area near its northeast corner, this fault extends southward ($S.20^{\circ} +W$) for about 2 miles before changing to a southwest course ($S.40^{\circ} +W$) and holding that direction until it enters the St. Lawrence. Throughout this length, movement along the fault has brought together rocks of different formations. For the first $1\frac{1}{2}$ miles Precambrian rocks lie to the northwest of the break and Utica shales to the southeast. Within a hundred feet or so of the fault the Utica beds commonly dip $55^{\circ} -65^{\circ}$ to the southeast. For the next $1\frac{1}{2}$ -miles there are no exposures on the southeast side, but for the last mile or so Trenton limestone occupies the western side and Utica shale the eastern.

Because of the refusal of most investigators of this region to recognize the faulted nature of the contact between these different formations, it may not be amiss to quote Logan's description of the occurrence. On pages 155 and 156 of his Geology of Canada he records his observations as follows: "A great development of limestone occurs at Pointe aux Trembles (modern Neuville). The fossils ... shew the rock to belong to the Trenton formation, ... (which here) folds over the Pointe aux Trembles anticlinal. ...

"On the south-east side of the anticlinal, the dip is more precipitous than on the north-west, and the strata on that side are broken and let down by a fault. The position and course of this dislocation are plainly seen on the beach at and near a spring ..., where strata of the Utica formation are brought against those of the Trenton without any of that interstratification of calcareous and argillaceous layers which indicates the passage from the one to the other. The course of this dislocation, in its continuation, strikes the south-east side of the Bonhomme Mountain; and near the line of division between Pointe aux Trembles and St-Augustin, the Trenton formation is wanting, and the Utica shales come in contact with the gneiss. ... A considerable distance farther on (beyond the Portneuf map-area), a narrow strip of Trenton limestone becomes interposed between the shales and the gneiss both rocks being tilted up to a high angle as they approach the gneiss." Why the concept of an anticline, which Logan mentioned but did not describe, has persisted, whereas the concept of a fault, so clearly revealed by Logan, did not germinate, is difficult to understand.

Nowhere along the northern part of the Neuville fault is the actual contact between the Utica and the Precambrian visible. However, gaps of not more than 30' together with the steep dip of the shale, rule out the possibility that the contact might be a normal sedimentary one. Farther south, along the shore of the St. Lawrence, Utica shale and Trenton limestone are in actual contact, and this relationship can be followed, more or less continuously, for 1,000' along the beach at low tide (Fig. 14b). There the Trenton limestone forms a low escarpment, 2'-6' high, which dips to the southeast at angles of 60°-65°. Intensely contorted Utica shale occupies the beach flat, and nowhere stands up in relief. The buff-weathering bands lie brecciated and disrupted within the shale mass in such confusion that it is not possible to reconstruct their original distribution. The Trenton limestone is also much disturbed along the fault, but less so than the shale. For 200' or so northwest of the fault the limestone is thrown into a series of folds, with minor dislocations, that make building a continuous section impossible (see Fig. 12, 14b). Not until a point along the beach is reached some 100' west of where the fault passes is it possible to treat the limestone as a stratigraphic succession. This is where the Neuville Shore Section (recorded above) begins. One of the most interesting details observed along this fault is a smear of brecciated limestone over the face of the fault in some places. The blocks are of all sizes up to a foot across. This brecciated zone is rarely more than 2' thick, and usually less than a foot.

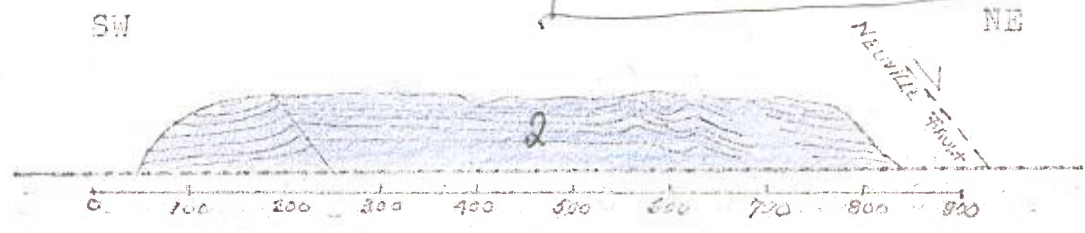
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Legend, Figs 12-14

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102

Figure 12



Scale in feet.

Section of the Trenton limestone along the abandoned Transcontinental Railroad track one-half ^{0.5} mile ^{NE} northeast of Neuville wharf. Note position of Neuville fault.

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Figure 13

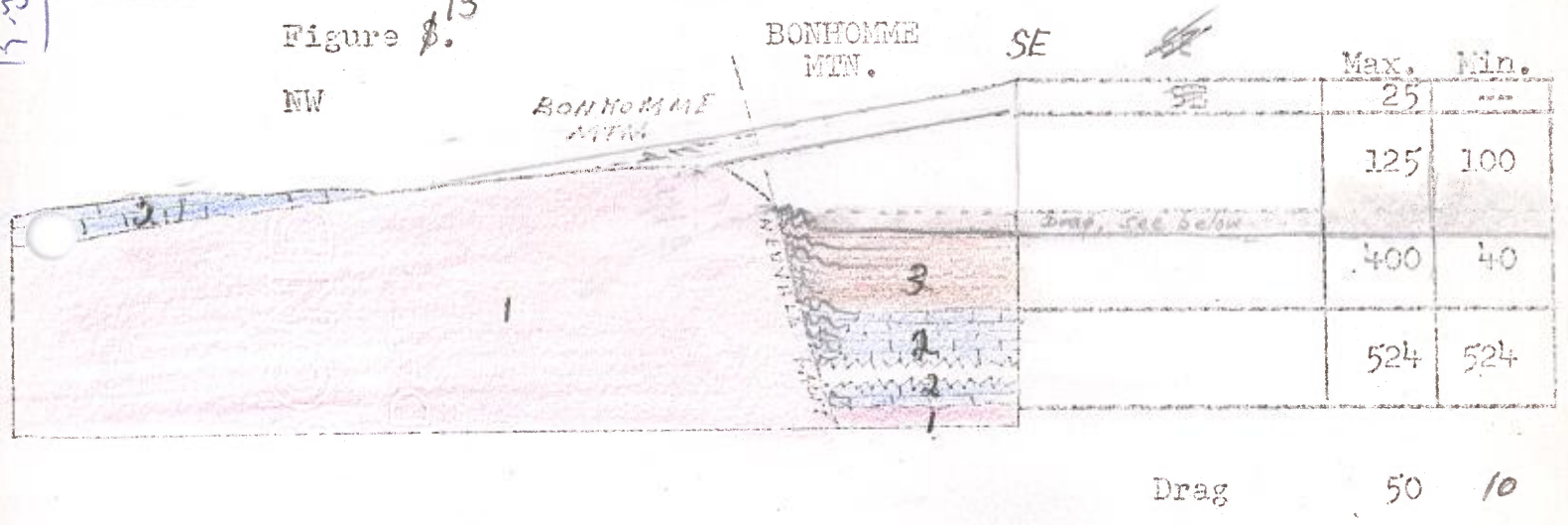
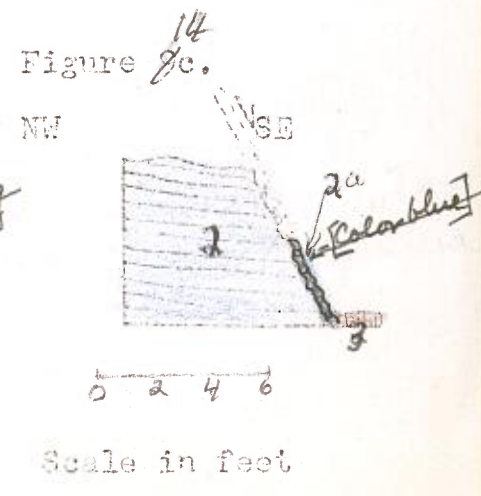
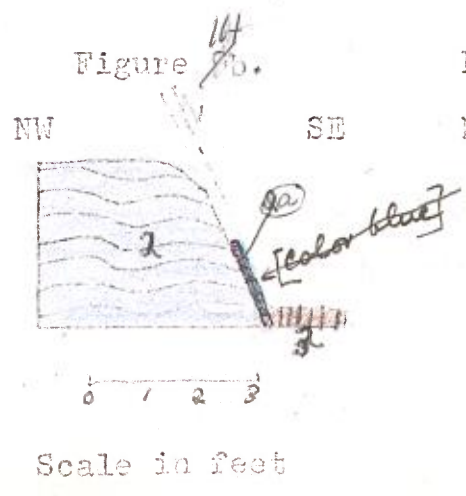
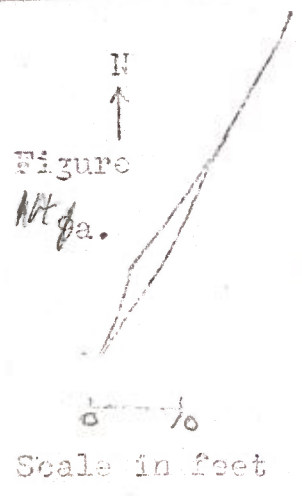


Diagram to illustrate how the maximum and minimum vertical displacement along the Neuville fault may be estimated.



- Figure 12. Section of Trenton limestone along abandoned Transcontinental railroad track .5 mile N.E. of Neuville wharf. The Neuville fault is approximately 100' east of eastern end of section.
- Figure 13. Diagram to illustrate how maximum and minimum vertical displacements along the Neuville fault can be estimated. Length of section about 3 miles.
- Figure 14a. Plan of details of Neuville fault on beach 1,500' N.E. of Neuville wharf. For each component fault the movement of the limestone was the same -east side down.
- Figure 14b. Section across Neuville fault. Same location as 14a. The breccia is rarely more than a few inches thick. Note the undulating Trenton limestone and the vertical Utica shale.
- Figure 14c. Diagram showing similar relationships along Deschambault fault, 1.5 miles due west of Deschambault village.

No identification of any horizontal component in the movement was seen. There are no slickensides, and, of course, no laterally disrupted beds. Hence it has been assumed that the displacement was vertical, or nearly so. A measure of the amount is difficult to determine accurately (Fig. 13). Along the northern part the Utica has been dropped down to lie alongside the Precambrian, and the elimination here of the Trenton alone indicates a movement of 524 feet. This is a minimum, and could be increased if we knew the horizon within the Utica which has been brought against the Precambrian, and if we knew how much of the Precambrian has been removed by erosion. As for the first modification, nowhere along the fault do we find any evidence of the lower 40' of the Utica, which, because of its abundance of fossils, can be easily recognized. This raises the minimum to 564 feet. As for the erosion of the Precambrian, we can attack that problem as follows: -If we assume that before faulting the beds were essentially horizontal, and reasonably widely distributed, then the base of the Trenton would have covered the lower part of Bonhomme mountain (the spur of Precambrian). From the present sedimentary contact northeastward the present Precambrian surface has a dip of 2° , which is only slightly less than the dip of the Trenton limestones. Probably, therefore, the basal Trenton limestones rested on the top of the Precambrian spur, which has an elevation of 450' today. The Utica shale is found at elevations of 350-325 feet. Hence we must add another 100'-125' to our minimum estimate, which now becomes 664 feet. If we adopt the maximum figures the movement becomes the sum

of 524', 125', and 400' (maximum thickness of Utica), i.e. 1,049 feet.

Neither of these estimates takes account of possible erosion of the Precambrian surface upon which the Trenton limestone may have rested. Now at 450', there may have been an additional 25' of Precambrian there, before erosion was able to attack the Precambrian consequent upon the removal of the Trenton; nor have we taken into account the effect of the highly inclined Utica beds along the fault itself. Actually the drag along the fault has resulted in the observed Utica today being at a higher elevation than is the horizontal Utica a few hundred feet away. The correction might be ten to fifty feet. If we use these figures the minimum becomes 674' and the maximum becomes 1,124 feet.

Logan plotted the course of this fault to the northeast. The continuation in that direction, however, lies outside the limits of this area. Southwestward, it enters the St. Lawrence river, and no trace of it is found until at a point on the south shore opposite Donnacona where Lower Lorraine shales dipping steeply south-southeast are followed along the shore to the northwest by Utica shales with low dips, for the most part to the southwest. Its continuation toward the west must pass between Turenne and the site of well no. 72 (S-75, Part 11). The log of this well, disregarding 6' of overburden, starts in Lower Lorraine shale and continues in that formation for 884' (see log, Appendix I, II). Without the evidence from the log of this well the site would be considered to lie on the southeastern limb of the Cap Santé

anticline, and hence should show Utica shale at the surface. Still farther to the southwest the only evidence of this fault is in the abnormally high dip of the Lower Lorraine shale farthest upstream along Grande Rivière du Chêne. This high dip is taken to be a reflection of drag along the fault. The minimum amount of movement near the site of well no. 72 is 884 feet. Rough calculations indicate that probably little more than 100' of Utica would be found immediately northwest of the fault, so that it is in order to consider that the movement here is around 1,000', a figure in harmony with the calculated movement near Neuville.

The Deschambault Fault

This fault is recognized by much the same evidences as characterize the Neuville fault. Beginning a little more than 2 miles west of St-Basile railway station, and extending irregularly southwestward, this fault can be traced by the juxtaposition of Precambrian, Trenton and/or Utica in situations which rule out sedimentary contacts. For the first 5 miles southwest from the northern border of the map-area only Trenton limestone is observed in near contact with the Precambrian. Thence to near Belisle river only Utica shale occurs on the downthrown side, with the exception of the limestone at Deschambault Station. As with the Neuville fault, to the north the Utica shale is in contact with the Precambrian, whereas farther south, from Deschambault Station to Belisle river, it is in contact with Trenton beds.

Within $\frac{1}{2}$ -mile of the northern border of the map-area the trace of the fault can be closely approximated where exposures of Precambrian and Trenton limestone are separated by not more than 200 feet. The Trenton limestone there strikes 65° , and dips 27° S, both measurements being abnormal. No more exposures of Ordovician rocks occur for $3\frac{1}{2}$ miles toward the southeast, and the contact is assumed, arbitrarily, to follow the base of the Precambrian highland, and, more specifically, to lie parallel to, and just to the northwest of, the abandoned Transcontinental Railway track.

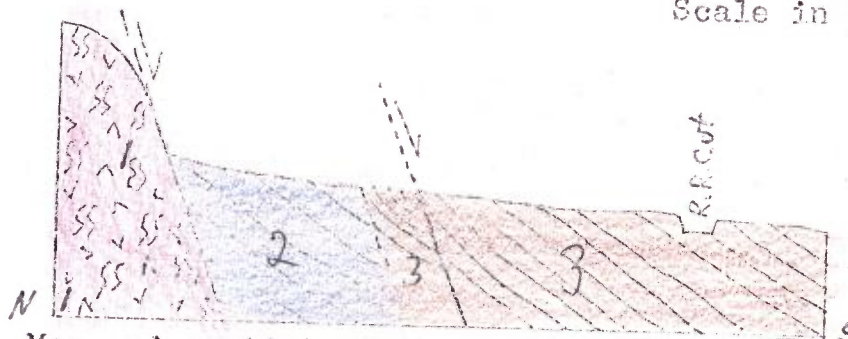
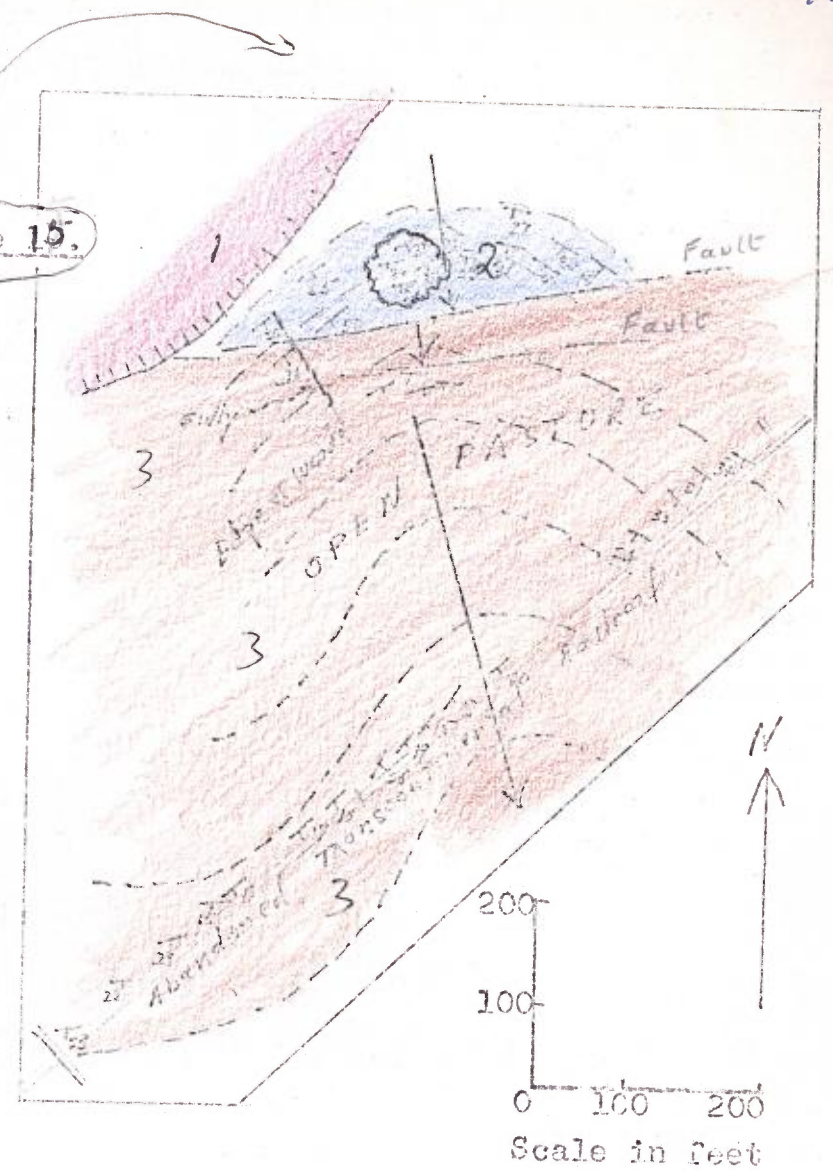
At Portneuf Station (see Fig. 15) the railroad ran through a long cut of Utica shale, with Trenton limestone occupying part of the territory between the track and the steep Precambrian escarpment to the northwest. The limestone here had at one time been quarried in part at least for lime, the remains of small lime kilns being still visible. Apparently, only Trenton limestone lies against the Precambrian. It is possible that beyond, and to the southwest of, these exposures the Utica shale is in contact with the gneiss. The Utica occurs not only in the cut, but also in the fields and woods to the northwest, and its contact with the Trenton must be a fault, -this is shown by the lack of harmony between the attitudes of the two sedimentary series, because the fossils of the Trenton point to a Neuville age, and because of the lack of the lower beds of the typical Utica development. Thus, it is probably the high degree of susceptibility to weathering which prevents the Utica from being exposed where it would normally come into contact with the Precambrian immediately southwest of these

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- 3 Utica
- 2 Trenton
- 1 Precambrian

- Precambrian boundary
- Axis of plunging syncline
- Trend lines of bedding
- Fault
- Quarry

Figure 15.



Map and section of the rocks exposed ~~one~~ mile due west of Fortneuf Station. The Precambrian escarpment here is steep and high. The dips of the Utica shale ~~should have been shown to decrease towards the south.~~ The section is ~~taken~~ approximately along the synclinal axis.

exposures. The lack of sedimentary rock exposures for more than 3 miles to the northeast is possibly due to the presence, under the overburden, of Utica shale.

At Deschambault Station, fairly strongly tilted Trenton limestone has been actively quarried for the production of lime in the past, and though Laverdière (1935) showed this outcrop to be a tongue of undisturbed Trenton, it is much more likely to belong to the downfaulted mass. Its attitude favors this hypothesis as does also its much greater resemblance to sedimentary types of the Neuville Formation than to those of the Deschambault Formation. In two places along the tracks Precambrian rocks occur within a few hundred feet. To the east of the four corners Utica shale is common in the fields and the streams. The discordances between the attitude of the Utica shale, of the Trenton limestone, and of the direction of the Precambrian - Paleozoic boundary can only be explained by presupposing the existence of a fault zone affecting all three rocks.

Southwestward from Deschambault Station the fault follows a course of about 40° , passing along the base of a low hill composed of Trenton limestone and finally crossing Belisle river, - after which all trace of it is lost. Laverdière showed the exact trace of the fault at the mill where the river crosses the road running northwestward to St-Julien. Along the base of the hill just referred to, the Trenton limestone stands up in relief against the Utica shale precisely as it does along the Neuville shore. The limestone escarpment dips 60° - 65° , and in several places a breccia of limestone fragments up to 2'-3' thick, is plastered to the face of the

escarpment (Fig. 14c). Though the Trenton limestone rarely dips as much as 20° , and commonly ranges between horizontal and 10° , the Utica shale in the fields and drainage ditches to the southeast dips from horizontal to vertical. In strike, both limestone and shale agree with the strike of the fault.

This fault is not known beyond Belisle river. No evidence of it can be seen on the south shore of the St. Lawrence where, in the Grondines area, there are no exposures. Because the Utica shale is in places faulted against the Precambrian the displacement must be at least 524' (the thickness of the Trenton). This figure is a minimum, but it is not possible along this fault to be as definite as it is along the Neuville fault. In all probability the two faults are comparable in amount of displacement.

The Portneuf Station Fault

Some 2 miles due west of Portneuf are the sites of wells 15 and 16 (S-75, Part 11). As the Trenton-Utica boundary lies $\frac{1}{2}$ -mile northwest of the sites, the wells should normally have started in Utica shale. Instead, the logs of these wells show Lower Lorraine shale down to 392' and 400', respectively. Because there is no appropriate dislocation of the Utica-Trenton boundary or of the Deschambault fault, the situation calls for a strike fault between the well sites and the nearest Utica outcrop. Such a fault, continued northeastward, would pass through Portneuf Station, from which it takes its name. The vertical movement is in the same sense as along the Deschambault fault, and involves 400' of Lorraine and

some 200' of Utica. Thus, 600' feet is a reasonable displacement figure.

It is, of course, probable that the Portneuf Station fault is closely related to the Deschambault fault, and may be a branch of that latter fault. If so, then the total movement along this fault zone can be measured directly from the dislocation of the Precambrian surface. This lies 1,360' below the surface (cl. 128') at the well site, and 225' above sealevel northwest of the Deschambault fault, giving a net differential of 1,453 feet. To this must be added an unknown vertical thickness of Precambrian rock stripped by erosion off the present exposures. If we allow about 50' as a minimum thickness so eroded the movement comes to around 1,500 feet.

On the aeromagnetic map, these normal faults, in which the northwest side has moved up in relation to the southeast side, are easily detected. The Precambrian basement, being closer to the surface on the northwest side of these faults, produces magnetic anomalies which are readily seen on the map.

Jacques Cartier River Powerhouse Fault

This fault (Fig. 16a,b) has already been alluded to. It crosses the river at a very narrow spot, and can be seen well on both sides. It strikes 55° E. and dips 65° S.E. All of the St-Casimir and most of the Grondines members of the Neuville Formation are eliminated by this fault, which therefore represents a movement of at least 400', and probably not much more. Its extension on either side of the river cannot be determined. It is, in reality, a pair

of faults, the more northerly being responsible for marked drags in the adjacent rocks, whereas the more southerly (at least on the east side of the river) is marked by a brecciated zone more than 1' thick.

Transcontinental Railway Fault

Three miles due north of Donnacona, Utica shales exposed in the abandoned Transcontinental Railway track strike about N.30°E. and dip 25° S.E. Less than ½-mile away Trenton limestone exposed in track gutters and in adjacent fields strike similarly, but dip only 2°. This relationship suggests a fault, but is not proof of one. However, about 2 miles along the strike of the beds to the south-southwest, where a small stream plunges down to Jacques Cartier river, the Utica shales have the abnormally high dip of 20°. Positive evidence of faulting can be seen in the cliffs bordering the river. It is reasonable to assume that the two localities were affected by the same fault.

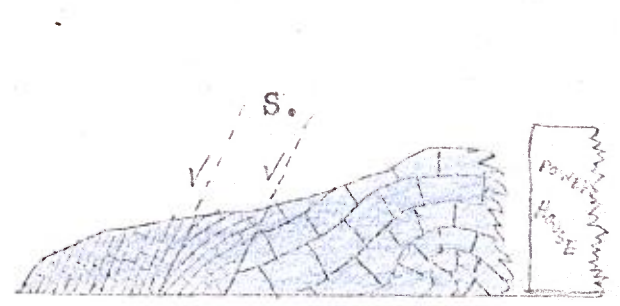
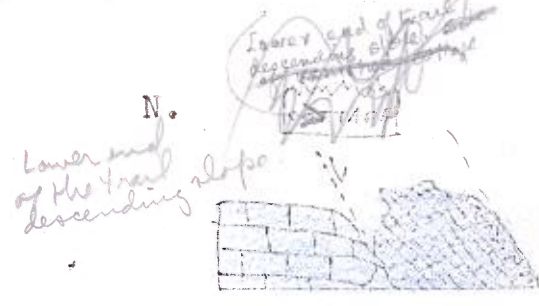
Cap Santé Structure

Immediately west of the wharf at Cap Santé the Utica shales dip as much as 10°, with visible very small-scale faults (Fig. 17). However, it is probable that these abnormal dips are more the result of minor folds than of regional faulting.

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16a
Figure 11a.

16b
Figure 11b.



0 5 10 15
Scale in feet

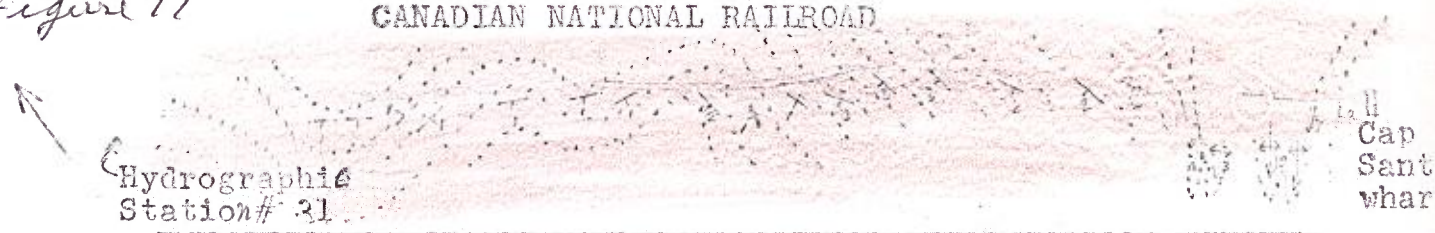
0 5 10 15
Scale in feet

Diagrammatic views looking respectively east and west, across the Jacques Cartier river at the site of the Power House below the horse shoe bend and a mile south of the northern border of the map.

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Figure 17

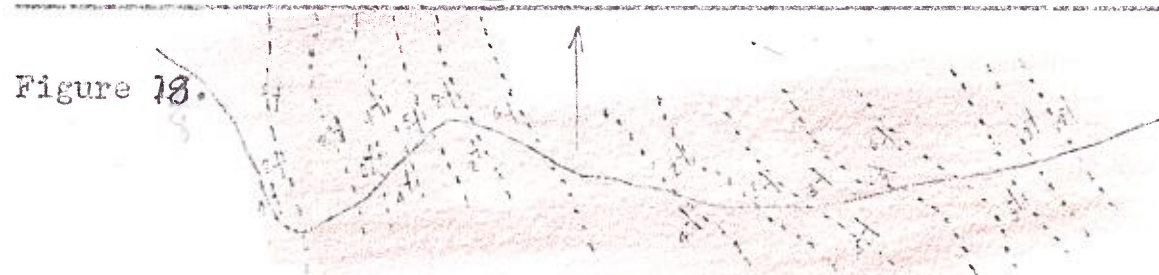
CANADIAN NATIONAL RAILROAD



0 1000 2000 3000 4000 5000 6000 7000 8000
Scale in feet

Figure 18.

Map showing attitudes and presumed trend lines of the Utica shale as exposed along the north shore of the St. Lawrence river and the Canadian National railroad track west of Cap Sante wharf.



UTICA TRENTON

0 1000 2000 3000 4000 5000
Scale in feet

Get 121 photos
as legend

Figure 16 a, b. Diagrammatic views looking respectively east and west across Jacques Cartier river at Power House below horseshoe bend a mile south of northern border of map-area. There is no significance to the two patterns of limestone, - both belong to the Deschambault Formation.

Figure 17. Map showing attitudes and presumed trend lines of Utica Shale as exposed along the north shore of the St. Lawrence and the Canadian National railroad west of Cap Santé wharf. Note that all plunges are in the same direction. There is one anomalous dip near western end of section.

Figure 18. Map showing attitudes and presumed trend lines of uppermost Trenton limestone along the Neuville shore from a point 7,000' west of Neuville eastward. The Trenton-Utica contact from this point runs east of north to the locality shown in Fig. 5.

