CHAPTER I

INTRODUCTION

INTRODUCTORY STATEMENT

A detailed investigation of the geology and surface conditions in the Port Hawkesbury - Port Hastings - Point Tupper areas of Richmond and Inverness counties was carried out by the Nova Scotia Department of Mines, Geological Division, during the 1960 and 1961 field seasons. This investigation was concerned primarily with the assessment of bedrock and surficial geology with emphasis on economic possibilities in relation to metallic and non-metallic minerals.

The areas under investigation were divided into two parts: (1) the Immediate or Study area which consists of a rectangular block of approximately 18 square miles surrounnding and including the communities of Port Hawkesbury, Port Hastings and Point Tupper, and (2) a larger area which consists of approximately 100 square miles designated as the Metropolitan or "Metro" area.

The Immediate or Study area was mapped on a scale of 1 inch to 400 feet and the "Metro" area on a scale of 1 inch to ¼ mile.

Information gathered in the "Immediate Area" has been recorded in the Preliminary Report, Port Hawkesbury Project, 1961. However, a considerable amount of information found in the preliminary report will be included in this final report in order to maintain a maximum degree of continuity for the entire project area:

The Preliminary Report, Port Hawkesbury Project, 1961, can be obtained on request from the Nova Scotia Department of Mines.

LOCATION AND SIZE

The area surveyed, which includes the Metropolitan and Immediate areas, covers a total of approximately 116.3 square miles. This area involves a portion of southern Inverness County and a portion of southwestern Richmond County on the island of Cape Breton. See Map 1.

The area is bounded on the south, southwest and southeast by the Strait of Canso, Inhabitants Bay and Lennox Passage. It is bounded on the northwest and northeast by a line from Hefferman's Pond to Queensville and thence along the Inhabitants River to Cleveland and easterly along Highway No. 4, and on the east by a line drawn north-south through Shannon Lake. More specifically, it is the area zoned by the Inverness-Richmond Metropolitan Planning Commission in co-operation with the Department of Municipal Affairs of the Province of Nova Scotia. See Map 5.

SCOPE OF INVESTIGATION

The investigation and study of this area was carried out during the field seasons of 1960 and 1961. The major portion of the work carried out in this area was surveying and mapping the bedrock geology. Limited studies were also made of soil conditions, source of building materials, potential water supply and economic geology. A preliminary study was made of the base metal content in the soils of areas underlain by the Windsor-Horton sedimentary series and their contact. This work was done with a portable geochemical testing kit in the field.

Field staff for the project consisted of two parties which mapped the bedrock geology and a two-man party which carried out soil geochemical surveying. Personnel of the field parties were students and graduates from Nova Scotia universities.

The subject matter of this report will cover information from both the Metropolitan and Immediate area.

TRANSPORTATION

Water, rail and highway are the three modes of transportation to, from, and in this area. Approximately half of the Metropolitan area is bounded by the waters of the Strait of Canso. Inhabitants Bay and Lennox Passage,

Marine Railway Company Limited, Point Tupper,
Nova Scotia.

giving excellent facilities for coastal transportation between towns and villages in this area.

Prior to the construction of the Canso Causeway in 1955, transportation between mainland Nova Scotia and Cape Breton Island was dependent entirely upon car and railway ferries. Although this service was carried on for many years, it was far from satisfactory as numerous delays in transportation were due to inclement weather, ice conditions, and severe tides at certain times of the year. With the construction of the Causeway, a readily accessible and permanent entry into Cape Breton Island from the mainland has been provided for rail and highway transportation. Probably one of the most important results of the Causeway construction is the formation of an excellent harbor south of the causeway from Port Hastings to Point Tupper. The harbor can readily cater to deep sea and coastal shipping, thus making this area one of the most promising locations for industrial development on the East coast of Canada.

Water transportation has been important to this area in the past, is continuing at the present time, and will evidently play a major role in the future by contributing to its development and prosperity. Examples of this are the construction of docking and loading facilities by the Nova Scotia Pulp Mill Limited and by the British American Oil Company Limited. While only limited loading and docking facilities now exist along the shore line of this area, an unlimited water frontage is ready for development. Loading and storage piers were being constructed in one section of this frontage for the Bestwall Gypsum Company in late 1961.

The Canadian National Railways have one main line and three branch lines which service the Metropolitan area. The main line enters Cape Breton Island from mainland Nova Scotia via the Canso Causeway and runs through Port Hastings, Port Hawkesbury and all major points east to Sydney. One branch line leaves Port Hastings and runs northward, serving western Cape Breton to the town of Inverness. A second branch line serves Point Tupper and the Nova Scotia Pulp Mill Limited, while the third line runs east through Evanston, Whiteside, and Grand Anse to St. Peters, Richmond County. See Map 1.

In relation to its present population of approximately 4,000, the map area is well endowed with paved highways and secondary roads. Route 19 is paved from Port

Hastings to Inverness and around the Cabot Trail. Route 5, a section of the Trans-Canada Highway, runs from Port Hastings to Sydney via Baddeck and North Sydney. Route 4 runs through Port Hawkesbury and serves all major points east to Sydney.

A relatively close network of secondary roads throughout the map area plays an important part in the transportation system. These roads join the various major trunk highways and facilitate residential and commercial development in the area.

Although the nearest air transportation is through air terminals at Sydney and at Trenton, Nova Scotia, assistance by the Department of Mines was given to the Inverness-Richmond Counties Metropolitan Planning Commission and to the Federal Department of Transport in assessing and locating a site considered suitable for constructing an air strip. Several locations were surveyed and one, approximately four miles from Port Hawkesbury at MacIntyre Lake (see Map 1), was found to be favorable. This site has subsequently been approved by the Department of Transport.

INDUSTRY AND MINING

At the present time there are no mining or quarrying operations within the map area. During the last century a small tonnage of gypsum was quarried at Plaster Cove near Port Hastings. The gypsum outcroppings can still be seen at this location. It has been reported that this deposit supplied some of the first commercial gypsum to be exported from Nova Scotia. However, for present day requirements this occurrence is too small and is of questionable grade.

Several small coal operations were carried on in this area at various times during the last century. Included in these operations were the Richmond Mine, Whiteside Mine and the Seacoal Brook Mine. The Richmond Mine, located approximately one mile south of Beaver Dam Lake, was in operation from 1863 to 1878 and reportedly produced 8125 tons of coal. The Seacoal Brook Mine operated in 1863. Little or nothing is known regarding the actual production of this mine. The last coal mine to operate in this area was the Whiteside Mine, located approximately 1 mile south of the community of Whiteside in Richmond County. (See Map 2). This mine was financed and operated by American interests and produced

Fig. 1

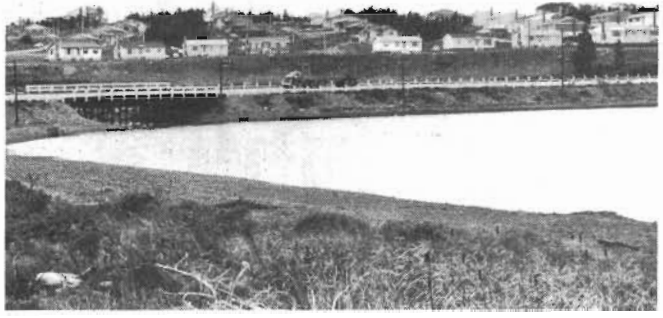


Fig. 2

Figure 1 View of Marine Storage Facilities, British American Oil Company Limited, Point Tupper, N. S.
Figure 2 View of "Hawkesbury Heights" Subdivision, Port Hawkesbury, Nova Scotia.

900 tons of coal from October 1st, 1928, to December 19th, 1928.

A small amount of limestone has been quarried at various locations through the area. This limestone was used by the local residents for agricultural purposes and no records of production are available. The rock quarried was almost entirely part of the Windsor basal limestone. It was usually crushed and burned in kilns before being used for agricultural purposes.

The oldest established industry in the map area is the Marine Railway Company (see Plate 2). This industry has been in operation since 1865, and has contributed greatly to the shipbuilding and fishing industry in this part of the Maritime Provinces. Two ship cradles, 165' x 35' x 17' and 96' x 27' x 12', are employed for ship repairs and various marine works. The cradles have a lifting capacity of 1,000 and 300 tons respectively.

