GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS

PRELIMINARY SERIES

SHEET 11 L/2 AND PARTS OF 11 E/15, 11 L/1 (W) AND 11 E/16 (W)

Adjoins Map 36-1960, "Mount Stewart"

LEGEND

CENOZOIC

POST-GLACIAL AND RECENT

- **6** Shore deposits: sand
- **5** Salt marsh (includes peat bogs covered by salt marsh): muck and grass
- **4** Swamps: 4a, muck; 4b, peat

PLEISTOCENE

- **3** Glacio-fluvial deposits: 3a, esker; 3b, kame; 3c, kame terrace (includes only multiple level terraces); 3d, kame complex (areas of multiple kames, and including eskers and crevasse fillings too small to map independently); 3e, valley edge kame complex (includes kames extending down valley sides and probably some single level kame terraces) } Well to poorly sorted sand and gravel, locally some admixed washed till

  3f, glacio-lacustrine deposits: fine sands, silts; 3g, outwash and other glacio-fluvial deposits exhibiting no topographic form: washed till, well to poorly sorted sands
- **2** Ablation moraine: loose, generally sandy till, with some streaks and pockets of sand
- **1** Ground moraine: 1a, sand phase; 1b, clay-sand phase; 1c, clay phase: compact sand till

BEDROCK OUTCROPS

PALAEOZOIC

PERMO-CARBONIFEROUS

- **R** Red to brown, and grey sandstone; minor conglomerate and shale (drift cover generally less than 3 feet thick)

Observed rock outcrop, conglomerate outcrop	× ×C
Geological boundary (defined, approximate)	⁓
Till coverage over bedrock greater than 3 feet	T
Ablation sand veneer 0.5 to 1 foot thick over bedrock	S
Glacial striae	⌀
Gravel pit, material used for road metal	G.P.

Geology by L. Frankel, 1956, 1957, 1959

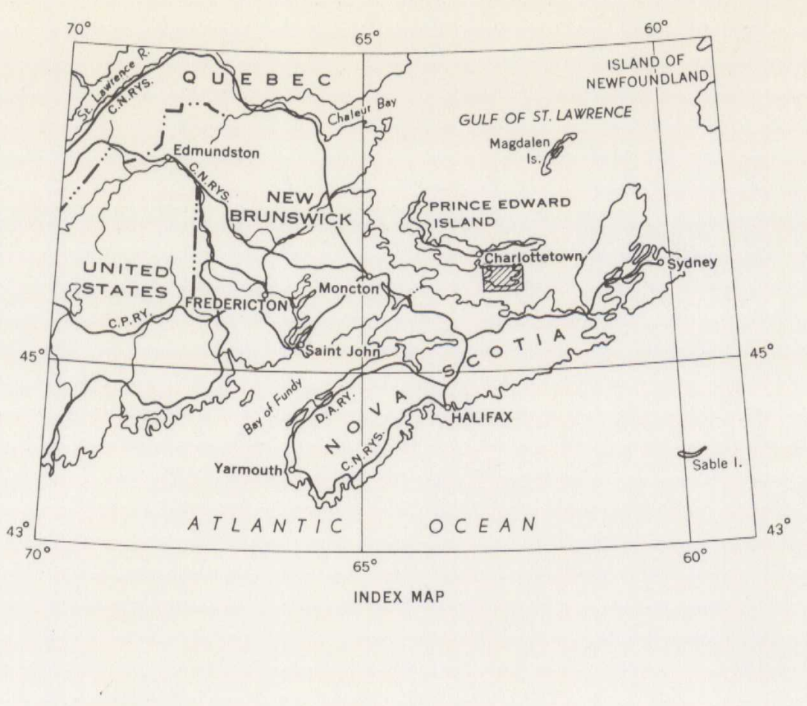
Main highway	①
Other roads	═
Trail	- - -
Railway	┼
Abandoned railway	-┼-
County boundary	—·—
Post Office	P
Lighthouse	☼
Wharf	
Intermittent stream	
Contours (interval 100 feet)	200

Cartography by the Geological Survey of Canada, 1960

Approximate magnetic declination, 24° 12' West

Air photographs covering this area may be obtained through the National Air Photographic Library, Topographical Survey, Ottawa