The Ste-Emélie Fault

The positioning of this fault, like that of the southwestern part of the Neuville fault, is based on the anomalous presence of Upper and Middle Lorraine strata in well 69 (S-75, Part 11). The site of this well would normally have been considered the southwestern continuation of the Lower Lorraine rocks on the northwest limb of the Cap Santé anticline. Scarcely a mile intervenes in the direction of plunge between the outcrops of Lower Lorraine along Grande Rivière du Chêne (el. approx. 50') and the site of the well (el. 168'). Through this distance about 250' of Lower Lorraine beds would normally be distributed, so that the top of the Lower Lorraine or possibly the basal beds of the Middle Lorraine should occur 118' below the well site. Instead, the Lower-Middle Lorraine boundary comes in 830' below the surface at the well site, and so a movement of 712' is indicated. The aeromagnetic map of this region shows a northwest-southeast trend of crowded isogams, which is taken as the basis for the direction of this fault as shown on the map. The extensions of this fault beyond the limits of the Fortneuf area are unknown. This is the only known major fault in this area the strike of which does not conform in general with that of the Neuville fault.

The Champlain Thrust

The Champlain Thrust is the third great structural control in this area (the second is reviewed later in this report). Whether

a single fault (as is widely conceived) or a complex fault (as we interpret it) its general effect in the province of Québec has been to bring Cambrian and Lower Ordovician Appalachian rocks against and over Upper (or Middle and Upper) Ordovician Lowlands rocks.

This thrust was first postulated by Logan (1863) to explain the abnormal relations between the Appalachian and Lowlands rocks. He described the fault as follows (pp. 233-234), illustrating his idea with a diagram (cross-section, Montmorency to Orléans island) which needs little improvement today: "... an overturn anticlinal fold, with a crack and great dislocation running along its summit, by which the "Québec group, including the Sillery" is made to overlap the Hudson River formation. ... The dislocation ... comes upon the boundary of the province, in the neighborhood of Lake Champlain, From this, it proceeds in a gently curving line to Québec. And, on page 241, he wrote "the dislocation reaches the ... (south) side of the river a little above St-Nicolas church; and here the red and green shales, ... underlying the Sillery sandstones, constitute the strata which lean against the Hudson River beds". Ellis (1888, p. 15K) wrote "On the south side of the St. Lawrence, two miles above the wharf at St-Nicolas,, ... the contact between the grey, sandy shales and sandstones of the Lorraine and the red, green and black shales of the Sillery formation is well seen both on the beach and in the cliff. The beds along the line of fault for several yards are much crushed, but the general dip of the two series is S. "65°-90°". And, on page 17K,

he wrote: "From the fault above St-Nicolas the line of contact there described between the Lorraine and Sillery formations extends apparently in a direct line, as indicated on the geological map, 1866, to the Bécancour River, where it is seen about fourteen miles above the mouth". This distance given by Ellis should be doubled.

Raymond (1913) showed in detail the course of part of this fault, and later Parks (1929) gave further details. However, there was very little information regarding the precise trace of the fault along its supposed course through Québec until the recent work of the Québec Department of Natural Resources. Its intersections with the St. Lawrence shores shortly above Québec city are well known. Thence southwestward its position in the Portneuf map-area can be placed between Normanskill on the east and Utica-Lorraine on the west. Thus, starting from the rear of Québec City the Thrust goes southwesterly to the north shore of the St. Lawrence at Cap Rouge, where it can be well seen at low tide. Crossing the river, it comes upon the south shore $2\frac{1}{2}$ miles west of St-Nicolas church and enters the Portneuf map-area $1\frac{1}{2}$ miles south of Hydrographic Station #38. Thence it follows a curving line, concave to the southeast, as far as the second road intersection southeast of Les Fonds. From here it presumably goes southwestward, passing $\frac{1}{2}$ -mile east of Laurier. Throughout this 14 miles stretch in the Portneuf map-area there are no exposures along its course, which in the southern part may be as much as $\frac{1}{2}$ -mile out in either direction as traced on the map. In the Chaudière map-area, it dips to the southeast at a low angle.

In the Portneuf map-area, the Champlain Thrust cannot be referred to as a single fault as is usually done. Rather, it is a series of thrust faults which have brought a band of allochthonous rocks in contact with those of the Lowlands. This allochthonous band is composed of several slices which contain Sillery, Lévis, Bourret, Aubin and Utica-Lorraine types of rocks.

In the St-Nicolas map-area to the east, a series of thrust sheets or slices is also present, and the rule here is "the older the slice, the younger its rocks". Here we find Lower Cambrian (Sillery Group) rocks resting on Lower (Lévis-Lauzon Group), Middle and even Upper Ordovician (Utica-Lorraine Groups) rocks; Lower Ordovician rocks resting on Middle and Upper Ordovician rocks; and Middle Ordovician rocks resting on Upper Ordovician rocks of the Utica-Lorraine type which cover the northeastern part of the Chambly-Fortierville syncline. In the Portneuf area, the same principle can be applied since we have Lower Cambrian (Sillery Group) rocks resting on Lower (Lévis Group), and Middle (Normanskill Group) Ordovician rocks; Lower Ordovician rocks (Lévis Group) resting on Middle Ordovician (Normanskill Group) and Upper Ordovician (Utica-Lorraine Groups) rock. There is also the St-Augustin slice (containing Utica-Lorraine complexly folded) which rests on the northeastern flank of the Chambly-Fortierville syncline.

Poorly preserved graptolites found in the Lorraine unit of this slice are similar to the graptolites of the Canajoharie shale (Riva, 1969 personal communication). This will be further investigated when better preserved graptolites are available.

FOLDS

The major folds in the area are the northern extensions of the Chambly-Fortierville syncline and the Leclercville anticline. The two folds are accompanied to the west and to the east by a series of smaller anticlines and synclines whose axes are more or less parallel to the axes of the two main structures. At Cap Santé, west of the wharf, folds that give a good idea of the nature of the folding in the area may be easily seen (Plate XVIIIIA).

At the eastern limit of the map-area, the northeastern continuation of the Chambly-Fortierville syncline can be seen near Roches river east of Neuville. The attitudes of the Lorraine beds show the presence of a syncline whose axis crosses Roches river in a northeasterly direction at the point where this river intersects Highway 2.

In several localities where the folding is gentle (and gentle folding is the rule except in the folded bands of Utica-Lorraine and in the Bourret Formation) the attitudes of the beds indicate broad, open folds plunging southwest. This is, of course, entirely expectable. Reference to Figure 8a-d, where all pertinent data are assembled will bear this out. -Although the folding is not strong in the localities illustrated, minor disturbances such as drag folds, complications, and even brecciations, occur on the southeastern flanks of the anticlines, indicative of a yielding to pressure there (see also the exposures along the lower part of the Grande Rivière du Chêne). This tendency to fracture on the flanks

1 page
2 versions

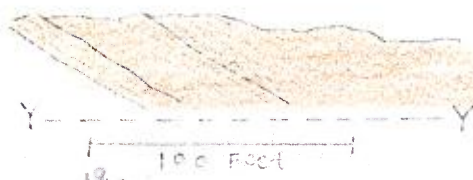


Figure 19a. Thrust faults on right bank of Bourret Brook, 200' above the bridge east of Les Fonds. Bourret Formation member. For location see Figure 19e.



Figure 19c. For location see Figure 19e. Complications along the right bank of Bourret Brook, 500' below bridge east of Les Fonds. NE SW



Figure 19b. Right bank of Bourret Brook, for location see Figure 19e. Complications two anticlines and two synclines, in Bourret Formation.

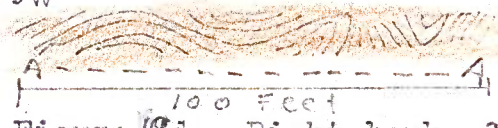


Figure 19d. Right bank of Bourret Brook, for location see Figure 19e. Complications two anticlines and two synclines, in Bourret Formation.



Figure 19e. Map of Bourret Brook from bridge east of Les Fonds (#) to Highway No. 3 (3).

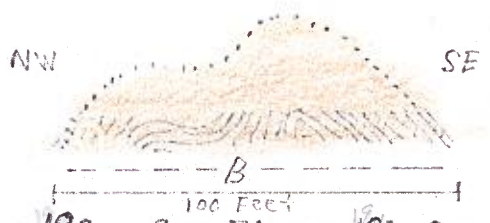


Figure 19f. See Figure 19b for location. Lorraine Shale with bed of limestone.

Figure 19b. Enlargement of part of Bourret Brook marked A in figure 19e, showing closely crowded fold axes.

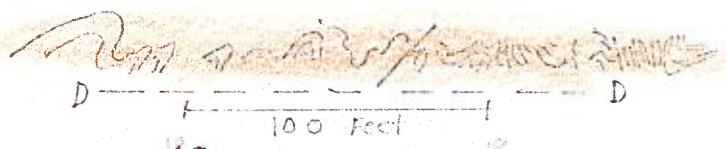


Figure 19g. See figure 19e for location. Complications in Bourret Formation.

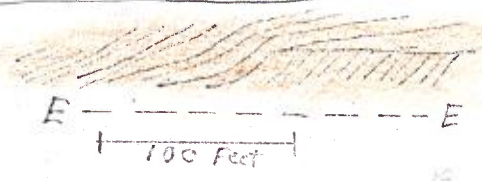



Figure 19h. See Figure 19e for location. Bourret Formation shales showing gradation from flexure to overthrust.

Figure 8. Illustrations of the exposures of Bourret Formation structures in shales on the eastern limb of the Chambly-Fortierville syncline to show the stronger folding characteristic of that limb.

 Bourret Formation

(127A suite)

of open folds is not a favorable indication of the ability of the rock to retain oil or gas. A compilation of the deformation is shown in Figure 9.

Plotting of the attitudes of the beds exposed along the streams flowing into the St. Lawrence northeast of Lotbinière show that a few subsidiary wrinkles complicate this western limb of the main fold. The most important of these is the Cap Santé anticline, which, in itself, would be capable of rendering otherwise normal attitudes into those actually seen.

Chambly-Fortierville Syncline and the Cap-Santé Anticline

In the northeastern corner of the Bécancour map-area, outcrop of the Queenston shale almost pinches out. It is probable that some of the Queenston actually crosses onto the Portneuf map-area. Evidence for this is provided by the log of a deep well drilled within the Lyster map-area (Fortierville No. 1, Q.D.N.R., S-75, Part II p. 51, 1964), in which Queenston beds were cut down to 180' below the surface. Direct evidence of the synclinal structure in the Portneuf map-area is given by the distribution of the beds of the Middle Lorraine (Chambly Member) in relation to the distribution of the underlying Breault Member; this distribution indicates that the beds concerned form part of the northeastern end of a southwest-erly plunging syncline. There is, however, one peculiar development. The easternmost exposure of Chambly Member beds on Grande Rivière du Chêne agrees with the rest perfectly in its lithology and its

fauna, but it dips northeast. Although other interpretations are possible, we consider this as a result either of a minor axial wrinkle within the main fold, or drag along a northeast-southwest fault with a downdrop to the northwest. No such faults are known in this area, but they do occur farther southwest, especially near Montréal. The synclinal axis cuts the shore of the St. Lawrence close to Ste-Croix. Thick sandstones of the Chambly Member are found in the cliffs, dipping southwest and flanked on both sides by Cryptolithus-bearing strata of the Breault Member.

Exposures east of the axis of the main syncline are few, but these few indicate that as the Appalachian frontal series of thrusts is approached the beds become more and more intensely folded. In general it may be said that more than 6 miles from thrust # III the dips of the Lorraine beds are almost invariably less than 10° , whereas within $1\frac{1}{2}$ miles of this thrust the dips are almost invariably more than 10° ; also, between thrust # III and thrust # II isoclinal structures are the rule. Illustrations of a few such structures are given in Fig. 19a-h.

Observations along the south shore of the St. Lawrence from the eastern border of the area westward for about a mile reveal a complex of rocks in which there is an alternation of Utica and Lorraine, with some Normanskill. The lithologic observations made here are as follows:

- 0 feet St. Lawrence shore at eastern edge of Portneuf map-area.
Proceeding upstream.
- 600 Black, bituminous, fissile shales, with graptolites;
scattered small exposures from 0'-600'. Lower Lorraine.
- 1030 Heavy-bedded sandstone and conglomerate (pebbles up to
2"). Lower Lorraine
- 1145 2' sandstone bed, widening eastward to 6' of conglomerate,
similar to that at 1,030'. Pebbles up to 3", well
rounded. Lower Lorraine
- 1180 Brecciated dark gray beds with hard, green, cherty layers.
Aubin Formation
Normanskill
- 1800 Hard flinty shales, bluish gray with greenish and brownish
beds, forming point near Hydrographic Station # 37. No
fossils seen. Rarely break along stratification. Small
but well marked anticline at 1,700'. Considerable
crumpling in some layers. The same type of rock occurs
on the tidal flat, where some beds have graptolites.
The beds along the shore are interpreted as Lorraine
beds slightly metamorphosed by faulting.
Aubin Formation.
Normanskill.
- 2000 Foot of road near eastern border of map-area.
- 2010 Stream, not shown on map. See below for description of
exposures. See Figure 9a.
- 2500 Soft gray shales with several intercalated beds of
fragments green rock. Probably indurated Lorraine.
- 3600 Coarse, light gray sandstone, some layers conglomeratic.
3650 Lower Lorraine
- 3700 Soft, solid, bituminous shale, with graptolites.
Lower Lorraine
- 4000 Soft and hard, greenish, flinty shale; well stratified.
Lower Lorraine
- 4150 Thin-bedded, well stratified limestone and shale, intensely
crumpled. Block of Normanskill
- 4250 Red shale and slate, fissile and chunky breaking, with
soft and flinty, black and gray shale and some dove-gray
limestone. Block of Normanskill
Figure 9e.

- 4450 Dark shale Utica, or possibly
L. Lorraine
- 6410 Soft, crumbly, sandy shale. Beyond this locality nothing
but definitely Lorraine and Utica beds occur as far as
St-Antoine. Lower Lorraine
and Utica.

In this sequence the Normanskill rocks contain blocks of green chert (Aubin Formation), of dolomitic mudstone and ribbon limestones, and of red shales (probably also Normanskill). These thrusting Normanskill rocks are surrounded by Lorraine shales.

The Chambly-Fortierville syncline is broken by northeast-trending normal faults, especially on its northwest flank. To the southeast, bands of much folded and faulted Utica-Lorraine type of rocks cover the southeast part of the Chambly-Fortierville syncline. Southeast of fault # III isoclinal folds overturned toward the northwest and plunging generally toward the southwest are present in the Utica-Lorraine complex. Also, there are some slivers of folded Normanskill (Aubin Formation, Bourret Formation) in this complex.

These folded bands of the Lowlands type of rocks plus the Bourret Formation could well represent what has been called elsewhere the St-Germain Complex.

The more or less uniform strikes and dips are in accord with what is usually found in the St-Germain Complex, where incompetent beds have been regionally deformed by an overriding slice and have therefore assumed a rough regularity of structure of which the main characteristic is isoclinal folding with the axis plunging steeply

toward the southeast. This gross structural feature extends along the shore to St.-Antoine, beyond which point the folding, though intense, is not isoclinal. As a consequence, high dips to both northwest and southeast are common. Ste.-Croix Est is a critical point structurally because to the east the minimum dip is 30° whereas to the west dips of more than 8° are exceptional. Moreover, west of Ste.-Croix Est the strikes are no longer predominantly northeast, as should be the case in a uniformly and tightly folded region where the beds are almost everywhere parallel to the axial planes of the folds. Instead, and because the folds are open the dips "migrate" around their ends.

A peculiar feature near Les Fonds is outlined below. From near the wharf a road ascends to the plateau top and, in about a mile, crosses Bourret brook. Downstream, the brook makes several sharp hairpin turns, flanked practically all the way by rock walls. Anticlines and synclines may be seen along these walls, some extending from one bend to another (see Fig. 8b). The beds here are Lower Lorraine (Dalmanella sp. and Chonetoides plicatella) on both flanks and Utica in the center of the main anticline. About half-way between the road mentioned above and Highway 3 a remarkable flexure-fault can be seen on the north bank of the brook. There (Fig. 8h) the beds change from a simple tilted condition on the southwest through a monocline to an actual fracture toward the northeast. The fracture is actually a thrust fault developed along a nearly horizontal surface. It would appear that the rocks were securely anchored at the northwest part of this section, and that

pressure applied from the southeast at the northeast end was sufficient to fracture the beds as indicated, thus producing a rotational thrust movement. Complications abound in the shales in this section.

ECONOMIC GEOLOGY

Petroleum and Natural Gas

Although both the Trenton limestone and the Utica shale have generally an oily odor when freshly broken, no record exists of any findings of oil in commercial quantities in the area. The same applies to gas, with the exception of a well which produces gas on the Convent property at Neuville, where it was once used for lighting purposes. In many instances, droplets of oil ooze from freshly broken Deschambault limestone, and black coal-like seams traverse the limestone in several places. Both the oil and the "coal" have excited local curiosity, and more has been expected of these phenomena than they deserve. ~~The "coal" have excited local curiosity, and more has been expected of these phenomena than they deserve.~~ The "coal" is solidified petroleum residues.

The Utica shale is everywhere bituminous. Some layers are strongly odoriferous, and it is possible to detect an oily odor while walking alongside many cliffs of this rock. Analyses made by the Québec Department of Natural Resources showed only a trifling amount of hydrocarbons, however.

In 1956, 1957, 1958 and 1964 a total of 7 deep wells were drilled in the present area in a search for oil or gas. These are

listed in Québec Department of Natural Resources Publication S-75 as numbers 9, 10, 15, 16, 51, 69, and 72. Summary logs of these wells are below given in Appendix I, and complete logs in Appendix II. A correlation chart showing the formations cut in 6 of these wells all except 51 given on page 25. None of the wells produced commercial amounts of gas or oil. Wells 10 and 72 were barren. In 9 and 15, gas was tapped in the Middle Trenton, and oil appeared in the core at various horizons in the Deschambault and Black River formations. Well 16 had shows of gas in the Lower Lorraine, Upper Trenton, Deschambault, and Precambrian, and traces of oil in the Deschambault. In well 69 gas was found in the Utica, Upper Trenton and Deschambault.

If any generalization can be made it is that gas occurred most commonly in Trenton horizons. It is disappointing that, although the "Black Beds" are largely sandstone, gas was found in but two horizons in well 69. Unfortunately the finding of commercial quantities of oil or gas seems not to be favored by either experience or geologic indications.

Copper, Molybdenum, Radioactive Minerals

The Black River mine, on land owned by Mr. Desrochet ^{Stanislas} ^{is} ~~on~~ ^{4 miles east of St. Flavien Parish, 1,600' from the public road on Range Bois Tronc de l'Ar} ~~the eastern slope of St. Flavien hill,~~ was worked for copper but there is no record of any successful extraction of ore. This was in the 1860's, and has been a constant source of rumors of riches in copper ever since.

The Portneuf Mineral Corporation prospected for molybdenite in Precambrian rocks ^{in Range II, lots 290, 291, 293, 293-A and 509 of Deschambault} ~~northwest of Portneuf,~~ but nothing was found ^{Parish} ~~and on lots 184, 185, 185-A, 187 and 658 of N.-D. of Portneuf Parish~~ of commercial value. A smaller exploration program was carried out

on the land of Narcisse Perron^{lots 301, 304, 305, 306, 3rd concession, Deschambault seigneurie, Antwerp County} for copper and molybdenite but without results. Mica in pegmatites has also attracted some attention.

According to Shaw (1958) four holes were drilled in 1953 on lot 331, concession III, Notre-Dame de Portneuf parish, Portneuf seigneurie, on the Gaudry property, in search for radioactive minerals. Urenophane, autunite, thucolite, and a heavy, unidentified radioactive mineral were found. The best assay was 0.1% of U_3O_8 along 5' of core.

Agricultural Lime, Cement

Lime formerly was produced in a number of local kilns, one at Deschambault and one at Pont Rouge particularly. Now it comes from only the Gauthier Frères' mill at Neuville, with a capacity of 1,500 tons/day.

Nearly all of the Trenton limestone has a lime-producing potential (see Tables I and II), and the Deschambault limestone is rich enough in $CaCO_3$ to support a chemical industry.

At St-Basile, cement is produced by Ciment Québec Inc. This mill has a capacity of 29,000 97½-lb bags/day. Most of the cement goes to the Montréal market.

BUILDING STONE

The Portneuf area abounds in good deposits of first-class building stone. However, since the industry moved west to St-Marc des Carrières, all such production ceased here. The

Portneuf area could easily supply the needs of any of the large Canadian cities from its store of Trenton limestone alone.

The Utica shale is not in itself a good building stone, but in a few places it contains several beds of splendid, fine-grained limestone which break into rectangular blocks 2", 3" or 4" thick.

Some Precambrian gneiss has been quarried in this area. The church and one or two houses at St-Gilbert were built of gneiss from a nearby quarry. The cost of opening a quarry in the Precambrian gneiss would probably be prohibitive today.

Road Material

With the St-Marc des Carrières quarries producing all the crushed stone the local region requires there is little need to utilize today the inexhaustible supply of that material from the Trenton limestone deposits of the northern Portneuf area. However, the Gauthier brothers at Neuville produce crushed stone for local use; and, in March, 1968, "Pavage Frontenac Ltée" of Québec, opened a new quarry at Neuville. On the south side of the St. Lawrence, a quarry (St-Flavien Quarry Inc.), about 3 miles northeast of St-Flavien, was in operation until November, 1967. Road material has been taken in the past from the sandstone north of Hurette, on Mr. Lambert's land.

Gravel is in short supply in the area north of the St. Lawrence. In the most northern parts, particularly on the Precambrian uplands, the glacial drift can be screened, in places, to give a fairly satisfactory road material, for enough clayey component remains with the sand to make a good binder. In the area south of

TABLE I

Drolet Property

Stone ex Neuville, Quebec

Hole #9

<i>Carotte</i> Casing Core	SiO ₂	R ₂ O ₃	CaO	MgO	<i>Perte</i> Loss	Total
0'-10'	1.36	.62	53.66	.79	41.94	98.37
10'-20'	1.00	.56	54.05	.47	42.64	98.72
20'-30'	.96	.44	54.21	.62	42.50	98.73
30'-40'	2.32	.98	53.35	.68	41.90	98.23
40'-50'	1.20	.86	53.90	.63	41.94	98.53
50'-60'	12.16	4.28	44.44	1.12	35.74	97.74
60'-70'	4.92	3.04	49.95	.87	39.44	98.22
70'-80'	60.86	7.34	15.21	1.30	12.16	96.87
80'-87'	85.30	6.30	2.38	1.06	2.34	97.38

TABLE II

Darveau Property

Hole #10

<i>Carotte</i> Casing Core	SiO ₂	R ₂ O ₃	CaO	MgO	<i>Perte</i> Loss	Total
0'-6'	2.00	.98	53.11	.97	41.90	98.96
6'-16'	1.90	.70	53.66	.59	42.12	98.97
16'-26'	2.36	1.14	52.64	.65	41.68	98.47
26'-36'	.90	.58	54.13	.54	42.44	98.59
36'-46'	2.08	1.02	52.93	.72	41.52	98.29
46'-56'	14.48	3.14	44.13	1.10	35.16	98.01
56'-67'	21.82	4.44	38.06	1.31	31.88	97.51

Holes drilled by Canada Cement Co. Ltd. in their Neuville Property.

Tous forés par la compagnie Canada Ciment sur leur propriété de Neuville.

the St. Lawrence, sand is widespread, but is generally too clean to be a good road material. River sand and gravel are common in the southeastern corner. Also, there are numerous ridges of nearly pure quartz sand, presumably old dune ridges paralleling post-glacial shorelines. An asphalt mix plant is in operation 3 miles northeast of St-Flavien, using local sand.

At Pont de la Noreau a small industry has developed the sifting post-glacial shells from sands, which can be sold for chicken grits, drives, etc.

gravier à poulet, on comme gravier pour les entrées de maison.

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Province of Quebec

DEPARTMENT of MINES

NAME Convent de Neuville
ADDRESS Neuville village
MAP AND REFERENCE NUMBER _____

WELL INFORMATION

Year drilled 1915 Diameter of hole _____
1900
Depth of overburden probably none Depth in rock 200'
Nature of rock, particularly color limestone

GAS INFORMATION

Gas struck in overburden - - between overburden and rock - -
_____ feet below top of rock
~~Violent, easy, merely bubbles~~ Poor flow of gas
Attempts at control
Used for ~~cooking~~ lighting, heating ~~1~~ convent houses
~~increasing~~ ~~constant~~ ~~decreasing~~
Flow decreasing, constant, increasing.

Only two lights were ever used

ADDITIONAL INFORMATION

Well was dug for water. No water supply.

*Dug by Emile Guebaud & fondus
No longer used
July 1949
Villey*

Company: Bald Mountain Oil Co.

Well Name: Bald Mountain-Cap Santé No. 1

Location

Lot: 102
Concession: I
Parish: Cap Santé
County: Portneuf
Coords: Approx. 7/10 mile N.W. of highway No. 2, 200'
from Cap Santé-St. Basile road side

Ground Elevation: 219'
RF Elevation: 221'

Spudded: April 5, 1957

Completed: May 20, 1957

Driller: Logan Brothers

Type of Rig: Diamond Drill

Result: Dry Hole

Water

42', 55', 84', 558'-560'

Gas at: 647', 662'

Oil at: 736', 763'-764', 792.5', 803', 805', 887'-887.5'

Log by T.H. Clark:

<u>Formation</u>	<u>Depth interval (in feet)</u>
Overburden.....	0 - 5
Lower Lorraine.....	5 - 57
Utica.....	57 - 330
Upper and Middle Trenton.....	330 - 740
Lower Trenton (Deschambault).....	740 - 840
Black River.....	840 - 914
Precambrian.....	914 - 954

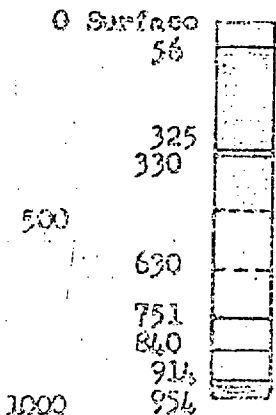
QUEBEC DEPARTMENT OF MINES

SUMMARY LOG OF CAP SANTE NO. 1

BAIRD MOUNTAIN OIL CO.

Depths in feet below surface

DIAMOND DRILL CORE



LOWER LORRAINE
 UTICA
 LOWER UTICA
 UPPER TRENTON
 UPPER OR MIDDLE TRENTON
 MIDDLE TRENTON
 LOWER TRENTON
 BLACK RIVER
 PRECAMERIAN

See also...
See also...

- LOWER LORRAINE --- Dark gray, finely micaceous shale, 92%
Thin sandstone beds up to 3", 8% of core
- UTICA --- 56-150 Dark gray, soft shale, finely color banded, slightly calcareous
Oily odor; oil in fractures. Silty beds up to 6", 4% of core
150-235 Dark brownish gray shale, finely color banded, hard, calcareous.
A few thin sandstone beds. Silty beds up to 6", 8% of core. Oily
odor, oil in fractures
235-325 Dark, soft, fissile shale. Siltstone beds 8% of core
- LOWER UTICA --- Dark gray to black shale, calcareous. No siltstone. 1/4" trilobite
debris bed at base
- UPPER TRENTON --- Dark gray, dense to crystalline limestone and dark gray shale.
bedding mostly irregular. Limestone:shale 46:54 above, 78:22 below
- UPPER AND MIDDLE TRENTON --- Lithology as above. Middle Trenton fossils present
- MIDDLE TRENTON --- Dark gray, dense limestone, a few 1" crystalline beds. Shaly
partings common. Limestone: shale 85:15
- LOWER TRENTON --- Faint brownish gray crystalline limestone. Shale never more
than 5%.
Bryozoan mats occur from 822 to 839
- BLACK RIVER --- Dark brownish gray, dense to fine-grained limestone, with inter-
bedded gray sandstone. Limestone beds contain *Phytosia*
904-914 Coarse-grained sandstone, some quartz conglomerate, pink feldspar
grains
- PRECAMERIAN --- Biotite gneiss and pink quartzite

Handwritten signature or initials

Company: Bald Mountain Oil Co.

Well Name: Bald Mountain-Cap Santé No. 2

Location

Lot: 210
Concession: Pincourt
Parish: Cap Santé
County: Portneuf
Coords: 200' from W. LL., 200' from S. LL.

Ground Elevation: 236'
RF Elevation: 238'

Spudded: Aug. 7, 1958

Finished: December 10, 1958

Driller: A. Dubé

Type of Rig: Cable

Result: Dry Hole

Water

30'-62', 380', 655', 725', 800'

Log by T.H. Clark:

<u>Formation</u>	<u>Depth interval (in feet)</u>
Overburden.....	0 - 50
Utica.....	50 - 185
Upper & Middle Trenton.....	185 - 655
Lower Trenton (Deschambault)...	655 - 750
Black River.....	750 - 805
Precambrian.....	805 - 853

QUEBEC DEPARTMENT OF MINES

CAP SAITE NO. 2

BALD MOUNTAIN OIL CO.

COLUMNAR SECTION

Depth in feet below surface	Thickness	Formation	Description
0	0	OVERBURDEN	
50	50	WYCK	Dark gray shale, light brown streak, calcareous. Graptelites common
185			
250		UPPER and MIDDLE TRENTON	Limestone, dark gray, mostly dense to very fine-grained — 70% to 95% of samples
500	525	TRENTON	Shale, dark gray to brownish gray, non-calcareous. 5% - 30% of samples
			535' Possible boundary between Upper and Middle Trenton
	655	LOWER TRENTON	Light buff limestone, dense to fine-grained Shale less than 5%
750	750	BLACK RIVER	Medium dark limestone, dense to fine-grained
	805	PRECAMBRIAN	Shale, dark gray up to 10%
	855		Quartz-biotite rock
1000			

T. H. Clark
T. H. Clark
June 22, 1959

Company: Bald Mountain Oil Co.

Well Name: Bald Mountain-Portneuf No. 1

Location

Lot: 3
 Concession: I
 Parish: Deschambault
 County: Portneuf
 Coords: 1/2 mile S.E. of C.P.R. Right of Way

Ground Elevation: 129'

RF Elevation: 131'

Spudded: Feb. 18, 1957

Completed: April 2, 1957

Driller: Logan Brothers

Type of Rig: Diamond Drill

Result: Dry hole

Water

300', 420', 952'

Gas at: 937'-940', 976', 1071', 1122', 1199', 1237', 1274'

Oil at: 1225', 1260'

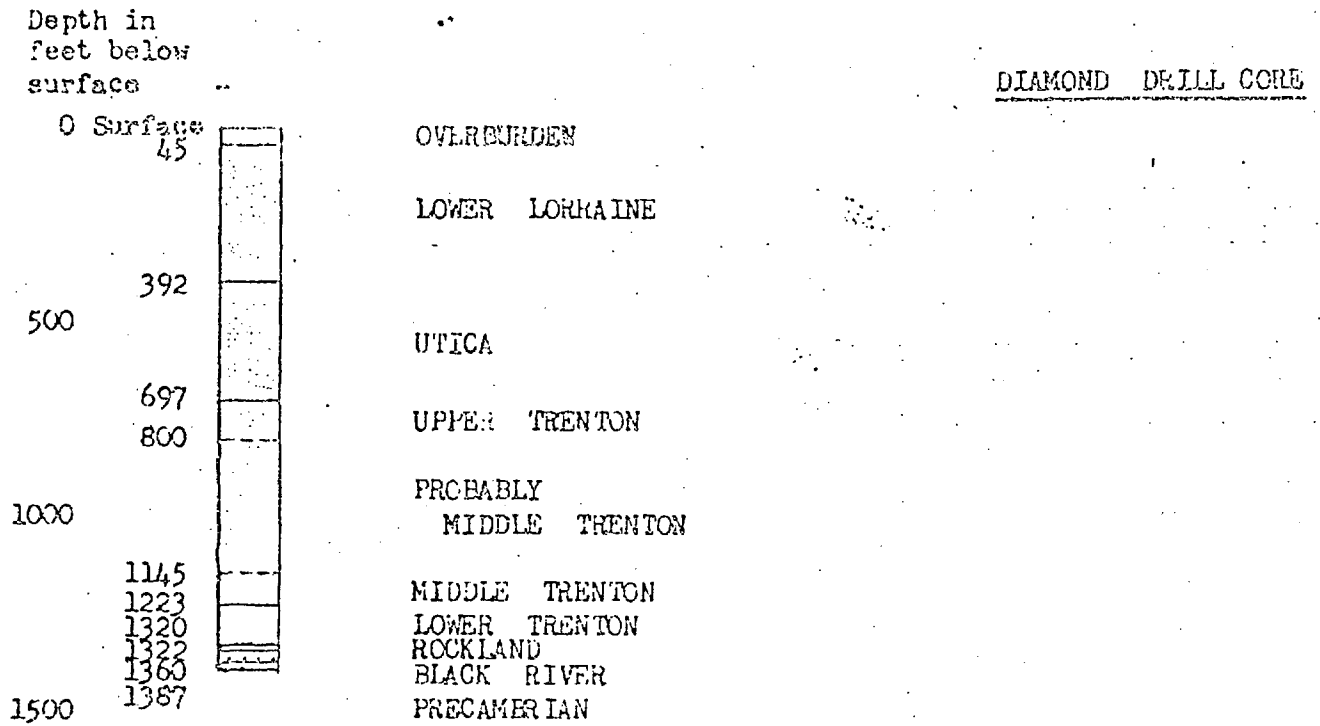
Log by T.H. Clark:

<u>Formation</u>	<u>Depth interval (in feet)</u>
Overburden.....	0 - 45
Lower Lorraine.....	45 - 392
Utica.....	392 - 698
Upper and Middle Trenton.....	698 - 1224
Lower Trenton.....	1224 - 1320
Lower Trenton (Rockland).....	1320 - 1322
Black River.....	1322 - 1360
Precambrian.....	1360 - 1388

QUEBEC DEPARTMENT OF MINES

SUMMARY LOG OF PORTNEUF NO. 1

BALD MOUNTAIN OIL CO.



LOWER LORRAINE -- Very dark gray shale, with 1" beds of light sandstone. A few silty beds. Oily odor. Shale: sandstone

UTICA -- Dark gray to black shale; a few calcareous siltstone beds 1" - 2". Oily odor

UPPER TRENTON -- Dark gray, fine- to coarse-grained crystalline limestone. Dark gray shale. Limestone : shale. Irregularly interbedded

MIDDLE TRENTON -- Dark gray, dense to fine-grained limestone. Dark gray shale. Bedding regular to irregular. Limestone:shale

LOWER TRENTON -- Light to medium gray, brownish, crystalline limestone. Shale less than 1%. Oily odor. Bryozoan mats 1268 - 1280

ROCKLAND -- Dark gray, fine-grained crystalline limestone and pale greenish gray sandstone

BLACK RIVER -- Limestone, fine-grained to lithographic 1322 - 1325. Sandstone, limestone and a little dolomite, all mostly black 1325 - 1360

PRECAMBRIAN -- Pink biotite gneiss

*W. Clark
January 1909*

Company: Bald Mountain Oil Co.

Well Name: Bald Mountain-Portneuf No. 2

Location

Lot: 3
Concession: I
Parish: Deschambault
County: Portneuf
Coords: 100' S. of Bald Mountain-Portneuf No. 1

Ground Elevation: 128'

RF Elevation: 130'

Spudded: April 22, 1957

Suspended: June 1, 1957

Driller: McMaster & Sons

Type of Rig: Cable

Result: Dry hole

Water

Fresh at: 37', 406'-408'
Salty at: 1352'

Gas at: 83', 352', 700'-705', 1240'-1245', 1347'

Oil at: 1313', 1338'

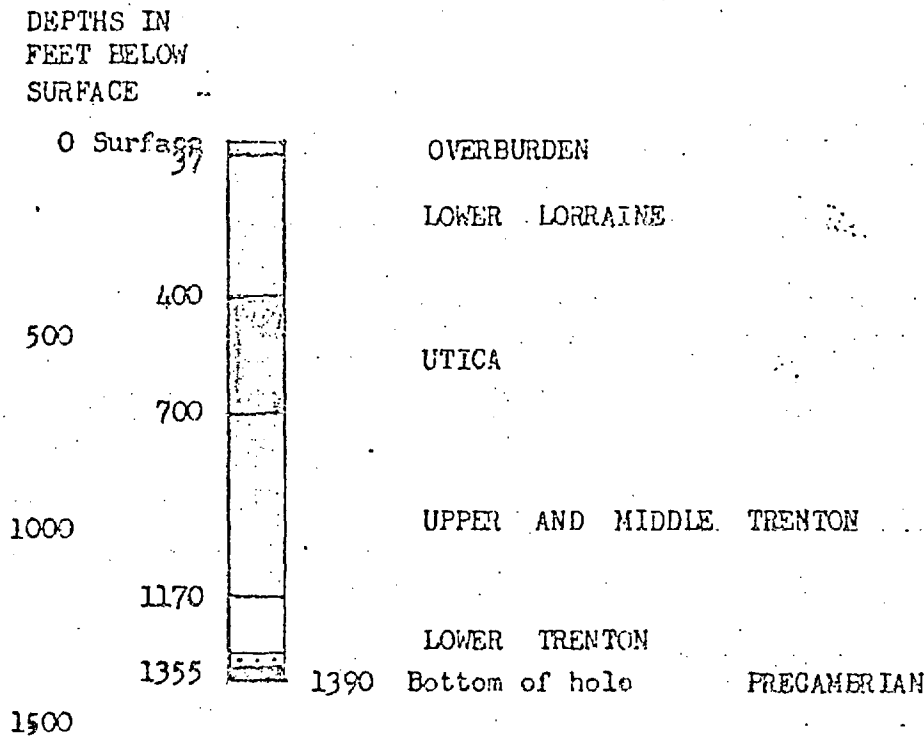
Log by T.H. Clark:

<u>Formation</u>	<u>Depth interval (in feet)</u>
Overburden.....	0 - 37
Lower Lorraine.....	37 - 400
Utica.....	400 - 700
Upper and Middle Trenton....	700 - 1170
Lower Trenton.....	1170 - 1355
Precambrian.....	1355 - 1387

QUEBEC DEPARTMENT OF MINES

SUMMARY LOG OF FORTNEUF NO. 2

BALD MOUNTAIN OIL CO.



DESCRIPTION OF FORMATIONS

LOWER LORRAINE: Dominantly dark gray shale; lesser amounts of light gray, fine-grained sandstone and medium to dark gray siltstone.

UTICA: Predominantly dark gray to black shale; a little shaly buff-gray limestone

UPPER & MIDDLE TRENTON: Mostly medium gray, fine-grained limestone, with dark gray dense and medium gray crystalline limestone in lesser amounts. Shale 10%

LOWER TRENTON:
1200-1315 Predominantly light to medium gray crystalline limestone; very little dense limestone. Shale 4%

1315-1350 More than half light gray quartz sandstone. Limestone 41%; Shale 1%

PRECAMERIAN: Biotite gneiss.

T. H. Clark
T. H. Clark
December, 1958

Q.D.N.B. P.S.-75, 11, 1964

Propriétaire: Goyette

Nom du Puits: Fortierville No 1

Endroit

Lot: 17
Rang: 1X
Paroisse: St-Jean Deschaillons
Comté: Lotbinière

Elévation du Terron: 226'

Elévation du Plancher de la Foreuse: 228'

Commencé: 15 septembre 1943

Terminé: 5 novembre 1943

Foreur: Connors Drilling Co.

Type de Foreuse: Foreuse au diamant

Résultat: Forage non productif

Eau

263', 266', 418'

Gaz à: 771'

Analyse géologique:

<u>Formation</u>	<u>Intervalle de profondeur (en pieds)</u>
Mort-terrain.....	0 - 70
Richmond (Bécancour River)....	70 - 180
Richmond (Pontgravé River)....	180 - 771

*On ne sait pas si ce puits a été obturé

Company: Lowlands Exploration Ltd.

Well Name: Imperial Lowlands No. 1

Location

Lot: 24
 Range: Village St. Michel
 Parish: Ste. Emmélie de Lotbinière
 County: Lotbinière
 Seigniory: Lotbinière
 Coords: 310' from E. LL., 813' from N. LL.

Ground Elevation: 168'

RF Elevation: 170'

Spudded: June 22, 1956

Completed: Oct. 20, 1956

Driller: Stubble & Stubble

Type of Rig: Cable

Result: Dry Hole

Water

Fresh at: 26'
 Salty at: 3043'

Gas at: 2276', 2389', 2940', 3042'

Log by T.H. Clark:

<u>Formation</u>	<u>Depth interval (in feet)</u>
Overburden (sand).....	0 - 10
Overburden (sand & clay)...	10 - 30
Overburden (sand).....	30 - 50
Overburden (sand & clay)...	50 - 60
Upper Lorraine.....	60 - 330
Middle Lorraine.....	330 - 830
Lower Lorraine.....	830 - 1955
Utica.....	1955 - 2281
Upper Trenton.....	2281 - 2492
Middle Trenton.....	2492 - 2755
Lower Trenton.....	2755 - 2920
Lower Trenton and/or Black River.....	2920 - 3408
Precambrian.....	3408 - 3445

QUEBEC DEPARTMENT OF MINES

SUMMARY LOG OF IMPERIAL LOWLANDS LACLERVILLE NO. 1

LOWLANDS EXPLORATION LTD.

Depths in feet below surface			
0 Surface		OVERBURDEN	Sand and clay
60			
		UPPER LORRAINE	Shale, light to medium gray. Lesser amounts of light gray siltstone, light gray, very fine-grained ss.
330			
500		MIDDLE LORRAINE	Shale, medium gray, micaceous; lesser amounts of medium gray siltstone, medium gray very fine-grained ss.
830			
1000			
		LOWER LORRAINE	Shale, medium dark; lesser amounts of medium gray siltstone, medium gray, very fine-grained sandstone
1500			
2000	1955	UTICA	Shale, black
	2281	Upper Trenton	Limestone, medium to dark gray, fine-grained; shaly limestone; buff and gray dense ls.; shale.
2500	2492	MIDDLE TRENTON	Limestone, buff, dense; shaly limestone; very little shale
	2755	LOWER TRENTON	Limestone, crystalline, light to med. gray; shaly limestone;
3000	2920		
		LOWER TRENTON and/or	Sandstone, almost pure quartz, grain averaging .5mm. Mostly white, also gray, buff and green
		BLACK RIVER	Shale present near base
3500	3408		
	3455	PRECAMERIAN	Biotite-quartz foliate

*J. W. Clark
Jan. 1959*

Company: Lowlands Exploration Ltd.

Well Name: Imperial Lowlands No. 4 Lotbinière

Location:

Lot: 557
Range: St. Jean-Baptiste
Parish: St. Louis de Lotbinière
County: Lotbinière
Coords: 99' from W. LL., 400' from N. LL.

Ground Elevation: 209'

RF Elevation: 212'

Spudded: Sept. 16, 1957

Completed: Nov. 9, 1957

Driller: Meier & Shaw

Type of Rig: Cable

Result: Dry Hole

Water

38'

Log by T.H. Clark:

<u>Formation</u>	<u>Depth interval (in feet)</u>
Overburden.....	0 - 6
Lower Lorraine.....	6 - 890
Utica.....	890 - 1150
Upper Trenton.....	1150 - 1600
Middle Trenton.....	1600 - 1650
Lower Trenton (Deschambault)	1650 - 1700
Black River limestone.....	1700 - 1760
Black River sandstone.....	1760 - 1820
Precambrian.....	1820 - 1969

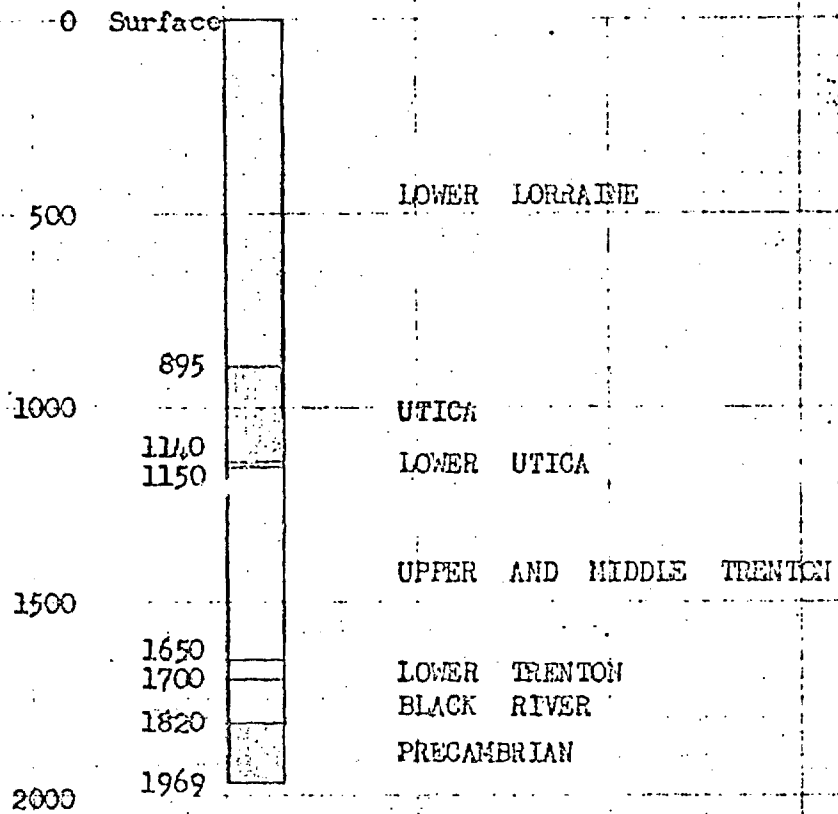
REF 148

QUEBEC DEPARTMENT OF MINES

SUMMARY LOG OF IMPERIAL LOWLANDS NO. 1 (LOUBIERE)

LOWLANDS EXPLORATION LTD.

Depths in feet below surface



DESCRIPTIONS OF FORMATIONS

LOWER LORRAINE: Dark to medium gray shale; light gray, fine-grained sandstone and light to medium gray siltstone in minor amounts

UTICA: Black shale. Calcareous beds at base

UPPER AND MIDDLE TRENTON: Dark gray, dense and shaly limestones; lesser amounts of crystalline limestone and of shale

LOWER TRENTON: Crystalline limestone; A little dense limestone, and very little shale

BLACK RIVER: Dark gray, dense and shaly limestones predominates at top; quartz-rich sandstone at base

PRECAMBRIAN: Biotite - quartz - orthoclase gneiss

T. H. Clark
January, 1959

APPENDIX 11

QUEBEC DEPARTMENT OF MINES

LOG

CAP SANTE NO. 1

BALD MOUNTAIN OIL CO.

T. H. CLARK

DECEMBER, 1958

QUEBEC DEPARTMENT OF MINES

SUMMARY LOG OF CAP SAINTE NO. 1

BALD MOUNTAIN OIL CO.

Depths in feet below surface			
0 Surface			
56		LOWER LORRAINE	
		UTICA	
325		LOWER UTICA	
330		UPPER TRENTON	
500		UPPER OR MIDDLE TRENTON	
630		MIDDLE TRENTON	
751		LOWER TRENTON	
840		BLACK RIVER	
914		PRECAMERIAN	
1000	954		

- LOWER LORRAINE — Dark gray, finely micaceous shale, 92%
Thin sandstone beds up to 3", 8% of core
- UTICA — 56-150 Dark gray, soft shale, finely color banded, slightly calcareous
Oily odor; oil in fractures. Silty bands up to 6", 4% of core
150-235 Dark brownish gray shale, finely color banded, hard, calcareous.
A few thin sandstone beds. Silty beds up to 6", 5% of core. Oily
odor, oil in fractures
235-325 Dark, soft, fissile shale. Siltstone beds 8% of core
- LOWER UTICA -- Dark gray to black shale, calcareous. No siltstone. 1/4" trilobite
debris bed at base
- UPPER TRENTON -- Dark gray, dense to crystalline limestone and dark gray shale.
bedding mostly irregular. Limestone: shale 46:54 above, 78:22 below
- UPPER AND MIDDLE TRENTON -- Lithology as above. Middle Trenton fossils present
- MIDDLE TRENTON -- Dark gray, dense limestone, a few 1" crystalline beds. Shaly
partings common. Limestone: shale 85:15
- LOWER TRENTON -- Faint brownish gray crystalline limestone. Shale never more
than 5%.
Bryozoan mats occur from 822 to 839
- BLACK RIVER -- Dark brownish gray, dense to fine-grained limestone, with inter-
bedded gray sandstone. Limestone beds contain Phytosia
904-914 Coarse-grained sandstone, some quartz conglomerate, pink feldspar
grains
- PRECAMERIAN -- Biotite gneiss and pink quartzite

A. M. Clark
1919

QUEBEC DEPARTMENT OF MINES

CAP SANTE NO. 1

BALD MOUNTAIN OIL CO.

DESCRIPTION OF FORMATIONS

LOWER LORRAINE: Predominantly dark gray, finely micaceous shale, with thin sandstone beds up to 3"; sandstone about 8% of core.

UTICA: Dark gray to brownish gray shale, soft, finely color banded, slightly calcareous. Oily odor. Silty bands up to 6". A few thin sandy bands. Liquid petroleum in fractures.

LOWER UTICA: Dark gray to black shale, no siltstone, 1/4" trilobite debris bed at base.

UPPER TRENTON: Dark gray, dense to crystalline limestone, and dark gray shale, bedding mostly irregular. Shale slightly more abundant than the limestone, at top, lower making up about 25% of core.
30


UPPER AND MIDDLE TRENTON: As Upper Trenton, but shale makes up about 25% of core throughout.

MIDDLE TRENTON: Dark gray dense limestone, with a little crystalline limestone in 1" beds,; shale partings and interbeds common. Shale makes up about 17% of core.

LOWER TRENTON (DESCHAMBAULT): Faint brownish gray, crystalline limestone. Shale nowhere as much as 5%. Bryozoan mats nearly throughout.

BLACK RIVER: Dark brownish gray, dense to fine-grained limestone above. Medium to dark gray calcareous sandstone with a few semi-lithographic limestone beds in middle. Coarse-grained sandstone with some quartz conglomerate at base.

PRECAMBRIAN: Biotite gneiss and pink quartzite.


T. H. Clark
December, 1958

QUEBEC DEPARTMENT OF MINESCAP. SANTI NO. 1BALD MOUNTAIN OIL CO.STATISTICAL SUMMARY

	Sandstone	Siltstone	Shale	Limestone
LOWER LORRAINE	8	--	92	--
UTICA	1	5	94	--
UPPER TRENTON	---	--	30	70
MIDDLE AND UPPER TRENTON	---	--	25	75
LOWER TRENTON (DESCHAMBAULT)	--	--	3	97
BLACK RIVER	No data			
PRECAMBRIAN	Foliated			

Dr. Cook
December
1958

ABBREVIATIONS

pr. or pres.	-	present - in amounts not more than 1%		
ab. or abund.	-	abundant - in amounts between 1% and 3%		
pc, pcs.	-	piece or pieces	inartic.	-- inarticulate
v.	-	very	brach.	-- brachiopod
calc.	-	calcareous or calcite	cryst.	-- crystalline
av. or aver.	-	average	fgmt.	-- fragment
ign.	-	igneous	qz.	-- quartz
rx.	-	rocks	qzte.	-- quartzite
lt.	-	light	r. & f.	-- rounded and frosted
med.	-	medium	slick.	-- slickenside
dk.	-	dark		
sh.	-	shale		
ss.	-	sandstone		
ls.	-	limestone		
dol.	-	dolomite or dolomitic		
metab. metabent.	-	metabentonite		
br.	-	brown		
co.	-	coarse		

CONVENTIONS

Fossil names -- Genera and species underlined.

Light/medium - color ranges from light to medium.

Light medium - color uniform, as given.

Albertite - any hard asphaltic material.

Medium gray, but medium-grained.

Streak and acid reaction, where given, refers only to shale.

QUEBEC DEPARTMENT OF MINES

LOG OF CAP SANTÉ NO. 1

BALD MOUNTAIN OIL COMPANY

Continued

Depth in feet	Description	Diamond Drill Core		
		Percentage Sandstone	Streak	Acid
0 - 5	Overburden			
5 - 10				
5 - 10	Dark gray, finely micaceous shale, with thin sandstone beds up to 3", ss. fine-grained	5%		
10 - 15	Ditto, sandstone more abundant	23		Fair
15 - 20	Ditto, do.	8		
20 - 25	Ditto. Some sandstone medium-grained and cross-bedded	17		Poor
25 - 30	Ditto, sandstone all very fine-grained, paper thin ss. beds	3		
30 - 35	Ditto	3		
35 - 40	Ditto	3		
40 - 45	Ditto, with 2" siltstone	5		Poor
45 - 50	Ditto, two 2" ss beds	8		
50 - 55	Ditto, ss. beds less abund.	3		Faint
55 - 56	Probably ditto. Core broken up			
56 - 57	Brownish gray sandstone with graptolites			
57 - 59	Dark gray shale with very fine-grained sandstone beds			
59 - 60	Ditto. <u>Leptobolus</u>			
60 - 61	Probably ditto, core broken up			
61 - 65	Dark hard shale, no sandstone beds Fairly oily odor <u>Leptobolus</u>		V. faint	Faint
65 - 75	Dark and medium-dark gray shale Very finely bedded - 'variegated'			Fair

LOWER LORRAINE -- BREAULT MEMBER, NICOLEE R. FORM. U.T.I.C.A.

QUEBEC DEPARTMENT OF MINES

LOG OF CAP SANTE HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core		
		Percentage sandstone	Streak	Acid
75 - 80	Dark and medium gray shale, very finely bedded - 'variegated'. Oily odor throughout. Sandstone beds few, about 1/8".	1%	Faint	Fair
80 - 82	Ditto. 1/16" vein at 60°	1	do	do
82 - 90	Ditto	1	do	do
90 - 95	Ditto, but with a few clear sandy beds up to 3/4" Graptolites	2.5	do	do
95 - 100	Ditto. Clear sandy beds more abund. At 96, heavy black oil in joint	4	do	do
<p>NOTE: Heavy petroleum residue occurs sparingly at 81' No odor. 82' Always in joints 87'-88' Never on outer 96' core surface 94' 97' 98'</p>				
100 - 105	'Variegated' shale as above. Clear sandstone beds present Oily odor. Black oil in fractures	2	Faint	Fair/ non good
105 - 110	Ditto	3	do	do
110 - 115	Ditto. Several dense, dark brown gray silty beds, 1"-2", light gray on core surface	5	do	do
115 - 120	Ditto. No silty beds	7	do	do
120 - 125	Ditto.	8	Light	do
125 - 130	'Variegated' shale as above. No sandstone beds. Dark, dense silty beds present, light gray on core surface, 5% of core	--	Lt./lt.med.	do

QUEBEC DEPARTMENT OF MINES

LOG OF CAP SANTÉ HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core		
		Percentage	Streak	Acid
130 - 135	Dark and medium gray shale, 'variegated' type. <u>Leptobolus</u> Faint oily odor	5%	It./lt.med.	Fair/ good
135 - 140	Do. <u>Dark oily deposit in two fractures</u>	7	do	do
140 - 145	Ditto. <u>Oil in one fracture</u>	10	do	do
145 - 150	Ditto. <u>Oil in one 4" fracture</u>	10	do	do
150 - 155	Ditto. Dark brownish gray. Mostly hard, massive, steel leaves streak. Fairly strong oily odor Dark hard silty bands, brownish gray on core surface	5	do	do
155 - 160	Ditto	10	do	do
160 - 165	ms Ditto	13	do	do
165 - 170	Ditto	12	do	do
170 - 175	Ditto	2	do	do
175 - 180	Ditto, very finely banded	10	do	do
180 - 185	Ditto, with several thin medium gray sandstone bands	3	do	do
185 - 190	Ditto, no sandstone	15	do	do
190 - 195	Ditto	15	do	do
195 - 200	Ditto	3	do	do
200 - 205	Ditto. At 202, <u>oil in vein</u>	15	Light	do
205 - 210	Ditto. A few 70° veins, no oil.	2	do	do
210 - 215	Ditto <u>Climacograptus</u>	5	do	do
215 - 220	Ditto	2	do	do

LOG OF CAP SANTE HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core		
		Percentage Siltstone	Streak	Acid
220 - 225	Dark, hard, massive brownish gray shale, finely bedded, 'variegated' type. Oily odor throughout. Dark hard silty bands, light on core surface	8	Lt.	Fair/good
225 - 230	Ditto	7	do	do
230 - 235	Ditto	7	do	do
235 - 240	Ditto, but softer, fissile	8	Medium	do
240 - 245	Ditto, intermediate <u>Climacograptus</u>	--	do	do
245 - 250	Ditto, but not 'variegated'	--	do	do
250 - 255	Dark soft fissile shale, dense grain, dull. <u>Climacograptus</u> C <u>Diplograptus</u> C	C --	do	do
255 - 260	Ditto do. do	3	do	do
260 - 265	Ditto do. do	--	do	do
265 - 270	Ditto do. do	2	do	do
270 - 275	Ditto, see below do. do	12	do	do
275 - 280	ditto, but no oily odor	7	Light	do
280 - 285	Ditto	2	do	do
285 - 290	Ditto	--	do	do
290 - 295	Ditto	13	do	do
295 - 300	Ditto	10	do	do

275-300' indistinctly banded shale; 'semi-variegated'

QUEBEC DEPARTMENT OF MINES

LOG OF CAP SANTE HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core	Ls:sh proportion
360 - 365	Dark gray limestone and dark gray shale more or less regularly alternating Crinoid stem fossils common in shale		75:25
365 - 370	Ditto. Crinoid fossils common in shale and limestone		67:33
370 - 375	Ditto, bedding mostly irregular		75:25
375 - 400	Limestone and shale as above. Shale well provided with crinoid fragments, limestone contains few. Poorly bedded. Limestone all crystalline, but nowhere coarse-grained		85:15
400 - 425	As above, but shale more abundant. Bedding irregular, contacts cloudy. <u>Sowerbyella sericea</u> Metabentonite, 1/2", at 418' Limestone all crystalline		80:20
425 - 430	Limestone and shale as above. More or less regular bedding. Limestone is dark, fine-grained		67:33
430 - 435	Ditto.	Smooth ostracods <u>Prasopora</u>	67:33
435 - 450	Ditto, bedding very irregular. Crinoid stem fossils in shale		75:25
450 - 455	Ditto, very irregular bedding. (454-455, regular bedding. <u>Sowerbyella sericea</u> Translucent rod		75:25
455 - 460	Ditto, very irregular bedding. Shale scarce		90:10
460 - 463	Nearly all fine-grained medium gray limestone		95: 5
463 - 465	Ditto, with crinoidal shale		75:25
465 - 470	Dark gray fine-grained limestone and shale irregularly bedded. Limestone may be in beds up to 6"		80:20
470 - 475	Ditto		80:20

