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PRELIMINARY REPORT ON THE CAUSAPSCAL EAST AREA

MATAPEDIA CO. QUEBEC

C. W. Stearn

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INTRODUCTION

The east half of the Causapscal area was mapped by the writer during the summer of 1958. The area lies largely on the east side of the Matapedia River near the base of the Gaspé Peninsula. It is bounded on the south by latitude 48 deg. 15', on the north by latitude 48 deg. 30', on the west by longitude 67 deg. 15', and on the east by longitude 67 deg. 00', and is about 200 square miles in area. Included within the area mapped are large parts of Casault, Lepage, Laverendrye, and Casupscull townships and small parts of Blais, Assemetquagan, and Matalic townships.

The area is easily reached from all parts of Quebec by provincial highway No. 6, a paved road that passes through the Matapedia valley. From this artery gravel roads give ready access to nearly all parts of the region. Much of the area is farm land but the northeastern third is covered with dense woods. Numerous lumber roads and old trails traverse this wooded part in all directions but only a few are maintained in a condition that permits car travel. The main Canadian National Railway line from Montreal to Halifax follows the Matapedia valley through the southwestern part of the area.

The land surface is a dissected upland. From points of vantage, such as the Casault Fire Tower which is built on the highest hill (1870 ft.), it appears to be formed of low, rolling hills with little relief.

However, into this upland surface the rivers and their major tributaries have cut valleys up to 400 feet deep producing a maximum relief in the area of about 1500 feet. Most of the bedrock exposures are in stream valleys for the gently sloping uplands are heavily covered with mantle and bush.

All the streams flow into the Matapedia River which traverses the southwestern part of the area. The upper part of its valley is broad and open but near Ste. Florence the valley becomes narrow and the sides steep. The Causapsal River flows south and then west to join the Matapedia at the town of Causapsal. The best outcrops of bedrock occur along this river and its major tributaries: Ruis. Huit Milles, Ruis. Petit Huit Milles, Ruis. Quatre Milles, Ruis. Petit Quatre Milles, and Ruis. Trois Milles. The northern boundary of the area crosses a region of low relief where water has accumulated in Lakes Casault and Huit Milles and in extensive swamps along the south branch of the Causapsal River.

## GENERAL GEOLOGY

### General Statement

The Causapsal East Area is underlain by bedrock of Silurian and Devonian age. These sandstones, siltstones, slates, and limestones constitute a section over 20,000 feet thick. A layer of intermediate volcanic rocks about 700 feet thick is intercalated in the slates in the southern part of the area. The sedimentary and volcanic rocks were deformed in the Devonian period into broad folds and broken along high angle faults.

A small dike was intruded into the Devonian sedimentary rocks after the folding. Deposits of Pleistocene age are not thick except in the Matapedia valley but scattered erratic boulders indicate that the Laurentide ice sheet completely covered the area.

Table of Formations

Pleistocene	Ice contact drift, minor till, erratics.
Middle Devonian	<u>York River - Heppel formation</u> - 12,000 ft. Grey sandstone, red sandstone, siltstone, calcareous siltstone, minor conglomerate.
Middle and/or Lower Devonian	----- fault ----- <u>Fortin Slate</u> - thickness unknown Slate, phyllitic slate, thin beds of sandstone <u>Ste. Marguerite member</u> - amygdaloidal and compact andesitic volcanics, minor breccia.
Lower Devonian	<u>Grand Greve Siltstone</u> - 3,500 ft. Calcareous siltstone, silty limestone. <u>Cape Bon Ami Limestone</u> - 2,500 ft. Argillaceous limestone, minor silty limestone, siltstone.
Silurian	<u>St. Leon Siltstone</u> - 5,000 ft. Calcareous siltstone, minor sandstone.

St. Leon Siltstone

The St. Leon siltstone is exposed in the crests of two anticlines which plunge in opposite directions. In these structures approximately the upper 2,000 feet of the formation is exposed. Most of the formation is greenish grey, calcareous siltstone in thick or thin beds which weather medium grey and shades of orangish grey. Intercalated with the siltstones are minor beds of greenish grey, medium and fine grained sandstone. The bedding planes show flow casts in some localities but cross bedding, ripple mark, and other evidence of shallow water deposition is lacking.