During the past two years, however, many industries, both large and small, have been attracted to this area. Largest and foremost is the 40 million dollar Nova Scotia Pulp Mill Limited which is scheduled for completion in late 1961 or early 1962 (Plate 1). This operation will employ in the vicinity of 300-400 personnel directly and many hundreds indirectly. The daily consumption of pulpwood has been placed at 3,000 cords. The water supply for the mill will be drawn from a large reservoir at Gooseharbor Lake, Guysborough County. This water is at present being piped across the Strait of Canso to the mill site. The British American Oil Company has established a tank farm and docking and unloading facilites on its property immediately southeast of the pulp mill (See Plate 3, fig. 1). It is unofficially reported that this company plans to construct an oil refinery and chemical plant on this property in the future.

Numerous secondary industries and business establishments have moved into this area during 1961. Some of the more prominent of these are a woodworking plant, a tire market, two modern motels, new auto garages, shopping centre and restaurants.

As a direct result of the new industries and influx of hundreds of technicians, tradesmen, and laborers, the town of Port Hawkesbury has had to improve and expand its facilities. Approximately 200 new homes and one church have been or are in the process of completion. An ex-

cellent example of the number of new homes being built is the new subdivision "Hawkesbury Heights", which overlooks Grant's Cove in Port Hawkesbury. (See Plate 3, fig. 2).

The Bestwall Gypsum Company has begun to develop its gypsum quarrying operation at River Denys, Inverness County. Plans call for the transporting of the crushed gypsum by rail to the site of the old Canadian National Railway ferry dock at Point Tupper. On this site a new dock with loading facilities to accommodate deep-sea vessels is now being constructed (Plate 4).

