Cartography by Maritime Resource Management Service, Amherst, Nova Scotia.

GEOCHEMISTRY

Sample location

Anomalous sample location

Sample depth notation

Sample number → 289A ← Anomalous element
Co

Note:

1. The letter A represents a surface till sample. Ensuing letters represent deeper samples. Map-unit block above sample depth notation indicates till type at that depth. Sample depths are listed with the analyses. Anomalous elements are listed under corresponding sample depth notation.

2. "Anomalous" values are taken to be all values greater than or equal to the 95th percentile of the cumulative frequency distribution for each till type listed in the Summary Statistics table below. Anomalies in other units were calculated using Quartzite till facies percentile values.

3. All elements except Sn and W were analyzed using the clay fraction (< 2 microns) (see Stea and Fowler, 1979). Sn and W were analyzed from heavy mineral separates (Tetrabromethane, S.G. = 2.96) of the fine and medium sand fractions (-50 + 230 mesh) of the till sample.

4. All elements done by Atomic Absorption Spectrophotometry except As and W (Colorimetry) and U (Flourimetry). Analyses by Bondar-Clegg and Co. Ltd., Ottawa.

Pleistocene geology by R.R. Stea and D.R. Grant, 1981. