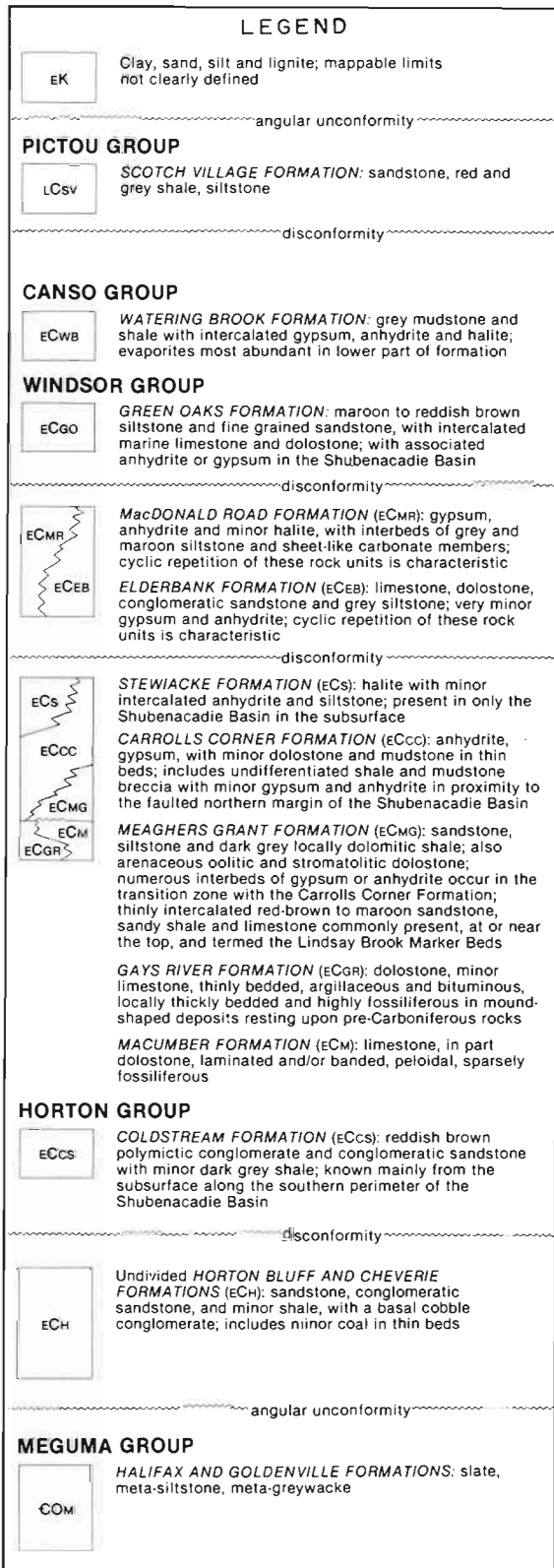


# CHAPTER 4. COLCHESTER COUNTY



After Giles and Boehner, 1982

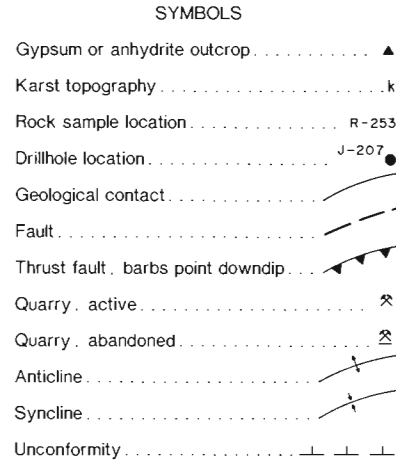


Figure 4-1. Continued.

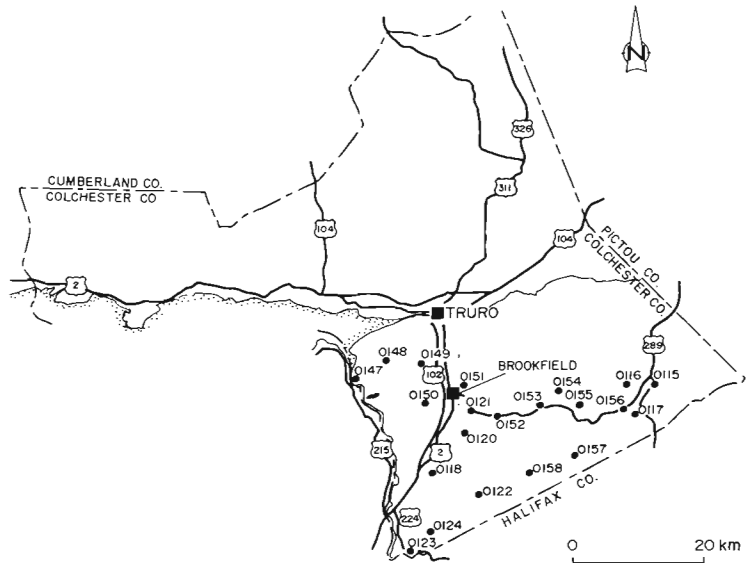
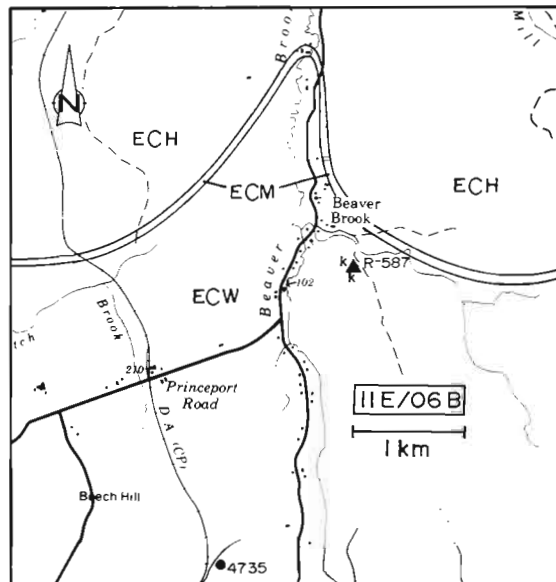


Figure 4-2. Location map for Colchester County gypsum and anhydrite occurrences by reference number.

Figure 4-1. Geological legend for Colchester County gypsum and anhydrite occurrence maps.

**BEAVER BROOK (0148)**  
 NTS 11E/06B  
 UTM 467500 E 5017100 N

The Beaver Brook occurrence area is located 10 km west-southwest of the Town of Truro, Colchester County (Fig. 4-3). It consists of 0.5 ha of moderate to heavy karst topography with a few small rounded heads of white to light blue-grey, fine grained, massive, partially hydrated anhydrite.



Geology after Stevenson, 1958

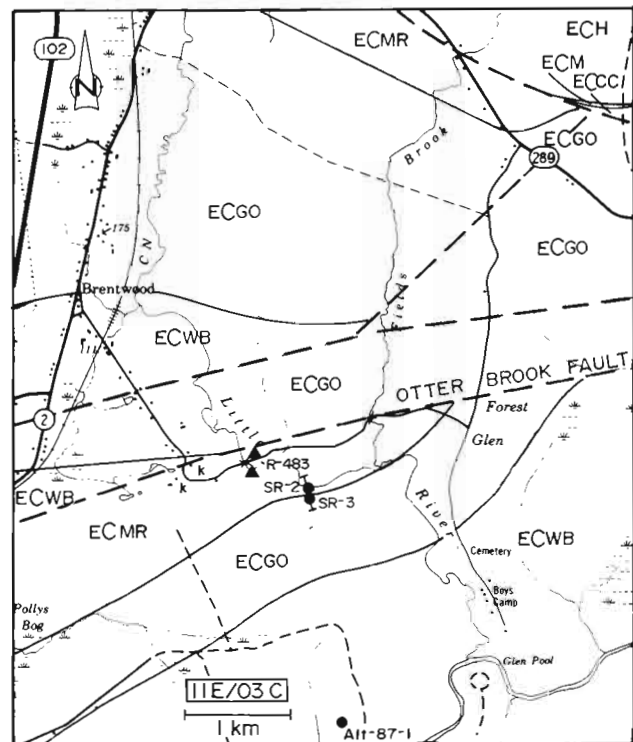
Figure 4-3. Location and geology of the Beaver Brook occurrence area. See Figures 4-1 and 4-2 for legend and location.

Regional geological mapping by Stevenson (1958) showed this area as underlain by units of the Lower Windsor Group near the contact with the underlying Horton Group. Outcrops of the basal Windsor Macumber Formation carbonate are known in this area and subsequently it was the subject of a small drilling program in 1988 carried out by Lafarge Canada (Canada Cement Lafarge Ltd., 1988). Although limited in its scope, this work indicated that the geology of the area is structurally complex. None of the Lafarge holes passed through any portion of the Carrolls Corner Formation sulphates.

The Beaver Brook area is structurally complex and the lack of hydration in the small exposures indicate development possibilities are limited. Should additional drilling be carried out in this area for limestone resources, then stepout holes could add to the limited information presently available.

**BRENTWOOD (0120)**  
 NTS 11E/03C  
 UTM 478900 E 5006000 N

The Brentwood occurrence area is located south and west of Little River, 5 km south of the Town of Brookfield, Colchester County (Fig. 4-4). The occurrence consists of several small outcrops of light grey to white, fine grained gypsum with minor interstitial silt which can be found along the Little River, a small area of karst topography south of the River and gypsum and anhydrite units intersected in two diamond-drill holes.



Geology after Giles and Bohner, 1982

Figure 4-4. Location and geology of the Brentwood occurrence area. See Figures 4-1 and 4-2 for legend and location.

Recent geological mapping by Giles and Bohner (1982) indicated that the immediate area is underlain by interbedded carbonates, clastics and sulphates of the MacDonald Road and Green Oaks Formations of the Windsor Group as well as similar lithologies of the Watering Brook Formation of the Canso Group. These units strike northeast-southwest through the area and dip southward into the Stewiacke Syncline. They are also in fault contact with similar units to the north along the Otter Brook Fault. Two diamond-drill holes (SR-2, SR-3) were completed in this area by Aurum Gold Mines Ltd. (1973) as part of a base metal exploration program. Considerable sections of gypsum and anhy-

drite of varying purities were encountered in both drill-holes. The sulphate horizons are interbedded with siltstones and dolomite carbonates. The gypsum beds are described as varying from light grey and pure to dark grey selenitic with lenses of siltstone (Aurum Gold Mines Ltd., 1973).

