INDUSTRIAL MINERALS SURVEY - 1984

by

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INTRODUCTION

Attention again focused on barite during the 1984 field season. Activities were concentrated in two areas of south-eastern Newfoundland, mainly as a follow-up to work done in the previous two field seasons. A brief survey was undertaken on the Isthmus of Avalon in an attempt to explain some of the barium anomalies revealed by a 1983 regional stream sediment survey (Howse et al., 1984). On the Burin Peninsula, a stream sediment survey was conducted in and around the St. Lawrence fluorspar district. Although that region has potential of hosting a wide range of mineral deposits (Strong et al., 1978),the primary objective of the survey was to help assess the potential for fluorite-barite minerali-zation in the outer fringe areas of the district. There, mineral occurrences in the form of fluorite-barite-galena veins and fluorite-barite float are well documented (Smith, 1957), and significant deposits of these minerals may be present. Other industrial mineral commodities briefly investigated in 1984 included a little known deposit of diatomaceous earth near the community of Victoria and brick shales on the Port au Port peninsula.

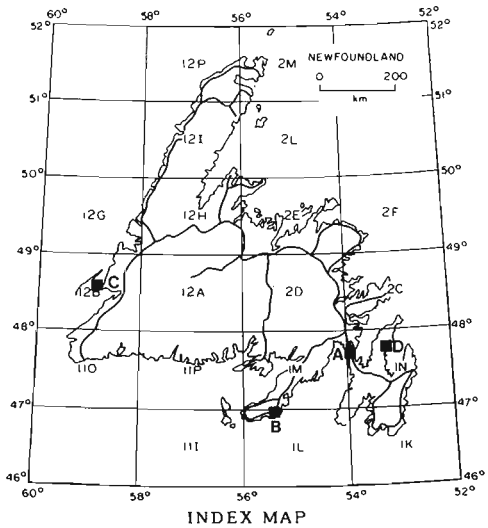

Figure 1: *Field study areas during 1984 field season (A) Avalon isthmus; (B) St. Lawrence area; (C) Shoal Point; and (D) Victoria/Carbonear areas.*

WESTERN AVALON PENINSULA

Previous Barite Assessment

Because of the wide distribution of vein deposits of barite throughout the western Avalon Peninsula, that area has been the focus of attention during the past three field seasons. Geologically, the region is underlain by a sequence of sedimentary and volcanic rocks belonging to the Upper Precambrian Connecting Point and Musgravetown Groups and to various Lower Cambrian formations. Barite, with or without quartz, occurs in veins cutting strata of all ages. On the eastern side of Placentia Bay, barite is present in the La Manche galena-calcite vein (Green, 1981), and as a very minor gangue mineral at the Silver Cliff lead-zinc-silver vein near Argentia (Chute, 1939). Specifically, the Isthmus of the Avalon and the St. Brides areas have been subjected to more intense investigations. Initially, the coastlines of both areas were surveyed by boat, inland areas were traversed by foot and highway and railway rock-cuts were examined. Numerous new, narrow, high grade veins of barite were discovered during the course of the 1982 project (Howse and French, 1983).

Typically these consist of salmon-pink, bladed or tabular crystal aggregates, occupying small fissures and commonly asso ciated with quartz and/or calcite. Faults which cross-cut the regional northeasterly structural trends are readily discernible on air photographs; those that parallel these trends are not as apparent. On the Bellevue Peninsula, several composite veins with varying proportions of barite, quartz and calcite were discovered. There, the most significant veins in terms of width and grade of barite occupy fractures that trend approximately north-south. The Colliers Point vein to the immediate south, first mined early in the century and sporadically reactivated in recent years, occupies an approximately north-south trending fault.

In 1983, the Mineral Deposits Section, in a coordinated effort with the Geochemical Section, carried out stream sediment surveys in two areas of the Western Avalon Peninsula. The projects conducted in the Isthmus of the Avalon and the St. Brides

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areas were aimed at assessing both industrial mineral and base metal potential. Prospecting for mineralized float and outcrop was also an integral part of the stream traverses. During the course of the field work additional barite veins were discovered on the Bellevue Peninsula, in the northern part of the Isthmus near Jacks Pond (Howse and Collins, 1984), and at Cuslett, near St. Brides. A new barite-lead vein was discovered near Southern Harbour. Most of these deposits have subsequently been staked and results of the stream sediment surveys have been released on open file (Howse et al., 1984).