T R E N T O C O N T A I N S

QUEBEC DEPARTMENT OF MINES

LOG OF CAP SANTE HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core	
		Percentages	
475 - 480	Limestone, dark gray, medium-grained and dark gray shale, irregularly bedded	ls:sh	90:10
480 - 485	Ditto. Limestone appears to be conglomeratic in places		75:25
485 - 490	Ditto, shale very crinoidal		75:25
490 - 495	Ditto, but limestone in long stretches, 9"		80:20
495 - 500	Ditto, contacts very cloudy		75:25
500 - 502	Ditto, but bedding regular		
502 - 502 ²⁰	Ditto, irregular bedding. Fair abundance of medium to light gray, coarse-grained limestone		
520 - 525	Ditto, with similar coarse-grained limestone <u>Leptaena. Platystrophia. Sowerbyella</u>		
525 - 530	Dark gray to dark brownish gray very fine-grained crystalline limestone, with thin wispy shaly partings		95: 5
530 - 531	Ditto		95: 5
531 - 535	Limestone as above. Shale in beds 1/4" to 1" thick. Bedding very irregular in detail		80:20
535 - 540	Ditto. One shale bed 7" thick. Bedding becoming more regular		70:30
540 - 547	Ditto. Bedding more regular. Limestone beds up to 6", shale up to 3"		55:45
547 - 550	Ditto, with 1" beds of medium-grained crystalline limestone, and bedding fairly irregular		80:20
550 - 555	Limestone and shale as above. Very irregular bedding. Limestone beds up to 4", shale 1" One small drusy vug 1/4" x 1/2"		75:25
555 - 560	Ditto, but shale beds inclined. Slickensides throughout shale. Network of thin calcite veins		75:25

TRENTON
UPPER
AND
MIDDLE

QUEBEC DEPARTMENT OF MINES

LOG OF CAP SANTE HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core
560 - 565	Dark gray, very fine-grained limestone and dark gray shale. Latter very highly inclined Limestone beds up to 4", shale 3" Large <u>Isotelus</u>	ls:sh 60:40
565 - 570	Ditto. Limestone mostly dense. Calcite veins at 567'. Drusy vugs with dark asphaltic film	75:25
570 - 575	Ditto Limestone beds up to 3", shale 3"	70:30
575 - 580	Limestone and shale as above, alternations. Contacts cloudy, Probably horizontal in outcrop Slickensides in shale common. Fossil bands common. <u>Sowerbyella sericea</u> . <u>Isotelus gigas</u> Limestone in beds up to 5", shale 6"	50:50
580 - 585	Ditto, but very irregular bedding. Crystalline bands present in limestone. <u>Sowerbyella sericea</u> . Large <u>Isotelus</u>	60:40
585 - 590	Ditto, bedding regular. Ls. up to 4", sh. 6"	50:50
590 - 595	Ditto, partly regular bedding, partly very irregular, pseudoconglomeratic Ls.(6". sh.(3"	70:30
595 - 600	Ditto	70:50
600 - 605	Ditto, almost all regular bedding. Contacts both sharp and cloudy, horizontal. Fossils visible on surface. Ls.(4", sh.(2"	65:35
605 - 610	Ditto, with two 1" crystalline beds near base Network of shaly partings. Ls.(6", sh.(2"	75:25
610 - 615	Ditto, contacts mostly sharp and horizontal. Network of shaly partings. Ls. (7", sh.(3"	90:10
615 - 620	Ditto. Contacts not sharp. Ls. (8", sh.(1"	95: 5
620 - 625	Ditto. Contacts clear and horizontal	95: 5
625 - 630	Ditto. Limestone and shale alternating. Contacts mostly sharp and partly horizontal Crinoid fragments common. One pyrite ?sponge Ls. (7", sh. (1"	80:20

M I D D L E A N D U P P E R T R E N T O N

LOG OF CAP SANTE HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core
630 - 635	Dark gray, dense limestone and dark gray shale Contacts fairly sharp, bedding rather irregular	ls:sh
	<u>Sowerbyella</u> Ls. (7"; sh. (2"	70:30
	<u>Prasopora</u>	
635 - 640	Ditto, but with 50% medium crystalline limestone Bedding partly irregular. One small vug, 1/8"	75:25
	Ls. (4"; sh. (1"	
640 - 645	Ditto. No crystalline limestone. Very irregular network of shale beds	75:25
	Ls. 2(3"; sh. (1/2"	
643 - 645	Ditto. Network ditto, giving appearance of pseudoconglomerate	60:40
645 - 650	Ditto.	80:20
	Ls. (3"; sh. (2"	
650 - 655	Dark gray, dense but clear (not muddy) limestone and very irregular shaly seams	80:20
	Ls. (4"; sh. (1"	
655 - 660	Ditto	80:20
660 - 665	Ditto. With a few 1" medium-grained crystalline limestone beds.	70:30
665 - 670	Ditto.	75:25
670 - 675	Ditto. With a few 1" medium-grained crystalline limestone beds	80:20
675 - 680	Limestone and shale as above, and about half of core fine-grained crystalline ls.	95: 5
680 - 685	Mostly fine-grained limestone, very little dense, and very little shale	95: 5
685 - 690	Ditto, but with shaly partings and thin beds very prominent and very irregular. Most of limestone fine-grained crystalline	80:20
690 - 695	Ditto	90:10
695 - 700	Ditto	90:10

MIDDLE TRENTON

QUEBEC DEPARTMENT OF MINES

LOG OF CAP SAINTE HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core
700 - 705	Medium dark gray, fine-grained crystalline limestone with thin, very irregular shaly partings	ls.sh 90:10
705 - 707	Ditto	90:10
707 - 710	Limestone and shale as above, nearly regular bedding approximately horizontal	80:20
710 - 715	Partly dense, partly fine-grained limestone with shale. Bedding highly irregular	90:10
715 - 720	Ditto	90:10
720 - 725	Ditto	90:10
725 - 728	Clear dense dark limestone and very irregular shaly partings and thin beds	ls. (4"; sh. (1" 75:25
728 - 730	Fine-grained crystalline limestone and thin shaly beds	ls. (4"; sh. (1" 75:25
730 - 735	Dense to fine-grained limestone, and very irregular shaly beds	ls. (6"; sh. (1" 95: 5
735 - 737	Ditto	
737 - 740	Very fine- to fine-grained crystalline limestone Black shaly seams thin and irregular. ls. (5" At 738' veins and seams have black residue	95: 5
740 - 745	Ditto	<u>Prasopora</u> 95: 5
745 - 750	Dark dense limestone, with irregular shaly bands and partings, latter with fossils showing on surface	
750 - 751	Ditto	

TRENTON
MIDDLE

QUEBEC DEPARTMENT OF MINES

LOG OF CAP SANTE HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core
751 - 753	Very fine-, fine-, to medium-grained crystalline limestone, with very irregular shaly wisps	ls;sh
753 - 754	Ditto, but with two ¹ / ₄ bryozoan mats	
754 - 755	Medium- to medium-coarse cryst. limestone, brownish gray	
755 - 756	Brownish gray ditto	
756 - 760	Brownish gray, dense, fine-, to medium coarse-grained crystalline limestone. Bryozoan mats in shale, 2" thick	
760 - 775	Ditto. No mats	
775 - 777	Medium gray, with brownish tinge, crystalline limestone dense to coarse-grained. Bryozoan mats	100:--
777 - 779	Medium gray, medium-grained cryst. limestone. No mats	100:--
779 - 780	Medium gray, dense to fine-grained limestone	95: 5
780 - 780	Medium dark gray, dense limestone	95: 5
780 - 785	Medium gray, brownish limestone, dense to coarse-grained. Bryozoan mats	95: 5
785 - 788	Ditto 1/4" vugs present down to 800'.	95: 5
788 - 789	Medium light brownish gray limestone, fine- to medium-grained. Almost no mats	95: 5
789 - 790	Dark gray limestone, dense. No mats	95: 5
790 - 794	Dense and fine-grained limestone, medium dark brownish gray. Thin shaly partings. <u>Prasopora</u>	95: 5
794 - 795	Medium to light gray-brown limestone, bryozon mats	
795 - 796	Ditto	95: 5
796 - 800	Medium dark brownish gray limestone, dense to fine-grained. Bryozoan mats	95: 5
800 - 810	Ditto	95: 5

FORMATION
DESCHAMBAULT
--
TRENTON
LOWER

165

QUEBEC DEPARTMENT OF MINES

LOG OF CAP SAINTE HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	<u>Diamond Drill Core</u>
810 - 817	Medium dark brownish gray, dense to fine-grained crystalline limestone. Bryozoan mats present <u>Prasopora</u>	95: 5
817 - 818	Ditto, with abundant bryozoan mats in both shale and limestone	95: 5
818 - 822	Light gray, fine-grained limestone. No mats	100:--
822 - 822½	Ditto, with mats	95: 5
822½ - 825	Light to medium brownish gray limestone, fine- to medium-grained. No mats	100:--
825 - 826	Ditto, but brecciated	
826 - 831	Ditto, not brecciated, thin shaly partings	
831 - 833½	Ditto	
833½ - 836	Light brownish gray crystalline limestone, medium-grained	
836 - 837½	Ditto, but coarse-grained	
837½ - 837¾	Limestone breccia with shaly matrix.	
837¾ - 839½	Light to medium brownish gray crystalline limestone fine-, medium-, and coarse-grained, with thin shaly partings	
839½ - 840	Dark brownish gray dense limestone with 1" shaly interbed	
840 - 845½	Dark gray, dense and fine-grained limestone	

DESCHAMBAULT FORMATION

DESCHAMBAULT FORMATION

-

TRENTON

LOWER

BLACK RIVER

QUEBEC DEPARTMENT OF MINES

LOG OF CAP SANTE HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	<u>Diamond Drill Core</u>
845 $\frac{1}{2}$ - 848	Alternations of 6" black shale and 6" black limestone 3" black shale, 6" limestone breccia, 9" medium gray shale <u>Dalmanella</u>	
848 - 850	Dark gray, dense and fine-grained with thin shaly interbeds containing very fine-scale bryozoa	
850 - 860	Ditto	
860 - 865	Medium to dark gray limestone, fine- to medium grained. Thin irregular shaly partings and beds up to 3/4"	
865 - 870	Ditto	
870 - 872 $\frac{1}{2}$	Ditto, with very small branching bryozoa	
872 $\frac{1}{2}$ - 874 $\frac{1}{2}$	Dark gray, dense to fine-grained limestone, with highly irregular and feathery shaly partings	
874 $\frac{1}{2}$ - 875 $\frac{1}{2}$	Dark gray sandstone, fine-grained. Calcareous cement	
875 $\frac{1}{2}$ - 876	Medium gray, medium grained crystalline limestone	
876 - 877	Ditto, with abundant quartz grains, grading into sandstone at base	
877 - 88 $\frac{1}{2}$	Gray calcareous sandstone, fine- to medium-fine-grained Basal 3" a siliceous shale	
878 $\frac{1}{2}$ - 884	Medium gray, very fine-grained to dense limestone almost lithographic in places. <u>Phytopsis</u> A few wavy shaly partings	
884 - 885 $\frac{1}{2}$	Ditto, but with large quartz grains	
885 $\frac{1}{2}$ - 886	Medium gray shaly limestone with abundant quartz grains.	
886 - 886 $\frac{1}{2}$	Sandstone, mostly medium-grained. grains 2mm at base, .5mm at top	
886 $\frac{1}{2}$ - 886 $\frac{1}{2}$	Black shale	
886 $\frac{1}{2}$ - 887	Missing	

BLACK RIVER

QUEBEC DEPARTMENT OF MINES

LOG OF CAP SANTE HOLE NO 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	<u>Diamond Drill Core</u>
887 - 888	Light gray, dense limestone, with large, 2mm, quartz grains	
888 - 890	Calcareous sandstone, shaly at base	
890 - 892	Sandy limestone or calcareous sandstone. Pebbly structure. Thin shaly partings	
892 - 896	Dark gray, dense limestone	
896 - 900	Calcareous sandstone, coarse-grained at base, fine-grained at top. Matrix greenish at base. Kaolin matrix from 899-900	
900 - 903	Ditto	
903 - 903	Fine-grained sandstone with a few coarse grains	
903 - 904	Dark dense limestone, with wavy shaly partings and quartz grains	
904 - 910	Coarse-grained sandstone. At several horizons albertite fills in between grains	
910 - 911	Very coarse-grained sandstone, Strong kaolin matrix	
911 - 911	Medium coarse-grained sandstone, greenish color	
911 - 913	Conglomerate. Large (3") pebbles of quartz, matrix of medium-grained sandstone	
913 - 914	Coarse-grained sandstone with some pink feldspar grains Kaolin matrix	

BLACK RIVER

LOG OF CAP SANTE HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	<u>Diamond Drill Core</u>
914 - 915	Dark biotite gneiss. Schistosity 45°	
915 - 925	Medium dark biotite gneiss. Schistosity 45°	
925 - 930	Ditto, becoming light gray at base. Schistosity becomes nearly horizontal at base	
930 - 931	Ditto	
931 - 936	Pink quartzite. No schistosity visible. Black vein of ?albertite at 931	
936 - 940	Medium gray biotite gneiss, grading at base into pinkish quartzite	
940 - 942	Pink quartzite. Schistosity poorly developed	
942 - 950	Medium gray biotite gneiss	
950 - 954	Ditto	
	Bottom of hole	

T. H. Clark
T. H. Clark

December 1958

QUEBEC DEPARTMENT OF MINES

LOG

CAP SANTE NO. 2

BALD MOUNTAIN OIL CO.

T. H. CLARK

JUNE, 1959

PUBLIC

QUEBEC DEPARTMENT OF MINES
MINERAL DEPOSITS BRANCH
No QM- 6891

QUEBEC DEPARTMENT OF MINES

CAP SANTE NO. 2

BALD MOUNTAIN OIL CO.

COLUMNAR SECTION

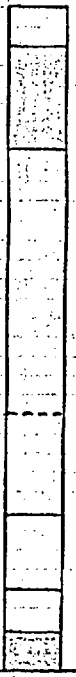
Depth in feet
 below surface

Thick-
 ness

Formation

Description

0
 50
 185
 250
 500
 525
 655
 750
 752
 805
 855
 1000



50 OVERBURDEN

135 UTICA

470 UPPER and
 MIDDLE
 TRENTON

525 LOWER
 TRENTON

752 LOWER
 TRENTON

805 BLACK RIVER

855 PRECEMBRIAN

Dark gray shale, light brown streak,
 calcareous. Graptolites common

Limestone, dark gray, mostly dense to
 very fine-grained -- 70% to 95% of samples

Shale, dark gray to brownish gray, non-
 calcareous. 5% - 30% of samples

535' Possible boundary between
 Upper and Middle Trenton

Light buff limestone, dense to fine-grained
 Shale less than 5%

Medium dark limestone, dense to fine-grained
 Shale, dark gray up to 10%
 Quartz-biotite rock

T. H. Clark
 T. H. Clark
 June 22, 1959

QUEBEC DEPARTMENT OF MINES

CAP SANTE NO. 2

BALD MOUNTAIN OIL COMPANY

STATISTICAL SUMMARY

	Sandstone	Siltstone	Shale	Limestone
Utica	--	--	98%	2%
Upper & Middle Trenton	--	--	13	87
Lower Trenton (Deschambault)	--	--	3	97
Black River	--	--	20	80
Precambrian	Crystalline schists, etc.			

T. H. Clark

T. H. Clark
June, 1959

LOG OF CAP SANTE NO. 2

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description			<u>DIAMOND DRILL CORE</u>	
				<u>Streak</u>	<u>Acid</u>
					<u>Cable Rig Cuttings</u>
			Shale, dark brownish gray		
			Shale, medium gray		
			Limestone, gray, dense		
125 - 130	90	10	pr	Lt. 1/2 lt. med.	Fair to good
130 - 135	100		pr ab		
135 - 140	100		pr ab	Poor graptolites	do
140 - 145	100		ab pr	<u>Leptobolus insignis</u> <u>Triarthrus</u> in trilobite debris bed of brown shale	
145 - 150	100		ab pr	do	do
150 - 155	do	--	--	<u>Leptobolus insignis</u> Trilobite debris bed	
155 - 160	200		ab pr	<u>Triarthrus</u> Trilobite debris bed	do
160 - 165	100	--	--	<u>Leptobolus insignis</u>	
165 - 170	100		ab pr	<u>Leptobolus insignis</u> Smooth ostracods	do
170 - 175	80	20	pr		
175 - 180	80	20	pr	Light	do
180 - 185	100	--	pr	1 pc. metabentonite	
185 - 190	10	fm	90	Limestone dense to very fine-grained a little fine-grained. Metabentonite, soft, flaky brown shale, no biotite	
190 - 195	10	fm	90	<u>Primitia binodosa</u>	
195 - 200	10	--	90	A few pieces fine- and fine-medium-grained limestone	

U T I C A
 TRENTON & UPPER MIDDLE

LOG OF CAP SANTE NO. 2

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description				<u>Diamond Drill Core</u>		
					<u>Cable</u>	<u>Rig</u>	<u>Samples</u>
				Shale, brownish gray			
				Limestone, dark gray, shaly, dense and very fine-grained			
				Limestone, buff gray, fine-grained			
200 - 205	10	90	--				
205 - 210	10	90	--	<u>Prasopora</u> -type bryozoa			
210 - 215	10	90	--	A few pieces white limestone, fine-gr., sandy residue			
215 - 220	20	80	--	pr <u>Cyclospira bisulcata</u> Crinoids common			
220 - 225	20	80	--	pr <u>Bythocypris cylindrica</u> do			
225 - 230	25	75	--	pr <u>Cyclospira bisulcata</u> . <u>Primitia binodosa</u> Crinoids			
230 - 235	10	60	25	pr 5% medium-grained limestone. <u>Cyclospira bisulcata</u>			
235 - 240	10	60	25	pr 5 Crinoids			
240 - 245	5	85	10	pr pr Crinoids			
245 - 250	10	90	pr	pr -- Crinoids			
250 - 255	5	90	5	pr -- Crinoids			
255 - 260	5	90	5	pr -- Crinoids. <u>Prasopora</u> -type bryozoa			
260 - 265	5	90	5	pr -- Crinoids			
265 - 270	15	85	pr	pr -- Crinoids. <u>Ceraurus</u>			
270 - 275	10	90	pr	pr -- Crinoids. <u>Prasopora</u> -type bryozoa			
275 - 280	10	90	pr	pr -- Crinoids. <u>Sowerbyella sericea</u> . <u>Bythocypris cylindrica</u>			
280 - 285	10	90	pr	pr -- Crinoids			
285 - 290	15	80	5	pr --			
290 - 295	10	85	5	pr pr			
295 - 300	25	70	pr	5 --			

UPPER TRENTON
MIDDLE AND

LOG OF CAP SANTE NO. 2

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description					Diamond Drill Core Cable Rig Cuttings	
	Shale, gray and gray brown, silty as indicated						
	Limestone, dark gray, shaly, dense, very fine-grained						
	Limestone, fine-grained, buff gray						
	Limestone, buff gray, medium-grained						
	Limestone, white, fine-grained, white sandy resi-						due
300 - 305	30	55	5	--	10		
305 - 310	20	75	pr	--	5		
310 - 315	20*	65	10	--	5	Crinoids	*shale is silty from here on
315 - 320	20	65	10	--	5	Crinoids	
320 - 325	15	70	10	--	5	Crinoids	
325 - 330	15	70	10	--	5	Crinoids	<u>Sowerbyella sericea</u>
330 - 335	10	50	35	--	5	Crinoids.	<u>Dalmanella</u> , <u>Sowerbyella</u>
335 - 340	15	75	5	--	5	Crinoids	
340 - 345	10	85	pr	--	5	Crinoids.	Inarticulate brachiopods
345 - 350	15	80	pr	--	5	Crinoids.	Inarticulate brachiopods
350 - 355	15	75	--	--	10	Crinoids	
355 - 360	15	75	--	--	10	Crinoids	
360 - 365	10	80	--	--	10	Crinoids.	<u>Sowerbyella</u>
365 - 370	10	75	--	--	15	Crinoids.	<u>Sowerbyella</u>
370 - 375	10	80	--	--	10		<u>Primitia binodulosa</u>
375 - 380	10	75	--	--	15		<u>Sowerbyella</u>
380 - 385	5	85	--	--	10	Crinoids.	<u>Sowerbyella</u> . <u>Rafinesquina alter-</u> Blue chert ^{nata}
385 - 390	10	85	--	--	5	Crinoids.	<u>Sowerbyella</u>
390 - 395	10	85	pr	--	5	Crinoids.	<u>Sowerbyella</u>
395 - 400	15	80	--	--	5	Crinoids.	<u>Dalmanella</u>

MIDDLE AND UPPER TRENTON

LOG OF CAP SANTE NO. 2

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drilling			Cable Rig	
		Core	Cuttings			
	Shale, gray and gray brown, silty					
	Limestone, medium to dark buff gray, dense, shaly, or very, very fine-grained					
	Limestone, buff gray, fine-grained					
	Limestone, light buff gray, medium-grained					
	Limestone, white, fine-grained, very fine quartz residue					
400 - 405	15 80 pr -- 5 <u>Dalmanella</u> Crinoids. <u>Rafinesquina</u> <u>Sowerbyella</u>					
405 - 410	10 80 pr -- 5 Crinoids. <u>Isotelus</u>					
410 - 415	20 70 -- -- 10 Crinoids					
415 - 420	25 65 -- -- 10 Crinoids. <u>Sowerbyella</u>					
420 - 425	25 65 -- -- 10 Crinoids. <u>Sowerbyella</u>					
425 - 430	10 85 -- -- 5 Crinoids. <u>Rafinesquina</u> <u>Sowerbyella</u>					
430 - 435	5 90 -- -- 5 Crinoids. <u>Sowerbyella</u> Pale green and blue gray metabentonite					
435 - 440	10 80 5 -- 5 Crinoids. <u>Sowerbyella</u> Ditto					
440 - 445	15 75 5 -- 5 Crinoids. Translucent rod. Ditto					
445 - 450	20 70 5 pr 5 Crinoids Ditto					
450 - 455	20 70 5 -- 5 ". Smooth ostracods Ditto					
455 - 460	20 75 pr -- 5 "					
460 - 465	10 85 pr -- 5 "					
465 - 470	10 85 pr -- 5 ". <u>Sowerbyella</u>					
470 - 475	10 85 pr -- 5 ". <u>Sowerbyella</u> <u>Bythocypris cylindrica</u>					
475 - 480	15 75 5 -- 5 "					
480 - 485	10 80 5 -- 5 ". <u>Sowerbyella</u> Metabentonite, as above					
485 - 490	15 80 pr -- 5 ". Smooth ostracods					
490 - 495	15 80 pr -- 5 ". <u>Sowerbyella</u>					
495 - 500	20 75 -- -- 5 "					

MIDDLE AND UPPER TRENTON

LOG OF CAP SANTE NO. 2

BALD MOUNTAIN OIL COMPANY

continued

Depth
in feet

Description

Diamond Drill Core

Cable Rig Cuttings

Depth in feet	Description					<u>Diamond Drill Core</u>	<u>Cable Rig Cuttings</u>
	Shale, gray and gray brown, silty						
	Limestone, medium buff gray, dense, shaly, or very very fine-grained						
	Limestone, buff gray, fine-grained						
	Limestone light buff gray, medium-grained						
	Limestone, White, fine-grained, fine quartz residue						
	Crinoids present in every sample						
500 - 505	10	80	5	pr	5	<u>Sowerbyella</u>	
505 - 510	25	70	pr	--	5		
510 - 515	20	75	5	pr	pr		
515 - 520	10	85	5	--	pr		
520 - 525	5	95	--	--	--	Smooth ostracods.	<u>Primitia binodosa</u>
525 - 530	pr	80	20	pr	--	<u>Rafinesquina</u>	
530 - 535	ab	60	35	5	--	Smooth ostracods.	<u>Dalmanella</u>
535 - 540	5	70	25	--	--	<u>Primitia binodosa</u>	
540 - 545	15	45	40	--	--	5% shale brown, flaky,	?metabentonite
545 - 550	15	60	25	--	--		
550 - 555	5	85	10	--	--	<u>Dalmanella</u>	
555 - 560	15	70	15	--	--		
560 - 565	20	50	30	--	--	<u>Sowerbyella</u>	<u>Prasopora</u>
565 - 570	20	40	40	--	--	<u>Dalmanella</u>	
570 - 575	15	40	45	pr	--		
575 - 580	10	20	65	5	--	<u>Dalmanella</u> .	Smooth ostracods
580 - 585	5	20	65	5	--	Smooth ostracods	
585 - 590	10	15	65	5	--	<u>Sowerbyella</u> .	Smooth ostracods
590 - 595	5	10	85	pr	--		
595 - 600	10	15	75	pr	--		

MIDDLE AND UPPER TRENTON

LOG OF CAP SANTE. NO. 2

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description					Diamond Core Cable Rig Cuttings
	Shale, dark gray, silty					
	Limestone, medium buff gray, dense, shaly, very v. fine-grained					
	Limestone, buff gray, fine-grained					
	Limestone, light buff gray, medium grained					
	Limestone, white, fine-grained with fine quartz residue					
600 - 605	15	20	65	--	--	<u>Dalmanella</u>
605 - 610	15	10	70	--	5	
610 - 615	30	15	55	--	pr	
615 - 620	25	10	70	--	pr	
620 - 625	20	10	65	5	pr	<u>Dalmanella</u> <u>Prasopora</u>
625 - 630	5	10	80	5	pr	
630 - 635	20	5	75	--	pr	
635 - 640	10	10	70	pr	10	
640 - 645	10	20	60	--	10	<u>Zygospira.</u> Pale greenish gray metabentonite
645 - 650	10	10	65	10	5	Ditto
650 - 655	10	15	70	5	--	<u>Prasopora</u> Ditto
	All limestone below this is light buff gray					
655 - 660	5	25	70	--	--	<u>Sowerbyella</u> <u>Prasopora</u>
660 - 665	ab	5	95	--	--	
665 - 670	pr	--	100	--	--	
670 - 675	pr	10	90	--	--	Metabentonite as above, probably cavings
675 - 680	ab	5	90	5	--	<u>Leperditia</u> ditto
680 - 685	5	10	85	--	--	ditto
685 - 690	5	40	55	--	--	
690 - 695	5	40	55	--	--	
695 - 700	5	40	55	--	--	

UPPER TRENTON
 MIDDLE AND
 LOWER TRENTON
 DESCHAMBAULT FM.

LOG OF CAP SANTE NO. 2

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet			Description	<u>Diameter</u>	<u>Drilling</u>	<u>Core</u>	<u>Cable Rig</u>	<u>Cuttings</u>
			Shale, dark gray					
			Limestone, light buff gray, dense or very very fine-grained					
			Limestone, light gray buff, fine-grained					
			Limestone, light gray buff, medium-grained					
700 - 705	LOWER TRENTON	DESCHAMBAULT FORN.	5	10	85	**	Most of the samples are ground so fine that no grains remain of this size	Metabentonite, pale greenish gray, probably cavings
705 - 710			5	10	85		Very poor sample, determination approximate	
710 - 715			5	10	85		ditto	
715 - 720			pr	30	70			
720 - 725			5	40	55			
725 - 730			pr	40	60		Very poor sample, determination approximate	
730 - 735			pr	40	60		ditto	
735 - 740			5	50	45		ditto	
740 - 745			5	55	40		Sample somewhat darker	
745 - 750			5	40	55		ditto	
750 - 755	BLACK RIVER		15	60	25		All limestones medium dark to dark gray below this	
755 - 760			10	50	45			
760 - 765			10	80	10			
765 - 770			20	70	10			
770 - 775			25	75	--			
775 - 780			30	60	10			
780 - 785			30	60	10			
785 - 790			25	70	5			
790 - 795			15	70	15			
795 - 800			20	70	10			
800 - 805	25	70	5					

LOG OF CAP SANTE NO. 2

BALD MOUNTAIN OIL COMPANY

continued

Depth
in feet

Description

~~mDiamondDrillinGama~~
Cable Rig Cuttings

805 - 810

Quartz (90% or more), biotite, and white feldspar, granulated to less than .5mm

810 - 815

Ditto, with shreds of dark green mica

815 - 820

Ditto

820 - 825

Ditto

825 - 830

Ditto

830 - 835

Ditto

835 - 840

Ditto

840 - 845

Ditto

845 - 850

Ditto

850 - 855

Ditto

Bottom of hole

PRECAMBERIAN

T. H. Clark
T. H. CLARK
June 22, 1959

QUEBEC DEPARTMENT OF MINES

LOG

PORTNEUF NO. 1

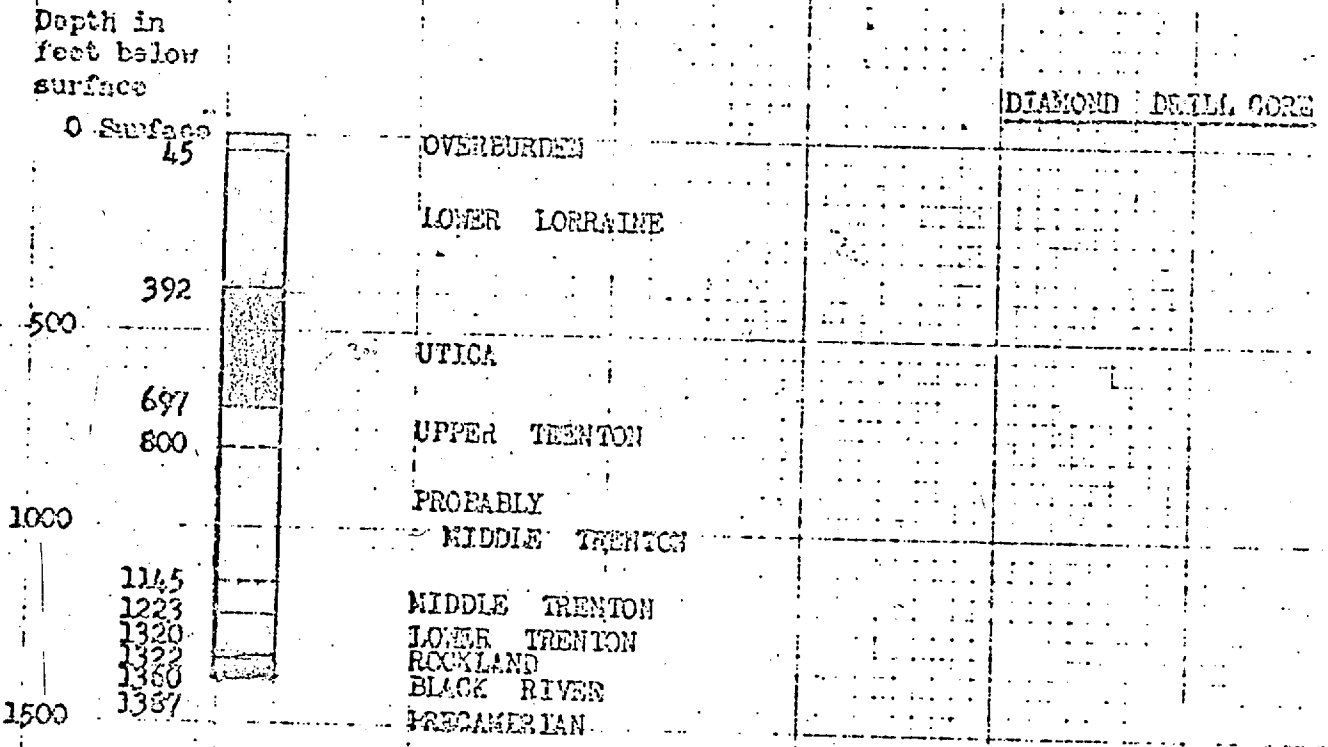
BALD MOUNTAIN OIL CO.