In response to public demand for earlier publication, Preliminary Series maps are issued in this simplified form and will be clearer to read if all or some of the map-units are hand-coloured



INDEX MAP

DESCRIPTIVE NOTES

Rock outcrops are restricted mainly to coastal areas and along river valleys. Bedrock(R) consists primarily of sandstones with minor amounts of shale and conglomerate. These rocks are of terrestrial origin and probably represent parts of a complex of coalescing alluvial fans. They are predominantly red to brown, with all hues present; grey rocks are only locally prominent. In many places severe weathering has completely removed the cementing material, turning the upper few feet of the sandstone into sand.

Two types of conglomeratic sediments are recognized. The more prominent type consists mainly of well-rounded quartzitic material. The matrix has been weathered locally, perhaps since deglaciation, releasing the conglomeratic particles. This material is quarried for road metal where the overburden is thin. More exploration in the areas of known conglomeratic deposits could probably result in the discovery of additional workable deposits. The Iris Station area, not yet explored by test-pits is a good potential source of this gravel.

The second type consists of conglomerates or breccias composed of angular to semi-rounded particles of coarse-grained granitic and metamorphic rocks. Quartzitic pebbles are not abundant. This material is now quarried 1 mile south of Murray River. Elsewhere the rock is too well cemented for use as road metal, unless it is blasted. Thin bands of this conglomeratic material are interbedded with sandstone along the coast and up to about a mile inland from Stewart Point to High Bank; a thick band occurs on Wood Islands. Thick beds are found at the outlet of the South River at Murray Harbour, and between Terras and Smith Points along the east coast. The only outcrop of this material found north of Smith Point is located under glacio-fluvial materials, approximately 3/4 mile west of the Georgetown cemetery.

Shale is exposed as relatively thin beds in outcrops that are predominantly sandstone; few thick beds have been seen. Best exposures occur along the shores of Orwell and Pownal Bays, and the rivers that empty into them. Shale exposures are also found along the south coast from Stewart Point to Murray Head, and north to Murray Harbour. The few shale exposures seen in other parts of the area are generally only a few inches thick.

The structure of the area is imperfectly known because of complex crossbedding and the scarcity of large rock exposure. Most observations of structural trends come from coastal areas, and even here only meagre data are available. The following generalizations are suggested. Hillsborough Bay, just west of Pownal and Orwell Bays, may reflect a breached elongate domal structure, which in turn may be the result of salt intrusion at depth. The hills north of Pownal are a cuesta dipping gently to the north; near Gallows Point the rocks strike generally northeast and dip gently southeast; the peninsula from Prim Point to Eldon is a cuesta dipping southeast. The Iona-Caledonia area, where the conglomerates cap the hills, is the centre of a broad shallow syncline. From Bell Point to Guernsey Cove on the south coast, the rocks strike parallel to the coast and dip north. The east-trending course of the Murray River is parallel to the coast, and is thought to be structurally controlled. The eastward course of the Montague River and the southeastward courses of the Brudenell and Cardigan Rivers are also thought to be structurally controlled. The large bays on the east coast may also indicate breached domal structures on salt intrusions. The rocks strike parallel to the coast from Cape Bear to Murray Head, and dip west; this may be an irregular dip on the flank of a dome.

A few plant remains have been found in the sedimentary rocks, most of them at Penn Point. Their preservation is so poor, however, that they have been identified only as representatives of the following groups: Filicineae, Lycopsida, Equisetales, and Pteriodospermales. A few unidentifiable bone fragments have also been found. The rocks are of Permo-Carboniferous age but no closer age can be assigned.

Ground moraine covers much of the eastern and northern part of the area. The reddish brown till upon which it is developed is generally less than 10 feet thick, and in many areas it thins to only 1 foot, or is absent. In a few exposures, however, the till is as much as 25 feet thick. A few exotic pebbles or erratics are found in the till, particularly near the coastal areas of the eastern and western parts of the island. Their source is not yet known, but is assumed to be the highlands of Cape Breton and/or New Brunswick. Pebbles derived from local conglomerates are abundant in the till in some areas. Their presence in abundance is usually a good indication of the proximity of the conglomerate.