Avalon Follow-up - 1984

A brief period in June was spent traversing some of those streams, which contained anomalous amounts of barium in their stream sediments. Only a few streams were traversed and water levels were high. The aim was to examine the bedrock of the immediate drainage area for barite mineralization where it was located in four out of the seven anomalous areas. The strongest anomalies occur in streams which drain areas underlain by rhyolitic rocks of the Bull Arm Formation. In fact the concentration of barium in one stream, which flows in a northeasterly direction into Broad Lake, (maximum 24,964 g/t) suggests that some form of physical concentration of the barite is present in the stream sediment. This is probably accomplished through erosion of the host rock and the barite followed by gravity settling of the denser barite. Near the stream, barite and quartz occur as films along fractures and joints in rhyolite on the north side of the stream valley. Because of its high specific gravity, barite may have become segregated into highly anomalous zones in the streams, through the action of water.

An investigation of a barium stream sediment anomaly near the Old Rantem Station resulted in the discovery of barite mineralization within a few metres of the sample site. Stringers and veinlets of gray-pink and reddish-pink barite cut red medium-grained sandstone. The northeast trending zone, which dips steeply to the southeast, can be traced for about 5 metres. Hematite coated slikensides occur in the footwall.

Barite was also found about 1 km southwest and along strike from the Little Southern Harbour barite-lead vein, discovered in 1983 (Howse and Collins, 1983). The vein is about 15 cm wide and consists of pink and reddish-pink bladed crystals of barite. It is exposed in the north bank (cliff) of the stream, strikes 028° and dips subvertically. The host rocks are siltstones of the Connecting Point Group. The stream sediments downstream of the vein are anomalous in both barium and lead, although no lead mineralization was seen. Overburden covers the top of the 3 metre cliff in which the vein is exposed.

A barite occurrence at Bellevue reported by McCartney (1956), was also investigated. This was the only inland occurrence of barite shown on McCartney's map. The 20-50 cm wide vein consists of pink, platy barite with numerous inclusions of country rock. It strikes 020°, dips vertically and can be traced 4 metres along the stream bed in which it is exposed. Stream sediment a few metres downstream from the vein contain anomalous concentrations of barium.

ST. LAWRENCE AREA

Fluorite-barite Mineralization - "Outer" Veins

A stream sediment survey was carried out in the St. Lawrence fluorspar district on the Burin Peninsula during the 1984 field season (Figure 2). Although the area has potential for hosting a wide range of mineral deposits (Strong et al., 1978) the primary objective of the survey was to help assess the potential for fluorite-barite mineralization of the northern part of the district. The project area is underlain by Late Precambrian volcanic and sedimentary rocks, Cambrian sedimentary rocks and the Carboniferous St. Lawrence Granite, the latter being the principal host rock for the area's fluorite mineralization. Studies of the genesis of the fluorite veins (Teng, 1974; Teng and Strong, 1976; Collins, 1984) have supported hypotheses by Van Alstine (1948) and Williamson (1956), that the granite and fluorite had a common source, i.e. a magma chamber that released ore fluids during late stage differentiation. These formed fluorite veins along faults and shears in the granite as it cooled and contracted. Veins of fluorite with an associated barite content ranging up to 30 percent, occur in a number of widely scattered locations north of Lawn and St. Lawrence. These, which include the Big Meadow Woods, Anchor Drogue, Lunch Pond, Devils Kitchen, Tilt Hill and Clam Pond veins, were collectively referred to as "outer" veins by Smith (1957) because of their location in the peripheral region of the distinct. The following arebrief descriptions of some of these deposits based on the authors' own field observations and experience in the area, as well as data from the Department of Mines and Energy geofiles. The description also includes that of the Lawn Barite vein, a relatively newly (198^' discovered vein uncovered by a road construction crew in the community of Lawn.

LEGEND FOR FIGURE 2

CARBONIFEROUS
6 *St. Lawrence Granite*

CAMBRIAN
5 *Inlet Group (clastic sedimentary rocks)*

PRECAMBRIAN
4 *Marystown Group (subaerial volcanics)*
3 *Burin Group (submarine basalts)*

INTRUSIVE ROCKS
2 *Loughlins Hill Pluton (gabbro)*
1 *Anchor Drogue Pluton (granodiorite)*

Abbreviations

ba *Barite*
dum *Dumortierite*
fl *Fluorite*
py *Pyrite*
pph *Pyrophyllite*

Cu *Copper*
Pb *Lead*
Mn *Manganese*
Mo *Molybdenum*
Ag *Silver*
U *Uranium*
Zn *Zinc*

SYMBOLS

Fluorite vein xxxx
Mineral occurrence (dumortierite) ..... ✖dum
Mineralized float ..... △

Meadow Woods Vein

The Meadow Woods vein is by far the most important of the "outer" veins of the district. Discovered in 1944 by Aloysius Molloy and Louis Kelley, about 4 km north of Lawn, early workers traced it for approximately 600 m along its east-west strike. The width of the vein decreases eastward, averaging 3.6 m for 180 m, then 1.8 m for the next 180 m and gradually narrowing to about 1.2 m for the remaining strike length.

In the 1950's Newfoundland Fluorspar Limited sank a 12.2 m shaft into the vein to learn more about its characteristics at depth, and to establish the relative proportions of the different minerals (fluorite, barite, galena). The average analyses (Smith, 1957) of 12 run-of-mine samples taken while shaft-sinking were:

CaF_2 - 58.8%
$BaSO_4$ - 15.1%
$CaCO_3$ - 0.6%
SiO_2 - 19.5%
Pb - 2.2%

Fluorite and barite was found to be mixed intimately but the galena was concentrated in a 15 cm wide band in the vein.

Alcan (1976) drilled eleven holes along the vein structure. Drilling confirmed the high fluorite content of the vein but the core was not assayed for $BaSO_4$.

The Big Meadow Woods trenches were examined by the authors in 1983. Rubble in the trenches consists of blocks of barite-rich, white fluorite; the barite is pink and salmon in color. The barite occurs as fine-grained bands and crystal aggregates with fluorite and quartz. Malachite was also observed. Barite is estimated to comprise up to 20% of the vein. Smith (1957) concluded from his examination of the vein, as exposed in the trenches, that it contained barite sufficient to make up one-quarter to one-third run of the mine ore, and our observations tend to support that view.

Big Meadow Woods - East Extension Vein(s)

Extensive barite float was also noted in trenches about 6 km northeast of Lawn. The barite displays pink and white banding and has a bladed crystal texture. White, purple and green varieties of fluorite were noted. Minor galena and pyrite are associated with the barite and fluorite. The trenches were dug by David S. Robertson Associates Limited (1972), who explored a series of airborne VLF anomalies in the area. The anomalies trend toward the Meadow Woods vein, some 2.5 km to the west. These anomalies were tested by a series of three diamond drill holes in the immediate area of the trenches. Hole 72-4 (45°) intersected extensive barite-fluorite mineralization in granite from 13.9 m to 46.0 m. The hole log describes a system of parallel veins, up to 1.3 m thick, occurring in fractured, hematized, kaolinized, granite. Barite and fluorite occur in brecciated and silicified zones; galena was also noted. In most of the veins barite is the dominant mineral, but in some, fluorite is proportionally greater. The log notes several kaolinized zones, described as faults in the section, in which the rock was very incompetent and core recovery was extremely poor. The log also notes that the mineralized fault zone was intersected at a 45° angle. It is possible that this zone is an eastward extension of the Big Meadow Woods Structure.