T. H. CLARK

DECEMBER. 1958

SUMMARY LOG ON FORNEUF NO. 3

BALD MOUNTAIN OIL CO.



LOWER LORRAINE -- Very dark gray shale, with 1" beds of light sandstone
A few silty beds. Oily odor. Shale: sandstone

UTICA -- Dark gray to black shale; a few calcareous siltstone beds 1" - 2".
Oily odor

UPPER TRENTON -- Dark gray, fine- to coarse-grained crystalline limestone
Dark gray shale. Limestone: shale. Irregularly interbedded

MIDDLE TRENTON -- Dark gray, dense to fine-grained limestone. Dark gray shale.
Bedding regular to irregular. Limestone: shale

LOWER TRENTON -- Light to medium gray, brownish, crystalline limestone.
Shale less than 1%. Oily odor. Exposures 1268 - 1280

ROCKLAND -- Dark gray, fine-grained crystalline limestone and pale greenish
gray sandstone

BLACK RIVER -- Limestone, fine-grained to lithographic 1322 - 1325
Sandstone, limestone and a little dolomite, all mostly black. 1325 - 1360

PRECAMBRIAN -- Pink biotite gneiss

*G. A. Clark
January 1959*

QUEBEC DEPARTMENT OF MINES

PORTNEUF NO. 1

BALD MOUNTAIN OIL CO.

STATISTICAL SUMMARY

	Sandstone	Siltstone	Shale	Limestone
LOWER LORRAINE	11	3	86	--
UTICA	--	7	93	--
UPPER TRENTON	--	--	50	50
MIDDLE TRENTON	--	--	22	78
LOWER TRENTON (DESCHAMBAULT) (ROCKLAND) No data	--	--	2	98
BLACK RIVER	85	--	5	10 Estimated
PRECAMBRIAN	Pink biotite gneiss			

P. H. Clark
P. H. Clark
January, 1959

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ABBREVIATIONS

pr. or pres.	-	present - in amounts not more than 1%		
ab. or abund.	-	abundant - in amounts between 1% and 3%		
pc, pcs.	-	piece or pieces	inartic.	-- inarticulate
v.	-	very	brach.	-- brachiopod
calc.	-	calcareous or calcite	cryst.	-- crystalline
av. or aver.	-	average	frag.	-- fragment
ign.	-	igneous	qz.	quartz
rx.	-	rocks	qzte.	quartzite
lt.	-	light	r. & f.	-- rounded and frosted
med.	-	medium	slick.	-- slickenside
dk.	-	dark		
sh.	-	shale		
ss.	-	sandstone		
ls.	-	limestone		
dol.	-	dolomite or dolomitic		
metab. metabent.	-	metabentonite		
br.	-	brown		
co.	-	coarse		

CONVENTIONS

Fossil names -- Genera and species underlined.

Light/medium - color ranges from light to medium.

Light medium - color uniform, as given.

Albertite - any hard asphaltic material.

Medium gray, but medium-grained.

Streak and acid reaction, where given, refers only to shale.

QUEBEC DEPARTMENT OF MINES

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LOG OF PORTNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

Continued

Depth in feet	Description	Diamond Drill Core	
		Streak	Acid
0 - 45	Overburden		
45 - 50	Dark gray shale with thin beds of light gray sandstone every 2" to 1". Very finely micaceous. Very fissile. Pale Bedding approximately horizontal		Weak
50 - 55	do. 2" of sandstone at 55'	do	do
55 - 60	do.	do	do
60 - 65	do.	do	do
65 - 70	do.	do	do
70 - 75	do.	do	do
75 - 80	do.	do	do
80 - 85	do.	do	do
85 - 90	do.	do	do
90 - 100	do. 5' of core so marked	do	do
100 - 105	do.	do	do
105 - 110	do. 105-106 hard sandy shale 107-108 tough, very fine-grained ss	do	do
110 - 115	do.	do	do
115 - 120	do.	do	do
120 - 125	do.	do	do
125 - 130	do.	do	do
130 - 135	do.	do	do
135 - 140	do.	do	do
140 - 145	do.	do	do
145 - 150	do.	do	do

LOWER LORRAINE

QUEBEC DEPARTMENT OF MINES

LOG OF CORNEUB HOLE NO. 1

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BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core	
		Streak	Acid
150 - 155	Very dark gray, almost black, shale otherwise as above Strong oily odor	Pale	Fair
155 - 160	do. do.	do	do
160 - 165	do. do. <u>Glimacograptus</u>	do	do
165 - 170	do. do. Somewhat harder 166-168 almost a siltstone	do	do
170 - 175	do. do.	do	do
175 - 180	Black shale, as above, but sandstone beds less abundant. No odor	do	do
180 - 185	do.	do	do
185 - 190	do.	do	do
190 - 195	do.	do	do
195 - 200	do.	do	do
200 - 205	do.	do	do
205 - 210	do.	do	do
210 - 215	do.	do	do
215 - 220	do 217 - Pyrite nodule	do	do
220 - 225	do.	do	do
225 - 230	do.	do	do
230 - 235	do.	do	do
235 - 240	do.	do	do
240 - 245	do.	do	do
245 - 250	do. Oily odor 247-250	do	do

LOWER LORRAINE

QUEBEC DEPARTMENT OF MINES

LOG OF PORTNEUF HOLE NO. 1

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BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core	
		Streak	Acid
250 - 245 ⁵	Dark gray to black finely micaceous shale with paper thin sandy beds (a); thicker fine-grained sandstone beds (b); and hard, solid siltstone (c), in percents (a) (b) (c) 3 -- 23 including one 12" siltst one bed	It./lt.med.	Fair
255 - 260	do 3 -- --	do	do
260 - 265	do 3 -- 7	do	do
265 - 270	do 5 -- 2	do	do
270 - 275	do 7 -- 8	do	do
275 - 280	do 2 25 3 One 15" ss. bed	do	do
280 - 285	do 5 -- --	do	do
285 - 290	do 5 2 --	do	do
290 - 295	do 5 ⁵ -- --	do	do
295 - 300	do 5 -- --	do	do
300 - 305	do 5 -- 21 7" and 6" siltst. beds	do	do
305 - 310	do 5 -- --	do	do
310 - 315	do 5 -- --	do	do
315 - 320	do 5 -- --	do	do
320 - 325	do 5 8 --	do	do
325 - 330	do 8 11 --	do	do
330 - 335	do 8 2 --	do	do
335 - 340	do 8 6 --	do	do
340 - 345	do 5 10 --	do	do
345 - 350	do 5 6 --	do	do

LOWER FORAMINE

Depth in feet	Description	Diamond Drill Core		Streak	Acid
350 - 355	Dark gray to black shale, very micaceous with paper thin sandy beds (a); thicker sandstone beds (b); and solid, siltstone beds (c) (a) 10% (b) 8 (c) --			Lt./lt.med.	Poor
355 - 360	do. 8 2 --	Graptolites		do	do
		One pc. albertite		do	do
360 - 365	do. 8 5 --			do	do
365 - 370	do. 10 8 --			do	do
370 - 375	do. 5 3 16	One 10" bed siltst, strong oily smell		do.	do.
375 - 380	do. 5 13 6	One 6" ss. bed		do	Poor to fair
380 - 385	do. 10 6 3			do	do
385 - 390	do. 5 10 --			do	do
390 - 392	do. 3 5 --	at 391' 3" coarse metabentonite		do	do
392 - 395	Dark gray to black shale with almost no sandy beds, but with many medium dark gray solid dense calcareous siltstone beds, light gray on core surface, mostly 1"-2" thick at 8% siltstone			<u>Climacograptus</u>	do do
395 - 400	do 5% ^{tr} Strong oily odor			do	do
400 - 405	do 3 do			<u>Climacograptus</u>	do do
405 - 410	do 20 do			<u>Climacograptus</u> <u>Diolograptus</u>	do do
410 - 415	do 8 do			do	do
415 - 420	do 10 do			<u>Climacograptus</u>	do do
420 - 425	do. 2 do			do	do

LOWER TORONTO

QUEBEC DEPARTMENT OF MINES

LOG OF PORTNEUF HOLE NO. 1

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BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core	Streak	Acid
	Dark gray to black shale, with medium gray solid dense siltstone beds mostly 1" to 2" thick, light gray on core surface. Shale less fissile			
425 - 430	do. 5% siltstone beds Strong oily odor	<u>Climacograptus</u> <u>Geisonoceras</u> <u>Diplograptus</u>	Lt./lt.med.	Fair/good
430 - 435	do -- do	<u>Geisonoceras</u>	do	do
435 - 440	do. 2% do	<u>Diplograptus</u>	do	do
440 - 445	do. -- do			
445 - 450	do. 2% do		do	do
	Shale as above. Hard dense siltstone more indefinite as to boundaries. Strong oily odor. Long cores			
450 - 455	do. -- do		do	Good
455 - 460	do 3 do	<u>Climacograptus</u> <u>Diplograptus</u>	do	do
460 - 465	do do do	do do	do	do
465 - 470	do do do	do do	do	do
470 - 475	do 2 do	do do	do	do
475 - 480	do 3	Graptolites	do	do
480 - 485	do 5	<u>Climacograptus</u>	do	do
485 - 490	do 6	Graptolites <u>Geisonoceras</u> <u>Priarthrus</u>	do	do
490 - 495	do. 13	Graptolites	do	do
495 - 500	do 3	Graptolites	do	do

QUEBEC DEPARTMENT OF MINES

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LOG OF PORTNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core	
		<u>Streak</u>	<u>Acid</u>
	Dark gray to black solid shale, with more of the hard dense silty beds. Latter leave steel streak.		
	Shale		
	Silty beds		
500 - 505	do 10%	<u>Climacograptus</u> <u>Leptobolus</u>	Good Lt.med. / med
505 - 510	do. 17		do do
510 - 515	do. 2		do do
515 - 520	do.		do do
520 - 525	do. 13		do do
525 - 530	do. 7		do do
530 - 535	do. 7		do do
535 - 540	do. 20 One 8" silty bed		do do
540 - 545	do. 11		do do
545 - 550	do. 11		do do
	Shale as above. Long cores Silty beds more indefinite		
550 - 555	do. 13	Graptolites, esp. <u>Climacograptus</u>	do do
555 - 560	do. 13	do. <u>Leptobolus</u>	do do
560 - 565	do. 7	do. <u>Leptobolus</u>	do do
565 - 570	do. 5	do	do do
570 - 575	do. 10	do	do do
575 - 580	do. 5		do do
580 - 585	do; 13		do do
585 - 590	do. 13	<u>Orthograptus</u> <u>Climacograptus</u>	do do

QUEBEC DEPARTMENT OF MINES

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LOG OF FORNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	<u>Diamond Drill Core</u>	
		<u>Streak</u>	<u>Acid</u>
	Dark gray to black hard dense shale Hard dense silty beds, boundaries not definite All long cores		
590 - 595 590 - 595	do. 16 mm%	Light/med.	Good
595 - 600	do. 11	do	do
600 - 605	do. 2 Strong oily odor <u>Leptobolus</u>	do	do
605 - 610	do. 14 do <u>Leptobolus</u> <u>Climacograptus</u>	do	do
610 - 615	do. 11 75° veins. <u>Climacograptus</u>	do	do
615 - 620	do. 11 <u>Triarthrus</u> <u>Climacograptus</u>	do	do
620 - 625	do. 3 <u>Triarthrus</u> <u>Climacograptus</u>	do	do
625 - 630	do. 2 Core much broken up <u>Orthognaptus</u> Vertical veins. <u>Climacograptus</u>	do	do
630 - 635	do. 16 do	do	do
635 - 640	do. 5 45° veins do. <u>Trilobites</u>	do	do
640 - 645	do. 11 do do.	do	do
645 - 650	do. 2 do. <u>Triarthrus</u> <u>Gelsonoceras</u> <u>Leptobolus</u>	do	do
650 - 655	do. 3 <u>Trilobite debris</u> <u>Graptolites</u> <u>Leptobolus</u> <u>Triarthrus</u> <u>Ostracods</u>	do	do
655 - 660	do. 18 do., all five	do	do
660 - 665	do. 2 do. all five	do	do
665 - 670	do. -- do. all five <u>Leptobolus</u>	do	do

QUEBEC DEPARTMENT OF MINES

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LOG OF PORNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	<u>Diamond Drill Core</u>		
	Dark gray to black, hard, dense shale Hard dense silty beds	<u>Streak</u>	<u>Acid</u>	
670 - 675	do. 3 Graptolites <u>Dicellograptus</u> Trilobite debris <u>Triarthrus</u> <u>Leptobolus</u> Ostracods	Light/med.	Good	
675 - 680	do. 3	do. as above	do	do
680 - 685	do. 11 Dip 10°	do. as above	do	do
685 - 690	do. 6 do	do. as above	do	do
690 - 695	do. 1-2 Several poor thin silty beds 692 ₂ probably Metabentonite	do. as above <u>Isotelus</u> <u>Conularia</u> but no trilobite debris	do	do
695 - 695 ^{1/2}	do. 10	Fossils as above	do	do
697 ^{1/2} - 700	Limestone, with small 1mm crystals of calcite. Gradational contact with shale above. <u>Dalmanella</u> <u>Crinoids</u>			
700 - 705	Shale and shaly limestone very irregularly interbedded Shale rich in crinoid fossil fragments. Contacts cloudy. Proportion of shale to limestone thus (60:40) (60:40) <u>Cyclospira bisulcata</u>			
705 - 710	do. (70:30) Shale has smooth ostracods			
710 - 715	do. (60:40)			
715 - 720	do. (50:50) Some limestone is dense to coarsely crystalline, light to dark gray.			
720 - 725	do. (40:60) do.			

MIDDLE

UPPER

LOG OF FORMINUS HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	<u>Diamond Drill Core</u>
	Shale and shaly limestone, proportions thus (xx:yy). Shale rich in crinoidal debris. A few lengths of limestone up to 4", fine- to medium-grained, medium to dark gray	
725 - 730	do. (60:40)	
730 - 735	do. (60:40)	
735 - 740	do. (50:50)	
740 - 745	do. (50:50)	
745 - 750	do. (60:40)	
	Black shale and medium gray, fine- to medium-grained crystalline limestone alternating. Contacts cloudy Shale to limestone throughout (50:70). Shale shows abundant crinoidal fossil fragments	
750 - 755	do.	
755 - 760	do.	
760 - 765	do.	
765 - 770	do.	
770 - 775	do., but clear limestone more abundant At 774', branching algae	
775 - 779	Do. but crystalline limestone predominant (20:80)	
779 - 787	do. but shale predominates (60:40)	
787 - 800	do. very irregularly bedded, crinoid fragments show in both shale and limestone (50:70)	

UPPER TRENTON

QUEBEC DEPARTMENT OF MINES

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LOG OF PORTNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	<u>Diamond Drill Core</u>
	Dark gray shale and medium dark to dark gray, fine- to coarse-grained limestone intimately interbedded so as to appear conglomeratic. All probably (25:75)	
800 - 805	do. <u>Sowerbyella</u> . <u>Platystrophia</u> . <u>Zygospira</u> . <u>Dalmanella</u>	
805 - 810	do. Fossils as above	
810 - 815	do. Three 2" to 3" beds of clear limestone. Fossils do.	
815 - 820	do. Fossils as above	
820 - 825	do. Fossils as above	
825 - 830	do. <u>Sowerbyella</u> . <u>Prasopora</u> . <u>Platystrophia</u>	
830 - 835	do. Fossils as above	
835 - 840	do. Fossils as above	
840 - 845	do. Fossils as above. 841 $\frac{1}{2}$ -845 Mostly shale	
845 - 850	do. Fossils as above	
850 - 855	do. Bedding tends to approach regularity	
855 - 860	do. do.	
860 - 865	do. Maclurella	
865 - 867	do. do.	
867 - 868	do. Bedding very irregular. <u>Prasopora</u>	
868 - 871	do. Bedding tends to be regular	
871 - 875	do. Shale and limestone cloudily interbedded. Crinoids common in both limestone and shale. (70:30) No definite limestone beds appear here.	
875 - 880	do.	
880 - 881	do. Bedding tends to be regular. Limestone all dense to fine-grained	

PROBABLY MIDDLE TRIASSIC

QUEBEC DEPARTMENT OF MINES

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LOG OF FORNBEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth
in feet

Description

Diamond Drill Core

Depth in feet	Description	<u>Diamond Drill Core</u>
881 - 882	Dark gray shale and medium dark to dark gray, fine-grained to dense limestone, interbedded very irregularly	(58:48)
882 - 885	Bedding highly irregular	
885 - 890	Bedding tends to be regular. Limestone predominates	(20:80)
890 - 900	Bedding tends to be regular. Almost all limestone	(10:90)
900 - 925	Bedding tends to be regular, limestone predominates	(20:80)
925 - 930	Dark gray to black, dense to fine-grained limestone with calcareous dark gray shaly interbeds. Contacts mostly intergradational, here and there sharp. Bands in the shale show crinoid specks and brachiopod sections. Oily odor. For fossils present, see below	(20:80)
930 - 935	As above	(15:85)
935 - 950	As above, but with a few 1" bands of pebble-like limest. Contacts fairly irregular	(10:90)
950 - 955	As above, but no bands as above.	(20:80)
<hr/> <p>Fossils present from 900 to 925 <u>Sowerbyella</u>. <u>Isotelus</u>. <u>Leptaena</u> <u>Dalmanella</u>. <u>Platystrophia</u>. <u>Zygospira</u>. Smooth ostracods</p> <hr/>		
955 - 960	Dark, fine-grained limestone grading to dense, and to medium-grained crystalline. Shale irregularly developed	
960 - 965	do. Very irregularly bedded, cloudy contacts. 1952 1" vug filled with light petroleum. Oily odor.	(40:60)
		<u>Leptaena</u> . <u>Sowerbyella</u> . <u>Lingula</u> <u>Rafinesquina</u>
965 - 966	do.	(25:75)
966 - 968	do. limestone becoming fine- to medium-grained	(20:80)

TRENTON

PROBLY MIDDLE

LOG OF BORMNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core
965 - 970	Dark gray, dense, fine-grained, and medium-grained limestone. Shale beds and partings irregularly developed. Oily odor.	
970 - 975	do. but limestone all fine-grained to dense. Bedding fairly regular	(20:80)
975 - 980	do. Bedding fairly regular	(30:70)
980 - 981 1/2	do. Both limestone and shale in beds up to 6" Fossils, see below	
981 1/2 - 985	do. do	
985 - 986	do. Limestone and shale intimately mixed, giving semi-conglomeratic effect. do	
986 - 988	do. do	
988 - 990	do. Limestone and shale intimately intermixed	
990 - 992	do. do	
992 - 995	do. Bedding fairly irregular	do.
995 - 1000	do. do.	do.
	Fossils from 975 to 1000 as follows: <u>Lingula. Sowerbyella. Dalmanella.</u> <u>Rafinesquina. Strophomena. Climacograptus</u> <u>Calymene. Isotelus. Translucent rooks</u>	
1000 - 1005	Dark shale and limestone, very irregularly interbedded. Probably like 'nodular' limestone in field (90:70)	
1005 - 1007	do. Oily odor	
1007 - 1010	do. Shale interbeds thinner. Limestone (6"; shale (3" Oily odor	(15:85)
1010 - 1015	do. <u>Dalmanella. Rafinesquina. Ceraurus</u> Shale (3"; ls. (5". Contacts in places sharp, in places gradational. Oily odor	(25:75)
1015 - 1022	do. do. Oily odor	(25:75)

PROBABLY MIDDLE

QUEBEC DEPARTMENT OF MINES

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LOG OF PORTNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core
1022½ - 1024	Dark gray dense limestone and dark gray shale very irregularly interbedded. Oily odor	(sh:ls) (25:75)
1024 - 1026	Do., but shale interbeds not prominent	(15:85)
1026 - 1027	like 1022½-1024 above	(20:80)
1027 - 1036	Dark gray limestone, dense, and dark gray shale. Contacts sharp or cloudy. Bedding nearly horizontal Ls.(2"; sh.(1"	(25:75)
1036 - 1037	Very irregularly interbedded dark gray dense limestone and shale. Ls.(2"; sh.(1" <u>Dalmanella</u>	(25:75)
1037 - 1042	Like 1027 - 1030. Ls.(4"; sh.(1" <u>Isotelus</u>	(25:75)
1042 - 1043	like 1036 - 1037 Ls.(2"; sh(1"	(20:80)
1043 - 1050	Like 1027 - 1030 Ls.(5"; sh.(2"	(30:70)
1050 - 1052	Dark gray, dense limestone, with very little shale	(5:95)
1052 - 1053½	Dark gray, fine- to medium-grained limestone with irregularly distributed snaly interbeds. Contacts irregular and cloudy. A few thin beds of light gray, dense limestone <u>Zygospira</u>	(20:80)
1053½ - 1056	Dark gray dense limestone, very little shale (5:95) At 1054 a calcite filled cast of <u>Parastrophis</u> , 1½" x ½". Some of shell substance remains.	
1056 - 1057½	Dark gray dense limestone and shale with more or less horizontal contacts	(20:80)
1057½ - 1058½	Like 1052 - 1053½	(5:85)
1058½ - 1066½	Dark gray dense limestone and dark shale, with more or less horizontal contacts. Ls.(5"; sh.(5"	(20:80)
1066½ - 1068	do., but limestone is in part medium-grained	(25:75)
1068 - 1069	limestone and shale, very irregularly interbedded	(25:75)
1069 - 1071	Limestone and shale, more or less horizontal bedding Ls.(3"; sh.(2"	(25:75)

PROBABLE
 PORTNEUF
 1022½
 1024
 1026
 1027
 1036
 1037
 1042
 1043
 1050
 1052
 1053½
 1056
 1057½
 1058½
 1066½
 1068
 1069
 1071

QUEBEC DEPARTMENT OF MINES

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LOG OF PORTNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	<u>Diamond Drill Core</u>
1071 - 1075	Dark gray, dense limestone and dark gray shale irregularly interbedded	(sh:ls) (20:80)
1075 - 1078	Do., but bedding only fairly irregular	
1078 - 1084	Do., bedding more or less horizontal	
1084 - 1084½	Do., bedding very irregular	
1084½ - 1085	Medium gray, medium-grained crystalline limestone	
1085 - 1087	Dark gray, dense limestone and shale, more or less irregularly interbedded	
1087 - 1087½	Do., very irregularly interbedded	
1087½ - 1089	Like 1085 - 1087	
1089 - 1090	Dark dense limestone	
1090 - 1100	Dark dense limestone, with thin, ½"-2", shaly interbeds	
1100 - 1115	Dark dense limestone and dark gray shale, more or less horizontally bedded. Ls.(6"; sh.(1"	(15:85)
1115 - 1118	Limestone and shale as above, very irregularly bedded	(10:90)
1118 - 1120	As above, but mostly shale.	(60:40)
1120 - 1125½	Like 1115 - 1118. Vertical joints with asphaltic residue Occasional bed of light gray, crystalline limestone	
1125½ - 1130	Limestone and shale as above, fairly regularly bedded Ls.(3"; sh.(5"	(40:60)
1130 - 1134	do. Ls.(8"; sh.(1"	(25:75)
1134 - 1135	do., very irregularly bedded Ls.(3"; sh.(1"	(25:75)
1135 - 1142½	do., more or less regularly bedded Ls.(5"; sh.(2"	(25:65)
1142½ - 1145	Dark dense limestone and calcareous shale, latter fossil spotted. Concretions indistinct, but approx. horiz. Ls.(8"; sh.(8"	(25:75)

PROBABLY TRENTON

QUEBEC DEPARTMENT OF MINES

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LOG OF PORTNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core
		(sh:ls)
1145 - 1147	Dark gray dense limestone and dark gray shale with crinoid spots. Contacts indistinct	(30:70)
	ls.(4"; sh.(2"	
1147 - 1150	Do., grading downwards into same with contacts sharp and regularly bedded	(30:70)
	ls.(3"; sh.(1"	
1150 - 1153	Dark dense limestone and dark shale very irregularly and intimately interbedded A 6"-long vein with asphalt-like residue	(35:65)
1153 - 1155	do., more or less regularly bedded, approx horizontal	(20:80)
	ls.(4"; sh.(1"	
1155 - 1165	Like 1150 - 1153	(30:70)
1165 - 1170	Do., with a few 4" medium-grained crystalline limestone beds.	(25:75)
1170 - 1172	do.	(25:75)
1172 - 1175	Dark dense limestone and dark shale, very irregularly interbedded	(25:75)
	ls.(3"; sh.(1"	
1175 - 1185	Same rock types, more or less irregularly interbedded	(15:85)
	ls.(4"; sh.(1"	
1185 - 1190	do.	(20:80)
	ls.(3"; sh.(2"	
1190 - 1195	do.	(25:75)
	ls.(6"; sh.(1"	
1195 - 1200	do.	m(10:90)
	From 1175 to 1200 there are a few 1"-2" beds of light gray crystalline limestone	
	At 1191-1191 1/2 } vertical joints with asphalt-like 1194 } residue	
	<u>Sowerbyella. Rafinesquina</u>	
1200 - 1207	Dark dense limestone and dark shale, highly irregularly and intimately interbedded	
1207 1/2 - 1210	Similar limestone and shale more or less well bedded	

BRENTON
11324

QUEBEC DEPARTMENT OF MINES

200

LOG OF PORTNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core
1210 - 1219	Limestone and shale, ^{mm} fairly well and evenly bedded. Some of the limestone is dark and dense, but most is brownish, fine-, medium-, coarse-grained crystalline. There is no oily odor, nor are there any bryozoa present	
1219 - 1223	Similar limestone and shale very irregularly and intimately intermixed. Smooth ostracods. <u>Prasopora</u> <u>Dalmanella</u> . <u>Sowerbyella</u>	
1223 - 1225	Medium gray, medium-grained crystalline limestone with branching bryozoa	
1225 - 1233	Light to medium brownish gray, fine- to medium-grained limestone, crystalline.	
1233 - 1235	do., but mostly fine-grained	
1235 - 1240	do., but fine-, medium-, and coarse-grained. Open vertical veins at 1237 and 1238	
1240 - 1249	Light gray brown, mostly coarse-grained crystalline lime	
1249 - 1253	Fairly dark gray brown, medium- to fine-grained limest.	
1253 - 1259	do., coarse-grained. Open vugs at 1254	
1259 - 1265	Medium gray brown, medium-grained, a little fine-grained and a few shaly partings	
1265 - 1268	do., but mostly medium-grained, and a little coarse-gr. Shaly partings present	
1268 - 1272	Medium dark gray brown, fine-grained limestone. Shaly partings more abundant. Some bryozoan mats (1". At 1269, 1" light gray lithographic limestone	
1272 - 1275	Limestone as above, but medium-grained. Shaly partings	
1275 - 1278	Medium to light gray brownish limestone, mostly fine-grained, with bryozoan mats.	
1278 - 1283	At 1274, there is 1" of limestone with irregular vertical open fractures. Whole sample oil soaked, but not limestone above and below. Open space completely lined with asphaltic residue	

MIDDLE TRENTON

TRENTON

LOWER

LOG OF PORTEVEU HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	<u>Diamond Drill Core</u>
1274 $\frac{1}{2}$ - 1275	Light brownish gray limestone, coarse-grained	
1275 - 1280	Medium light brownish gray, medium- to medium-coarse-grained limestone. A little fine-grained, almost dense. One bryozoan mat.	
1280 - 1282 $\frac{1}{2}$	Medium gray brown, mostly fine-grained limestone <u>Prasopora</u>	
1282 $\frac{1}{2}$ - 1284 $\frac{1}{2}$	Dark gray brown, very fine-grained to dense limestone. Shaly partings common	
1284 $\frac{1}{2}$ - 1284	Light medium gray, medium-grained limestone	
1284 - 1285 $\frac{1}{2}$	Light gray brown, coarse-grained limestone. Open veinwork, no residue.	
1285 $\frac{1}{2}$ - 1286 $\frac{1}{2}$	Medium dark brownish gray, very-very-fine-grained limestone. Open vertical veins; no residue	
1286 $\frac{1}{2}$ - 1291	Light to medium brownish gray, fine- to medium-grained limestone	
1291 - 1291 $\frac{1}{2}$	Light brownish gray, coarse-grained limestone	
1291 $\frac{1}{2}$ - 1292	Medium dark brownish gray, fine-grained limestone <u>Prasopora</u>	
1292 - 1293 $\frac{1}{2}$	Medium light brownish gray, medium-grained limestone	
1293 $\frac{1}{2}$ - 1293	Dark brownish gray, very, very, fine-grained to lithographic limestone. One open vug with a little asphaltic residue.	
1293 - 1296 $\frac{1}{2}$	Light brownish gray, coarse-grained limestone	
1296 $\frac{1}{2}$ - 1298 $\frac{1}{2}$	Dark brownish gray, very, very fine-grained to lithographic limestone. <u>Prasopora</u> Vertical open veins at 1297, with abundant black residue.	
1298 $\frac{1}{2}$ - 1299	Light medium gray, medium-grained limestone	
1299 - 1300	Light gray brown, coarse-grained limestone	

LOWER TRENTON

QUEBEC DEPARTMENT OF MINES

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LOG OF PORTNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	<u>Diamond Drill Core</u>
1300 - 1300 $\frac{1}{2}$	Medium gray brown, fine- to medium-grained limestone Metabentonite at 1300 $\frac{1}{2}$.	
1300 $\frac{1}{2}$ - 1301 $\frac{1}{2}$	Light brownish gray, coarse-grained limestone	
1301 $\frac{1}{2}$ - 1302 $\frac{1}{2}$	Medium dark gray, fine-grained limestone	
1302 $\frac{1}{2}$ - 1303 $\frac{1}{2}$	Medium dark gray, medium-grained limestone	
1303 $\frac{1}{2}$ - 1305	Light brownish gray, coarse-grained limestone	
1305 - 1305 $\frac{1}{2}$	Medium gray brown, medium-grained limestone	
1305 $\frac{1}{2}$ - 1306 $\frac{1}{2}$	Light gray brown, coarse-grained limestone	
1306 $\frac{1}{2}$ - 1308 $\frac{1}{2}$	Dark gray brown, medium grained limestone	
1308 $\frac{1}{2}$ - 1309 $\frac{1}{2}$	Light gray brown, coarse-grained limestone	
1309 $\frac{1}{2}$ - 1310	Dark gray, fine-grained and semi-lithographic limestone	
1310 - 1310 $\frac{1}{2}$	Light brownish gray, coarse-grained limestone	
1310 $\frac{1}{2}$ - 1311	Medium gray, fine-grained limestone.	
1311 - 1311 $\frac{1}{2}$	Dark gray brown, very fine-grained limestone	
1311 $\frac{1}{2}$ - 1312	Medium light gray, medium-grained limestone. Shaly p partings present	
1312 - 1320	Light brownish gray, coarse-grained limestone	
1320 - 1320 $\frac{1}{2}$	Light brownish gray, medium-coarse-grained limestone	
1320 $\frac{1}{2}$ - 1321 $\frac{1}{2}$	Dark gray, fine-grained crystalline limestone. Irregular contact with limestone above. Abundance of quartz grains up to 1mm.	
1321 $\frac{1}{2}$ - 1321 $\frac{1}{2}$	Very sandy limestone with abundant fossil cross-sections including gastropods	
1321 $\frac{1}{2}$ - 1322 $\frac{1}{2}$	Pale greenish gray sandstone. Sand grains up to 2mm, mostly about .5mm. Large grains angular. No efferves- cence.	