Associated Development's Causapscaal No. 1 well is coring a fine section of the St. Leon. The well was started about 2,000 feet stratigraphically below the top of the formation and by September 1958 had penetrated 4,200 feet of these beds with only minor changes in lithology. This well has established that the St. Leon is at least twice as thick in the Causapscaal area as was estimated by Crickmay for the Lake Matapedia area to the north. A coarse fracture cleavage is evident in most outcrops of this unit.

The only fossils found in the St. Leon siltstones were a few specimens of the graptolite Monograptus. On the basis of similar fossils the formation has previously been dated as Middle Silurian but it is possible that the upper part is Late Silurian in age for it is apparently conformable with the Cape Bon Ami limestone.

#### Cape Bon Ami Limestone

The contact of the Cape Bon Ami with the St. Leon is not exposed in the Causapscaal East Area but no structural discordance is apparent between the beds of the two formations. The Cape Bon Ami formation is composed largely of dark grey, argillaceous, and locally silty limestone, typically closely cleaved and slaty in the more argillaceous layers. Bedding is commonly difficult to detect but where the beds are defined in a large outcrop they are two to three feet thick. A thinner lamination may also be present. In a few outcrops the beds have been greatly contorted by movement in the sediment while it was still unconsolidated but generally the bedding is even and regular. A dark grey, non-calcareous siltstone unit about 100 feet thick occurs near the top of the formation. Near Ruis. Huit Mille this siltstone is overlain by about

10 feet of light grey sandy rock that is possibly tuffaceous. This distinctive horizon could be traced over a limited area but does not seem to be regionally distributed.

The thickness of this formation is difficult to compute from its dips and width of outcrop for it is cross folded in most of the area. It is estimated to be about 2,500 feet thick. Along the southern belt of outcrop in the Causapschal East area the Cape Bon Ami stands almost vertical and its outcrop width is less than 1,000 feet. Flowage of this unit, and the overlying Grand Greve into the crest of the anticline to the north is presumed to have taken place for there is little evidence of faulting.

The only fossils found in these limestones are small brachiopods and these are very rare. More extensive fossil collections from other areas have been dated by paleontologists as Early Devonian in age.

#### Grand Greve Siltstone

The Grand Greve siltstone outcrops in a southern linear belt extending east and west from the southern outskirts of Causapschal, and in a northern, S-shaped belt. In the southern belt dips are steeply south, vertical, or overturned toward the north but in the northern belt dips are gentle. The formation is composed predominantly of calcareous siltstones which are interbedded with silty limestones. Most of the rocks placed in this formation react sluggishly to dilute hydrochloric acid, easily scratch glass, and weather to a non-calcareous, light grey rubble whose constituent fragments, although leached of carbonate entirely, are still coherent. The lower part of the Grand Greve formation is banded with thin, light grey, silt-rich layers. This banding and thin bedding

have been used as criteria to distinguish the Grand Greve from the Cape Bon Ami. Small outcrops may be difficult to assign to one or other of these two formations without detailed study of their lithology especially where the Grand Greve has been sheared and developed the closely spaced cleavage more typical of the Cape Bon Ami. Generally the spacing of the cleavage planes is much closer in the latter. On vertical weathered surfaces of the Grand Greve formation closely spaced silty laminae are etched into relief.

The lower contact is gradational but can generally be placed within a few hundred feet where argillaceous limestone or dark grey, non-calcareous siltstone of the Cape Bon Ami changes to banded calcareous siltstone. The Grand Greve siltstone passes upward through an alternation of beds into the York River formation. The upper contact is placed for mapping purposes at the appearance of the first thick sandstone bed. Although this procedure places many beds of Grand Greve lithology in the York River formation, the contact can only be mapped on this basis.

The Grand Greve siltstone is about 3,500 feet thick below the falls of the Causapschal River but in the southern belt it appears to have been tectonically thinned on the limb of a partly overturned anticline so that its outcrop width is only 2,000 feet. On Ruis. Trois Milles the Grand Greve is so thin and structurally disturbed that a fault is postulated between it and the York River-Hoppel unit. Fossils are not common in rocks of this formation in the Causapschal area but an extensive fauna of Early Devonian age is known from these beds in the eastern Gaspé.