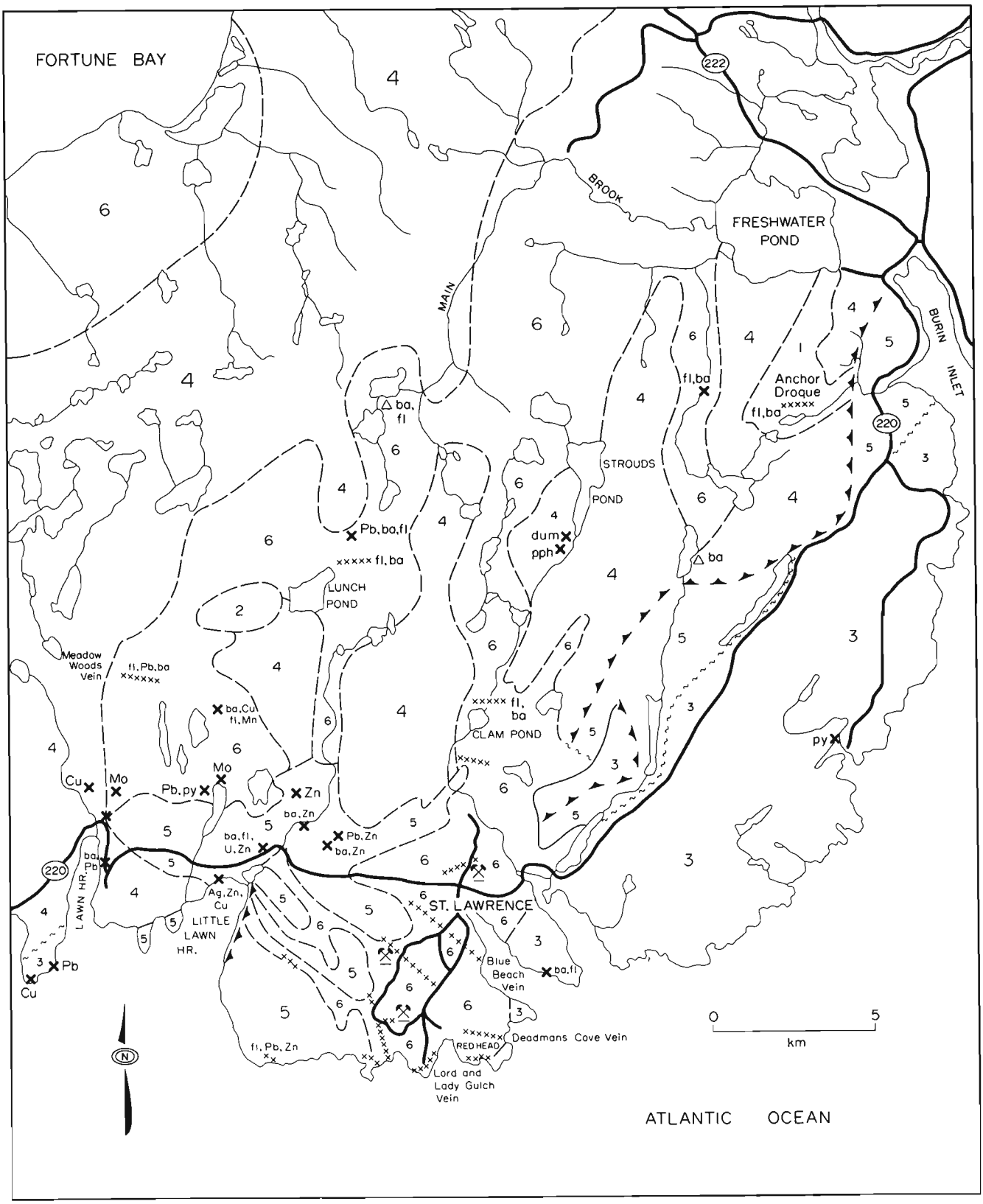

Figure 2: *Geological map of St. Lawrence area.*

Anchor Drogue Vein

The Anchor Drogue vein lies 3.2 km west of Salmonier or about 20 km northeast of the town of St. Lawrence. The vein occurs along a fault which cuts volcanic rocks of the Marystown Group and granodiorite of the Anchor Drogue Pluton. Its attitude is 085/65°N and it has a maximum exposed width of 1.5 m. The vein is composed mainly of green-white coarsely crystalline fluorite, displaying prominent zoning with barite-rich bands on the hangingwall and footwall. Galena occurs as blebs and crystals scattered throughout the vein.

The Anchor Drogue vein was tested by 4 diamond drill holes in the 1950's (Newfoundland Fluorspar Limited) and 14 holes in the early 1970's (Allied Chemical Corp). The latter program indicated a reserve of about 15,000 tonnes of 40 - 50 percent CaF_2 and about 15 percent barite, in a shallow vein deposit.