LOWER BRENTON

LOG OF FORTNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core
1322 1/2 - 1323 1/2	Medium dark gray sandstone, quartz grains abundant; effervescence good at top, fair at base.	
1322 1/2 - 1324 1/2	Medium dark gray limestone, quartz grains abundant in upper 2", remainder fine-grained to lithographic. 1323 1/2 - 1324 1/2 fine-grained limestone conglomerate	
1324 1/2 - 1325 1/2	Sandstone, black and calcareous at top, greenish and quartzitic at base. Effervescence good at top, fair at base. <u>Dinorthis sp.</u>	
1325 - 1327 1/2	Black sandstone as above. Grains mostly up to 1mm, a few at 2mm. Somewhat rounded	
1327 1/2 - 1330 1/2	Black limestone, very fine-grained. Sand grains in lowest 3".	
1330 - 1330 1/2	do., sand grains common	
1330 1/2 - 1333 1/2	Fine-grained black dolomite, with patches of pebble-like calcite, light to medium gray. Quartz grains present	
1333 1/2 - 1335 1/2	Dolomite as above, no limestone patches. Abundant sand grains. Effervescence good; At 1334 a small 2" pebbly bed of buff lithographic limestone	
1335 - 1337 1/2	Fine-grained black dolomite, with light gray limestone patches, quartz grains abundant	
1337 1/2 - 1339 1/2	do., but no limestone patches	
1339 1/2 - 1340 1/2	like 1335 - 1337 1/2	
1340 - 1340 1/2	do, with one pebble, 1", of buff lithographic limestone	
1340 1/2 - 1343 1/2	Light gray, fine-grained sandstone, very calcareous. At 1341 1/2 1" pebble of light buff lithographic limestone	
1343 1/2 - 1344 1/2	Greenish gray sandstone, fine-grained, dark above, lighter, almost white, below. Very faint effervescence. A few pink feldspar grains	

LOG OF PORTNEUF HOLE NO. 1

BALD MOUNTAIN OIL COMPANY

continued

Depth in feet	Description	Diamond Drill Core
1344 - 1350	Black sandstone, grains up to 1mm, average about .7mm Several feldspar grains about .5mm	
1350 - 1350 $\frac{1}{2}$	do., but lighter because of prominent kaolin matrix	
1350 $\frac{1}{2}$ - 1351 $\frac{1}{2}$	Black sandstone as in 1350 ⁴⁴ - 1350	
1351 $\frac{1}{2}$ - 1352 $\frac{1}{2}$	Greenish gray fine-grained conglomerate at top, very fine-grained sandstone at base. Fair effervescence	
1352 $\frac{1}{2}$ - 1353	Light gray limestone, with quartz grains common. Sand grains up to 2mm at base, none above 1353	
1353 $\frac{1}{2}$ - 1354	Black sandstone. Effervescence fair. Fine-grained	
1354 - 1355	Sandstone, green at top, medium gray in middle, and black at base. Grains up to 2mm, but mostly less than 1mm. Hardly any effervescence. Feldspar and biotite grains present	
1355 - 1360	Do., all medium gray, biotite present	
1360 $\frac{1}{2}$ - 1364	Do. grading into pink quartz-biotite gneiss	
1364 - 1387	Quartz-pink feldspar-biotite gneiss. Schistosity steep, about 65°. <u>Bottom of hole.</u>	

BLACK RIVER
PRECA

*J. W. Clark
January 1919*

QUEBEC DEPARTMENT OF MINES

LOG

PORTNEUF NO. 2

BALD MOUNTAIN OIL CO.

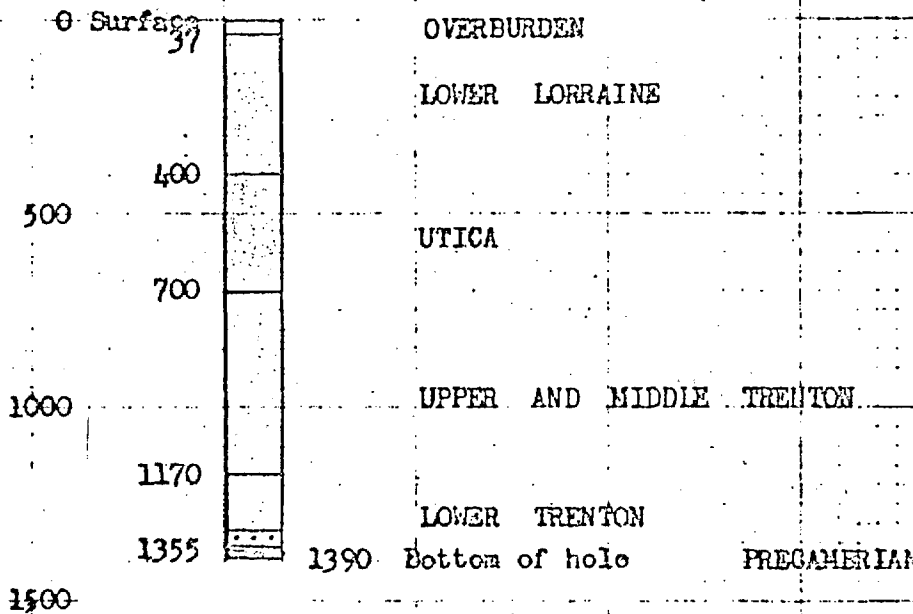
T. H. CLARK

DECEMBER, 1958

SUMMARY LOG OF FORTNEUF NO. 2

PAID MOUNTAIN OIL CO.

DEPTHS IN FEET BELOW SURFACE



DESCRIPTION OF FORMATIONS

LOWER LORRAINE: Dominantly dark gray shale; lesser amounts of light gray, fine-grained sandstone and medium to dark gray siltstone.

UTICA: Predominantly dark gray to black shale; a little shaly buff-gray limestone

UPPER & MIDDLE TRENTON: Mostly medium gray, fine-grained limestone, with dark gray dense and medium gray crystalline limestone in lesser amounts. Shale 10%

LOWER TRENTON:
 1200-1315 Predominantly light to medium gray crystalline limestone; very little dense limestone. Shale 4%

1315-1350 More than half light gray quartz sandstone. Limestone 41%; Shale 1%

PRECAMERIAN: Biotite gneiss.

T. H. Clark
 T. H. Clark
 December, 1958

QUEBEC DEPARTMENT OF MINES

PORTNEUF NO. 2

BALD MOUNTAIN OIL CO.

STATISTICAL SUMMARY

	Sandstone	Siltstone	Shale	Limestone
LOWER LORRAINE	7	4	89	58 --
UTICA	--	--	96	4
UPPER & MIDDLE TRENTON	--	--	10	90
LOWER TRENTON 1200-1315	--	--	4	96
1315-1355	58	--	1	41
PRECAMBRIAN	Foliated			

*S. P. Clark
December 25-8*

DIAGRAMMATIC LOG OF

PORTNEUF NO. 2

LEGEND

Depth in feet	Line- stone	Sandstone	Siltstone	Shale	Acid*	*Reaction with 5% HCl
5%	5%	5%	5%	5%	None	
10	10	10	10	10	Weak	
15	15	15	15	15	Poor	
20	20	20	20	20	Fair	
		etc.	etc.	etc.	Good	

Streak
White
Pale brown (=faint)
Light brown
Medium brown
Brown

Miscellaneous
Pyrite
Metabentonite
Igneous intrusion

Presence only.
No percentage implied

Horizontal blanks -- depths for which no sample is available

DIAGRAMMATIC LOG

BALD MOUNTAIN -- FORTNEUF NO. 2

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	Depth	Lime- stone	Sandstone	Siltstone	Shale	Acid	Streak	P	M	I
LORRAIN	100									
	200									
	300									
LOWER	400									
	500									
UPPER	600									

*J. H. Clark
December 25/28*

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ABBREVIATIONS

pr. or pres.	-	present - in amounts not more than 1%		
ab. or abund.	-	abundant - in amounts between 1% and 3%		
pc, pcs.	-	piece or pieces	inartic.	-- inarticulate
v.	-	very	brach.	-- brachiopod
calc.	-	calcareous or calcite	cryst.	-- crystalline
av. or aver.	-	average	fgmt.	-- fragment
ign.	-	igneous	qz.	quartz
rx.	-	rocks	qzte.	-- quartzite
lt.	-	light	r. & f.	-- rounded and frosted
med.	-	medium	slick.	-- slickenside
dk.	-	dark		
sh.	-	shale		
ss.	-	sandstone		
ls.	-	limestone		
dol.	-	dolomite or dolomitic		
metab. metabent.	-	metabentonite		
br.	-	brown		
co.	-	coarse		

CONVENTIONS

Fossil names -- Genera and species underlined.

Light/medium - color ranges from light to medium.

Light medium - color uniform, as given.

Albertite - any hard asphaltic material.

Medium gray, but medium-grained.

Streak and acid reaction, where given, refers only to shale.

QUEBEC DEPARTMENT OF MINES

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LOG OF PORTNEUF HOLE NO. 2

BALD MOUNTAIN OIL COMPANY

(Continued)

<u>Depth in feet</u>	<u>Description</u>	<u>Cable Rig Cuttings</u>	
0 - 37	Overburden		
	Sandstone, light gray, fine-grained		
	Siltstone, medium to dark gray		
	Shale, dark gray	Streak	Acid
37 - 40	5 5 90	Pale	Weak
40 - 45	5 5 90	do	do
45 - 50	5 5 90	do	do
50 - 55	5 10 85	Light	Poor
55 - 60	10 5 85	do	do
60 - 65	5 5 90	do	do
65 - 70	5 10 85	do	Fair
70 - 75	5 5 90	do	do
75 - 80	5 10 85	do	do
80 - 85	pr 5 95	do	do
85 - 90	10 5 85	do	do
90 - 95	10 5 85	do	do
95 - 100	10 5 85	do	do
100 - 105	5 5 90	Light/medium	do
105 - 110	pr 10 90	do	do
110 - 115	pr 5 95	Light	do
115 - 120	pr pr 100	do	do
120 - 125	10 5 85	do	Fairly good
125 - 130	10 5 85	do	Fair

LOWER LORRAINE

QUEBEC DEPARTMENT OF MINES

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LOG OF PORTNEUF HOLE NO. 2

BALD MOUNTAIN OIL COMPANY

(continued)

<u>Depth in feet</u>	<u>Description</u>	<u>Cable Rig Cuttings</u>
	Sandstone, light gray, fine-grained Siltstone, medium and dark gray Shale, dark gray	Streak Acid
130 - 135	5 pr 95	Light Fair
135 - 140	5 pr 95	do Fairly good
140 - 145	10 5 85	Light/medium Fair
145 - 150	5 pr 95 Pyrite	Light Fair/good
150 - 155	15 5 80	do do
155 - 160	20 5 75	do Fair
160 - 165	10 ab# 90 Pyrite #buff quartzitic sltst.	do Fair/poor
165 - 170	5 -- 95	do Fair
170 - 175	5 ab 95	Light/med. Fair/good
175 - 180	5 pr 95	do do
180 - 185	5 pr 95	do do
185 - 190	pr -- 100 Pyrite	do do
190 - 200	5 -- 95	do do
200 - 205	5 5 90	do do
205 - 210	-- 5 95	do do
210 - 215	5 5 90	do do
215 - 220	pr pr 100	do do
220 - 225	pr 5 95	do do
225 - 230	pr pr 100 Pyrite	do do

LOWER LORRAINE

QUEBEC DEPARTMENT OF MINES

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LOG OF PORTNEUF HOLE NO. 2

BALD MOUNTAIN OIL COMPANY

(continued)

<u>Depth in feet</u>	<u>Description</u>			<u>Cable Rig Cuttings</u>	
				Streak	Acid
230 - 235	5	ab	95	Light/med.	Fair/good
235 - 240	5	5	90	do	do
240 - 245	5	--	95	do	do
245 - 250	pr	pr	100	Light	do
250 - 255	--	pr	100	do	do
255 - 260	5	pr	95	do	do
260 - 265	5	ab	95	do	do
265 - 270	10	5	85	Light/med.	do
270 - 275	20	5	75	do	do
275 - 280	10	5	85	Light	do
280 - 285	5	pr	95	do	do
285 - 290	5	5	90	Light/med.	do
290 - 295	5	--	95	do	do
295 - 300	5	--	95	do	Fair
300 - 305	10	5	85	do	do
305 - 310	10	5	85	Light	Fair
310 - 315	10	5	85	do	do
315 - 320	15	5	80	Light/med.	do

LOWER LORRAINE

Sandstone, light gray, fine-grained
Siltstone, medium to dark gray
Shale, dark gray

QUEBEC DEPARTMENT OF MINES

LOG OF PORTNEUF HOLE NO. 2

214

BALD MOUNTAIN OIL COMPANY

(continued)

<u>Depth in feet</u>	<u>Description</u>	<u>Cable Rig Cuttings</u>	
		Streak	Acid
	Sandstone, light gray, fine-grained		
	Siltstone, medium to dark gray		
	Shale, dark gray		
320 - 325	15 5 80	Light /med.	Fair
325 - 330	15 5 80	do	do
330 - 335	10 5 85	do	do
335 - 340	10 5 85	do	do
340 - 345	20 5 75	do	do
345 - 350	5 5 90	do	do
350 - 352	10 10 80	do	do
352 - 355	20 -- 80	do	do
355 - 360	15 10 75	Light	Poor
360 - 365	5 5 90	do	do
365 - 370	10 5 85	Lt. /med.	Fair
370 - 375	10 5 85	do	do
375 - 380	15 -- 85	do	do
380 - 385	10 5 85	do	do
385 - 390	10 5 85 pr Metabentonite	do	do
390 - 395	5 5 85 pr do 5%	do	do
395 - 400	5 5 85 pr do 5%	do	Fair/fairly good

LOWER LOUFAITE

QUEBEC DEPARTMENT OF MINES

LOG OF PORTNEUF HOLE NO. 2

2/5

BALD MOUNTAIN OIL COMPANY

(continued)

Depth in feet	Description	Cable Rig Cuttings
	Sandstone, light gray, fine-grained	
	Siltstone, medium to dark gray	
	Shale, /dark gray	Streak Acid
	very	
400 - 405	100 1 piece buff dense ls.	Fair
405 - 406	95 5% do Pyrite	Light/medium do Good
406 - 410	95 5% do Pyrite	do do
410 - 415	95 5% do Pyrite	do do
415 - 420	100 ab.do	Light do
420 - 425	100 ab.do Metabentonite	do do
425 - 430	100 pr.do (do, brown	Lt./med. do
430 - 435	95 5% do do Pyrite	(Leptobolus insignis) do do
435 - 440	100 ab.do do	do do
440 - 445	100 do	do do
445 - 450	100	do do
450 - 455	100	do do
	Shale mostly black	
455 - 460	100 Pyrite	Med./light do
460 - 465	100 Pyrite	do do
465 - 470	100 Pyrite	do do
470 - 475	100 Pyrite	do do
475 - 480	100 Pyrite	do do
480 - 485	100 Pyrite	do do
485 - 490	100	do do
490 - 495	100	do do
495 - 500	100	do do

U.T.I.C.A.

QUEBEC DEPARTMENT OF MINES

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LOG OF PORTNEUF HOLE NO. 2

BALD MOUNTAIN OIL COMPANY

(continued)

<u>Depth in feet</u>	<u>Description</u>	<u>Cable Rig Cuttings</u>
	Shale, dark gray but mostly black	
	Limestone, shely, medium gray, a little buff	
		Streak Acid
500 - 505	100 --	Med./light Good
505 - 510	95 5# # brownish gray	do do
510 - 515	80 20# # do	do Very good
515 - 520	95 5	do Good
520 - 525	95 5	do do
525 - 530	95 5# # brownish gray	do do
530 - 535	95 5# # do	do Very good
535 - 540	95 5 do	do do
540 - 545	90 10# # do	do do
545 - 550	90 10# # do	do do
550 - 555	95 5# # do	do do
555 - 560	100 -- Metabentonite, greenish	do do
560 - 565	100 pr do, brownish	do do
565 - 570	95 5	do do
570 - 575	100 pr Pyrite	do do
575 - 580	90 10 A little med. gray sh.	do do
580 - 585	95 5 mm do	do do
585 - 590	95 5	do do
590 - 595	90 10	do do
595 - 600	95 5	do do

QUEBEC DEPARTMENT OF MINES

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LOG OF FORENEUF HOLE NO. 2

BALD MOUNTAIN OIL COMPANY

(continued)

<u>Depth in feet</u>	<u>Description</u>	<u>Cable Rig Cuttings</u>
	Shale, dark gray, but mostly black, a little medium gr.	
	Limestone, medium gray, shaly, a little buff	
	Streak Acid	
600 - 605	95 inches 5	Medium/light Very good
605 - 610	90 10	do do
610 - 615	95 5 mm	do do
615 - 620	100 pr Graptolites Light Metabentonite, pale br. ma do	
620 - 625	100 pr	do do
625 - 630	95 5	Light/med. do
630 - 635	100 pr	do do
635 - 640	100 pr	do do
640 - 645	100 mm --	do do
645 - 650	95 5	do do
650 - 655	100 --	do do
655 - 660	100 -- <u>Diplograptus</u>	do do
660 - 665	100 --	do do
665 - 670	100 -- Pyrite	do do
670 - 675	100 --	do do
675 - 680	100 --	do do
680 - 685	90 10# (<u>Leptobolus insignis</u> # Pure limestone, do (medium to light gray buff	
685 - 690	90 10# # do Ostracods	do do
690 - 695	90 10# # do do <u>Leptobolus insignis</u>	do do
695 - 700	85 15# # do <u>Leptobolus insignis</u>	Light do

QUEBEC DEPARTMENT OF MINES

218

LOG OF PORNEUB HOLE NO. 2

BALD MOUNTAIN OIL COMPANY

(continued)

<u>Depth in feet</u>	<u>Description</u>	<u>Cable Rig Cuttings</u>
	Shale, dark gray to black	
	Limestone, various kinds, shaly, dense, crystalline	
700 - 705	50 50	
705 - 710	20 80	
710 - 715	40 60	Fragments of common Trenton fossils
715 - 720	50 70#	# A little medium grained crystalline ls.
720 - 725	30 65	5% metabentonite, dark brown
725 - 730	10 90#	# mostly fine-grained crystalline
	Limestone, dark gray, shaly	
	Limestone, dark gray, dense	
	Limestone, medium gray, fine-grained crys	
	Limestone, med. to lt. gray, med.-grained cryst.	
730 - 735	30 -- 10 60 --	
735 - 740	20 -- 10 60 10	Black chert pres.
740 - 745	10 -- 10 80 --	Metabentonite, dark brown, ab.
745 - 750	20 -- 10 60 10	
750 - 755	10 -- 10 70 10	<u>Dalmanella</u>
755 - 760	20 -- 40 30 10	<u>Sowerbyella</u>
760 - 765	5 -- 30 60 5	
765 - 770	15 -- 20 65 --	
770 - 775	20 -- 20 50 10	
775 - 780	30 -- 10 60 --	
780 - 785	20 -- 20 60 --	
785 - 790	30 -- 20 45 5	
790 - 795	20 -- 10 60 10	
795 - 800	5 -- -- 70 25	

TRENTON

UPPER & MIDDLE

QUEBEC DEPARTMENT OF MINES

219

LOG OF PORTNEUF HOLE NO. 2

BALD MOUNTAIN OIL COMPANY

(continued)

Depth in feet	Description	Cable Rig Cuttings			
	Shale, dark gray to black				
	Limestone, dark gray, shaly				
	Limestone, dark gray, dense to dark gray				
	Limestone, medium gray, fine-grained crys				
	Limestone, medium to light gray, medium-grained crystalline				
800 - 805	5 -- 5 50 40				
805 - 810	5 -- -- 40 55 <u>Refinesquina</u>				
810 - 815	10 -- 10 60 20				
815 - 820	5 10 10 75 -- <u>Dalmanella</u>				
820 - 825	10 10 -- 50 30				
825 - 830	5 10 5 30 50				
830 - 835	-- 10 -- 50 40				
835 - 840	15 35 -- 40 10				
840 - 845	20 25 5 50 --				
845 - 850	20 35 5 40 -- <u>Sowerbyella</u>				
850 - 855	10 50 -- 40 -- <u>Sowerbyella</u>				
855 - 860	10 30 -- 60 --				
860 - 865	10 10 -- 70 10 <u>Sowerbyella</u>				
865 - 870	-- 20 5 70 -5				
870 - 875	-- 20 20 60 --				
875 - 880	-- 10 40 50 --				
880 - 885	-- 10 40 50 -- <u>Sowerbyella</u>				
885 - 890	-- 10 30 50 10 <u>Sowerbyella</u>				
890 - 895	-- 20 30 40 10				
895 - 900	-- 10 50 40 --				

TRENTON
UPPER & MIDDLE

QUEBEC DEPARTMENT OF MINES

220

LOG OF PORTNEUF HOLE NO. 2

BALD MOUNTAIN OIL COMPANY

(continued)

Depth in feet	Description	Cable Rig Cuttings				
	Shale, dark gray to black					
	Limestone, dark gray, shaly					
	Ls., dark gray, dense					
	Ls., medium gray, fine-grained					
	Ls., medium to light gray, medium-grained crystall					
900 - 905		10	20	50	20	--
905 - 910		--	10	70	20	--
910 - 915		--	20	40	40	-- <u>Sowerbyella</u>
915 - 920		10	10	30	40	10
920 - 925		--	20	20	50	10
925 - 930		10	20	20	50	-- <u>Sowerbyella</u>
930 - 935		20	10	10	50	10 <u>Sowerbyella</u>
935 - 940		--	20	60	20	--
940 - 945		10	20	50	20	-- Translucent rods
945 - 950		10	30	20	40	-- <u>Rafinesquina</u> , <u>Dalmanella</u> Byrozoa
950 - 955		--	15	5	60	20 <u>Sowerbyella</u> , Blue chert
955 - 960		10	20	20	40	10
960 - 965		10	20	40	30	-- <u>Sowerbyella</u>
965 - 970		--	20	25	50	-- <u>Sowerbyella</u> : Blue & buff chert Pale green shale
970 - 975		--	10	50	40	-- <u>Sowerbyella</u> : do. Blue chert
975 - 980		10	10	20	60	-- do.
980 - 985		5	15	20	60	-- <u>Sowerbyella</u> : Metabentonite, nearly white
985 - 990		10	20	20	50	-- <u>Rafinesquina</u> : do. Dark chert Translucent rods
990 - 995		10	20	10	50	10 Metabentonite
995 - 1000		10	20	10	40	20 Brown chert. do., common

TRENTON
UPPER & MIDDLE

QUEBEC DEPARTMENT OF MINES

221

LOG OF PORTNEUB HOLE NO. 2

BALD MOUNTAIN OIL COMPANY

(continued)

Depth in feet	Description	Cable Rig Cuttings				
	Shale, dark gray to black					
	Limestone, dark gray, shaly					
	Limestone, dark gray, dense					
	Limestone, medium to dark gray, fine-grained					
	Limestone, med. to lt. gray, medium grained crystallin					
1000 - 1005		20	20	10	50	-- <u>Rafinesquina</u> : bryozoa
1005 - 1010		10	10	10	40	30
1010 - 1015		10	20	20	40	10 <u>Sowerbyella</u>
1015 - 1020		--	30	30	40	--
1020 - 1025		20	20	10	40	10 <u>Isotelus</u> : <u>Rafinesquina</u> : <u>Sowerbyella</u>
1025 - 1030		20	10	10	50	10 do. do. do.
1030 - 1035		10	20	30	40	--
1035 - 1040		10	20	30	40	--
1040 - 1045		15	20	20	40	5
1045 - 1050		20	20	25	35	--
1050 - 1055		25	20	5	30	--
1055 - 1060		--	10	50	40	--
1060 - 1065		20	20	20	40	-- <u>Sowerbyella</u> : <u>Dalmanella</u>
1065 - 1070		20	10	20	40	10
1070 - 1075		10	10	10	50	20 <u>Sowerbyella</u> : bryozoa
1075 - 1080		10	--	10	50	30 Bryozoa (<u>Prasopora</u> type)
1080 - 1085		--	20	20	50	30 do. common
1085 - 1090		5	--	25	55	15 <u>Prasopora</u>
1090 - 1095		5	--	50	40	5
1095 - 1100		10	--	50	40	-- <u>Dalmanella</u>

UPPER & MIDDLE TRENTON

LOG OF PORTNEUF HOLE NO. 2

BALD MOUNTAIN OIL COMPANY

(continued)

Depth in feet	Description	Cable Rig Cuttings		
	Shale, dark gray			
	Limestone, dark gray, shaly			
	Ls., dark gray, dense			
	Ls., med. to dark gray, fine-grained			
	Ls., med. to lt. gray, med.-grained			
1100 - 1105		10	-- 60 25 5	<u>Rafinesquina</u>
1105 - 1110		10	-- 60 20 10	
1110 - 1115		5	-- 85 10 --	
1115 - 1120		--	-- 60 40 --	
1120 - 1125		5	-- 25 60 10	
1125 - 1130		5	10 20 65 --	Transparent rods; <u>Prasopora</u> Smooth ostracods
1130 - 1135		10	-- 25 55 10	<u>Prasopora</u> ; <u>branching bryozoa</u>
1135 - 1140		5	-- 30 55 10	Calcite veins
1140 - 1145		5	-- 30 55 10	do
1145 - 1150		10	-- 20 60 10	
1150 - 1155		10	-- 20 40 30	
1155 - 1160		5	-- 25 40 30	
1160 - 1165		5	-- 20 30 45	
1165 - 1170		5	-- 20 50 25	
1170 - 1175		pr	-- 40 60 --	All limestone buff to light brown from here down
1175 - 1180		pr	-- 40 60 --	
1180 - 1185		ab	-- 30 60 10	
1185 - 1190		10	-- 30 50 10	
1190 - 1195		10	-- 20 40 30	<u>Prasopora</u> ; <u>Dalmanella</u>
1195 - 1200		5	-- 25 30 40	<u>Prasopora</u>

TRENTON
 UPPER & MIDDLE
 LOWER TRENTON

LOG OF PORTNEUF HOLE NO. 2

BALD MOUNTAIN OIL COMPANY

(continued)

Depth in feet	Description	Cable Rig Cuttings				
	Shale, dark gray					
	Limestone, dark buff-gray, dense					
	Ls., med. to dark gray, buff, fine-grained					
	Ls., light gray-buff, medium-grained					
	Ls., lt. gr.-buff, coarse-grained					
1200 - 1205	10 20 60 10 --	--				<u>Dalmanella</u> : branching bryozoa
1205 - 1210	10 25 60 5 --	--				Black chert
1210 - 1215	10 20 70 -- --	--				
1215 - 1220	5 20 55# 20 --	--				# light buff
1220 - 1225	5 -- 75# 20 --	--				# do.
1225 - 1230	-- -- 80# 20 --	--				# do.
1230 - 1235	pr -- 10 90 --	--				
1235 - 1240	pr -- 10 80 10					
1240 - 1245	-- -- -- 90# 10					# very light
1245 - 1250	pr -- 10 80# 10					# medium buff
1250 - 1255	-- -- 20 70 10					
1255 - 1260	pr -- 10 85 5					
1260 - 1265	5 -- 20 70 5					
1265 - 1270	pr -- 5 70 25					
1270 - 1275	pr -- 20 70 10					
1275 - 1280	5 10 80 5 --					Limestone from here down is characteristically gray, not gray-buff
1280 - 1285	-- 30 40 20 10					
1285 - 1290	10 20# 60 10 --					# buff
1290 - 1295	25 20 55 -- --					
1295 - 1300	pr -- 50# 50# --					Branching bryozoan mats. Pyrit # medium-light gray buff

TRENTON

LOWER

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS LECLERCVILLE NO. 1

LOWLANDS EXPLORATION LTD.