#### Fortin Slate

The Fortin slate occupies a wide belt along the southern boundary

of the Causapsal East area separated from the York River-Heppel sandstones to the north by a fault. Its stratigraphical relationship to the other formations cannot be observed in this area. The formation consists of dark to medium grey, micaceous slate and phyllitic slate with intercalated beds of greywacke several tens of feet thick. Much of the slate is calcareous and a few beds approach the composition of limestone. Slaty cleavage is common throughout but closely spaced bedding laminae are conspicuous in most outcrops. Micaceous minerals seem to be more extensively developed near the fault which bounds the formation on the north and in this zone the Fortin is a phyllite. Fossils are very rare and have been collected in this area at but a single greywacke outcrop southwest of Ste. Florence. The specimens are so sheared that their identification, even on a generic level, will be difficult.

The Fortin formation is extensively folded and lacks key beds so that no estimate of its thickness is possible in the present state of our information. McGerrigle has suggested from evidence to the east that the Fortin slates grade laterally and vertically into the Grand Greve and York River formations and represent a deeper water facies equivalent to these formations.

#### Ste. Marguerite Volcanics

A belt of igneous rocks was mapped just south of the northern margin of the Fortin area. These dark green, fine grained, generally amygdaloidal rocks were identified by Alcock as augite andesite. They are well exposed in two hills south and west of Ste. Marguerite and in the stream valleys of Frazer Brook and Ruisseau Creux. Between these outcrops the band can be traced by the float rocks but it appears to be sharply

truncated 3 miles west of Ste. Marguerite. This truncation may be against the major fault north of the slates, as is assumed on the included map, or it may be against a cross fault. Just northeast of Ste. Florence along the boundary fault a sheared volcanic breccia crops out on the highway and hillside above. The breccia is composed of fragments about 1 cm. in diameter of light grey aphanitic rock set in a chloritic matrix and interbedded with chloritic schist. Layers of chloritic schist are also found interbedded with the igneous rocks on Frazer Brook and Ruisseau Creux.

The Ste. Marguerite igneous rocks are considered to be volcanic, although their contact with the Fortin slates is nowhere exposed, because they are interbedded with schistose beds of Fortin-like rocks, they are amygdaloidal and brecciated, and because they appear to be genetically related to the volcanic breccia near Ste. Florence. Their stratigraphic position in the complexly folded Fortin slates and their true thickness are both in doubt. On Frazer Brook the Fortin slates near the volcanics dip 30 degrees south. If this dip is assumed to continue through the volcanics, then their thickness can be calculated to be about 700 feet.

#### York River-Heppel Formation

The Grand Greve siltstones grade upward into a formation of interbedded sandstones and siltstones that has been called the York River in the north part of the Causapsca East area and the Heppel in the south part. The medium grey, calcareous siltstones and sandstones of the north occupy a shallow syncline in which less than 500 feet of beds is exposed. In the southern part of the area the Grand Greve is conformably overlain by the Heppel formation which is lithologically similar to the York River at its base but much thicker and different in its upper part. The Heppel

formation consists in a general way of an upper and lower sequence of interbedded dark grey siltstones and sandstones 4,000 to 6,000 feet thick each, separated by about 4,000 feet of reddish brown, thick bedded sandstone. The upper dark grey unit is possibly the lower part of the formation repeated by faulting or folding. The basal part of the Heppel is a correlative of the York River formation but the middle unit is lithologically distinct. The red sandstones are similar to those described by McGerrigle (MS) as the middle member of the Battery Point formation in the central Gaspé and mapped by him as the Lake Branch formation on map 1000 of the Gaspé. More detailed work may show that York River and Battery Point divisions can be mapped in the Heppel formation but for the purposes of the present preliminary report they are mapped as one unit.

Marine fossils are common at many horizons in the York River-Heppel siltstones but they are particularly abundant in a group of calcareous siltstones about 2,000 feet above the base that Kindle has called the Four Mile Brook beds. This zone contains numerous brachiopods, pelecypods, bryozoa, trilobites, gastropods, and corals that locally build into biohermal masses. Although Kindle regarded this fauna as of Late Devonian age, Cooper has placed it in the Onandaga (Middle Devonian). Many beds of green and red siltstone contain poorly preserved, comminuted plant remains. At some localities the bedding planes are covered with a mat of this carbonized plant material.