Lunch Pond Vein

The Lunch Pond vein is located near the northern tip of Lunch Pond, about 11 km northwest of St. Lawrence. Discovered by Newfluor prospectors in 1950 the vein was trenched and diamond drilled. Although the trenching showed only a 60 cm wide vein, subsequent drilling indicated extensive mineralization. The best results from the holes drilled showed a cumulative total of 8.4 metres of fluorite contained in three sections of 1.2 m, 4.2 m, and 3.0 m respectively. The average grade was 58.8 percent CaF_2, including the 3 m section which averaged 66.5 percent CaF_2.

The vein which is hosted by St. Lawrence Granite, appears to strike about N65°E and dip 80°N; its strike length is unknown. The vein contains a mixture of fluorite, barite and calcite with minor galena. Barite is proportionally less than that contained in the Big Meadow Woods vein.

Clam Pond Vein

The Clam Pond vein outcrops on the west side of a stream which flows into the northeast end of the pond. Large angular chunks of red and salmon-pink barite with white and blue fluorspar were observed in the stream bed, near a small notch which marks the site of the vein. Van Alstine (1948) observed the vein in place and reported that much of it consisted of alternating bands (up to 1 cm wide) of red platy barite and white fluorite. Galena and sphalerite were also noted. The vein is hosted by the St. Lawrence Granite.

Devil's Kitchen Vein(s)

During the stream sediment survey numerous trenches containing large blocks of white and pink barite float were noted east of Main Brook Pond about 16 km north of St. Lawrence. These trenches are undoubtedly those described by Smith (1957) as containing extensive barite float. Host bedrock is visible in only one trench; there it consists of mineralized pink, medium to coarse-grained granite with finer aplitic zones. Green and white fluorite and pink platy barite, as well as minor galena, occur as float. Dimensions of the mineralized blocks indicate vein widths of 30 cm or more.

Lawn Barite Vein

The Lawn Barite vein was discovered in 1982 during road construction through the community of Lawn. The following description of the vein is a condensed version of an account by Collins (1984). The vein is located on the eastern side of Lawn Harbour and occurs in the Webbers Cove Conglomerate, part of the Upper Proterozoic Marystown Group, a sequence of dominantly subaerial volcanic rocks, which outcrop throughout the Grand Bank and Lamaline region. (O'Brien et al., 1977). The mineralization, exposed in a 25 m wide roadcut, consists of granite, fluorite, galena and sphalerite in two zones on either side of the road. The main vein, which is located on the southern side of the road, strikes 105°, dips almost vertically, and can be traced for about 25 meters along the outcrop. The vein widens with depth from only 15 cm at sub-outcrop level (1 m below surface) to 60 cm at the road level (about 4 m deeper). Two smaller veins (10 cm wide) were noted near the main vein and may be offshoots from it.

The mineralization in the main vein is primarily pink to white barite with intergrown fluorite and minor zones of galena and sphalerite. Some narrow zones of massive galena and sphalerite are also present. The more massive sections of the vein are characterized by banded white and pink barite, with intimately intergrown fluorite, together with minor bands of massive galena and sphalerite. Breccias are common, and consist of conglomerate fragments within banded crystalline barite and fluorite. Conglomerate with a matrix composed entirely or partially of barite, fluorite and calcite with or without veins or veinlets, is also common.

The conglomerate is relatively unaltered, coarse grained, and has a sandy matrix. Fragments are generally well rounded and include sedimentary and vol-

canic rocks together with fragments of granites or porphyry. Near the vein the conglomerate is altered over a 20 m width; the alteration zone consists of white to yellow clay minerals, presumably of hydrothermal origin.

Stream Sediment Survey

The stream sediment survey covered an area of about 200 km^2 and encompassed all of the fluorite and barite occurrences described above as well as a wide range of other metallic and non-metallic mineral occurrences (Figure 1) in the project area. The topography of the area is a reflection of bedrock type and the effects of glaciation. Volcanic and sedimentary rocks form high, rounded hills, while the granite usually underlies areas of low relief. Glacial features such as roche moutonnées, drumlins, and glacial till characterize the area, the latter having its greatest thickness in valleys and depressions. The region is generally dotted with small bogs and ponds. Wooded areas are sometimes present in stream valleys and on hillsides. The main drainage system is poorly developed and runs from north to south. However, many small streams run an irregular pattern between ponds and bogs.