More recently, Nova Scotia Department of Mines and Energy hole Alt-87-1 was put down in the area 2000 m south of Aurum's drillholes. Carter (1988) gave a detailed description of the core and stratigraphic interpretation of the section encountered. The hole, collared in the Watering Brook Formation of the Canso Group, was stopped due to technical problems (natural gas flow) at 683.05 m in the Carrolls Corner Formation.

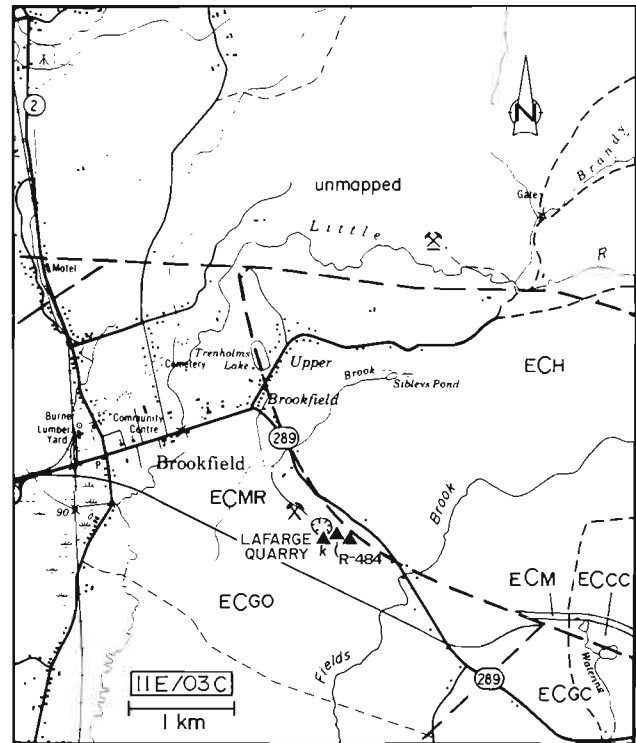
Hole SR-2 stopped at 147.83 m in gypsum after passing through a section dominated by gypsum with minor clastic and carbonate interbeds (Aurum Gold Mines Ltd., 1973). Although no information regarding the quality of gypsum is available, the section looks very promising. Unfortunately the areal extent of the MacDonald Road Formation in this area is quite restricted, cut off to the north by faulting and dipping underneath the clastic dominated Green Oaks Formation to the south. In addition, this area is becoming developed as a rural subdivision which would prevent any potential development. Finally the area is quite distant from any possible shipping sites which would also restrict site development.

Geologically the area is interesting; the section appears to be similar to the Cycle 2 (B Subzone) sections mined elsewhere in the Province. There would appear to be little development potential.

**BROOKFIELD (0121)**  
NTS 11E/03C  
UTM 479800 E 5010400 N

The Brookfield occurrence is located 2 km southeast of the Village of Brookfield, Colchester County (Fig. 4-5). A small quarry has been developed at this site (just southwest of Route 289) by Lafarge Canada Inc. to supply its cement plant west of Brookfield. Production has been reported for 1984 and 1985 when a total of 14 744 t of gypsum were extracted and trucked 7 km to its plant.

Regional geological mapping by Giles and Boehner (1982) interpreted the rocks underlying this area as belonging to Cycle 2 (B Subzone) MacDonald Road Formation of the Windsor Group. The units strike northwest-southeast through the area and dip under-



Geology after Giles and Boehner, 1982

Figure 4-5. Location and geology of the Brookfield occurrence area. See Figures 4-1 and 4-2 for legend and location.

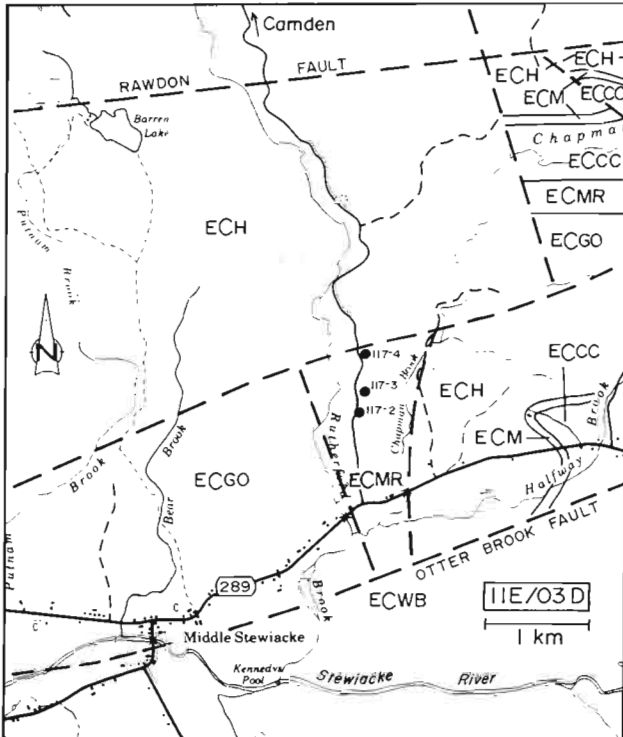
neath clastics and carbonate horizons of the Green Oaks Formation to the south and west. These units are also in fault contact with Horton Group clastics to the north and east.

Lafarge has drilled a number of shallow diamond-drill holes in the vicinity of its quarry, eight of which (86-02 to 86-09 inclusive) are presently stored at the Nova Scotia Department of Mines and Energy, Core Library in Stellarton. Variably silty, selenitic gypsum horizons which are up to 21.3 m thick (drilled thickness) were found to be interbedded with clastics and carbonates. Moderate to heavy karst topography with rounded gypsum outcrops extend along strike southeast for approximately 500 m. Insufficient information is available to carry out detailed stratigraphic correlation of the units, however beds appear to dip at roughly 40-45° to the south.

The limited areal extent of the MacDonald Road Formation, as well as the proximity of Route 289 which passes through the area limit the potential for large scale development at this site. Lafarge may continue to exploit this deposit, however it is unlikely that any large scale quarrying will be possible.

**CAMDEN ROAD (0153)**  
 NTS 11E/03D  
 UTM 491200 E 5010020 N

The Camden Road occurrence area is located 13 km east of the Village of Brookfield, Colchester County (Fig. 4-6). It consists of subsurface intersections of gypsum and anhydrite in three drillholes put down in 1974 by St. Joseph Explorations Ltd. (Jowett, 1974).



Geology after Giles and Boehner, 1982

Figure 4-6. Location and geology of the Camden Road occurrence area. See Figures 4-1 and 4-2 for legend and location.

Regional geological mapping by Giles and Boehner (1982) indicated that this locale is underlain by a fault-bound block of interbedded sulphates, carbonates and clastics of the MacDonald Road Formation. This is bound to the north and east by Horton Group clastics, to the west by the overlying Green Oaks Formation and to the south by units of the Watering Brook Formation. This block is only 2000 m north-south by 300-1300 m east-west and straddles the southern end of the Camden Road where it joins Route 289.

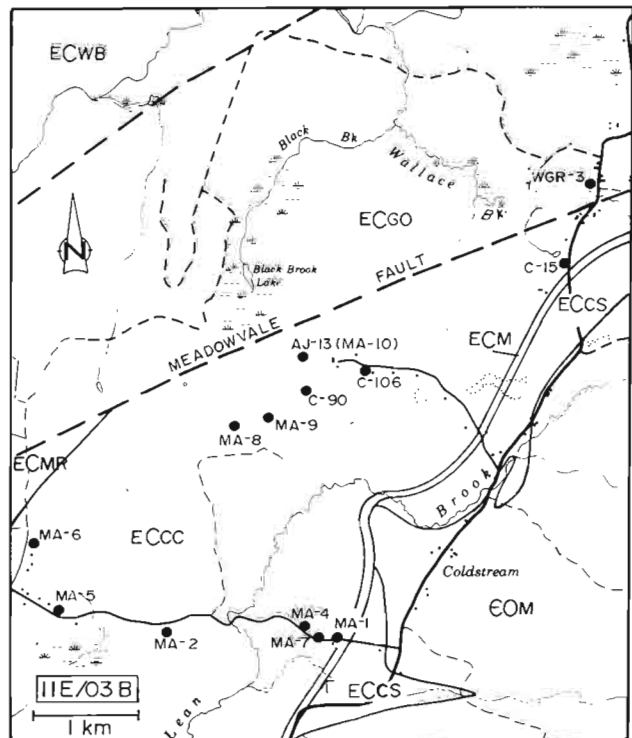
St. Joseph Explorations drilled three holes in this area in 1974 as part of a regional base metal exploration program (Jowett, 1974). All three appear to have been collared near the base of the MacDonald Road Formation and were stopped near the top of the Stewiacke Formation in salt. Although closely spaced,

correlation of these three holes is very tenuous which suggests that the area is structurally complex. One hole (117-2) was relogged by Nova Scotia Department of Mines and Energy staff after it was logged by St. Joseph's staff and units that they originally described as gypsum below 100 m were relogged as anhydrite (Boehner, personal communication). Bearing this in mind, hydration in the Camden Road area extends to at least 100 m below surface. Unfortunately overburden and interbedded horizons overlie thick sulphate horizons in all three holes to a depth of at least 39.6 m.

The Camden Road area occurrence is of geological interest only. The deeply buried sulphate horizons as well as the uncertain depth of hydration result in very poor potential for development.

**COLDSTREAM (0124)**  
 NTS 11E/03B  
 UTM 472000 E 4991000 N

The Coldstream occurrence area is located 5 km east of the Village of Shubenacadie, Hants County (Fig. 4-7). It is defined in numerous drillhole intersections through the sulphate-dominated Cycle 1 (A Subzone) Carrolls Corner Formation which underlies much of the area. This area abuts the Pine Grove occurrence area (0123) to the south.



Geology after Giles and Boehner, 1982

Figure 4-7. Location and geology of the Coldstream occurrence area. See Figures 4-1 and 4-2 for legend and location.

Regional geological mapping by Giles and Boehner (1982) indicated that much of this area is underlain by the Carrolls Corner Formation which strikes northeast and dips to the west into the Shubenacadie Basin. The anhydrite of the Carrolls Corner Formation is underlain by the Macumber Formation to the east and is overlain to the west by the mixed and interbedded sulphates, carbonates and clastics of the MacDonald Road Formation. A major fault along the northern end of the area brings the Upper Windsor Green Oaks Formation into contact with the Carrolls Corner Formation in this area.

A total of 13 diamond-drill holes were found which have intersected portions of the Windsor Group in this area. Amax Exploration Inc. (1974b) and Imperial Oil Ltd. and Jorex Ltd. (Johnston, 1973a), all drilled base metal exploration holes in the area during the early 1970s. All but one hole was collared in the A Subzone, 10 of 13 penetrated to the underlying Horton Group clastics. One hole, drilled by Dresser Minerals (WGR-3) collared beyond the fault to the north encountered interbedded clastics, carbonates and minor sulphates of the Upper Windsor (Boehner, personal communication). Unusually, no surface exposures and only minor hummocky terrain, which might reflect underlying karst features, were found in this area.

Virtually all of the drillholes in this area encountered thin surface hydration of the thick basal sulphate unit. As is seen elsewhere along this same margin of the Shubenacadie Basin, thicker sections of anhydrite are found towards the contact with the overlying MacDonald Road Formation. The best interval is noted in hole MA-6 where 54.9 m of dark grey, selenitic gypsum, with the minor siltstone and carbonate interbeds, is overlain by 17.7 m of overburden (Johnston, 1973a).

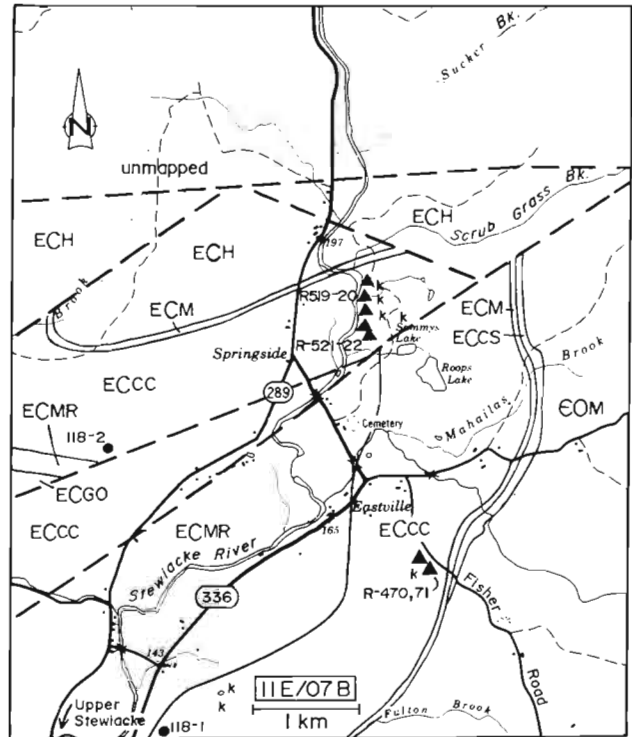
The Coldstream area has good potential for significant volumes of gypsum, similar to that mined at East Milford. It will require additional drillhole information to evaluate its potential. The lack of surface exposures and well developed karst topography should not detract from the area's appeal as an exploration target.

#### EASTVILLE (0115)

NTS 11E/07C

UTM 509500 E 5014500 N

The occurrence at Eastville consists of three separate areas of karst topography and outcrops located 10 km northeast of the Village of Upper Stewiacke, Colchester County (Fig. 4-8). In addition two drillholes through the same stratigraphic horizon are found within the Eastville area, although neither is located very near the surface showings.



Geology modified after Giles and Boehner, 1982

Figure 4-8. Location and geology of the Eastville occurrence area. See Figures 4-1 and 4-2 for legend and location.

Regional geological mapping by Giles and Boehner (1982) showed this area to be cut by several faults. Two of the surficial occurrences in the area are underlain by the Cycle 1 (A Subzone) sulphate dominated Carrolls Corner Formation. The third area which consists of karst is underlain by the MacDonald Road Formation which overlies the Carrolls Corner Formation. The Carrolls Corner Formation is underlain by the basal Windsor Group Gays River Formation or equivalent Macumber Formation. These are underlain by clastics of the Coldstream Formation of the Horton Group and metamorphic rocks of the Cambro-Ordovician Meguma Group.

The most widespread area of karst and outcrop of gypsum and anhydrite in the Eastville area is found east of the Stewiacke River and south of Scrub Grass Brook. Approximately 50 ha of heavy karst can be seen here accompanied by abundant heads and extensive outcrops of fine grained, white gypsum over light blue-grey anhydrite. Small borate nodules are common in the anhydrite. A second area of karst topography and outcrop can be found south 2 km, just west of Fisher Road. Karst is less extensive than the area to the north and outcrops here are generally small, rounded exposures of fine grained, light grey, mixed gypsum and anhydrite. The third area in the Eastville occurrence consists of a

number of sink holes located 500 m east of Route 336 and 1500 m north of Fulton Brook. Approximately 20 ha of karst topography can be seen on airphotos of this area.

Two diamond-drill holes (118-1 and 118-2) were completed in the Eastville area by St. Joseph Explorations in 1974 as part of a regional base metal exploration program (Jowett, 1974). Both holes appear to have been collared and stopped within the basal sulphate of the Carrolls Corner Formation. Although hole 118-2 encountered a dissolution zone at depth, both holes encountered thin hydration zones overlying thick anhydrite units. Hole 118-1, located near the area of karst north of Fulton Brook, encountered only 6 m of overburden followed by 6 m of gypsum before entering thick anhydrite.

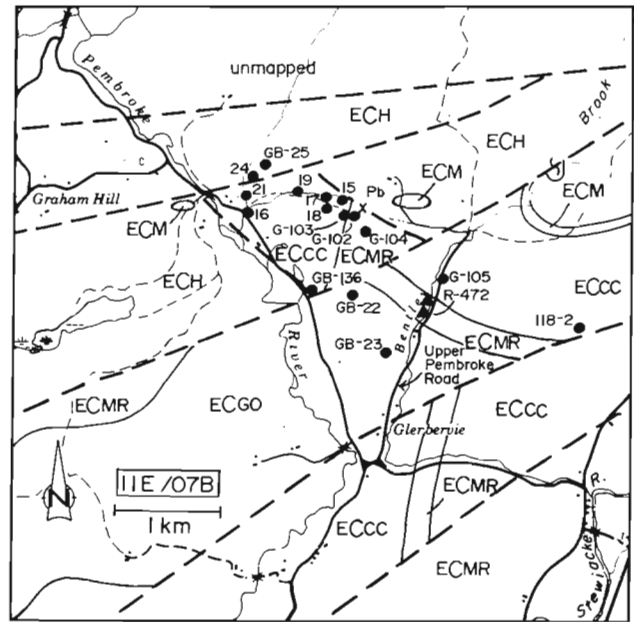
All three separate occurrences within the Eastville area warrant additional investigation. Although hydration zones appear to be quite thin, large areas of karst topography indicate shallow overburden underlain by gypsum over considerable areas. The nearest shipping access for this area would be the new facility at Sheet Harbour, approximately 65 km to the southeast.

**GLENBERVIE (0116)**  
NTS 11E/07B  
UTM 504840 E 5007350 N

The Glenbervie occurrence area is located 8 km north-east of the Village of Upper Stewiacke, Colchester County (Fig. 4-9). It is comprised of one surface exposure as well as numerous drillholes which encountered gypsum or anhydrite in the subsurface.

Regional geological mapping by Giles and Boehner (1982) suggested that the area is cut by numerous faults. A small lead showing in the area has resulted in a large number of drillholes being put down by exploration companies over the years. Data from these holes were used by Giles and Boehner (1982) in their interpretation of the local geology.

Two separate blocks of sulphate dominated Windsor Group strata are present in the Glenbervie occurrence area. In both cases, the sulphate dominated Carrolls Corner Formation is overlain by the interbedded carbonates, clastics and sulphates of the MacDonald Road Formation. One block is in fault contact with clastics of the Horton Group to the north, east and west. The other area is underlain to the northeast by the basal carbonate of the Windsor Group (Macumber Formation) which is underlain by the clastics of the Horton Group, and overlain to the southwest by units of the Upper



Geology after Giles and Boehner, 1982

Figure 4-9. Location and geology of the Glenbervie occurrence area. See Figures 4-1 and 4-2 for legend and location.

**Windsor Group Green Oaks Formation (Giles and Boehner, 1982).**

The surface exposure can be found along the western side of Bentley Brook, 1300 m north on the Upper Pembroke Road. It consists of several 10 m high, fine grained, gypsum outcrops, spread out along a 100 m long ridge running north-south along the Brook. The gypsum contains minor amounts of dark grey, shaly silt. Hole G-105, drilled 300 m further north, encountered 14.6 m of overburden, 3.4 m of limestone, 2.4 m white gypsum and 12.8 m of anhydrite before it was stopped (MacLeod, 1978). This occurrence is probably located near the base of the MacDonald Road Formation or the top of the Carrolls Corner Formation.

One kilometre to the northwest, in the vicinity of the lead showing, numerous drillholes have also encountered sulphates. Much of this area is covered by thick overburden and thick sections of solution fill material. The block is bound on four sides by faults (Giles and Boehner, 1982) which probably facilitated deep hydration and later dissolution of the gypsum. In general, only a thin gypsum horizon remains over the thick basal anhydrite and, in most cases, this is overlain by thick carbonate or overburden.

The Glenbervie occurrence is of little economic interest, dissolution having apparently removed whatever good gypsum sections may have been present in the area.

The highly faulted nature of the geology in this area probably made hydration of the basal anhydrite easier, but it also permitted dissolution of the gypsum which allowed later infilling by clastic materials.

