

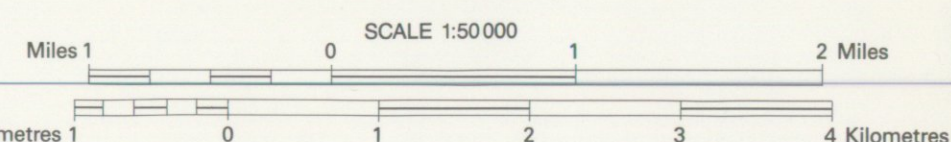
TILL CLAST AND SIMPLIFIED  
GLACIAL GEOLOGY  
OF  
MOUNT UNIACKE

(N.T.S. SHEET 11D/13 WEST HALF)

NOVA SCOTIA

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SCALE 1:50 000



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LEGEND

TILL CLAST LITHOLOGIES

- Granodiorite:** light to medium grey, occasionally blue-grey; medium- to coarse-grained; medium grained equigranular in part; K-feldspar megacrysts (2-3 cm); 15% biotite; 0% muscovite.
- Biotite monzogranite:** light to medium grey; medium- to coarse-grained; K-feldspar megacrysts (2-3 cm); 10% biotite; 0% muscovite; bedrock source is the Sandy Lake Monzogranite.
- Porphyry:** light buff; fine- to medium-grained; K-feldspar megacrysts; 3% biotite; 0% muscovite; bedrock source is the Big Indian Polyphase Intrusive.
- Muscovite-biotite monzogranite:** colour varies: light buff, pink, white; fine- to medium-grained and fine-grained equigranular; minor quartz megacrysts (3-4 mm); 2-5% biotite; 0-3% muscovite; bedrock sources are the Big Indian Polyphase Intrusive, Panuke Lake Leucomonzogranite, and Walsh Brook Leucogranite.
- Leucocratic rocks:** white; fine-grained equigranular; 0-3% biotite; 0% muscovite; minor garnet; minor hematization; bedrock source is the Big Indian Polyphase Intrusive.
- Meguma Group:** greywacke, grey quartzite, grey to buff-black slate.
- Foreign:** quartzite, meta-siltstone, basalt, rhyolite, tuff, sandstone, siltstone, diorite, gneissic granite; bedrock sources are the Minas Sub-basin, North Mountain basalt, Cobequid Highlands.

SIMPLIFIED SURFICIAL UNITS

- Quaternary**
- Late Wisconsinan**
- Greywacke Till:** loose; pale yellowish brown (10YR8/2); matrix to clay ratio is highly variable; clasts are predominantly Meguma Group greywacke; may contain local granites in contact areas.
- Slate Till:** loose; light olive brown (5Y5/6); sandy matrix; clasts are typically greater than 50% angular Meguma Group slate; may contain local granites in contact area.
- Lawrencetown Till:** cohesive; moderate brown (5YR4/4 to 5YR3/4); matrix may be massive though fissility is common; facies gradation from brown, compact silt and till to reddish, moderately compact mud till; Meguma Group and foreign clasts range in size from pebbles to boulders and are usually faceted and striated.
- Undivided Tills:** Contains Granite Till A, Lawrencetown Till and Granite Till B due to limited areal extent individual tills do not form mappable units; in general dominated by Lawrencetown Till.
- Pre-Quaternary**
- Bedrock:** areas where B soil horizon is developed to bedrock; weathered, shattered bedrock is common; thin till may occur in bedrock hollows; also large areas of glacially scoured bedrock.

TILL CLAST PERCENTAGES

- Granodiorite**
- Biotite monzogranite**
- Porphyry**
- Muscovite biotite monzogranite**
- Leucocratic rocks**
- Meguma Group**
- Foreign**