Stream sediment samples were collected at 400 m intervals, however, this spacing varied considerably for some streams. The number of tributaries, connection between ponds and small brooks flowing into ponds sometimes resulted in more detailed sampling of an area than was originally planned.

Over 650 samples were collected. Descriptive data was routinely recorded for each sample and duplicates were taken for control purposes. The samples will be analyzed for a suite of elements including Ba, Sr, Cu, Pb, Zn, Ag, Fe, Mn, F, Co, Ni, Mo, U, Sn, W, and L.O.I. The results will be released on open file when they become available.

DIATOMACEOUS EARTH

Victoria - Carbonear

A cursory examination was made of the diatomaceous earth deposit which lies near Beaver Pond within the community of Victoria, Carbonear (Figure 3) This deposit was first recognized by N. Sutton, a resident of the area, who reported it to the Mineral Resources Division in 1963. The deposit was examined by Fletcher (1964) who, using a Swedish sampler (a device originally designed for testing peat), drilled 13 holes in the bog at the western end of the pond, and 7 holes in the pond itself. He estimated that there are approximately 65,700 tonnes of diatomaceous earth under Beaver Pond and considerably less than that under the bog. Fletcher recommended more detailed logging with subsurface contouring and laboratory testing.

The 1984 field work was aimed at obtaining samples of the deposit for laboratory tests. Using a Swedish sampler, samples were taken from the bog at the western end of Beaver Pond; as well as the pond itself (see Figure 2). Diatomaceous earth was encountered in all of the holes. Generally the deposit exhibits a fairly well defined layering with seemingly pure white material (30 - 60 cm thick) overlying a gray silty mixed layer (30 cm+). In some holes the white diatomaceous earth was encountered immediately on the surface and in others it was capped with peat. The test holes were limited to a depth of 3.6 m because of rod extensions. Descriptive logs were recorded for each hole and samples taken of the diatomaceous earth for laboratory tests.

BRICK SHALE

Shoal Point - Port au Port

A brief period was spent investigating shales of the Port au Port Peninsula in light of their potential industrial uses. The shales, together with minor sandstone and limy beds, form part of the lowest structural slice of the Humber Arm Supergroup (Williams et al., 1979). Shoal Point, on which the sampled shales are exposed, is a low-lying, uninhabited point of land projecting northwards for about 9 kilometers into Port au Port Bay (Figure 4). Its elevation does not exceed 15 m and most of the land averages about 3 - 4 meters above sea level. Harris (1962) sampled shales along the east shore of Shoal Point and concluded that the area had excellent potential for a brick shale quarry. He estimated a total reserve of about 7 million tonnes, assuming that 2.1 m of shale could be quarried above sea level. However, Harris's estimate is based on his observations of shale thickness on the east side of the point. On the west side there is much less exposure above sea level and most of the coastal exposures are covered at high tide. Correspondingly the thickness of peat on the west side of the point increases 3.6 m meters. Therefore, the reserve estimate of Harris (1962) may be too high, although substantial, amounts of quarryable material probably exist.

The shales in the Shoal Point section are red, green, black and highly fissile; minor sandstone and limy beds were also noted. Some of the beds contain large crystalline concretions of pyrite and marcasite. The shales are folded and faulted, and dips up to 50° were noted. The elevation of shale exposures averaged 2.2 m