**HILDEN (0149)**  
NTS 11E/06B  
UTM 473900 E 5017400 N

The Hilden occurrence area is located 3 km west of the Village of Hilden, Colchester County (Fig. 4-10). This area has been the subject of previous investigations for gypsum, sulphur and barite and subsequently a number of diamond-drill holes have been put down in the area. An area of karst topography with gypsum heads can be found just north and northeast of Maritime Tel and Tel's relay station facility located in the middle of this area.

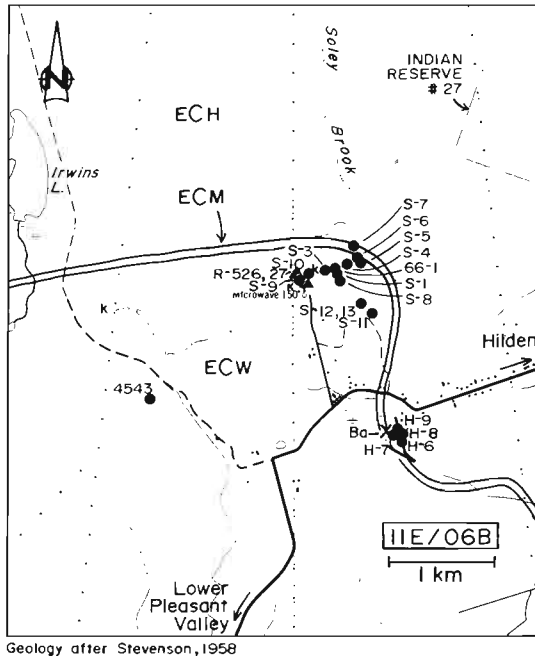


Figure 4-10. Location and geology of the Hilden occurrence area. See Figures 4-1 and 4-2 for legend and location.

Regional geological mapping by Stevenson (1958) appears to be simplified for this area. A series of 14 drillholes, completed by New Senator-Rouyn Ltd. and Peel-Elder Ltd. in 1966-67 (Campbell, 1967) as well as one completed by the Nova Scotia Department of Mines in 1966 (Nova Scotia Department of Mines, 1966), indicated that units underlying this area are dipping steeply ( $+50^\circ$ ) to the south-southeast. Carbonates are rarely described in these holes and no stratigraphic interpretation has yet been attempted. Much of the area appears to be underlain by the sulphate dominated

Carrolls Corner Formation which is underlain to the north and east by Macumber Formation and Horton Group clastics.

Native sulphur was first noted at Hilden (Johnsons Crossing) in the 1870s (Louis, 1878). Hole 66-1, drilled by the Nova Scotia Department of Mines, encountered native sulphur and led to the New Senator-Rouyn Ltd. and Peel-Elder Ltd. drilling. Although 5 of 14 holes contained significant sulphur, no additional drilling has been carried out for sulphur at Hilden. The sulphur is found as fracture fillings and blobs associated with calcite, anhydrite and hydrocarbons in the thick basal sulphate horizons. Its emplacement appears to be structurally related. A biopigenetic origin is indicated for some of the mineralization.

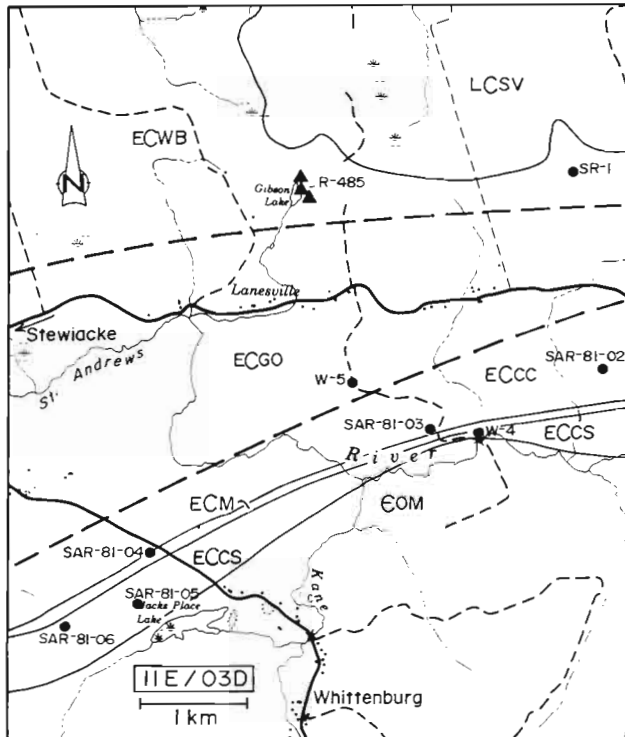
Anhydrite units at Hilden are variously described as massive, fine grained, blue grey to dark grey, medium grained, with up to 20% intermixed carbonate. Hydration is quite shallow with the thickest gypsum found in a narrow, northeasterly trending zone of karst topography just north and east of the Maritime Tel and Tel relay facility. The best gypsum section encountered is found in hole 66-1 where 7.9 m of overburden overlies 23.2 m of light to dark grey, coarse grained, selenitic gypsum. Similar gypsum sections can be observed in other holes, however these are overlain by a clastic unit which may belong to the MacDonald Road or Green Oaks Formations.

The Hilden area is of great interest geologically due both to its structural complexity and presence of native sulphur. Sufficient volumes of gypsum are probably not available to be of interest to a gypsum producer.

**LANESVILLE (0122)**  
NTS 11E/03C, 11E/03D  
UTM 481560 E 4998700 N

The Lanesville occurrence area is located 8 km east of the Town of Stewiacke, Colchester County (Fig. 4-11). It consists of one surficial occurrence as well as several drillhole intersections. The area is intersected by two major faults which complicate the local geology.

Regional geological mapping by Giles and Boehner (1982) indicated that the area where gypsum is found at surface northeast of Gibson Lake is underlain by units of the Canso Group Watering Brook Formation. These interbedded clastics and minor sulphates strike east-west through the area and dip generally northward into the Stewiacke Syncline under clastics of the Scotch Village Formation. Southward, across a fault, lie the interbedded clastics, carbonates and minor sulphates of the



Geology after Giles and Boehner, 1982

Figure 4-11. Location and geology of the Lanesville occurrence area. See Figures 4-1 and 4-2 for legend and location.

Upper Windsor Green Oaks Formation which are in turn in fault contact, to the south, with basal Windsor Group, Carrolls Corner and Macumber Formations.

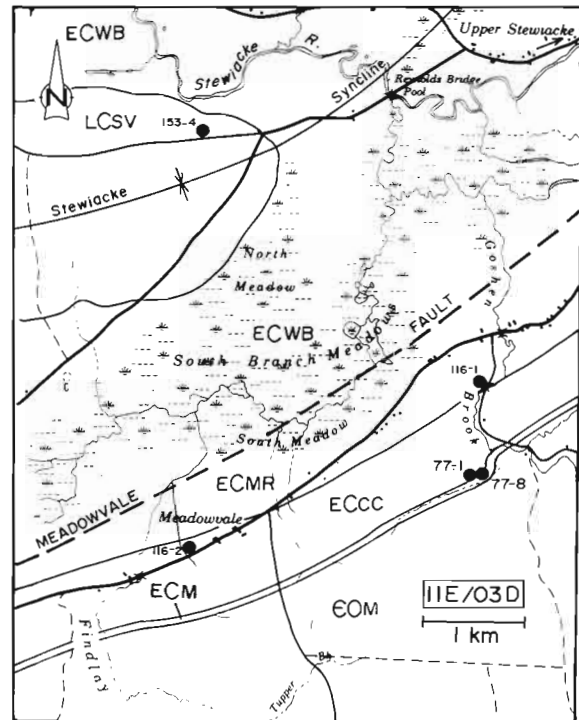
Within the Lanesville area both Aurum's SR-1 drillhole (Aurum Gold Mines Ltd., 1973) and Rio Tinto's W-3 (Shewman, 1973a) (see Fig. 4-20 for location) were collared in the Watering Brook Formation and penetrated down as far as the top of Cycle 2 (B Subzone) MacDonald Road Formation. Rio Tinto also drilled a hole to the south (W-5) which collared in the Green Oaks Formation and penetrated into the top of the MacDonald Road Formation (Keech, 1982). Five holes, drilled along the Windsor-Horton contact by Placer Development Ltd. in 1981, help to define this contact (Keech and Davidson, 1981).

Gypsum outcrops at Lanesville include several 1-2 m<sup>2</sup> exposures of interlaminated, dark grey, selenitic, dirty gypsum with white satin spar 'interlaminae'. Limited karst topography can be seen in the immediate vicinity. Drilling results show minor gypsum and anhydrite horizons in clastic dominated sections, generally at depth in the Watering Brook and Green Oaks Formations, as well as, very thin hydrated sections under

thick overburden in the Carrolls Corner Formation. Little or no economic potential exists for the Lanesville occurrence area.

**MEADOWVALE (0157)**  
NTS 11E/03D  
UTM 498000 E 5002500 N

The Meadowvale occurrence area is located 7 km south-east of Upper Stewiacke, Colchester County (Fig. 4-12). Although some hummocky terrain has been noted in this area previously, it is doubtful that it can be attributed to karst topography. The information about this occurrence consists of drillhole information from exploration programs carried out by St. Joseph Explorations Ltd. in 1974-75 (Jowett, 1974; St. Joseph Explorations Ltd., 1975) and by N. L. Industries Inc. in 1978 (Carrol, 1978).



Geology after Giles and Boehner, 1982

Figure 4-12. Location and geology of the Meadowvale occurrence area. See Figures 4-1 and 4-2 for legend and location.

Situated along the southern margin of the Shubenacadie Basin, the Meadowvale area is underlain by easterly trending units of the Lower Windsor and Canso Groups which dip to the north. According to Giles and Boehner (1982), this area is underlain by the sulphate dominated Carrolls Corner Formation which overlies the basal Macumber Formation carbonate to the



south. The Carrolls Corner is deeply eroded along this contact, being covered by a thickness of up to 72.2 m of glacial till and solution fill material. Infilled lenses of similar material were noted to depths of 220.7 m (St. Joseph Explorations Ltd., 1975). The salt dominated Carrolls Corner Formation equivalent, the Stewiacke Formation, is seen at depth in the Meadowvale area as well. Carrolls Corner Formation units are overlain to the north by the interbedded sulphates, carbonates and clastics of the MacDonald Road Formation in the eastern portion of this area, however it is in fault contact with the Watering Brook Formation of the Canso Group to the north in the western portion of the area west of the map area.