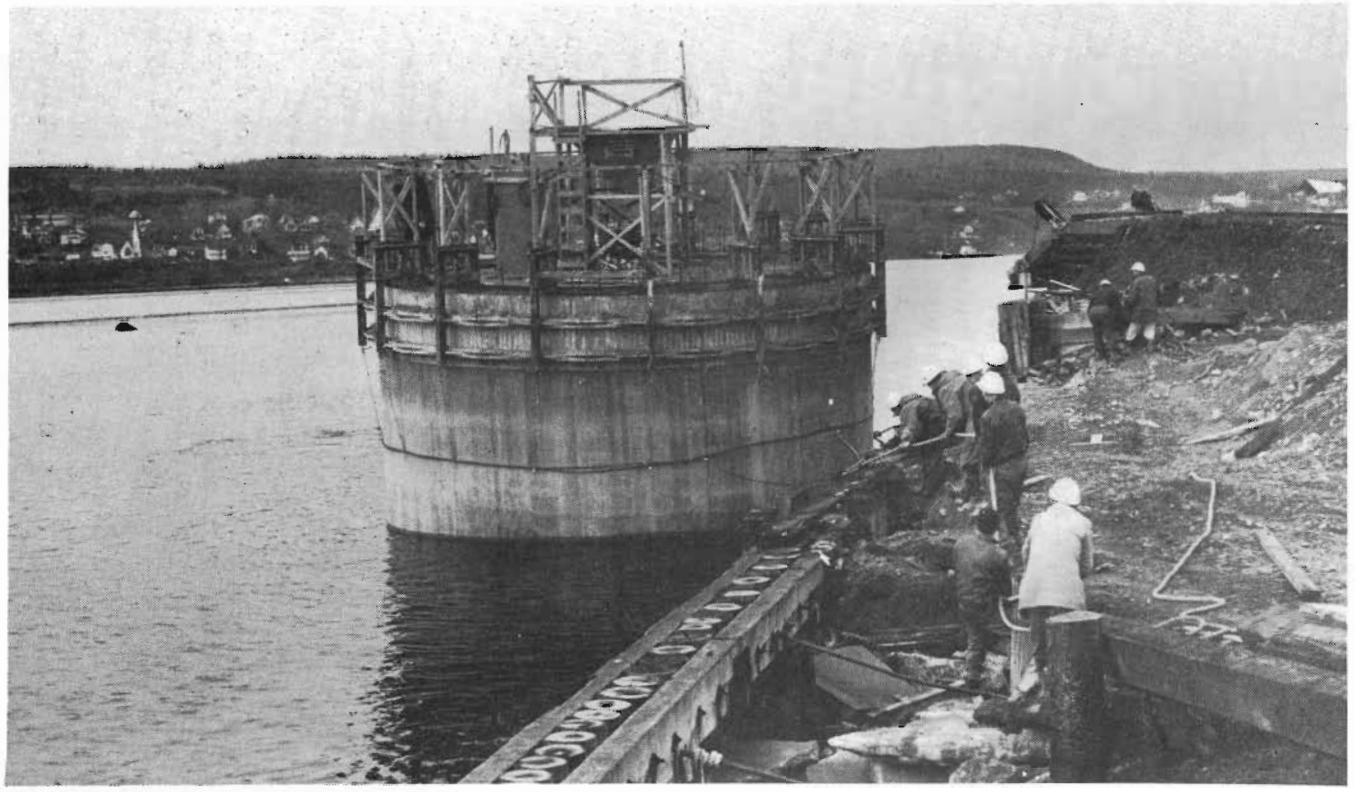
TOPOGRAPHY, GLACIATION, DRAINAGE

The area as mapped includes portions of the two physiographic regions of Cape Breton: the Atlantic Uplands, composed mostly of igneous and volcanic rocks, and the Lowlands, which are underlain mostly by the less-resistant sedimentary rocks. The Uplands, constituting the northern part of the surveyed area, attain a maximum elevation of 700 feet. They constitute the southern portion of the Creignish Hills. Rock exposure is fairly good in the Upland regions, due primarily to resistance to weathering, elevation, and sharp relief.

The Lowland region reaches a maximum elevation of 400 feet with a mean of 125 feet above sea level. Rock exposures in this portion of the map area are limited in occurrence, being mostly confined to shore lines, streams, roads, and railway cuts.

The topography appears to be closely related to the underlying bedrock in both the Upland and Lowland regions. The Creignish Hills, which form the Upland portion in the map area, are composed of fairly broad, lenticular masses of volcanic rocks cut in place by sills. These lenticular masses are relatively resistant to weathering and are characterized by well-rounded tops with steeply sloping sides, particularly steep on the western slopes facing the Strait of Canso. The general trend of these elevated rock masses is northwest-southeast.

The drainage pattern in the Upland regions is ill-defined. No large streams drain the western flank of the elevated areas. Numerous small, intermittent streams or a generally sheet-like runoff system is more characteristic. On the eastern side of the Creignish Hills a stream with several short branches drains southeasterly into Horton Lake. Northwest of the Creignish Hills the drainage is



Construction of new gypsum loading pier, Point Tupper, Nova Scotia.

toward the southeast and forms part of the drainage system of the Inhabitants River.

The Lowlands of the map area are underlain by sediments deposited during Carboniferous times. The topography is generally controlled by the underlying bedrock and is comparable with other areas in the Province having a similar bedrock lithology. The relatively soft sediments have been greatly denuded to form a peneplaned surface with a gradual slope to the southwest. In detail, the topography within this peneplane to the southeast is a series of small ridges and gullies. The north and northeast portions of the lowlands are generally characterized by gently sloping round hills.

In the extreme portion of the lowland region of the map area the topography and drainage are very closely related to the bedrock and structure. The ridges are composed of the more resistant Riversdale sandstone and thus trend parallel to the general strike of the sandstone horizons. Drainage gullies parallel the ridges and are probably underlain by partially eroded beds of soft shale such as are frequently interbedded with the sandstones.

An excellent example of this "ridge and small valley" topography may be seen in the area between Ship Harbor and MacPherson's Ferry. In this section of the map area the ridges are composed of sandstone while the gullies represent the interbedded shale horizons. Another example of these topographic features may be seen from Turbalton Bay east along Lennox Passage. Here the islands, streams, inlets, and shoreline exhibit clearly the trend of the rock formation and structure.

River Inhabitants is the longest and largest river in the surveyed area. It has mature river-valley characteristics with gently sloping walls and gradient. This river is affected by tides to approximately eight miles from the sea. The elevation of the river in the extreme north of the surveyed area is less than 25 feet above sea level.

The Inhabitants River and its many tributaries drain a large portion of the lowland area. This drainage system flows generally to the east and south. East of this river the drainage flows toward the west and southwest into the Inhabitants Basin.

It is believed that glaciation has played an extensive role in determining the present, or existing, topography.

Although definite signs of glaciation, such as striae, are limited in the area, they indicate, where found, that the ice movement was generally in a southeasterly direction paralleling the present Strait of Canso. Landry Lake, in the southeast portion of the map area, appears to have been formed primarily by ice action.