T. H. CLARK

JANUARY, '59

QUEBEC DEPARTMENT OF MINES

22-6

SUMMARY LOG OF IMPERIAL LOWLANDS INCLERCVILLE NO. 1

LOWLANDS EXPLORATION LTD.

Depths in feet below surface			
0 Surface		OVERBURDEN	Sand and clay
60		UPPER LORRAINE	Shale, light to medium gray. Lesser amounts of light gray siltstone, light gray, very fine-grained ss.
330		MIDDLE LORRAINE	Shale, medium gray, micaceous; lesser amounts of medium gray siltstone, medium gray very fine-grained ss.
500			
830		LOWER LORRAINE	Shale, medium dark; lesser amounts of medium gray siltstone, medium gray, very fine-grained sandstone
1000			
1500			
2000	1955	UTICA	Shale, black
	2281	Upper Trenton	Limestone, medium to dark gray, fine-grained; shaly limestone; buff and gray dense ls.; shale.
2500	2492	MIDDLE TRENTON	Limestone, buff, dense; shaly limestone; very little shale
	2755	LOWER TRENTON	Limestone, crystalline, light to med. gray; shaly limestone;
	2920	LOWER TRENTON and/or	
	3408	BLACK RIVER	Sandstone, almost pure quartz, grain averaging .5mm. Mostly white, also gray, buff and green
	3455	PRECAMERIAN	Shale present near base Biotite-quartz foliate
3500			

A. W. Clark
Jan. 1959

IMPERIAL LOWLANDS LECLERCVILLE NO. 1

LOWLANDS EXPLORATION LTD.

STATISTICAL SUMMARY

		Sandstone	Siltstone	Shale	Streak	Acid	
Up. Lor.	60- 200	11%	7%	82%	Light	Poor	
	200- 330	1	--	99	Light	Poor/Fair	
M.L.	330- 830	11	11	78	Light	Fair/Poor	
Low. Lor.	830-1400	14	7	79	Light	Fair/Poor	
	1400-1893	4	4	92	Lt/Med.	Fair/Fairly good	
	1893-1955	27	4	69	Lt/Med.	Fair/Good	
Ut.	1955-2050	--	--	100	Lt.med/Med.	F/Good	Dolomitic limestone
	2050-2210	--	--	95	Lt.med/Med.	Good/V. good	5
	2210-2284	--	--	85	Lt.med/Med.	Good/V. good	15
U.Tr.		Shale	Shaly ls.	Ls. gray, dense	Ls. buff, dense	Ls. gray, fine-gr, cryst.	Ls., white, sandy residu
	2284-2330	14	28	13	11	24	8
	2330-2492	3	10	3	15	64	5
	M.Tr	2492-2755	3	29	--	52	6
L.Tr	2755-2920	3	20	--	8	63	6
Tr. or B.R.		Sandstone White	Gray	Green	Red	Buff	Shale, green red
	2920-2990	67	11	22			
	2990-3239	100	--	--			
	3239-3299	52	42	6			
	3299-3331	69	--	4	11	4	6 10
	3331-3381	2	--	8	7	79	1 3
3381-3408	Various sandstones						
PeC	3408-3445	Biotite-quartz foliates					

*A. W. Clark
January 1959*

DIAGRAMMATIC LOG OF

IMPERIAL LOWLANDS NO. 1 (LECLERCVILLE)

LEGEND

Depth in feet	Line-stone	Sandstone	Siltstone	Shale	Acid*	*Reaction with 5% HCl
5%	5%	5%	5%	5%	None	
10	10	10	10	10	Weak	
15	15	15	15	15	Poor	
20	20	20	20	20	Fair	
		etc.	etc.	etc.	Good	

Streak
White
Pale brown
Light brown (faint)
Medium brown
Brown

Presence only.
No percentage implied

Miscellaneous
Pyrite
Metabentonite
Igneous intrusion

Horizontal blanks -- depths for which no sample is available

DIAGRAMMATIC LOG

229

LOWLANDS EXPLORATION LTD. NO. 1 - LECLERCVILLE

	Depth	Lime- stone	Sandstone	Siltstone	Shale	Acid	Streak	P	M	I
UPPER LORRAINE	130									
	200									
	300									
	400									
	500									
	600									
	700									
	800									
	900									
	MIDDLE LORRAINE	130								
200										
300										
400										
500										
600										
700										
800										
900										
LOWER LORRAINE		130								
	200									
	300									
	400									
	500									
	600									
	700									
	800									
	900									

DIAGRAMMATIC LOG

231

LOWLANDS EXPLORATION LTD. NO.1 - LECLERCVILLE

Depth	Lime- stone	Sandstone	Siltstone	Shale	Acid	Streak	P	M	I
1,700									
1,800									
1,900									
2,000									
2,100									
2,200									
2,280									

LORRAINE
LOWER
UTICA

*J. H. Clark
January 1959*

ABBREVIATIONS

pr. or pres.	-	present - in amounts not more than 1%		
ab. or abund.	-	abundant - in amounts between 1% and 3%		
pc, pcs.	-	piece or pieces	qz.	-- quartz
v.	-	very	qzte.	-- quartzite
calc.	-	calcareous or calcite	inartic.	inarticulate
av. or aver.	-	average	brach.	-- brachiopod
ign.	-	igneous	cryst.	-- crystalline
rx.	-	rocks	r. & f.	-- rounded and frosted
lt.	-	light	slick.	-- slickenside
med.	-	medium	fgmt.	-- fragment
dk.	-	dark		
sh.	-	shale		
ss.	-	sandstone		
ls.	-	limestone		
dol.	-	dolomite or dolomitic		
metab. metabent.	-	metabentonite		
br.	-	brown		
co.	-	coarse		

CONVENTIONS

Fossil names -- Genera and species underlined.

Light/medium - color ranges from light to medium.

Light medium - color uniform, as given.

Albertite - any hard asphaltic material.

Medium gray, but medium-grained.

Streak and acid reaction, where given, refers only to shale.

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 1 (Leclercville)

233

LOWLANDS EXPLORATION LTD.

Depth in feet		Description			Cable Rig	Cuttings	
0 - 10	OVERBURDEN	Mostly sandstone fragments (Lorraine)					
10 - 20		do. with much buff clay					
20 - 30		do. with sandy clay and small pebbles					
30 - 40		do. with abundance of limestone and Precambrian fgmts.					
40 - 50		do. do.					
50 - 60		do. with sandy clay, brownish, limestone and Precambrian fragments as above.					
60 - 60	UPPER LORRAINE	Sandstone, light gray, very fine-grained					
		Siltstone, light gray					
		Shale, light to medium gray				Streak of gray sh.	
		Shale, brown				Acid	
60 - 70		--	pr	60	40		Light brown Poor
70 - 80		--	10	90	pr		do do
80 - 90		--	25	75	pr	Brachiopods	do do
90 - 100		--	20	80	--		do do
100 - 110			5	5	80	10	do do
110 - 120			5	5	80	10	do do
120 - 130			20	5	70	5	do do
130 - 140			30	10	50	10	do do
140 - 150			5	10	80	5	do do
150 - 160			5	pr	90	5	do Fairly poor
160 - 170			15	5	75	5	do do
170 - 180			25	pr	75	--	do do
180 - 190			10	pr	80	10	do do
190 - 200			20	--	70	10	do <i>traptalites</i> Poor

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 1 (Leclercville)

234

LOWLANDS EXPLORATION LTD.

continued

Depth in feet			Description	Cable Rig Cuttings				
200 - 210	UPPER LORRAINE		Sandstone, light gray, very fine-grained					
210 - 220			Siltstone, light gray					
220 - 230			Shale, light to medium gray					
230 - 240			Shale, brownish	Streak	Acid			
240 - 250			--	--	100	pr	Light	Poor
250 - 260			--	--	90	10	do	do
260 - 270			--	--	95	5	do	do
270 - 280			--	--	95	5	do	do
280 - 290			--	--	95	--	do	do
290 - 295			--	--	100	--	do	do
295 - 300	MIDDLE LORRAINE		--	--	100	do	do	
300 - 310			--	--	100		do	do
310 - 320			--	--	100		do	do
320 - 330			--	--	100		do	do
330 - 340			--	5	95		do	do
340 - 350			5	15	80		do	do
350 - 360			pr	10	90		do	do
360 - 370			--	10	90		do	do
370 - 380			--	10	90		do	do
380 - 390			--	10	90		do	do
390 - 400	5	5	90		do	do		

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 1 (Leclercville)

235

LOWLANDS EXPLORATION LTD.

Continued

Depth in feet	Description	<u>Cable Rig Cuttings</u>	
	Sandstone, medium gray, very, very fine-grained		
	Siltstone, medium gray		
	Shale, medium gray, micaceous	Streak	Acid
400 - 410	pr 15 85	Light	Poor
410 - 420	10 15 75	do	do
420 - 430	-- -- 100	do	do
430 - 440	-- 10 90	do	do
440 - 450	5 5 90	do	do
450 - 460	5 10 85	do	Fair/poor
460 - 470	-- 10 90	do	do
470 - 480	10 20 70	do	do
480 - 490	15 10 75	do	do
490 - 500	5 10 85	do	Fair
500 - 510	pr 10 90	do	do
510 - 519	pr 10 90	do	do
519 - 530	10 20 70	do	do
530 - 540	15 15 70	do	do
540 - 550	15 10 75	do	do
550 - 560	5 10 85	do	do
560 - 570	20 10 70	do	do
570 - 580	5 10 85	do	do
580 - 590	10 10 80	do	do
590 - 600	5 5 90	do	do

TERRAIN
 MIDDLE

Continued

Depth in feet	Description			Cable Rig Cuttings		
590 - 600	MIDDLE BORRAINE	Sandstone, medium gray, very, very fine-grained				
		Siltstone, medium gray				
		Shale, medium gray, micaceous			Streak	Acid
600 - 610		35	10	55	Light	Fair
610 - 620		5	10	85	do	do
620 - 630		10	10	80	do	do
630 - 640		10	15	75	do	do
640 - 650		5	10	85	do	do
650 - 660		--	5	95	do	do
660 - 670		--	20	80	do	do
670 - 680		10	15	75	do	do
680 - 690		70	20	10	do	do
690 - 700		40	20	40	do	do
700 - 710		15	15	70	do	do
710 - 720		40	20	40	do	do
720 - 730		40	20	40	do	do
730 - 740		20	5	75	do	Fair/poor
740 - 750		pr	pr	100	do	do
750 - 760		10	pr	90	do	do
760 - 770		5	pr	95	do	do
770 - 780	15	10	75	do	do	
					Pyrite	
780 - 790	pr	15	85	do	do	
790 - 800	25	10	65	do	Fair	

IMPERIAL LOWLANDS NO. 1 (LEGLERGVILLE)

LOWLANDS EXPLORATION LTD.

Continued

Depth in feet	Description				Cable Rig Cuttings	
	Sandstone, medium gray, very, very fine-grained					
	Siltstone, medium gray					
	Shale, medium gray, micaceous				Streak	Acid
800 - 810	5	25	70	Light	Fair	
810 - 820	pr	10	90	do	Fair/poor	
820 - 830	20	10	70	do	do	
	8	15	77			
830 - 840	pr	10	90	do	do	
840 - 850	--	5	95	do	do	
850 - 860	5	10	85	do	do	
860 - 870	5	5	90	do	do	
870 - 880	5	10	85	do	Fair	
880 - 890	pr	10	90	do	do	
890 - 900	5	5	90	Shale medium dark	do	
900 - 910	5	10	85	do	do	
910 - 92 ⁵ _m	pr	10	90	do	Fair/poor	
925 - 930	10	10	80	do	do	
930 - 940	pr	10	90	do	Fair	
940 - 950	5	10	85	do	do	
950 - 960	10	5	85	do	do	
960 - 970	25	5	70	do	do	
970 - 980	15	5	80	do	do	
980 - 990	30	10	40	do	do	
990 - 1000	10	10	80	do	do	

MIDDLE LORRAINE
LOWER LORRAINE

IMPERIAL LOWLANDS NO. 1 (LECLERCVILLE)

LOWLANDS EXPLORATION LTD.

Continued

Depth in feet	Description			Cable Rig Cuttings	
			Sandstone, medium gray, very, very fine-grained		
			Siltstone, medium gray		
			Shale, medium dark gray	Streak	Acid
1000 - 1010	UPPER LORRAINE	5	5 90	Light	Fair
1010 - 1020		25	10 65	do	do
1020 - 1030		pr	10 90	do	do
1030 - 1040		5	pr 95	do	do
1040 - 1050		40	pr 60	do	do
5 1050 - 1060		30	10 60	do	Fairly poor
1060 - 1070		pr	5 95	do	do
1070 - 1080		20	5 75	do	do
1080 - 1090		10	20 70	do	do
1090 - 1100		25	10 65	do	do
1100 - 1110	LOWER LORRAINE	30	30 40	do	do
1110 - 1120		25	5 70	do	Poor
1115 - 1120		5	10 85	do	do
1120 - 1130		5	10 85	do	do
1130 - 1140		5	15 80	do	Fair/poor
1140 - 1150		pr	10 90	do	do
1150 - 1160		10	10 80	do	do
1160 - 1170		40	10 50	do	do
1170 - 1180		40	10 50	Light/lt.med.	do
1180 - 1190		30	5 65	do	do
1190 - 1200	20	5 75	Light	do	

LOWLANDS EXPLORATION LTD.

continued

Depth in feet	Description			Cable Rig Cuttings	
				Streak	Acid
			Sandstone, medium gray, very very fine-grained		
			Siltstone, medium gray		
			Shale, medium-dark gray		
1200 - 1205	15	5	80	Light	Fair/poor
1205 - 1210	25	5	70	Light/lt.med.	do
1210 - 1220	20	5	75	do	do
1220 - 1230	10	5	85	do	do
1230 - 1240	pr	5	95	Light	do
1240 - 1250	5	10	85	do	do
1250 - 1260	5	5	90	do	Poor
1260 - 1270	30	5	65	do	do
1270 - 1280	25	pr	75	Light/lt.med.	do
1280 - 1290	10	pr	90	do	do
1290 - 1300	20	pr	80	Light	do
1300 - 1310	pr	pr	100	do	do
1310 - 1320	10	5	85	Light/lt.med.	do
1320 - 1330	20	5	55	do	do
1330 - 1340	pr	10	90	do	Fair/poor
1340 - 1350	pr	10	90	do	do
1350 - 1360	30	10	80	do	Poor
1360 - 1370	pr	10	90	do	do
1370 - 1377	20	5	75	do	Fair/poor
1377 - 1390	80	5	15	A little dark brown sh.	do
1390 - 1400	20	5	75	Light/med.	Fair

UPPER
 LORRAINE
 LOWER

QUEBEC DEPARTMENT OF MINES

240

IMPERIAL LOWLANDS NO. 1 (LEGLERCVILLE)

LOWLANDS EXPLORATION LTD.

Depth in feet	Description	Cable Rig Cuttings	
		Streak	Acid
	Sandstone, medium gray, very fine-grained		
	Siltstone, medium gray		
	Shale, medium-dark gray		
1400 - 1410	5 pr 95	Light /med.	Fair
1410 - 1420	pr 5 95	Lt.med./med.	Fair/poor
1420 - 1430	pr 10 90	do	do
1430 - 1434	30 5 65 'variegated' sh.	do	do
1434 - 1439	5 5 90	do	do
1439 - 1446	10 5 85 'variegated' sh.	do	do
1446 - 1450	5 5 90	do	do
1450 - 1460	pr 5 95	do	Fair
1460 - 1470	5 10 85	do	do
1470 - 1480	5 5 90	do	do
1480 - 1490	5 30 65	do	do
1490 - 1495	-- 5 95	do	do
1495 - 1500	5 pr 95	Light /med.	do
1500 - 1507	pr 15 85	do	do
1507 - 1510	5 10 85	Light med.	do
1510 - 1516	5 10 85	do	do
1516 - 1520	pr pr 100	do	do
1520 - 1523	5 pr 95	do	do
1523 - 1530	5 pr 95	Light /med.	do
1530 - 1540	pr 10 90	Light med.	do
1540 - 1550	-- -- 100	do	do
1550 - 1560	-- 10 90	do	do
1560 - 1566	-- 10 90	do	do

LOWER

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 1 (LECLERCVILLE)

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LOWLANDS EXPLORATION LTD.

Continued

Depth in feet			Description	<u>Cable Rig Cuttings</u>	
			Sandstone, light medium gray, very fine-grained		
			Siltstone, medium gray		
			Shale, medium-dark gray, <u>Streak</u> <u>Acid</u>		
1566 - 1576		5	10 85	Lt.med./med.	Fair
1576 - 1587		5	5 90	Light med.	do
1587 - 1598		25	20 55	Light/med.	do
1598 - 1605		pr	25 75	do	do
1605 - 1615		--	10 90	Light med.	do
1615 - 1624		--	-- 100 # silty	Light/med.	do
1624 - 1630		pr	-- 100 do	do	do
1630 - 1636		pr	pr 100 do	do	Fairly good
1636 - 1640		pr	pr 100 do	do	do
1640 - 1650		5	pr 95 do	Lt.med./med.	do
1650 - 1660		5	pr 95 do	do	do
1660 - 1670		5	pr 95	do	do
1670 - 1680		10	pr 90	Lt./med	do
1680 - 1690		10	pr 90	do	do
1690 - 1700		pr	pr 100	Lt.med./med	do
1700 - 1707		pr	5 95	do	do
1707 - 1715		pr	5 95	do	do
1715 - 1725		--	10 90	Lt.med.	do
1725 - 1731		10	5 85	do	do
1731 - 1740		5	pr 95	Lt./med.	do.

LOWER LORRAINE

LOWLANDS EXPLORATION LTD.

Continued

Depth in feet	Description			Cable Rig	Cuttings
	Sandstone, medium gray, very fine-grained				
	Siltstone, medium gray				
	Shale, medium-dark to dark gray				
			Streak		Acid
1740 - 1746	pr	pr	100	Light/med.	Fairly good
1746 - 1753	--	pr	100	do	do
1753 - 1760	--	--	100	do	do
1760 - 1768	--	--	100	Lt.med./med.	do
1768 - 1775	5	pr	95	Lt./med.	do
1775 - 1782	pr	--	100	Lt./lt.med	Fair
1782 - 1792	--	--	100	do	do
1792 - 1800	pr	pr	100	Lt./med.	Good
1800 - 1810	--	--	100	do	do
1810 - 1820	--	--	100	do	do
1820 - 1830	--	--	100	do	do
1830 - 1840	10	5	85	do	do
1840 - 1846	5	5	90	do	do
1846 - 1853	pr	--	100	do	do
1853 - 1860	15	5	80	'variegated' sh.	do
1860 - 1866	10	5	85	do	do
1866 - 1871	pr	pr	100	do	do
1871 - 1877	15	5	80	do	do
1877 - 1885	5	pr	95	do	Fairly good
1885 - 1893	10	10	80	do	do

LOWER LORRAINE

IMPERIAL LOWLANDS NO. 1 (MORSEVILLE)

LOWLANDS EXPLORATION LTD.

Continued.

Depth in feet			Description	Cable Rig Cuttings		
			Sandstone, medium gray, very fine-grained			
			Siltstone, medium gray			
			Shale, dark gray	Streak	Acid	
1893 - 1901	LOWER LORRAINE	pr- pr	100	Light med.	Fairly Good	
1901 - 1910		20#	5 75	#'Dirty' sandstone with carbonaceous patches up to 2mm.	do do	
1910 - 1918		20	5 75	do	do do	
1918 - 1926		40	5 55	do	Lt./lt.med do	
1926 - 1934		30	5 65	do	do do	
1934 - 1941		50	5 45	do	Lt./med. do	
1941 - 1947		35	5 60	do	do do	
1947 - 1955		20	5 75	do	do do	
1955 - 1962		UTICA	pr --	100#	#Black shale	Lt./lt.med. Good
					Shale, black	
1962 - 1970	pr --		100	Few pcs. dol. ls.	do Fairly good	
1970 - 1980	pr pr		100	do Pyrite	do do	
1980 - 1990	pr --		100	do	do do	
1990 - 2000	-- --		100	Pyrite	do do	
2000 - 2010	-- --		100	Pyrite	do do	
2010 - 2020	-- --		100	do Pyrite	do do	
2020 - 2030	-- --		100	do	do do	
2030 - 2037	-- --		100	do	do do	
2037 - 2044	-- --	95 min	do, 5%	Lt.med./med. do		
2044 - 2050	-- --	100	do, ab.	do do		

QUEBEC DEPARTMENT OF MINES

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IMPERIAL LOWLANDS NO.

LOWLANDS EXPLORATION LTD.

Depth in feet	Description	Cable Rig Cuttings	
	Sandstone, medium gray, very fine-grained		
	Siltstone, medium gray		
	Shale, black		
	Dolomitic limestone, massive, med. gray		
	Streak Acid		
2050 - 2057	-- -- 100 ab.	Lt.med./med.	Fairly good
2057 - 2062	-- -- 95 100 5	do	do
2062 - 2069	-- -- 100 ab.	Pyrite do	do
2069 - 2076	-- -- 95 5	do	Good/very g.
2076 - 2083	-- -- 90 10	do	do
2083 - 2090	-- -- 90 10	ab. yellow brown metabentonite.	do
2090 - 2100	-- -- 95 5	Light/med.	do
2100 - 2110	pr -- 95 5	do	do
2110 - 2120	pr -- 95 5	Lt.med./med	do
2120 - 2128	pr -- 95 5	do	do
2128 - 2139	-- -- 100 pr	Pyrite do	do
2139 - 2147	-- -- 95 5	Pyrite do	do
2147 - 2156	-- -- 95 5	Pyrite do	do
2156 - 2165	pr -- 95 5	do	do
2165 - 2172	-- -- 95 5	Light med.	do
2172 - 2178	-- -- 100 pr	do	do
2178 - 2191	-- -- 95 5	do	do
2191 - 2200	-- -- 95 5	Pale drab meta- bentonite	Light med./med do
2200 - 2210	-- -- 95 5	do	do



IMPERIAL LOWLANDS NO. 1 (LECLERCVILLE)

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LOWLANDS EXPLORATION LTD.

Continued

Depth in feet	Description		Cable Rig Cuttings			
		Shale, black				
		Dolomitic limestone, massive, medium gray				
		Streak Acid				
2210 - 2220	90-	10 Pale drab metabentonite				
			Pyrite	Lt.med./med.	Good/very g	
2220 - 2230	80	20	Pyrite	do	do	
2230 - 2240	85	15		do	do	
2240 - 2250	80	20	<u>?Leptobolus</u>	do	do	
2250 - 2256	90	10		do	do	
2256 - 2263	80	20		do	do	
2263 - 2274	90	10	Pyrite	do	do	
2274 - 2276	90	10	Pyrite	do	do	
2276/- 2281	90	10		do	do	
2281 - 2284	50	-	50% various kinds of limestone, dense black; dense, light and medium brown; fine-grained crystalline, light and medium brown			
		Shaly limestone, dark gray				
		Limestone, dark to medium gray, dense				
		LS., ditto, buff brown				
		LS., lt. to med. gray, fine-grained				
		LS., white, with very fine sand residue				
2284 - 2291	15	25	15	25	20	--
2291 - 2297	15	25	15	15	20	10
2297 - 2305	15	30	20	5	5	15
2305 - 2316	15	30	10	5	30	10
2316 - 2323	15	30	10	5	30	10
2323 - 2330	10	25	10	10	40	5

UPPER TRENTON
 HETIC

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 1 (LEGLERCVILLE)

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LOWLANDS EXPLORATION LTD.

Continued

Depth in feet			Description				Cable	Rig	Cuttings
			Shale, black to dark gray						
			Limestone, shaly, dark gray						
			Ls. gray, dense						
			Ls., buff, dense						
			Ls., fine-grained cryst., lt. to med gray						
			Ls., white, with fine-grained sandy residue						
2330 - 2340			5	25	5	--	60	5	
2340 - 2350			5	5	--	--	90	pr	
2350 - 2357	TRENTON		5	40	--	--	50	5	
2357 - 2365		5	30	10	40	10	5		
2365 - 2376		5	30	--	--	65	--	Crinoids C	
2376 - 2389		pr	10	--	--	90	pr	<u>Rafinesquina</u>	
2389 - 2392		pr	10	--	10	80	--		
2392 - 2399		5	--	--	30	60	5		
2399 - 2404		UPPER	pr	5	--	20	65	10	
2404 - 2412			pr	5	10	30	50	5	
2412 - 2421			--	15	5	10	65	5	
2421 - 2429			5	--	--	10	75	10	
2429 - 2439	5		--	--	10	80	5		
2439 - 2451	pr		--	--	5	90	5		
2451 - 2458	5		--	--	25	60	10	Small flat gastropod	
2458 - 2465	5		--	--	25	60	10		
2465 - 2475	5	--	--	25	60	10	<u>Sowerbyella</u>		
2475 - 2485	5	--	10	10	70	5			
2485 - 2492	5	10	20	30	30	5	<u>Rafinesquina</u>		

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 1 (LECLERCVILLE)

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LOWLANDS EXPLORATION LTD.

Continued

Depth in feet			Description	Cable Rig Cuttings		
			Shale, black to dark gray			
			Limestone, shaly, dark gray			
			Ls., buff, dense			
			Ls., lt. to med. gray, fine-grained cryst.			
			Ls., white, fine-gr. sandy residue			
2492 - 2504	5	--	70	20	5	
2504 - 2515	5	20	60	20	5	
2515 - 2523	5	30	55	--	10	
2523 - 2532	--	10	75	--	15	
2532 - 2538	5	20	65	--	10	
2538 - 2545	5	25	60	--	10	
2545 - 2554	5	40	45	--	10	
2554 - 2565	10	50	25	5	10	
2565 - 2576	10	50	30	5	5	
2576 - 2584	5	25	60	5	5	
2584 - 2592	5	40	50 60	--	5	
2592 - 2599	--	20	70	--	10	
2599 - 2607	--	25	65	--	10	
2607 - 2615	--	40	50	--	10	
2615 - 2627	--	30	60	--	10	
2627 - 2631	--	20	60	--	10	
2631 - 2638	--	30	60	pr	10	
2638 - 2650	--	25	60	10	5	<u>Conotreta rusti</u> ; <u>Isotelus</u>
2650 - 2660	--	40	50	--	10	
2660 - 2672	--	40	40	5	15	<u>Sowerbyella</u>

MIDDLE TERTON

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 1 (LECLERCVILLE)

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LOWLANDS EXPLORATION LTD.