This occurrence is of geological interest only. Extremely thick overburden would prevent development of any potential gypsum/anhydrite deposits which might exist along the margin of the Shubenacadie Basin.

**MIDDLE STEWIACKE (0152)**  
 NTS 11E/03D  
 UTM 486900 E 5008800 N

The Middle Stewiacke occurrence area is located 8 km east of the Village of Brookfield, Colchester County (Fig. 4-13). It consists of several drillholes and a surface outcrop area found in two fault-bound blocks of Lower Windsor which lie just north of Route 289 between Brenton Brook on the west and Putnam Brook on the east.

Regional geological mapping by Giles and Boehner (1982) indicated that two small synclines containing units of the MacDonald Road, Carrolls Corner and Macumber Formations and underlain by Horton Group clastics are located in this area. These units are in fault contact with Upper Windsor Group Green Oaks Formation units to the south. Drilling was carried out during exploration for barite in these areas in 1948 and 1963 by Maritime Barytes Ltd. (Airth, 1948) and N. L. Industries Inc. (Boyle and MacLeod, 1979) respectively. Interpretation of drillhole information by Boyle and MacLeod (1979) indicated that these areas are highly faulted.

The single area of surficial outcrop contains several small round exposures of light brown, medium grained, selenitic gypsum. The best drillhole intersection was in hole 1350, drilled in 1948 in the eastern part of this area (Airth, 1948). It apparently collared and stopped in the Carrolls Corner Formation and encountered good gypsum horizons with clay filled solution intervals common.

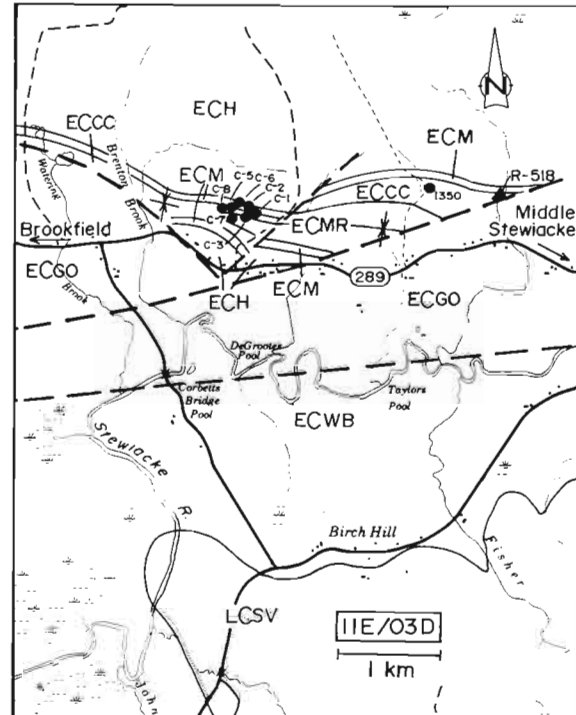


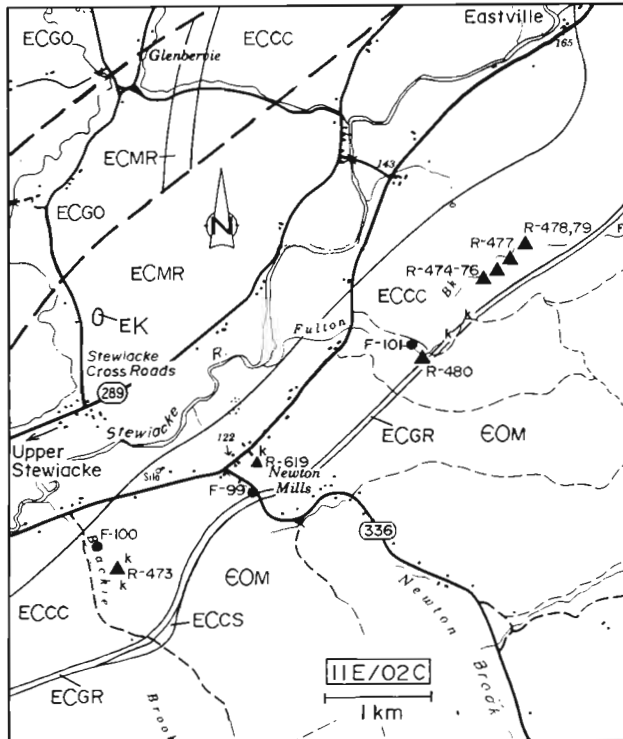
Figure 4-13. Location and geology of the Middle Stewiacke occurrence area. See Figures 4-1 and 4-2 for legend and location.

The Middle Stewiacke occurrence is of geological interest, but not of economic interest regarding gypsum and anhydrite. The fault-bound blocks found are too small to contain sufficient volumes of material required to open a gypsum quarry.

**NEWTON MILLS (0117)**  
 NTS 11E/02C  
 UTM 504840 E 5007350 N

The Newton Mills occurrence area is located 5 km east of Upper Stewiacke, Colchester County (Fig. 4-14). It includes surface and subsurface occurrences from Fulton Brook in the northeast to Blackie Brook in the southwest.

Regional geological mapping by Giles and Boehner (1982) indicated a straightforward geological sequence underlying this area. The sulphate-dominated Carrolls Corner Formation underlies much of the area striking northeast-southwest and dipping to the northwest. It is overlain to the northwest by Cycle 2 (B Subzone) MacDonald Road Formation. To the southeast the sulphates are underlain by the basal Windsor Gays River carbonate and then clastics of the Coldstream Formation of the Horton Group and metamorphics of the Meguma Group.



Geology after Giles and Boehner, 1982

Figure 4-14. Location and geology of the Newton Mills occurrence area. See Figures 4-1 and 4-2 for legend and location.

Three drillholes as well as two areas of gypsum and anhydrite outcrops with associated karst are found within the occurrence area. Amax Exploration Inc. drilled three holes through portions of the Carrolls Corner Formation into clastics in 1974 as part of a regional base metal exploration program (Amax Exploration Inc., 1974c). These were spaced about 2 km apart with F-100 located just east of Blackie Brook, F-99 just west of Route 336 and F-101 collared on the eastern side of Fulton Brook. All three were located in stream valleys.

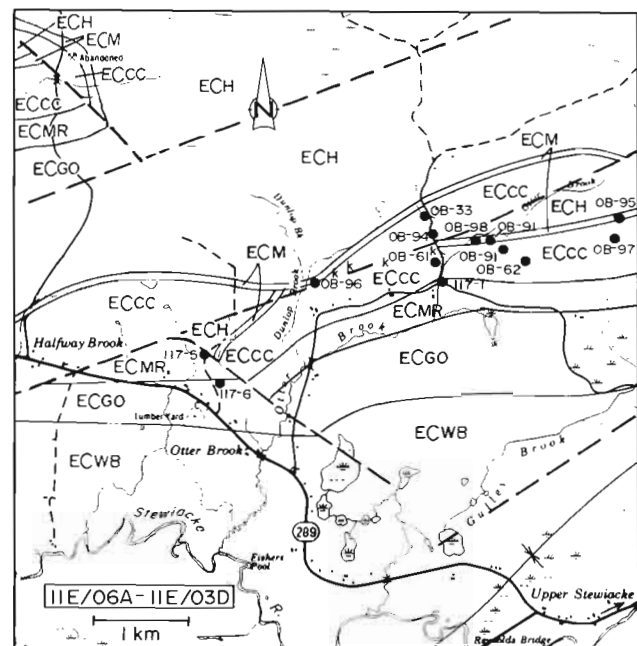
Hole F-100 passed through 20.7 m of overburden, 1.2 m of gypsum and 120.9 m of anhydrite before entering the basal carbonate (Amax Exploration Inc., 1974c). An area of karst topography with small rounded white gypsum outcrops is located 300 m southeast of F-100. The karst is moderate to heavy and covers 20-25 ha. At Newton Mills, although there is little surface evidence and only minor karst, drillhole F-99 passed through 11 m of overburden, then 12.5 m of "soft, white, crystalline, pure gypsum" before encountering anhydrite (Amax Exploration Inc., 1974c). Finally, in the area of Fulton Brook, hole F-101 encountered 9.4 m of overburden, only 0.6 m of gypsum and then 274.5 m of basal anhydrite. The shallow hydration found in the drillhole is

also noted in the extensive sulphate outcrops seen further up Fulton Brook to the northeast. Several exposures can be seen, some of which are over 15 m in height and up to 100 m in length. These consist primarily of massive, fine grained, light blue anhydrite with only thin hydrated caps in their uppermost portions. Thicker hydrated zones may exist away from the Brook where karst topography can be seen. This area abuts the Eastville occurrence area to the north and northeast.

Large volumes of high purity anhydrite exist in this area and significant areas of karst can also be seen. These factors suggest good potential for significant gypsum to be found in the Newton Mills area. Further drilling is required to determine the average depth of hydration as well as areas of deeper hydration such as the basal contact which may be found here. The closest shipping point for the area would be the new facilities located at Sheet Harbour, 60 km to the southeast.

**OTTER BROOK (0155)**  
NTS 11E/06A, 11E/03D  
UTM 498000 E 5009500 N

The Otter Brook occurrence area is located 4 km northwest of Upper Stewiacke, Colchester County (Fig. 4-15). No surface exposures were found in this vicinity, however there are a number of hectares of karst topography and several drillholes have intersected gypsum and anhydrite.



Geology after Giles and Boehner, 1982

Figure 4-15. Location and geology of the Otter Brook occurrence area. See Figures 4-1 and 4-2 for legend and location.