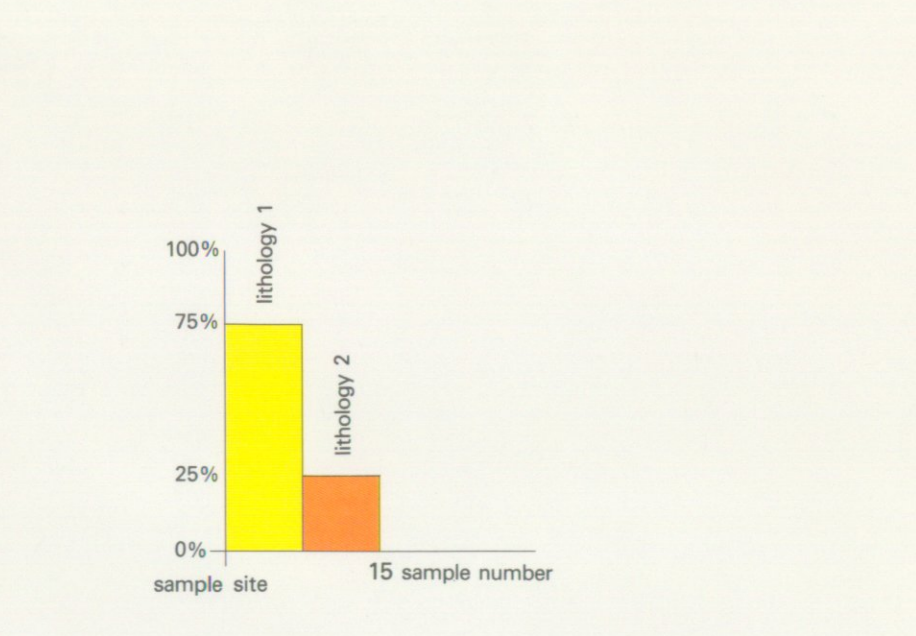
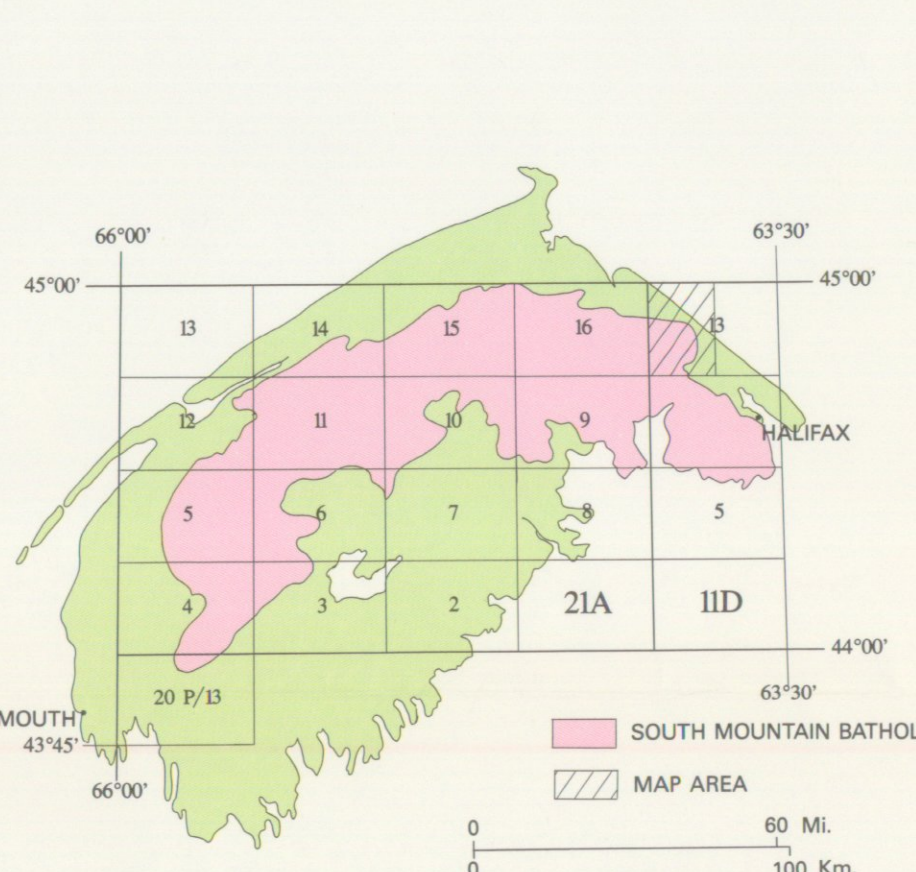
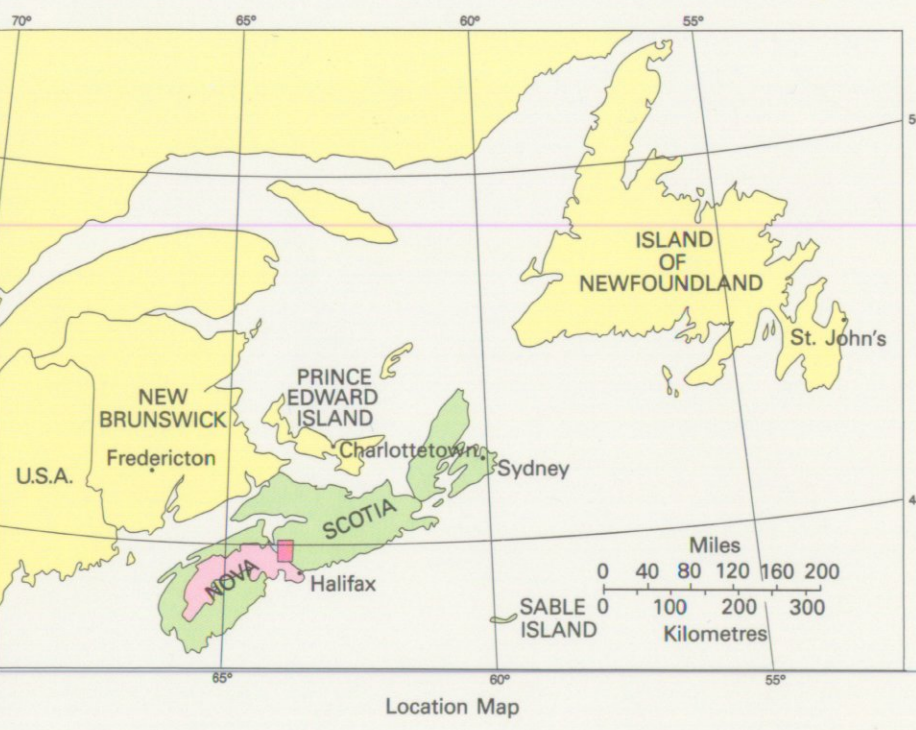