Along the Matapédia valley the beds of the Heppel formation dip steeply south through an outcrop width of almost  $3\frac{1}{2}$  miles. At the relatively few localities where a determination of the tops of the beds is possible they face south. Along the fault that bounds the Heppel on the south the attitude of the beds is irregular. In the southeast part of

the Heppel belt the beds do not dip systematically but appear to be folded into a west-plunging open syncline. This structure may terminate against the homoclinal sequence to the west in a fault or its south limb may become overturned. Further study may make a choice between these alternatives possible and such a decision will have a profound effect on the interpretation of the stratigraphy and correlation of the Heppel formation.

#### STRUCTURAL GEOLOGY

A fault of unknown displacement and attitude separates the Fortin slates from the Heppel formation and strikes across the whole area at 70 degrees. The fault is marked by an increase in micaceous minerals in the slates, the contortion and drag folding of the cleavage, and the disturbance of the bedding in the Heppel. As the formations on either side of the fault are little different in age, the fault may not have much stratigraphic displacement but appears to have brought together dissimilar facies.

The Fortin slates are folded into open anticlines and synclines whose limbs have dips up to 50 degrees. Many of the bedding attitudes measured in these slates show dips of less than 35 degrees. In most outcrops where the axis of the fold may be observed the limbs are symmetrical but on highway No. 6 on the south border of the area two faulted anticlines with steeper northern limbs are exposed in a road cut. In the absence of key beds it is difficult to follow folds in the slates from one stream valley to another or to assess the part that faulting played in their deformation. The schistosity in this belt dips a few degrees north or south of vertical and strikes about 70 degrees.

North of this major fault the Silurian and Devonian rocks have been folded into two major anticlines that plunge in opposite directions. The south limb of the southern anticline is overturned at Ruis. Quatre Milles but elsewhere it dips very steeply south. At both Ruis. Trois Milles and Quatre Milles there is evidence of minor faulting along this limb but to the east and west the beds seem sheared throughout but unbroken. The St. Leon siltstones are exposed in the crest of this southern anticline on the west side of the area but are carried beneath the Cape Bon Ami limestones by its westward plunge about 2 miles east of Causapscaal. The north limb of the anticline dips about 40 degrees but is complicated by a series of minor folds that are well exposed along Ruis. Petit Huit Milles. Along the contact between the St. Leon and the Cape Bon Ami on this limb a change in regional strike takes place, the beds are extensively dislocated by minor faults, brecciated locally, and veined. This evidence points to a fault contact between the two formations.

The northern anticline appears to have symmetrical limbs dipping about 20 degrees north of Causapscaal but few structural determinations could be made on its north limb due to lack of outcrop. The axis plunges northward at a low angle and strikes straight northeast at 45 degrees except for a slight curve at the Causapscaal river. South of Lac Croche the <sup>nor</sup> south limb of this anticline steepens to 70 degrees and the gentle south limb is crossed by a series of folds. These minor folds have axes striking east-west but curving to the northeast and plunging in that direction.

The synclincorium between the two anticlines is complicated by

several open, north-plunging cross-folds. These produce in the centre of the map area a broad belt of Cape Bon Ami in which dips are only locally more than 10 degrees.

The northwestern corner of the Causapsca East area is occupied by a north-plunging synclinatorium. This is a shallow structure whose limbs dip less than 10 degrees. The scattered nature of the outcrops of the York River formation in this synclinatorium makes it difficult to define accurately the minor folds but possibly four or five anticlinal and synclinal axes are present.

All these rocks are cut by a consistent fracture cleavage that strikes about 60 degrees and dips north and south within a few degrees of vertical.

#### ECONOMIC GEOLOGY

Considerable interest in the petroleum possibilities of the western Gaspé has been aroused by the drilling of Associated Developments's Causapsca No. 1 well on lot 20-A, Ra. I, Lepage twp. about 1000 feet west of the west border of the map area. The well was started about <sup>1000 feet</sup> ~~1000 feet~~ south of the axis of the <sup>Albertville</sup> ~~northern~~ anticline in the St. Leon siltstone. The operators hope to locate porosity in the reefal limestones of the Sayabec formation at the base of the St. Leon. These limestones are porous and some beds have a tarry odour when broken where they come to the surface about 20 miles to the north near Lake Matapédia. If the St. Leon should prove to be a satisfactory cap rock and the Sayabec a satisfactory reservoir for gas and oil, many other drilling sites are available along this anticline where a trap might be formed by slight irregularities in the

plunge. The southern anticline could also act as a trap for petroleum but it is more strongly deformed than the northern one and the additional fractures might let any possible oil or gas escape.

No mineral occurrences of economic importance were discovered.