Continued

Depth in feet			Description	Cable	Rig	Cuttings	
			Shale, dark gray to black				
			Limestone, shaly, dark gray				
			Ls., buff, dense				
			Ls., lt. to med. gray, (medium gr. fine-grained cryst				
			Ls., white, fine-gr. sandy residue				
2672 - 2684	TRENTON	--	15 70	--	15	<u>Sowerbyella</u>	
2684 - 2696		5	40 35	10	10		
2696 - 2707		5	40 25	20	10	Dark brown metabentonite, fissil ^e	
2707 - 2718		--	30 30	30	10	<u>Sowerbyella</u>	
2718 - 2728		--	30 40	20	10		
2728 - 2740	MIDDLE	--	30 40	20	10		
2740 - 2747		10	15 60	5	10		
2747 - 2755		10	15 60	5	10		
2755 - 2765	TRENTON	--	15 25	50	10	Limestone is very light	
2765 - 2775		--	15 25	50	10	do; Bryozoa; <u>Rafinesquina</u>	
2775 - 2786		--	15 15	65	5	<u>Isotelus</u>	
2786 - 2797		--	20 10	65	5		
2797 - 2806		--	30 10	55	5	Branching bryozoa	
2806 - 2815		--	30 10	55	5		
2815 - 2828		LOWER	--	30 --	60	10	
2828 - 2837			--	30 --	60	10	Chert; Pyrite
2837 - 2845	--		15 --	75	10		
2845 - 2850	5		5 10	75	5	#Ls. is nearly white	
2850 - 2863	10	30 20	35	5	Branching bryozoa		
2863 - 2871	5	30 --	60	5			

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 1 (LECLERCVILLE)

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LOWLANDS EXPLORATION LTD.

Continued

Depth in feet		Description				Cable Rig Cuttings		
		Shale, dark gray to black						
		Limestone, shaly, dark gray						
		Ls., buff and gray, dense						crystalline
		Ls., very light gray, fine- and med.-gr.						
		Ls., white, fine-gr. sandy residue						
2871 - 2880	LOWER TRENTON	5	30	--	60	5	Branching ammonian Black chert	
2880 - 2888		5	20	--	75	5		
2888 - 2896		5	20	--	75	5		
2896 - 2909		5	20	20	50	5		
2909 - 2920		5	5	10	75	5		
		Sandstone, white, clear quartz						
		Sandstone, pale green matrix, quartz grains						
		Sandstone, gray matrix, do						
2920 - 2935	LOWER TRENTON OR BLACK RIVER	60	(2.mm	30	(2mm	10	(1.mm	All calcareous
2935 - 2936		60	(2.mm	30	(2.mm	10	(1.mm	do. Black shale flakes
2936 - 2940		30	do	--	m	20	(1.mm	Gray ss. 90% matrix
2940 - 2945		10	do	80	do	10	(.5mm	Slightly calcareous
2945 - 2950		10	do	85	do	5	do	do Gray ss. has biotite
2950 - 2957		50	do	pr		50	do	do. do
2957 - 2963		80	(4.mm	5	do	15	do	do do
2963 - 2970		100	do	pr		pr		
2970 - 2977		75	do	15	do	5	do	do do. 5% black micaceous shale
2977 - 2980		75	do	15	do	5	do	do do do
2980 - 2985	100	(5.mm	--		pr	do	do Feldspar common	
2985 - 2990	100	(.8mm	--		pr	do	do Kaolin matrix	

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 1 (LECLERCVILLE)

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LOWLANDS EXPLORATION LTD.

Continued

Depth in feet	Description	Cable Rig Cuttings	
		clear quartz	
	All samples completely broken up into/sand grains		
2990 - 2996	100% Average grain .2mm, up to 2mm.		Slightly calcareous
2996 - 3001	100	.2mm	2mm do
3001 - 3007	100	.2mm	2mm do
3007 - 3021	95 mtam	.2mm	2mm do 5% green sandst. (.5mm)
3021 - 3025	100	.2mm	2mm
3025 - 3035	100	.2 - .4mm	
3035 - 3040	100	.2 - .4mm	
3040 - 3043	100	.2 - .4mm	
3043 - 3045	100	.2 - .4mm	2mm, rounded & frosted
3045 - 3048	100	.2 - .5mm	2mm, do
3048 - 3050	100 uniformly	.3mm	do
3050 - 3054	100 do	.3mm	do
3054 - 3056	100 do	.5mm	do
3056 - 3059	100 do	.5mm	do
3059 - 3061	100 do	.5mm	do
3061 - 3065	100 do	.5mm	do
3065 - 3068	100 do	.3mm	do
3068 - 3070	100 do	.3mm	do
3070 - 3073	100 do	.4mm	do
3073 - 3077	100	.3mm	.5mm do
3077 - 3078	100	.5mm	do

LOWER TRENTON OR BLACK RIVER

Continued

Depth in feet	Description	Cable Rig Cuttings			
	Cuttings consist entirely of clear quartz grains except where otherwise noted.				
		Average grain, in mm.			
		Maximum grain, in mm.			
		Rounded & frosted,			
3078 - 3083	do	.2	.5	Down to .25mm	
3083 - 3086	do	do	do	do	
3086 - 3089	do	do	do	do	
3089 - 3093	do	do	do	do	
3093 - 3095	do	do	do	do	
3095 - 3000	do	do	do	do	
3100 - 3104	do	do	do	do	
3104 - 3108	do	do	do	do	
3108 - 3113	do	do	do	do	
3113 - 3116	do	do	do	do	
3116 - 3120	do	do	do	do, several large r. & f. up to 1mm	
3120 - 3125	do	do	do	do	
312 ⁵ _m - 3130	do	do	do	do	
3130 - 3133	do	do	do	do	
3133 - 3136	do	do	do	do	
3136 - 3139	do	do	do	do	
3139 - 3142	do	do	do	do	
3142 - 3148	do	.3-.5	1mm	.3	do
3148 - 3154	do	do	do	do	
3154 - 3157	do	do	do	do	

BOULEA TRENTON OR BLACK RIVER

LOWLANDS EXPLORATION LTD.

Continued

Depth in feet	Description	Cable Rig Cuttings
3157 - 3160	Clear quartz sand grains, average diameter .2-.4mm rounded and frosted down to .3mm	
3160 - 3164	do	
3164 - 3165	do	
3165 - 3167	do	
3167 - 3169	White sandstone, siliceous cement. Grains up to .5mm, maximum 1mm	
3169 - 3171	do	
3171 - 3173	do	
3173 - 3176	do, but grain irregular up to 1.5mm	
3176 - 3180	do, do, but a few rounded & frosted grains up to 2mm	
3180 - 3186	do do do in abundance	
3186 - 3190	do do do in abundance	
3190 - 3194	do do do in abundance	
3194 - 3199	do do do in abundance	
3199 - 3201	do do do in abundance	
3201 - 3205	White sandstone, irregular grain up to 2mm Tight siliceous cement. A little pyrite	
3205 - 3208	do	
3208 - 3210	do	
3210 - 3213	do	
3213 - 3216	do	
3216 - 3218	do	
3218 - 3221	do, but sample composed of sand grains only.	

BLACK RIVER OR BRENTON LOWER

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 1 (LECLERCVILLE)

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LOWLANDS EXPLORATION LTD.

Continued

Depth in feet		Description	Cable	Rig	Cuttings
3221 - 3224	BLACK RIVER OR TRENTON OR MOVER	White sandstone, irregular grain up to 2mm, tight siliceous cement			
3224 - 3228		do			
3228 - 3231		do			
3231 - 3235		do			
3235 - 3239		do			
3239 - 3243		do, but 30% of sandstone is gray			
3243 - 3248		do, 30 and 20% greenish			
3248 - 3253		do 30 20			
3253 - 3258		do 30 20	Metabentonite present. Shaly with biotite crystals		
3258 - 3261		do 5mm 30 2 20	do pr. Pyrite		
3261 - 3264		20 80	greenish do pr. Pyrite		
3264 - 3267		20 80	gray with abundant pink feldspars do pr.		
3267 - 3271		20 80	do do pr.		
3271 - 3276		20 80	do do pr. Pink feldspar and rose quartz common		
3276 - 3280		20 80	do do		
3280 - 3283	20 80	do do			
3283 - 3288		Almost wholly sand grains, maximum 2mm minimum .3mm poorly r. & f. down to .5mm. Gray sandstone 5%			
3288 - 3293		do, pink feldspar 10%			
3293 - 3296		do, do 5%			
3296 - 3299		do 75% do 1%, Greenish gray ss., up to .5mm, 10% Greenish gray shale, 2% Reddish brown sandstone, 10% Reddish brown shale, 2%			

IMPERIAL LOWLANDS NO. 1 (LECLERCVILLE)

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LOWLANDS EXPLORATION LTD.

Continued

Depth in feet			Description	Cable Rig Cuttings			
			Sand grains, mostly clear quartz White sandstone Green sandstone Reddish brown sandstone Green shale Red shale				
3299 - 3303		75	1 10 10 2 2				
3303 - 3306		75	5 2 -- 15 3				Black shale present
3306 - 3309		75	5 2 -- 15 3				do
3309 - 3311		75	5 2 -- 15 3				do
3311 - 3312		70	15 5 pr 5 5				pr
3312 - 3314		70	5 m5 -- 15 5				pr
3314 - 3315		70	5 mm 5 15 -- 5				
3315 - 3318		60	5 10 15 5 5				
3318 - 3322		60	-- 5 20 5 10				
3322 - 3324		55	pr 5 25 -- 15				
3324 - 3326		50	pr pr 30 -- 20				
3326 - 3328		45	10 -- 25 -- 20				
3328 - 3331		40	pr 5 25 -- 30				
3331 - 3334		--	70 -- 20 -- 10				SS is faintly pink
3334 - 3337		--	5 9m pr pr -- 5				
3337 - 3339		--	100 pr pr -- pr				
3339 - 3341		--	100 pr pr -- pr				
3341 - 3343		--	100 pr pr -- pr				
3343 - 3346		--	100 pr pr -- ab				
3346 - 3348		--	90 5 -- ab 5				

BLACK RIVER OR TRENTON LOWER

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 1 (LECLERCVILLE)

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LOWLANDS EXPLORATION LTD.

Continued

Depth in feet	Description	<u>Cable Rig Cuttings</u>				
	Pink to buff sandstone					
	Green sandstone					
	Reddish brown sandstone					
	Green shale					
	Red-brown shale					
3348 - 3350		85	5	10	pr	5
3350 - 3352		90	5	pr	pr	5
3352 - 3354		85	5	pr	pr	10
3354 - 3356		90	pr	--	--	10
3356 - 3358		85	5	10	pr	pr
3358 - 3360		65	15	5	10	5
3360 - 3362		75	5	20	--	--
3362 - 3364		75	5	20	--	--
3364 - 3368		75	5	20	--	--
3368 - 3372		100	--	--	--	--
3372 - 3377		50	25	--	--	--
						25% white sandstone. Much kaolin matrix, and possibly chlorite
3377 - 3381		50	25	--	--	--
						do
3381 - 3386						White, gray and pink sandstone, with rusty biotite flake Abundant bright green mineral
3386 - 3390						White, gray, green and pink sandstone, with rusty biotite flakes. Bright green mineral as above
3390 - 3393						do.
3393 - 3395						Quartz grains scarce. Variety of sandstones, some probably glauconitic, some red, some white
3395 - 3399						Do, with abundant quartz splinters, as if from quartz pebbles, some flesh-colored feldspar, and rusted biotite
3399 - 3402						do., Very few sandstone fragments, biotite still rusty.

LOWER TRENTON OF BLACK RIVER

LOWLANDS EXPLORATION LTD.

Continued

Depth in feet		Description	Cable Rig Cuttings	
3402 - 3405	LOWER TERTIARY OR BLACK RIVER	Dirty gray and red sandstones, much shaly material intermixed. Sand grains very rare. Rusty biotite.		
3405 - 3408		Do.		
3408 - 3411		Fragments of biotite-quartz gneiss, and pink quartzite. Biotite is fresh, not rusted. Probably top of Precambrian		
3411 - 3414		Do.		
3414 - 3417		Pinkish quartzite abundant, Biotite schist less so.		
3417 - 3420		Do., with some chloritic rock		
3420 - 3422		Do.		
3422 - 3424		PRECAMBRIAN	Almost all biotite and clear quartz, with a very little muscovite. All rock fragments are quite fresh	
3424 - 3427			Do. Quartz 40%; biotite 25%; green mine al, ?chlorite 20%; remainder unidentified 15%	
3427 - 3430			Do.	
3430 - 3433			Do. Some quartz a rusty rose color	
3433 - 3437			No sample	
3437 - 3439			Do. Very little green mineral. Proportions 40:30:10:20	
3439 - 3442			Do. Do.	
3442 - 3445	Do. Do.			
		Bottom of hole		

*J. W. Clark
January 1959*

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 4 (LOTBINIERE)

LOWLANDS EXPLORATION LTD.

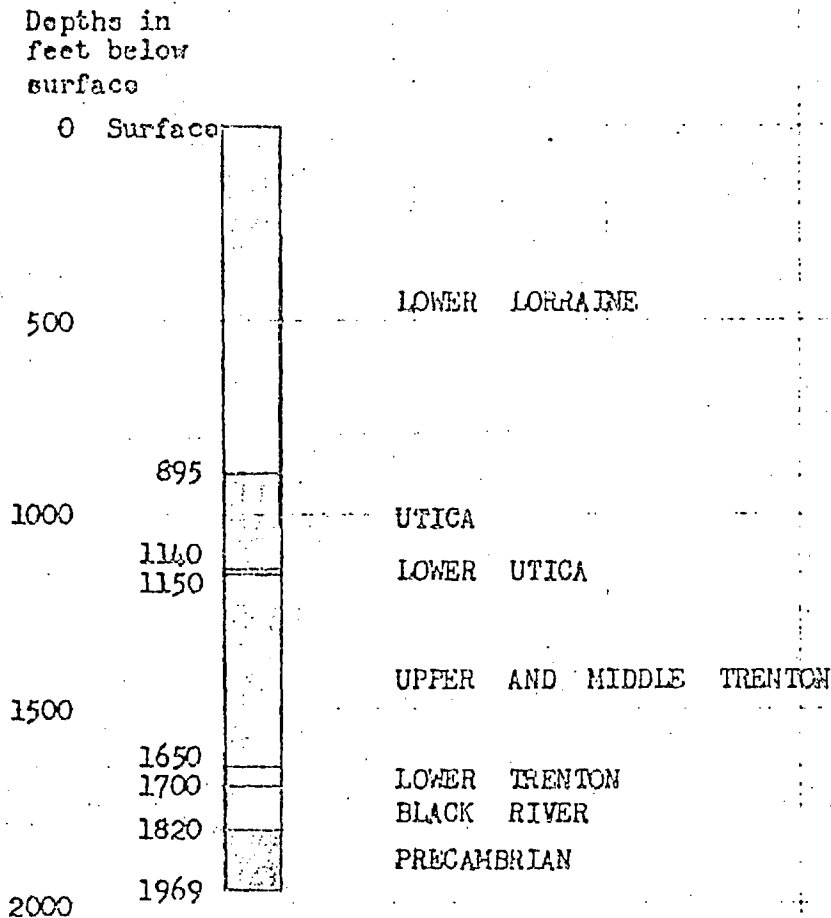
T. H. CLARK

JANUARY, 1959

QUEBEC DEPARTMENT OF MINES

SUMMARY LOG OF IMPERIAL LOWLANDS NO. 4 (LOTBINIERE)

LOWLANDS EXPLORATION LTD.

DESCRIPTIONS OF FORMATIONS

LOWER LORRAINE: Dark to medium gray shale; light gray, fine-grained sandstone and light to medium gray siltstone in minor amounts

UTICA: Black shale. Calcareous beds at base

UPPER AND MIDDLE TRENTON: Dark gray, dense and shaly limestone; lesser amounts of crystalline limestone and of shale

LOWER TRENTON: Crystalline limestone; A little dense limestone, and very little shale

BLACK RIVER: Dark gray, dense and shaly limestone predominates at top; quartz-rich sandstone at base

PRECAMBRIAN: Biotite - quartz - orthoclase gneiss

T. H. Clark
T. H. Clark
January, 1959

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 4, (LOTBINIERE)

LOWLANDS EXPLORATION LTD.

STATISTICAL SUMMARY

Depth in feet	Sandstone	Siltstone	Shale	Limestone	Streak	Acid
0-400	16	11	73	--	White/pale	Weak/poor
400-800	3	6	91	--	Pale/medium	Poor/good
800-900	18	6	76	--	Light/medium	Fair/good
900-1140	--	pr	100	--	Light/medium	Good
1140-1150	--	--	95	5		
1150-1160	--	--	80	20	<u>Limestone, shaly and dense</u>	
1160-1600	--	--	9	79	12	<u>Limestone, crystalline</u>
1600-1650	--	--	11	46	43	
1650-1700	--	--	4	8	88	<u>Sandstone</u>
1700-1760	--	--	7	73	20	
1760-1820	--	--	--	15	--	85
1820-1965	Biotite-quartz-orthoclase foliate					

*G. V. Clark
January 1959*

DIAGRAMMATIC LOG OF
IMPERIAL LOWLANDS NO. 4 (LOTBINIBRE)

LEGEND

Depth in feet	Lime- stone	Sandstone	Siltstone	Shale	Acid*	*Reaction with 5% HCl
5%		5%	5%	5%	None	
10		10	10	10	Weak	
15		15	15	15	Poor	
20		20	20	20	Fair	
		etc.	etc.	etc.	Good	

Streak	
	White
	Pale brown (=faint)
	Light brown
	Medium brown
	Brown

Miscellaneous	
	Pyrite
	Metabentonite
	Igneous intrusion

Presence only.

No percentage implied

Horizontal blanks -- depths for which no sample is available

DIAGRAMMATIC LOG

LOWLANDS EXPLORATION LTD. NO. 4 - LOTBINIERE

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Depth	Lime- stone	Sandstone	Siltstone	Shale	Acid	Streak	P	M	I
0									
100									
200									
300									
400									
500									
600									
700									
800									

LOWLANDS CORRAINE

DIAGRAMMATIC LOG

LOWLANDS EXPLORATION LTD. NO. 4 - LOTBINIERE

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LOWER LORRAINE
 UTICA

Depth	Lime- stone	Sandstone	Siltstone	Shale	Acid	Streak	P	M	I
800									
900									
1,000									
1,100									

A. H. Clark
January 1959

ABBREVIATIONS

pr. or pres.	-	present - in amounts not more than 1%		
ab. or abund.	-	abundant - in amounts between 1% and 3%		
pc, pcs.	-	piece or pieces	inartic.	-- inarticulate
v.	-	very	brach.	-- brachiopod
calc.	-	calcareous or calcite	cryst.	-- crystalline
av. or aver.	-	average	fgmt.	-- fragment
ign.	-	igneous	qz.	-- quartz
rx.	-	rocks	qzte.	-- quartzite
lt.	-	light	r. & f.	-- rounded and frosted
med.	-	medium	slick.	-- slickenside
dk.	-	dark		
sh.	-	shale		
ss.	-	sandstone		
ls.	-	limestone		
dol.	-	dolomite or dolomitic		
metab. metabent.	-	metabentonite		
br.	-	brown		
co.	-	coarse		

CONVENTIONS

Fossil names -- Genera and species underlined.

Light/medium - color ranges from light to medium.

Light medium - color uniform, as given.

Albertite - any hard asphaltic material.

Medium gray, but medium-grained.

Streak and acid reaction, where given, refers only to shale.

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 4 (LOTBINIERE)

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LOWLANDS EXPLORATION LTD.

Depth in feet	Description	Cable Rig Cuttings	
		Streak	Acid
	Sandstone, light gray, fine-grained Siltstone, light to medium gray Shale, medium gray		
0 - 20	20 20 60	White	Very weak
20 - 40	5 10 85	do	Weak
40 - 50	10 10 80	Wh./faint	do
50 - 60	15 10 75 (10%) of shale dark	do	do
60 - 70	5 10 85 (10)	do	do
70 - 80	5 15 80 (10)	do	do
80 - 90	5 10 85	do	do
90 - 100	20 10 70 (5)	do	do
100 - 110	30 15 55 (10)	do	do
110 - 120	15 10 75	do	Poor
120 - 130	15 15 70 (15)	do	do
130 - 140	50 10 40 (10)	Wh./light	do
140 - 150	15 15 70 (5)	Wh./faint	do
150 - 160	10 15 75 (10)	do	do
160 - 170	10 25 65 (10)	do	do
170 - 180	15 10 75 (20)	do	Fair/poor
180 - 190	10 10 80 (10)	do	do
190 - 200	30 10 60 (5)	Wh./light	do

LOWER LOTBINIERE

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 4 (LOTBINIERE)

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LOWLANDS EXPLORATION LTD.

Continued

Depth in feet	Description				Cable Rig	Cuttings	Streak	Acid
	Sandstone, light gray, fine-grained							
	Siltstone, medium gray							
	Shale, medium to (dark) gray							
200 - 210	20	10	70	(10)			White	Poor
210 - 220	20	10	70	(5)			do	do
220 - 230	10	5	85	(5)			do	do
230 - 240	20	10	70	(5)			do	do
240 - 250	20	10	70	(5)			do	do
250 - 260	30	10	60	(5)			do	do
260 - 270	20	5	75				do	do
270 - 280	10	10	80				Wh./faint	do
280 - 290	15	10	75				do	do
290 - 300	25	5	70				do	do
300 - 310	10	5	85	(5)			do	do
310 - 320	5	5	90				do	do
320 - 330	15	15	70				do	do
330 - 340	5	10	85	(15)			Faint/pale	do
340 - 350	30	15	55	(15)			do	do
350 - 360	25	10	65	(20)			do	do
360 - 370	5	5	90	(20)			do	do
370 - 380	10	15	75	(15)			do	do
380 - 390	10	10	80	(10)			do	do
390 - 400	5	10	85	(5)			do	do

LOWER LORRAINE

QUEBEC DEPARTMENT OF MINES

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IMPERIAL LOWLANDS NO. 4 (LOTBINIERE)

LOWLANDS EXPLORATION LTD.

continued

Depth in feet	Description				Cable Rig Cuttings	
					Streak	Acid
				Sandstone, light gray, fine-grained Siltstone, medium gray Shale, medium to (dark) gray		
600 - 610	5	5	90	(25)	Light/lt.med.	Poor
610 - 620	--	10	90	(30)	do	do
620 - 630	5	10	85	(25)	do	do
630 - 640	5	10	85		do	Fair/poor
640 - 650	5	5	90	(20)	do	do
650 - 660	5	10	85	(30)	do	do
660 - 670	--	5	95	(20)	do	do
670 - 680	--	pr	100	(40)	Calcite veins	lt./med
680 - 690	--	--	100	(60)	do	do
690 - 700	--	--	100	(40)	do	Fair
700 - 710	--	5	95	(45)	do	do
710 - 720	--	5	95	(40)	do	Fair/good
720 - 730	--	--	100	(35)	do	do
730 - 740	5	5	90	(30)	do	Fair
740 - 750	10	5	85	(30)	do	Fair/good
750 - 760	5	pr	95	(40)	do	do
760 - 770	5	pr	95	(30)	do	do
770 - 780	pr	--	100	(40)	do	Fair
780 - 790	pr	--	100	(40)	do	do
790 - 800	5	pr	95	(50)	do	Fair/good

LOWER LORRAINE

continued

Depth in feet	Description	Cable Rig	Cuttings
	Sandstone, light gray, fine-grained Siltstone, medium gray Shale, black		<u>Streak</u> <u>Acid</u>
1000 - 1010	-- -- 100		Light/med. Good
1010 - 1020	-- -- 100		do do
1020 - 1030	-- -- 100		do do
1030 - 1040	-- -- 100		do do
1040 - 1050	-- -- 100 Pyrite		do do
1050 - 1060	-- -- 100 (5% medium dark) <u>Leptobolus insignis</u>		Medium do
1060 - 1070	-- -- 100		Light/med. do
1070 - 1080	-- -- 100		Medium do
1080 - 1090	-- -- 100		Lt./med. do
1090 - 1100	-- -- 100		do do
1100 - 1110	-- -- 100 (20% medium gray)		do Fair/good
1110 - 1120	mm -- 100 (20% do) Pyrite		do do
1120 - 1130	-- -- 100 (20% do)		do do
1130 - 1140	-- -- 100 (20% do)		do do
1140 - 1150	-- -- 95 mm (20% do) 5% buff gray, fine-grained crystalline limestone		do do
1150 - 1160	-- -- 80 (30% do) 20% buff gray fine-grained crystalline limestone with fossil fragments. Med. brown metabentonite		do do

UPPER TRENTON
 LOWER UTICA

QUEBEC DEPARTMENT OF MINES

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IMPERIAL LOWLANDS NO. 4 (LOTBINIERE)

LOWLANDS EXPLORATION LTD.

continued

Depth in feet	Description	Cable	Rig	Cuttings
	Shale, dark gray			
	Limestone, shaly and dense, brownish gray			
	Limestone, crystalline, fine- to medium-grained			
1160 - 1170	10 40	50		
1170 - 1180	10 40	50		
1180 - 1190	10 40	50		
1190 - 1200	5 70	25		
1200 - 1210	40 50	10		
1210 - 1220	35 55	10		
1220 - 1230	15 45	40		
1230 - 1240	10 40	50		<u>Sowerbyella sericea</u>
1240 - 1250	-- 90	10		
1250 - 1260	10 70	20		
1260 - 1270	10 70	20		
1270 - 1280	-- 80	20		
1280 - 1290	-- 75	25		
1290 - 1300	pr 60	40		
1300 - 1310	No sample			
1310 - 1320	pr 80	20		
1320 - 1330	20 75	5		
1330 - 1340	10 80	10		
1340 - 1350	10 80	10		
1350 - 1360	10 85	5		
1360 - 1370	pr 90	10		
1370 - 1380	20 80	pr		
1380 - 1390	30 70	pr		
1390 - 1400	5 95	--		

TRENTON
UPPER

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 4 (LOTBINIERE)

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LOWLANDS EXPLORATION LTD.

continued

Depth in feet		Description	Cable	Rig	Cuttings	
		Shale,, dark gray				
		Limestone, dark brownish gray, shaly to dense				
		Limestone, medium brownish gray, crystalline, fine- to medium- grained				
1400 - 1410	FRENTON	10	90	--		
1410 - 1420		10	85	5		
1420 - 1430		10	85	5		
1430 - 1440		15	80	5		
1440 - 1450		10	90	pr		
1450 - 1460		10	90	--		
1460 - 1470		10	90	--		
1470 - 1480		5	95	pr		
1480 - 1490		UPPER	25	75	--	
1490 - 1500			5	95	pr	
1500 - 1510		--	90	10		
1510 - 1520		5	90	5		
1520 - 1530		pr	100	pr		
1530 - 1540		pr	100	--		
1540 - 1550		5	90	5		
1550 - 1560		pr	100	pr		
1560 - 1570		5	95	--		
1570 - 1580		5	95	--		
1580 - 1590		pr	100	--		
1590 - 1600		10	90	10		

QUEBEC DEPARTMENT OF MINES

IMPERIAL LOWLANDS NO. 4 (LOTBINIERE)

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LOWLANDS EXPLORATION LTD.

continued

Depth in feet		Description	Cable	Rig	Cuttings	
	UPPER TRENTON MIDDLE	Shale, dark gray				
		Limestone, dark gray, shaly to dense				
		Limestone, medium brownish gray, fine-grained				
1600 - 1610		pr	85	15		
1610 - 1620		--	75	25		
1620 - 1630	10	30	60			
1630 - 1640	20	20	60		Smooth ostracods common	
1640 - 1650	25	20	55			
	TRENTON	Limestone, dense to very fine-grained, light gray				
		Limestone, fine- to medium-grained, light gray				
1650 - 1660		5	10	85		
1660 - 1670	5	10	85#		nearly white	
1670 - 1680	pr	5	95		do	
	LOWER	Limestone, dark gray, dense, very little shaly				
		Limestone, light gray, medium-grained cryst.				
1680 - 1690	5	5	90#		some ls. dark and medium gray	
1690 - 1700	5	10	85		do	
1700 - 1710	10	80	10			
1710 - 1720	10	80	10			
1720 - 1730	5	50	45			
1730 - 1740	10	60	30			
1740 - 1750	5	75	20			
1750 - 1760	pr	95	5			
	BLACK RIVER					

IMPERIAL LOWLANDS NO. 4 (LOTBINIERE)

LOWLANDS EXPLORATION LTD.

continued

Depth in feet		Description	Cable	Rig	Cuttings
1760 - 1770	BLACK RIVER	60% White sandstone, grains up to 2mm, matrix clear quartz, with occasional pyrite			
		30% Buff sandstone, fine-grained, grains up to .5mm, 'dirty' kaolin matrix			
		10% Limestone, miscellaneous types, mostly buff gray, dense			
1770 - 1780		40	60	pr	
1780 - 1790		50	20	30	
1790 - 1800			Sandstone, white, average grain .5mm; maximum 1mm		
1800 - 1810			Ditto, average grain 1mm, well rounded, maximum 2mm. A few specks of bright green minerals		
1810 - 1820			Ditto		
1820 - 1830			Slivers of quartz and cleavage fragments of pink orthoclase feldspar. No sedimentary grains		
1830 - 1836			Ditto, some fragments of quartz and orthoclase together		
1836 - 1845	PRECAMERIAN	Ditto, with a few flakes of dark brown mica			
1845 - 1855		Ditto, ditto			
1855 - 1859		Ditto, ditto			
1859 - 1866		Ditto, ditto			
1866 - 1875		Ditto, but black mica common			
1875 - 1885		Ditto, ditto			
1885 - 1895		Ditto, ditto, large fragments of biotite-quartz-orthocl. gneiss			
1895 - 1901		Ditto, do, do			
1901 - 1910		Ditto, do, do, larger fragments			
1910 - 1915		Ditto, do, with 25% gneiss fragments			
1915 - 1925	Ditto, do, 40%				
1925 - 1935	Ditto, do, 5%				
1935 - 1945	Ditto, do, small fragments of quartz and orthoclase together				
1945 - 1955	Ditto, do, do 10% of whole				
1955 - 1965	Ditto, do, do 10%				
		Bottom of hole			

G. H. Clark
January 1959