Regional mapping by Giles and Boehner (1982) indicated that the geology of this area is highly faulted which is characteristic of the northern edge of the Shubenacadie Basin. A number of faulted blocks of easterly trending, steeply southward dipping Lower Windsor strata have been interpreted using results of a number of diamond-drill holes by St. Joseph Explorations Ltd. (Jowett, 1974) and Amax Exploration Inc. (Lebel, 1974a). These strata are part of the sulphate dominated Carrolls Corner Formation and towards the Shubenacadie Basin centre (south) of the salt-dominated Stewiacke Formation. They are overlain by the interbedded sulphates, carbonates and clastics of the MacDonald Road Formation which is overlain by the Upper Windsor Green Oaks Formation. The Carrolls Corner Formation is underlain to the north by the basal carbonate Macumber Formation and the clastics of the Horton Group.

The best gypsum intersection in the Otter Brook area was encountered in hole OB-97 where 63.7 m of soft, white gypsum is overlain by 11.6 m of overburden (Amax Exploration Inc., 1974d). Although this section appears very promising, other holes in the basal sulphate drilled further out into the Basin contain only shallow hydration underlain by massive anhydrite. Also, holes drilled along the Basin margin in areas to the west show typical deep dissolution and infilling with younger clastic material.

Additional drilling should be carried out in the Otter Brook area, especially in the higher ground northeast of hole OB-97 where some of the thicker gypsum sections may be preserved. The volume of potentially minable material would probably be small, however high purity might permit production of stone for specialty plaster applications. Shipments could be made via Sheet Harbour located 60 km south-southeast of this area.

**PINE GROVE (0123)**  
NTS 11E/03B  
UTM 471500 E 4987400 N

The Pine Grove occurrence area is located 5 km south-east of Shubenacadie, Hants County (Fig. 4-16). It includes several surficial occurrences as well as numerous drillhole intersections in an area which extends from Carrolls Corner in the southwest to Coldstream in the northeast and the Gays River area in the southeast.

This area lies just northeast of the Gays River lead/zinc mine and has been the subject of much drillhole investigation. As a result, regional geological mapping by Giles and Boehner (1982) is more detailed in the

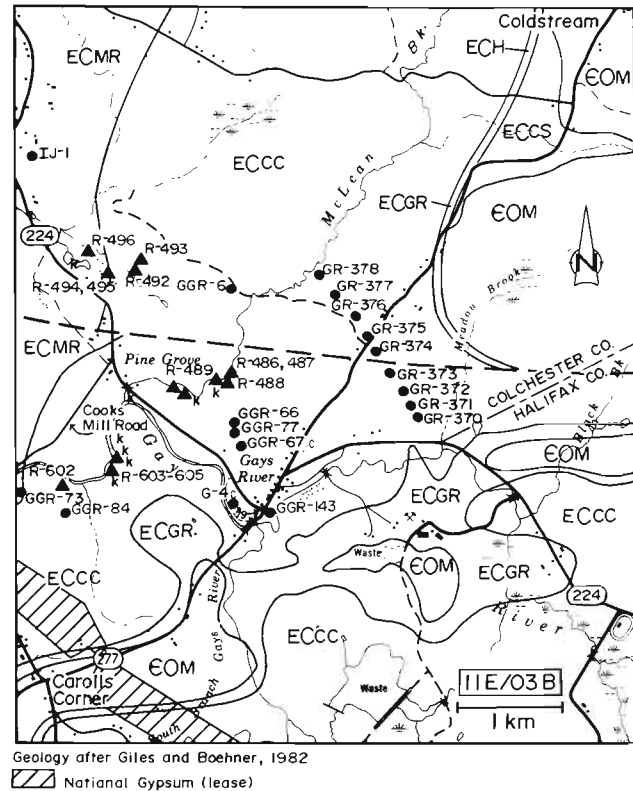


Figure 4-16. Location and geology of the Pine Grove occurrence area. See Figures 4-1 and 4-2 for legend and location.

area. Generally, units strike northeast-southwest and dip into the Shubenacadie Basin to the west-northwest. Most of the Pine Grove area is underlain to the west by interbedded and intermixed sulphates, clastics and carbonates of the MacDonald Road Formation. It is also underlain to the east by the carbonate dominated Gays River Formation which is in turn underlain by Cambro-Ordovician Meguma Group metamorphic rocks. At least one major fault passes through this area, offsetting the Windsor Group strata.

At least 19 drillholes were put down through the sulphate horizons in this area between 1971 and 1974 by Texas Gulf Sulphur Company (Mann, 1972), Getty Mines Ltd. (Getty Mines Ltd., 1974, 1975) and Imperial Oil Ltd. (Burton, 1974b). Most of these holes collared in the Cycle 1 (A Subzone) Carrolls Corner Formation and were stopped in the Meguma Group. Only two holes, Imperial's IJ-1 and Getty's GGR-73, collared in the Cycle 2 (B Subzone) MacDonald Road Formation and only IJ-1 penetrated to basement.

Surface exposures can be found at three separate locations within the Pine Grove area. The most extensive is located along the eastern side of Gays River between Cooks Mill Road and the entrance of McLean

Brook into Gays River where approximately 250 m of continuous exposure between 5-10 m in height can be found. Gypsum in these outcrops is light to medium grey in colour, nodular to laminated with variable amounts of intermixed dark grey selenite and dark brown carbonate. Laminae are generally subhorizontal. Moderate to heavy karst topography can be found paralleling this exposure up to 200 m away from McLean Brook. A second area is found between 0.6-1.3 km upstream above where MacLean Brook empties into Gays River. Here three separate outcrops, each 10 m high and up to 40 m long, can be seen. Light blue-grey anhydrite predominates these exposures and only thin surface hydration to fine grained, white gypsum can be observed. The third area is located in and around a series of gravel pits just northeast of Route 224 and northwest of Pine Grove. Here a series of small rounded outcrops of white to light grey gypsum with minor interstitial carbonate have been exposed by the aggregate operations. Also, small anhydrite exposures can be found a short distance to the east of the gravel pits. According to Giles and Boehner (1982), this area is located near the contact between the Cycle 2 (B Subzone) MacDonald Road Formation and the Cycle 1 (A Subzone) Carrolls Corner Formation.

Most of the drilling encountered massive, light blue-grey, basal anhydrite with only thin (<10 m) hydration at the top, usually overlain by 15-75 m of overburden. The greatest thickness of gypsum in the Pine Grove area was encountered in drillhole GGR-84 where 60 m of medium grey, dirty, mixed, selenitic gypsum, with common mudstone intervals up to 1 m thick, is overlain by 30 m of overburden (Getty Mines Ltd., 1975). This drillhole is along strike from the extensive outcrop and karst area found south of the Gays River. Hole GGR-73, down dip from GGR-84, encountered a similar section, however it is overlain by thicker clay interbeds. Hole IJ-1 also encountered a thick, dirty gypsum section (51 m) which may correlate with the others, but which is covered by an even greater thickness of interbedded clastics and carbonates. Descriptions of all of these sections (Burton, 1974b) appear to be very similar to the mining section at National Gypsum Canada's East Milford Quarry.

This area has good potential for development of gypsum resources in the area south of the Gays River in the vicinity of GGR-84. Much further work would be required to prove minable reserves, but the thick hydration in this drillhole, as well as extensive outcrop and karst topography, indicate that this is an excellent area for further investigations.

## PLEASANT VALLEY (0150)

NTS 11E/03C

UTM 474300 E 5009800 N

The Pleasant Valley occurrence area is located 3.5 km west of the Village of Brookfield, Colchester County (Fig. 4-17). It consists of a small surface exposure as well as an intersection of thin sulphate interbeds in a base metal exploration drillhole.

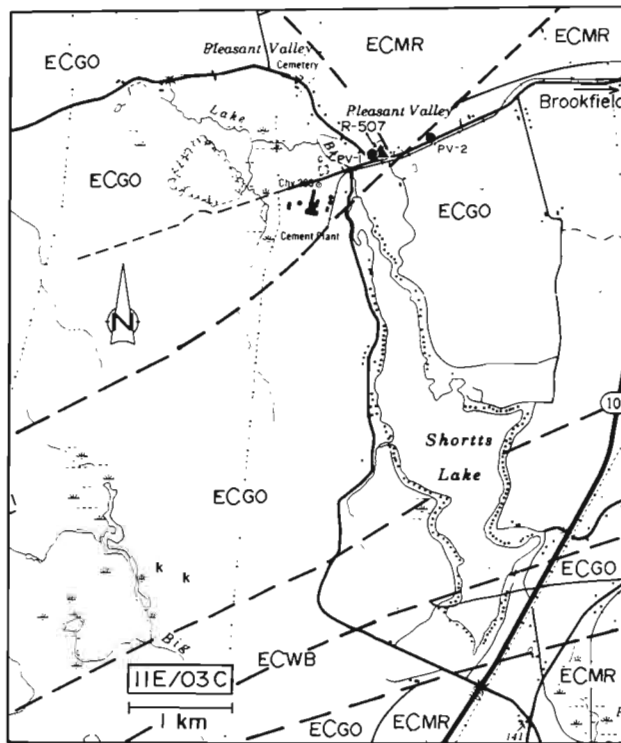


Figure 4-17. Location and geology of the Pleasant Valley occurrence area. See Figures 4-1 and 4-2 for legend and location.

Regional geological mapping by Giles and Boehner (1982) indicated that much of this area is underlain by the interbedded clastics, carbonates and sulphates of the Green Oaks Formation. These units are underlain by interbedded sulphates, carbonates and clastics of the MacDonald Road Formation to the north and are overlain by interbedded clastics and sulphates of the Watering Brook Formation to the south. The area is cut by at least one major fault trending northeast-southwest.

Imperial Oil Ltd. drilled two holes in the Pleasant Valley area in 1974 (PV-1 and PV-2) as part of a regional base metal exploration program (Hannon and Hannon, 1974). Hole PV-1 collared and stopped in silt-

stone and hole PV-2 intersected what appears to be a disturbed section of the bottom of the Green Oaks Formation and a faulted portion of the MacDonald Road Formation containing silty gypsum/anhydrite horizons near the bottom of the hole. A small 2 m<sup>2</sup> rounded outcrop of light grey, selenitic gypsum can be found just north of the Pleasant Valley Road in what appears to be an old quarry area. Approximately 4 km to the south, several areas of light to moderate karst topography can also be found in an area believed to be underlain by the Green Oaks Formation.