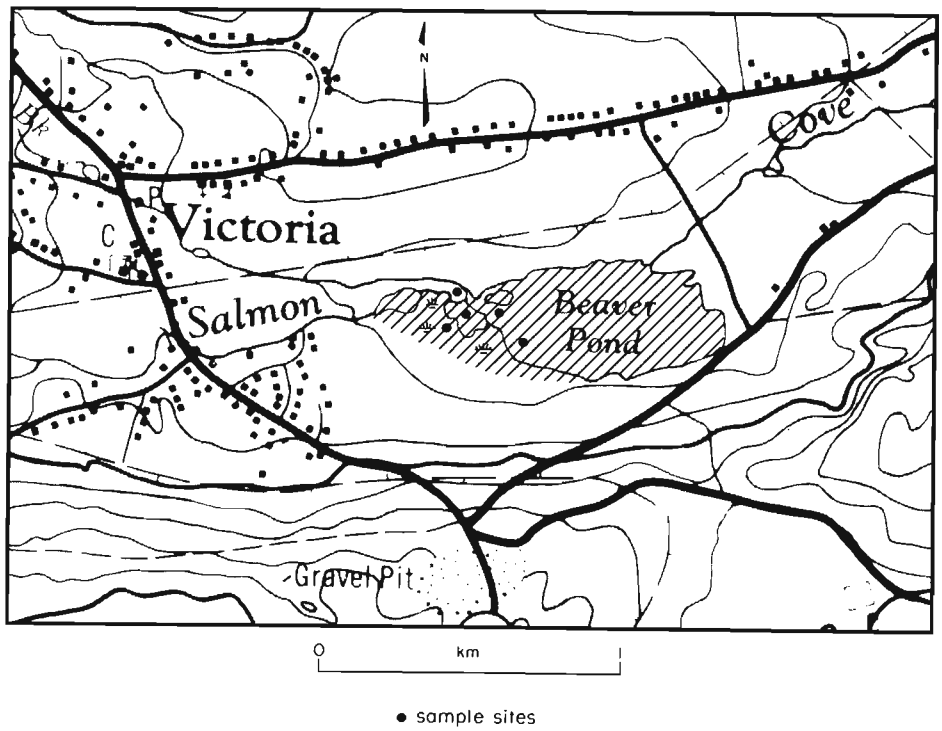

Figure 3: *Location of the diatomaceous earth deposit near the town of Victoria. The deposit (shaded area) underlis Beaver Pond and the bog at its west end.*

above sea level in the sampled area on the east side of the point; exposures on the opposite shore are weathered down to sea level. The peat cover has a maximum thickness of 2.4 m on the east side of the point and 3.6 m on the west side. A total of six bulk samples were collected at 500 m intervals from both sides of the point. Chemical analyses and firing tests on the shales will be carried out in order to determine their suitability for the brick and cement industries.

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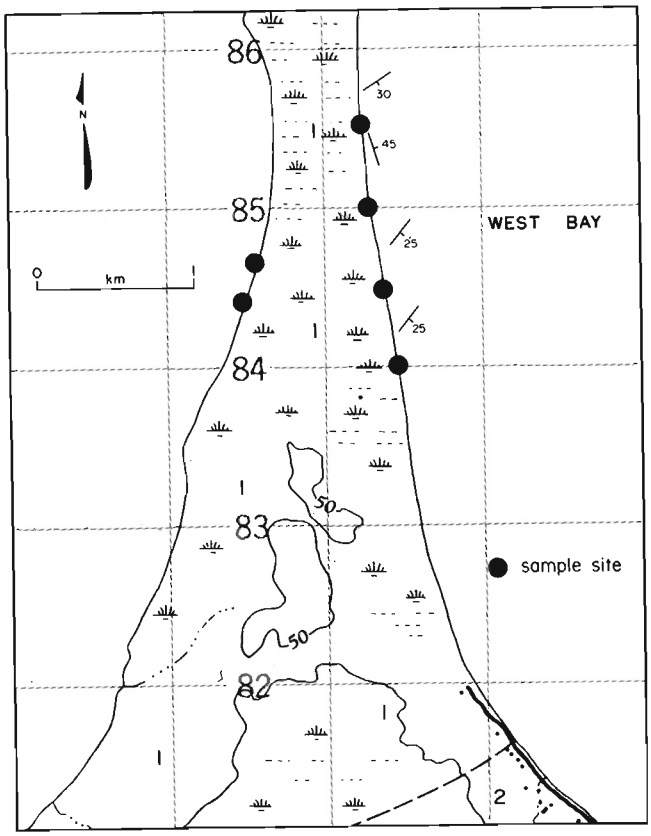

LEGEND

MISSISSIPPIAN

2 *Codroy Group: Limestone, shale, sandstone evaporites.*

HADRYNIAN TO MIDDLE ORDOVICIAN

1 *Humber Arm Supergroup: Red, green, and black highly fissile shales, scattered pyrite and marcasite concretions, sandstone, conglomerate, minor limestone.*

Figure 4: *Sketch map of the Shoal Point/ Port au Port Peninsula, showing sample site locations.*

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