No positive signs of glaciation were seen in the area east of the Habitants River. However, the topography along the north shore of Lennox Passage, Rabbit Island, and in the vicinity of Garry Passage, indicates that the ice movement was in an east-northeasterly direction. Glacial striae east and northeast of this area show that the movement of ice was in a southeast and southwest direction. From this it appears that the direction of movement of the ice changed quite radically, or that there were two separate local advances of the ice sheet. It is possible that the latter case may be true for this region—one local advance of ice moving in a direction parallel to the now-existing Strait of Canso and the other paralleling Lennox Passage.

Long, narrow ridges superimposed on the peneplain may show noticeable effects of glaciation. These ridges are usually made up of resistant sandstones and siltstones which parallel the direction of ice movement. Small V-shaped valleys are sometimes found more or less corresponding to incompetent shale horizons. Small intermittent streams may be found in these depressions.

PREVIOUS WORK

The first published survey in this portion of Cape Breton was carried out by the Geological Survey of Canada in 1878 and 1879 under the direction of Hugh Fletcher. Prior to this work investigations were carried out by Sir William Dawson in various parts of the area although no geological map was compiled. Information on several locations in the area may be found in Dawson's "Acadian Geology", published in 1855.

With the aid of more specific knowledge regarding Carboniferous rock types, stratigraphy and paleontology, the Geological Survey of Canada, in 1945, carried out a preliminary survey of southwestern Cape Breton which included the area covered in this survey. Field work was done under the direction of S. A. Ferguson and W. A. Bell. In 1947, L. J. Weeks completed the mapping of this area

and revised certain portions of the preliminary map. The main object of his work was to collect information for use in locating the causeway to be built across the Strait of Canso. The Mulgrave sheet, No. 995A, published in 1949, and based on Weeks' work, contained the last previous information available.

In 1957 the Hunting Technical and Explorations Services Limited carried out preliminary terrane investigations in this part of Cape Breton. Work was confined primarily to the Point Tupper area and was designed to collect and assemble information relative to the proposed construction of an oil refinery by British American Oil Company.

In 1960 and 1961 the Nova Scotia Department of Mines, Geological Division, undertook to do a survey of the area to assess its potential, if any, in minerals, building materials, and water, as well as to record the general geological characteristics of the map area. The initial phase of this survey was also designed to assist construction companies and industrial concerns in the evaluation and utilization of the resources within the area.

Numerous geologists, paleontologists, prospectors, and others, have worked in the area on one or another specific problem. Some of the more prominent ones were W. A. Bell, N. R. Goodman, and P. H. Hacquebard. Certain areas in the vicinity of Port Hastings have been surveyed and examined by prospectors and geologists for private interests, particularly at or near the Horton and Windsor sedimentary series and their contact zone. Most of this work was done to assess base-metal possibilities considered to exist within this sedimentary series throughout the province.

MAPS PREPARED OF AREA

Four maps covering the Port Hawkesbury Project have been prepared. All maps, including the key map, will constitute a part of this report.

A map of the general geology on a scale of 1" to 2 miles is the primary base map for this report. It shows all the observed and interpreted geology within the Project area as well as other pertinent information. Using the same scale, a map showing the general soil coverage of the area was prepared.

A series of 10 detailed geological maps on a scale of

¼ mile to 1 inch was prepared to cover the Project area. These maps can be obtained upon request from the Department of Mines.

The maps prepared and found in the Preliminary Report, Port Hawkesbury Project, 1961, may also be obtained on request from the Department of Mines.

ACKNOWLEDGMENTS

During the field seasons of 1960 and 1961 Messrs. J. M. Bingley, B. Lewis, D. Gossman, D. Crawley, R. Boylan, D. Capstick, D. Goudge, C. Cole, and D. Murphy ably discharged their duties as field assistants.

The writers express their appreciation to W. H. F. Langley, Chairman of the Inverness-Richmond Metropolitan Planning Commission, for civic and general information gained through his official capacity in that organization, and to others, too numerous to mention, for their assistance during this survey.

Dr. W. A. Bell of the Geological Survey of Canada identified the Mississippian and Pennsylvanian fossils collected by the survey parties, and in addition gave personal counselling regarding fossil identification and stratigraphy in the Project area.

The writers are much indebted to Drs. D. C. Kelley and P. H. Hacquebard of the Geological Survey of Canada for views and discussions on geological problems in this portion of Cape Breton

SUMMARY

This study of an area covering approximately 116.3 square miles of southern Inverness and Richmond counties, bordering the Strait of Canso, was designed to assess: (1) the bedrock and surficial geology; (2) the economic possibilities in relation to metallic and non-metallic mineral occurrences, and (3) to record pertinent data which may assist in the development of this part of the Province as an important industrial area.