The reddish brown till(1) can be divided into the following three phases on the basis of the physical characteristics of the material: sand, clay-sand, and clay. Because the till was developed mainly from local source materials, there appears to be a correlation between the phase of the till and local rock types.

The sand phase(1a) has the following characteristics: upon impact, dry material either collapses or breaks into small chips; chips have little or no cohesive strength; clay 'skins' around large quartz grains and pebbles are rare or absent; when wet, plasticity is low; matrix does not contain many fines; cut banks commonly tend to slump readily. This phase has developed where the underlying bedrock consists mainly of sandstone.

The clay-sand phase(1b) includes material whose characteristics are unlike those of the clay and sand phases, but may grade toward them. It is the most inclusive phase because it includes members (not differentiated in this report) that may be classified as clayey clay-sand, 'normal' clay-sand, and sandy clay-sand. The characteristics of the 'normal' clay-sand are as follows: when dry, it breaks into chips that have moderate cohesive strength; clay 'skins' surrounding large quartz grains and pebbles are prominent; moderately plastic when wet; many fines in matrix; and cut banks hold up moderately well, but exhibit slumpage. Characteristics of the other members are intermediate between this type and the clay or sand phases. This phase generally develops in areas where the bedrock consists of fine-grained sandstone with a little shale.

The clay phase(1c) includes materials with the following characteristics: breaks with blocky fracture when dry; fragments have much cohesive strength; clay 'skins' surround the larger quartz grains and pebbles; shale fragments may be locally abundant; very plastic when wet; many fines in matrix; and cut banks retain steep face with very little slumping. This phase develops where the bedrock contains shale.

Few glacial striae are preserved, owing to the susceptibility of the bedrock to weathering and erosion. They are found mainly along the coast, where exposed by the waves; even these will be obliterated after a few years. The area was apparently overridden by ice moving westward from Cape Breton and also eastward along Northumberland Strait.

Approximately one quarter of the map-area has a surficial cover of stratified drift(3). This consists of either ice-contact or outwash features, tentatively divided, on the basis of their form and internal structure (when known) into seven types (3a-3g).

This area had extreme ice stagnation during the waning stages of Wisconsin glaciation. Tongues or blocks of ice apparently remained in many of the glaciated stream valleys and bays after the ice melted off the highlands. Stagnation resulted in the complex anastomosing pattern of the glacio-fluvial deposits.

Because conglomeratic materials are available for road metal, the glacio-fluvial deposits in this area have rarely been worked. Only the Perth area is presently exploited.

Swamps(4) occur in undrained depressions and where drainage has been impeded. Most of them contain muck(4a) but a few contain peat (4b).

The shores of many of the smaller bays are covered by mats of salt marsh grass and/or organic muds(5). Tree stumps and peat deposits covered by the marsh-grass mats, and submerged at high tide, are also found in many bays. They indicate submergence of this part of the island by a rise in sea-level or structural downwarping. The most prominent submerged stumps or peat deposits occur along the coasts of Nicholas Point, Wood Islands, Point Pleasant, Cody Point, St. Mary's Bay (from east of Sturgeon to north of Albion), and Maitland Point. Radiocarbon analysis of a submerged tree in the Nicholas Point area places its age at 915 ± 90 years B.P. (I-GSC-23).

Temporary shore features, including baymouth bars, spits, tombolos, barrier bars, and beaches (6) are continuously built and destroyed by wave and current action. In some areas, beach sands are reworked by the wind and form small dunes; some of these have been partly stabilized by vegetation. These deposits are the source of sand for construction purposes, but only the deposit at Wood Islands is continuously exploited.

A few of the many swamps in this region contain peaty material. These deposits are of poor fuel quality and are too small to have any but local value. A radiocarbon date of 6,600 ± 270 years B.P. (I-GSC-12) on the basal materials of one bog at Iris Station gives a minimum age for the deglaciation of the area.

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MAP 33-1960
SURFICIAL GEOLOGY
MONTAGUE
KINGS AND QUEENS COUNTIES
PRINCE EDWARD ISLAND

Scale: One Inch to One Mile = $\frac{1}{63,360}$

Miles
1 1/2 0 2 3

MAP 33-1960
MONTAGUE
PRINCE EDWARD ISLAND