Fig. 1: Illustration shows the system of lithological representation used on this map. Each histogram represents the relative percentages of the lithologies found in the pebble fraction of an 8-9 kg sample.

**Till Types\***

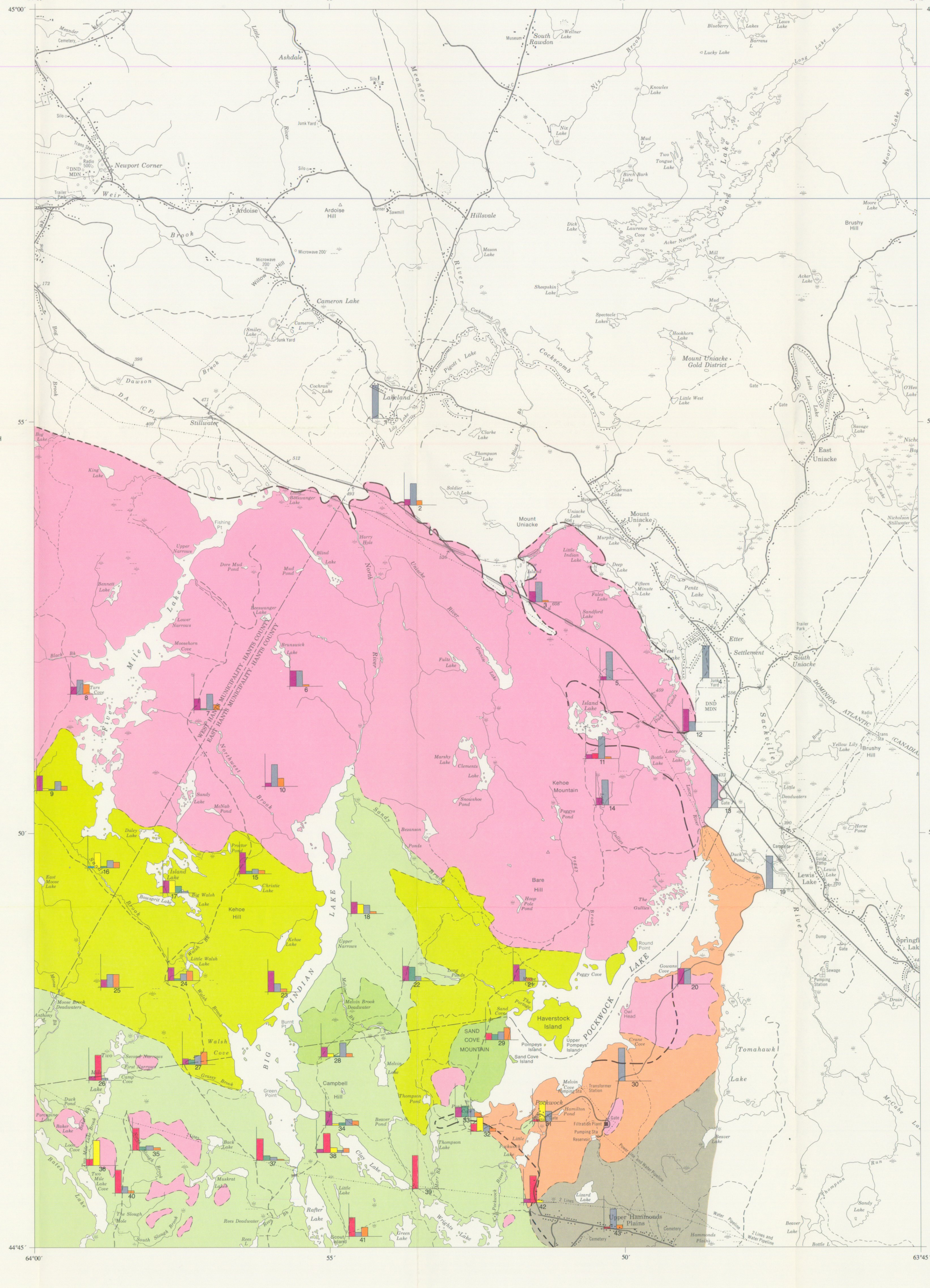
GWC	Greywacke Till C
GTC	Granite Till C
GWB	Greywacke Till B
STB	Slate Till B
GTB	Granite Till B
GTBWB	Till collected near South Mountain Batholith/Godenville Formation contact
LT	Lawrencetown Till
GTA	Granite Till A