Topographically, the map area is a region of upland and lowland areas. The uplands portion is underlain by hard pre-Carboniferous rocks and the lowlands by the relatively soft Carboniferous sediments. Rock outcrops appear to be plentiful in the upland region but otherwise

are scarce and confined to stream beds, shorelines, road and railway cuts.

The oldest rocks in the area are of the George River group and are designated as being Cambrian and/or Pre-Cambrian in age. From rock exposures observed, this group of rocks has been subjected to both regional and local metamorphism. The structures are quite obscure but there is enough evidence to suggest that they were subjected to considerable folding, faulting and shearing. These formations appear to have been intruded by granites of the Devonian period or earlier, causing a certain degree of metamorphism.

A unit of rock also found in this area may be placed as Horton or Post-Horton in age. They are of the volcanic intrusive and pyroclastic type. They vary from basic and intermediate lavas to volcanic breccia and tuffaceous graywackes. Andesites and diabase are the most common rock types exposed of this group. Structurally, there does not appear to be any major deformational features to these rocks but some minor faulting and folding was observed.

The Horton sedimentary series of Lower Mississippian age are the oldest such sediments found in the map area. They overlie the previously mentioned rocks unconformably and are formed through terrestrial deposition in which coarse clastic material is prominent. Generally this group ranges from coarse conglomerates to fine shales within the map area.

Rock of the Windsor marine series of Upper Mississippian age succeed the Horton group and probably rest disconformably upon it. These sediments are found in a narrow zone extending from Port Hastings to Sugar Camp, in a broad belt from Askilton to Richmond Mine, and in a five square mile area which covers the north and northwest shore of Inhabitants Bay and a number of islands in that bay. The sediments of this group are limestones, gypsum, anhydrate, limestone conglomerate, shales, and sandstones. Because of limited outcropping it was not possible to map any significant regional structures other than faults or minor folding.

Stratigraphically overlying the Windsor group is a series of thick, soft, terrestrial sediments known as the Canso group, considered as Upper Mississippian in age. This group consists of red, green and grey shales, siltstones, sandstones, and buff grey limestone beds. Internal

structures such as ripple marks, cross-bedding and mud-cracks are quite common. These sediments have been subjected to varying degrees of folding, as evidenced by broad anticlines and synclines in the MacDale area.

Riversdale sediments of Pennsylvanian age overlie and are thought to be conformable with the underlying Canso group. These sediments are the youngest in the map area and, like the underlying group, are terrestrial in origin. This group is composed of dark grey-black slaty shale, grey sandstones, coal seams and thin, calcareous, fragmental beds. This formation forms a basinlike synclinal structure in the Port Hawkesbury area and a gently dipping, nearly circular, basin structure east of River Inhabitants. Both these structures are faulted on the south and east.

The contact between the Horton and Windsor group is of particular interest because of the possibility of finding economic base-metal mineralization, based upon results in other parts of Nova Scotia which are underlain by the same geologic structure. No metallic mineral occurrences of economic significance were observed in the map area. Occurrences of coal, limestone, and gypsum were also assessed in the area but were found to be of little or no economic significance.

A geochemical reconnaissance survey was performed in the map area, particularly in sections underlain by the Windsor-Horton sediments and contact zone. Results of this work have shown a number of anomalous metal concentrations which apparently coincide with folded structures in these sediments.

A survey of a potential water supply was carried out in the map area. The results of this work have shown that detail work on various lakes in the area would be needed before any development plans are put into effect. In relation to rivers and streams, it is felt that none exist in the area to produce a continuous supply of water for domestic and commercial use on a fairly large scale. Subsurface water, particularly from boreholes, is found available for domestic or minor industrial uses in practically all sections of the map area.

Soil conditions in the map area were assessed and found in part to have a relationship to the underlying bedrock. That is, the bedrock was the parent material for the existing soils. For the most part the soils can

be classed as a mixture of sand, clay, loam, and boulder material. In some sections the soil resulted as a direct action of glaciers. Weathered material derived from the underlying rock was mixed and transported by the ice and glacial waters and later deposited as unsorted drift. These deposits are in the form of till ground moraine.