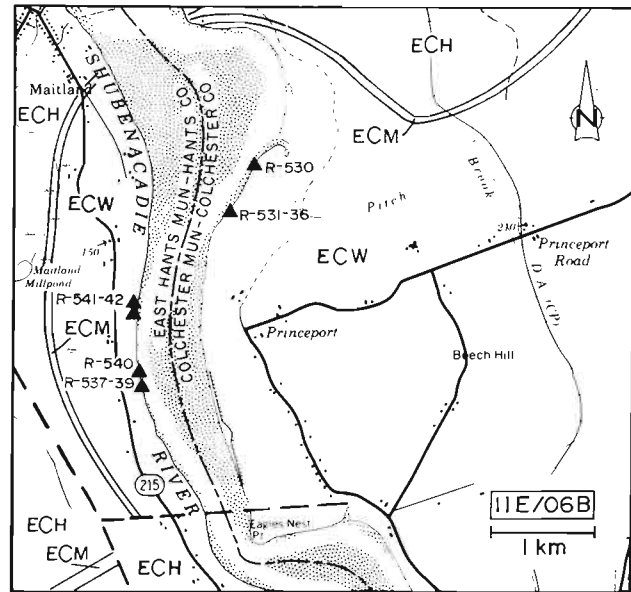
The Pleasant Valley area holds little economic potential for gypsum and anhydrite. The small outcrop area is believed to be part of the top of the MacDonald Road Formation. This section, like the lower part of the Green Oaks Formation, has minor sulphate horizons interbedded with thick clastic units as well as carbonate units and therefore it probably does not contain minable reserves of gypsum and anhydrite.

**PRINCEPORT (0147)**  
NTS 11E/06B  
UTM 462860 E 5016300 N

The Princeport occurrence area is located 15 km southwest of the Town of Truro, Colchester County (Fig. 4-18). It consists of a series of outcrops on the eastern and western banks of the Shubenacadie River containing interbedded sulphates, carbonates and clastics. This occurrence area is in Colchester County and in Hants County. No diamond-drill hole records are available in this area.

Mapping by Stevenson (1958) indicated that much of the area is underlain by the lower part of the Windsor Group. Additional work would be required to more accurately determine the Windsor Group stratigraphy in the area. These units lie in the western end of a small basin and generally dip to the south and east. They are underlain to the north and west by basal Windsor Group Macumber Formation and then by Horton Group clastics.

Outcrops on the eastern side of the Shubenacadie River in this area consist of a number of heads of different types of gypsum separated by concealed or brecciated mudstone sections. Gypsum varies from white, fine grained, massive and highly pure to light reddish brown, selenitic and nodular with medium grey, intermixed dolomite. These heads range from flat lying to 10 m in height and from 5-35 m in width. These units probably belong to the upper part of the MacDonald Road Formation or the Green Oaks Formation.



Geology modified after Stevenson, 1958

Figure 4-18. Location and geology of the Princeport occurrence area. See Figures 4-1 and 4-2 for legend and location.

Two exposures on the western side of the Shubenacadie River are found 3 km south of the Village of Maitland, Hants County. Both exposures are interbedded with red brecciated siltstones similar to those on the eastern side of the River.

The area is of geological interest only; the contorted and recrystallized gypsum outcrops suggest a greater degree of structural deformation than is indicated by Stevenson's map (1958). Units present appear to belong to the upper part of the MacDonald Road Formation or the Green Oaks Formation, however much more work is required to map the local geology in detail. There appears to be little opportunity for economic development in this area.

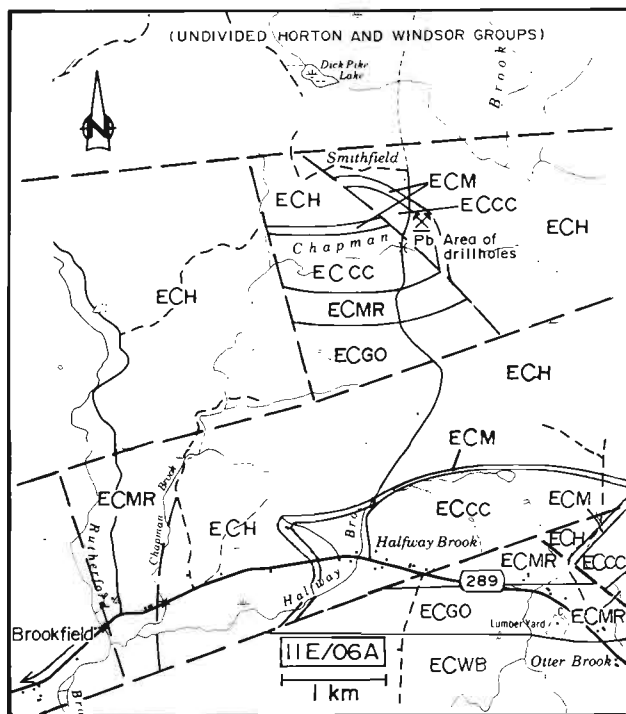
**SMITHFIELD (0154)**  
NTS 11E/06A  
UTM 494000 E 5012400 N

The Smithfield occurrence area is located 15 km east-northeast of the Village of Brookfield, Colchester County (Fig. 4-19). Gypsum and anhydrite have been intersected in base metal exploration drillholes put down by Corporation Administrative Services Limited (Nova Scotia Department of Mines, 1965a) and Granges Exploration AB (Zbitnoff, 1983) in this vicinity although no outcrops of either have been found to date.

Regional mapping (Giles and Bohner, 1982) indicated that the Smithfield area is underlain by a small

isolated block of Windsor Group strata surrounded by Horton Group clastics. The area is highly faulted as are most of the Windsor-Horton contacts. Drilling around the Smithfield lead occurrence indicated deep dissolution along the basal Windsor contact with extensive infilling of clastic materials in both the Macumber and Carrolls Corner Formations (Zbitnoff, 1983). As drilling has been concentrated in the vicinity of the lead occurrence, little is known about the extent and hydration of the Carrolls Corner Formation away from the contact.

The Smithfield occurrence is of geological interest only. The faulted nature and limited extent of the Windsor Group block would greatly restrict the size of any potential gypsum and anhydrite bodies which might be found here.

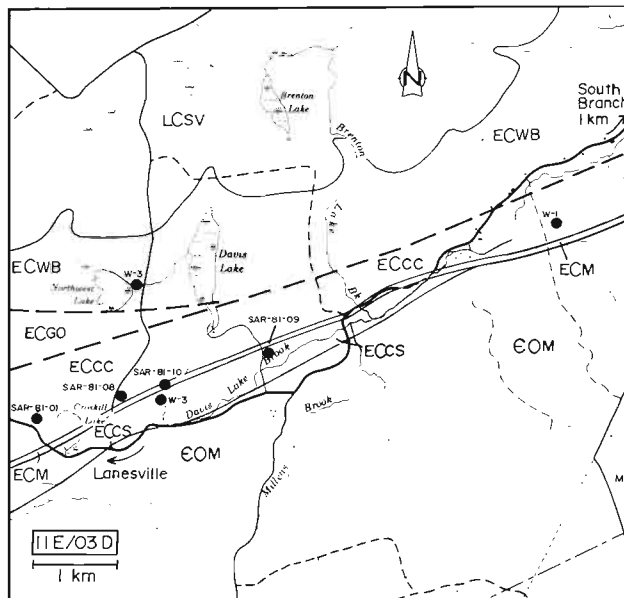


Geology after Giles and Boehner, 1982

Figure 4-19. Location and geology of the Smithfield occurrence area. See Figures 4-1 and 4-2 for legend and location.

**SOUTH BRANCH (0158)**  
 NTS 11E/03D  
 UTM 487000 E 4998000 N

The South Branch occurrence area is located 13 km east of the Town of Stewiacke, Colchester County (Fig. 4-20). No surface exposures of gypsum or anhydrite are known



Geology after Giles and Boehner, 1982

Figure 4-20. Location and geology of the South Branch occurrence area. See Figures 4-1 and 4-2 for legend and location.

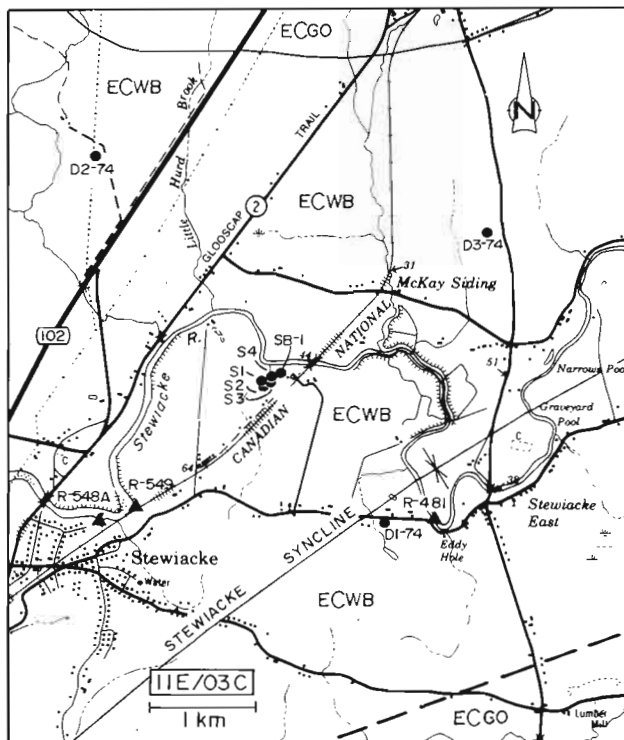
in the area, however drilling carried out by Rio Tinto Canadian Exploration Ltd. in 1973 (Shewman, 1973a) and by Placer Development Ltd. in 1981 (Keech, 1982) encountered sulphate units in the subsurface.

Regional geological mapping by Giles and Boehner (1982) showed this area to be underlain by the sulphate dominated Carrolls Corner Formation which strikes east-west and dips to the north into the Stewiacke Syncline. The Carrolls Corner Formation is underlain to the south by the basal carbonate Macumber Formation which overlies clastics of the Horton Group Coldstream Formation and Meguma Group metamorphics. Basinward to the north, the Carrolls Corner Formation is in fault contact with Upper Windsor Group Green Oaks Formation and Canso Group Watering Brook Formation.

Similar to occurrences elsewhere along the Shubenacadie Basin margin (i.e. Eastville (0115), Newton Mills (0117)), hydration of the basal sulphate is shallow away from the Windsor-Horton contact and at the contact the gypsum appears to have been dissolved and the solution trench infilled by clastic material. Significant volumes of high purity anhydrite with shallow overburden may be available in the eastern portion of this area, however there appears to be little potential for reserves of gypsum.

**STEWIACKE (0118)**  
 NTS 11E/03C  
 UTM 474500 E 5000000 N

The Stewiacke occurrence area is comprised of two surficial and several subsurface occurrences of gypsum and anhydrite (Fig. 4-21). These are located to the north and east of the Town of Stewiacke, Colchester County. Atypically, the gypsum found at surface in this area belongs in the Watering Brook Formation at the base of the Canso Group which overlies and forms the transition of the Windsor Group in which most of the Province's gypsum is found.



Geology after Giles and Bohner, 1982

Figure 4-21. Location and geology of the Stewiacke occurrence area. See Figures 4-1 and 4-2 for legend and location.

Regional mapping in the area by Giles and Bohner (1982) indicated that the area is on the northern side of the northeasterly-southwesterly trending Stewiacke Syncline. The area is underlain by interbedded clastics, sulphates and minor halite units of the Watering Brook Formation which are underlain to the north and west by mixed clastics, carbonates and minor sulphates of the Upper Windsor Green Oaks Formation. The Watering Brook Formation is also in fault contact with the Green Oaks Formation to the southeast.

There are outcrops of gypsum immediately north of the Town of Stewiacke along the southern bank of the

Stewiacke River. Several small occurrences, 0.25-1 m high by 4 m wide, can be found here. They consist of light to medium grey, medium- to coarse-grained gypsum with some dolomite and shale interbeds. Another outcrop can be found 3 km east of Stewiacke again on the southern bank of the Stewiacke River. This outcrop, 1.5 m high by 5 m wide, consists of interbedded, dark grey, selenitic gypsum and medium grey siltstone with satin spar filled fractures. Neither area has associated karst topography which would indicate any significant thickness or extent of gypsum units.

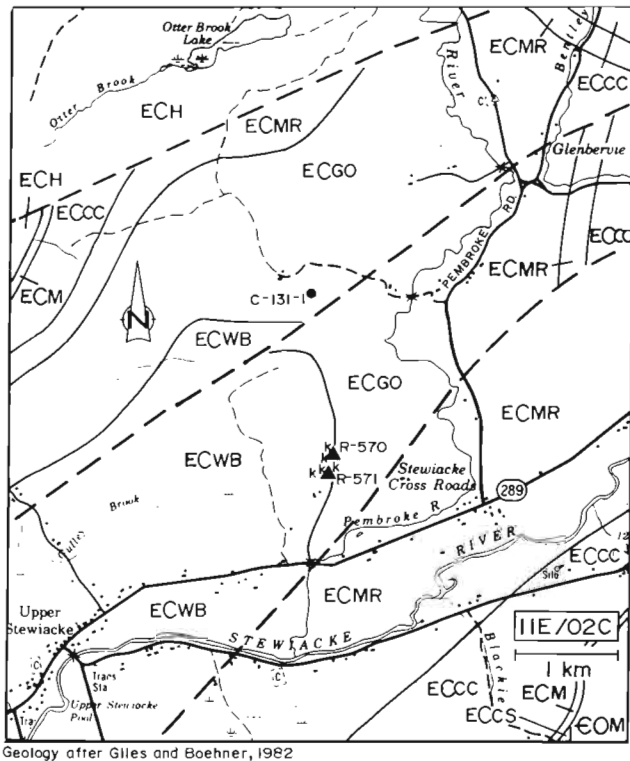
A total of eight diamond-drill holes have been put down in this area including four holes (S1-S4) in 1971 by Denison Mines (Avison, 1972), three (D1-74, D2-74, D3-74) in 1974 also by Denison (Chan, 1974) and one deep hole (SB-1) by U.S. Borax in 1976 (Boehner, 1986). Denison's drilling was part of a regional base metal exploration program. The U.S. Borax hole (SB-1) began as a base metal exploration hole and extended to a final depth of 892.45 m in order to gain stratigraphic information.

All but one of these eight drillholes encountered gypsum and anhydrite. Holes S1, S2, S3 and D2-74 encountered interbedded and intermixed gypsum, grey mud rocks, redbeds and locally thin salt of the Watering Brook Formation. Both S4 and D1-74 are believed to have penetrated as far as the top of the Cycle 2 (B Subzone) of the Windsor Group (Giles and Bohner, 1979) and encountered anhydrite of the MacDonald Road Formation as well as gypsum of the Watering Brook Formation. Hole SB-1, having penetrated the entire Windsor Group and stopped in Horton Group clastics, also encountered anhydrite in the Stewiacke and Carrolls Corner Formations.

None of these intersections nor the surficial occurrences are of economic importance. The intermixed and interbedded nature of the gypsum horizons in the Watering Brook Formation makes them too impure to be of interest even at surface. Other horizons encountered are far too deep to warrant further consideration.

**STEWIACKE CROSS ROADS (0156)**  
 NTS 11E/02C  
 UTM 503100 E 5009400 N

The Stewiacke Cross Roads occurrence is located 1500 m west of the intersection of Route 289 and the Pembroke Road (Fig. 4-22). It consists of an area of moderate to heavy karst topography containing several gypsum exposures.



Geology after Giles and Boehner, 1982

Figure 4-22. Location and geology of the Stewiacke Cross Roads occurrence area. See Figures 4-1 and 4-2 for legend and location.

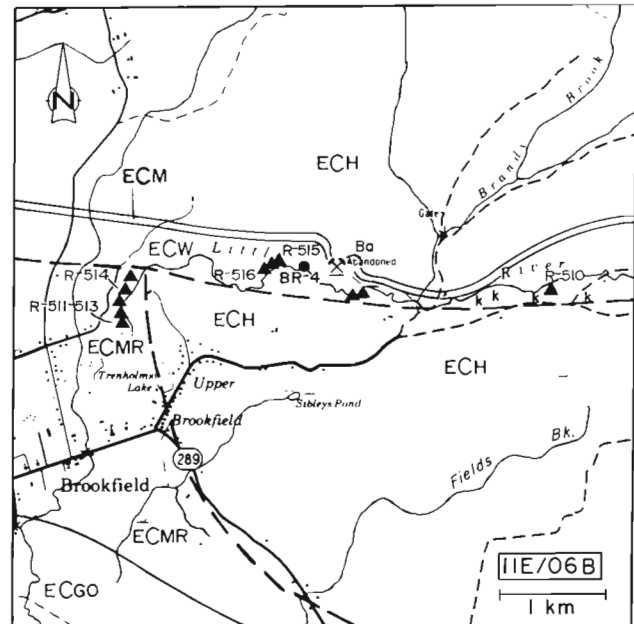
Regional geological mapping by Giles and Boehner (1982) showed excellent bedrock exposure of the Green Oaks Formation just north of this locale. They believed the area to be underlain by the interbedded clastic and sulphate units of the Watering Brook Formation of the Canso Group. These are underlain by Green Oaks Formation of the Windsor Group to the east and cut by faults to the north and south.

Outcrop in this area consists of numerous light grey to medium grey, medium grained gypsum exposures containing +10% intermixed silt and dolomite. The largest is a horseshoe shaped head found 250 m north up a small tributary of the Pembroke River above the cleared area of the Stewiacke Valley. Here the outcrop and scree slope are up to 10 m in height surrounding an apparent sink 30 m in diameter. A small brook appears to emanate from the foot of this exposure. Karst topography extends north, west and south away from these heads.

The Stewiacke Cross Roads area is primarily of geological interest. A few drillholes might be put down to determine the depth and lateral extent of the gypsum under the obviously karsted areas. If these units belong to the Watering Brook Formation, it is unlikely that the sulphate horizons are of sufficient thickness to be of economic interest.

**UPPER BROOKFIELD (0151)**  
NTS 11E/06B  
UTM 479030 E 5012400 N

The Upper Brookfield occurrence area is located 3 km northeast of Brookfield, Colchester County (Fig. 4-23). It consists of several outcrop exposures, areas of moderate karst topography and a single drillhole intersecting gypsum, all found along the Little River to the north and east of Brookfield.



Geology after Stevenson, 1958; Giles and Boehner, 1982

Figure 4-23. Location and geology of the Upper Brookfield occurrence area. See Figures 4-1 and 4-2 for legend and location.

Regional geological mapping by Stevenson (1958) and Giles and Boehner (1982) indicated that this highly deformed area has been subjected to much folding and faulting. An easterly trending fault, cutting through the middle of the area brings Horton Group clastics in contact with Lower Windsor Group sulphates and carbonates along the valley of the Little River. The Windsor Group is also underlain by Horton clastics to the north. Felderhof's (1978) description of a barite deposit found just north of the Windsor-Horton contact indicates much structural deformation in this vicinity.

The largest exposure of sulphates in the area is found along the western side of Little River just northwest of Trenholms Lake. A vaguely stratified sequence of massive gypsum and anhydrite underlain by petroliferous carbonate-rich selenitic gypsum can be found in heads up to 20 m high and 350 m long. These units appear to strike north-south and dip 20° west. Borate



nodules are common in the fine grained, blue-grey anhydrite. Karst topography and minor heads of gypiferous anhydrite extend to the north for several hundred metres. These units appear to belong to the Carrolls Corner Formation (not shown on map).

Between 1500-2200 m further up River, a number of gypsum outcrops can be found along the Little River valley. These generally consist of dirty, selenitic gypsum interbeds with brecciated, red, clastic materials. This section is reflected in a drillhole put down by

Corporation Administrative Services Ltd. in 1963 (BR-4) which encountered dark grey, dirty gypsum interbedded with brecciated shales (Hudgins, 1963). Two kilometres further upstream, another area of karst topography and small rounded outcrops can be found in the River valley.

The Upper Brookfield area is structurally complex and geologically interesting. However, due to this complexity and limited areal extent, there is little potential for development of gypsum or anhydrite resources in this area.