\* Classification after Finck, P.W. and Graves R.M., N.S.D.M.E. Maps 87-1,2

Sample No.	Till Type	Granodiorite	Biotite monzogranite	Porphyry	Muscovite biotite monzogranite	Leucocratic rocks	Meguma Group	Foreign
1	GWB	0	0	0	0	100	0	0
2	LT	17	0	0	0	68	15	0
3	GTB	32	0	0	0	65	3	0
4	STB	0	0	0	0	100	0	0
5	LT	10	0	0	0	90	0	0
6	GTA	48	0	0	0	48	4	0
7	LT	34	0	0	0	59	14	0
8	LT	23	0	0	0	46	31	0
9	GTC	47	0	0	0	4	36	13
10	LT	8	0	0	0	69	24	0
11	LT	12	15	0	0	69	4	0
12	GTBWB	70	0	0	0	30	0	0
13	GWB	0	0	0	0	100	0	0
14	LT	20	0	0	0	80	0	0
15	LT	12	0	0	0	7	15	11
16	LT	0	0	5	48	5	23	19
17	GTB	38	0	0	0	38	19	5
18	GTB	18	0	0	0	31	0	5
19	GWC	0	0	0	0	100	0	0
20	GTBWB	50	0	0	0	50	0	0
21	GTB	18	0	0	0	37	19	10
22	GTA	45	0	0	0	43	12	0
23	GTB	65	0	0	0	25	10	0
24	GTB	72	0	0	0	6	21	30
25	LT	22	0	0	0	0	39	39
26	GTB	12	0	0	0	0	0	16
27	LT	18	0	0	0	15	28	39
28	LT	29	0	0	0	8	4	13
29	LT	22	0	0	0	16	24	38
30	GWB	0	0	0	0	100	0	0
31	GTB	0	5	0	0	63	32	0
32	GTBWB	32	0	0	0	46	21	8
33	LT	30	0	0	0	31	25	14
34	GTC	45	0	0	0	9	25	16
35	GTB	72	0	0	0	16	12	0
36	GTB	0	20	0	0	80	0	0
37	GTB	0	100	0	0	15	13	0
38	GTB	60	0	0	0	0	6	12
39	GTB	0	100	0	0	0	0	0
40	GTB	74	0	0	0	0	20	6
41	GTB	0	98	0	0	0	0	29
42	GTB	0	86	0	0	0	0	0
43	GWB	0	7	0	0	0	82	11

SYMBOLS

- Contact between major surficial geological units (gradational).
- Geological boundary between Meguma Group rocks and South Mountain Batholith granitic rocks (defined, approximate).
- Planimetric base produced by the SURVEYS AND MAPPING BRANCH, DEPARTMENT OF ENERGY, MINES AND RESOURCES. Updated from aerial photographs taken in 1975. Culture check 1980. Published in 1982.



SUMMARY OF PREVIOUS WORK

The recognition of till clasts and boulders as useful tools in mapping glacial geology in Nova Scotia is not a new concept. In previous studies of Nova Scotian Quaternary geology the use of till clasts was vital in determining the provenance and direction of till transport. Piest (1898), while exploring for gold at Blockhouse, recognized a travelled, dark coloured clay till containing basalt clasts as distinct from an overlying locally derived auriferous slate till. Such observations are important when searching for gold in glaciated terrain overlying the gold-bearing Meguma Group rocks.

Hickox (1962) identified granitic boulders of South Mountain Batholith origin north of the Batholith. The boulders occurred in till on the Annapolis Valley floor and as surface erratics along the North Mountain and Bay of Fundy shore. Identification of these boulders allowed Hickox to infer the presence of a north-flowing ice cap centered on the Southern Uplands.

Grant (1963) differentiated locally derived granite, greywacke, slate and hybrid tills and also distinguished distally derived red muddy tills. He stated that locally derived tills were "characterized by the dominance of one rock species in amounts ranging from 80 to 100 percent and this same species always underlies the till as bedrock". The hybrid till is a "mixture of pebbles from the three local sources". Grant described the red muddy till as "transitional to a similar red till developed on the shale and sandstone of the Minas Basin area". Thus, Grant classified the pebble lithologies and determined till provenance based on clast origin.

Stea (1980), Wilson et al. (1980), Stea (1982), MacGillivray (1983), Stea and Finck (1984), Stea et al. (1986) and Turner and Stea (1986) have also recognized that distinctive pebble assemblages are associated with individual till units. The authors recognized clast dispersion and were able to make reliable inferences regarding the nature of underlying bedrock and (or) the direction of ice flow.

At Hackets Cove, Granite Till A overlies a small pluton of grey, fine-grained muscovite-biotite monzogranite mapped as part of the Tantallon Leucomonzogranite by MacDonald and Home (1987). Approximately 70% of the pebble fraction of the till is derived from the underlying two-mica monzogranite with a minor percentage of the clasts originating in the Halifax Peninsula Leucomonzogranite of MacDonald and Home (1987). West of Little Indian Lake, Granite Till A contains biotite monzogranite, fine- to medium-grained muscovite-biotite monzogranite and quartz-feldspar porphyry, all interpreted as having been derived from the underlying Sandy Lake Monzogranite (MacDonald and Home, 1987) and Tantallon Leucomonzogranite. Granite from underlying bedrock and nearby up-ice sources to the northwest constitute 65-85% of the till clast content.

Despite the general domination of Granite Till A by local bedrock clasts, a significant proportion of this till consists of more distally derived clasts. At Porcupine Lake 25% of the clasts in Granite Till A are biotite monzogranite. The nearest up-ice bedrock source of biotite monzogranite is 4 kilometres to the northwest. Granite Till A is also characterized by a significant (15-35%) component of Meguma Group and foreign clasts. At Little Indian Lake the closest up-ice source for the Meguma Group fraction of the till is metagreywacke 25 kilometres to the northwest.

A broad area of Lawrencetown Till extends from Sambro on the southern coast of the Halifax Peninsula (Map Sheet 11D/12) north to Hammonds Plains. It also occurs west of Pockwock Lake (Map Sheet 11D/13) as a thin drift overlain with lesser amounts of Granite Tills A and B. It is characterized by a high non-granitic pebble content that varies from 40-100%, generally decreasing with distance transported across the South Mountain Batholith. Lawrencetown Till was transported in a southward direction correlative with ice flow phase 2 of Stea and Finck (1984).

South of Hammonds Plains, clasts in the Lawrencetown Till are almost entirely derived from north of the South Mountain Batholith. Distinctive pebbles such as diorite, diabase, rhyolite, sandstone and siltstone are found in this till. Donohoe and Wallace (1982) mapped diabase dyke swarms and diorite intrusives in the Cobequid Highlands, 90 kilometres north of the Hammonds Plains area. They also mapped rhyolite in the Fountain Lake Group. Sedimentary rocks in the till are greenish-brown to reddish-brown and were derived from the Minas Sub-basin of Bell (1958), 60 kilometres to the north. Similar pebble assemblages occur in Lawrencetown Till drumlin cuts at Goodwood and Whites Lake (NTS 11D/12). West of Pockwock Lake (Map Sheet 11D/13) gneissic granite clasts were noted in the Lawrencetown Till. These clasts probably originated 70 kilometres to the north in the Cobequid Highlands.

Down-ice dispersal of granites in Lawrencetown Till has been recognized. The clasts are often small and weathered making coarse grained clasts difficult to distinguish with regard to granite type. Granodiorite clasts occur in Lawrencetown Till overlying the Big Indian Polyphase Intrusive (11D/13) mapped by Corey (1987). The granodiorite appears to have been derived from a body north of the polyphase intrusive and from numerous inliers mapped within the intrusive. Microgranite and two-mica monzogranite derived locally from the Big Indian Polyphase Intrusive, are less abundant when compared with the amount of granodiorite, Meguma Group, and foreign clasts in the till.

This till sheet covers the majority of the granitic terrain on Map Sheets 11D/12 and 11D/13. Its direction of transport is perpendicular and may vary from southeast to southwest.

Granite Till B can be subdivided into lithologically distinct facies that correlate with the underlying bedrock geology. A facies change is observed west of Nine Mile River where a bedrock contact between the Halifax Peninsula Leucomonzogranite and Harrietsfield Monzogranite has been delineated by MacDonald and Home (1987). West of this contact, the granite clasts are dominated by monzogranite derived from the Halifax Peninsula Leucomonzogranite, whereas east of the contact the granite drift lithology is characterized by Harrietsfield Monzogranite. The transport distance of granite clasts is generally < 1 kilometre.

Sampling of till overlying small intrusive bodies demonstrates the local nature of clast dispersion in portions of Granite Till B. At Fergusons Cove (NTS 11D/12) a small leucoporphry body mapped by MacDonald and Home (1987) is overlain by Granite Till B containing 100% leucoporphry clasts. The small size (0.6 square kilometres) of the intrusion implies a local source for the clasts in the till and a maximum transport distance of a few hundred metres. Similar patterns of limited dispersion are evident at Hackets Cove, Bates Lake, Tantallon and Pockwock Lake.

Where local provenance is so dominant, till clasts can be used to predict underlying bedrock geology. Near Hubley Big Lake (NTS 11D/12) two bodies of fine grained two-mica monzogranite are inferred using available bedrock exposure and till clast geology. The presence of radiometrically more evolved granitic bodies within the area of Halifax Peninsula Leucomonzogranite is substantiated by <sup>60</sup>Co and <sup>40</sup>K/Ar into airborne spectrometric data (GSC, 1979). The fine grained two-mica monzogranites are similar to those mapped within the Tantallon Intrusive Suite. Fine-grained two-mica monzogranites are also seen in Granite Till B at Third Pond (NTS 11D/12). A local body (or dykes) is believed to be the source for these clast types.

An unusual feature of Granite Till B in the study area is the high percentage of Meguma Group clasts. It contains greater than 50% greywacke and (or) slate at some localities (eg. Sambro Head and Wrights Lake NTS 11D/12). The Meguma Group clast background is elevated when compared to granite tills examined to the west of this map sheet. There are two possible sources for these clasts: (1) The Lawrencetown Till has transported Meguma Group clasts across the Halifax Peninsula. The younger flow phase that formed Granite Till B incorporated these lithologies from the Lawrencetown Till and re-deposited the clasts in Granite Till B. (2) A late southwestward ice movement may have transported Meguma Group clasts southwest across the region, reworking or forming the local granite till.

SUMMARY

Granite Till A is dominated by local and up-ice granites and contains a significant Meguma Group and foreign clast component. It was deposited by ice flowing in a southeast direction and is correlative with ice flow phase 1 mapped by Stea and Finck (1984) and the Hartien Till of Stea and Fowler (1979).

The Lawrencetown Till has a "dual provenance", as established by Stea and Fowler (1979) and corroborated by the present survey. It is characterized by local and up-ice South Mountain Batholith granite and non-granitic clasts from north of the Batholith. Ice crossing the Cobequid Highlands, Windsor Basin and Meguma Group rocks entrained material and dispersed clasts in a southward direction across the study area. The southward movement is correlative with ice flow phase 2 mapped by Stea and Finck (1984).

Granite Till B is the major surficial unit in the study area. The clasts are derived from local bedrock sources and transported generally 1 kilometre. Clasts in the most local till were transported a few hundred metres. The direction of transport in this till is problematical; it may vary from southeast to southwest. Stratigraphic evidence suggests that the till was formed during ice flow phases 3 or 4 mapped by Stea and Finck (1984).

Granite Till C has a limited areal distribution. Clast geology is varied and represents local and distal bedrock sources. Its direction of transport appears to be southward. Granite Till C may correlate with ice flow phases 3 or 4 mapped by Stea and Finck (1984).

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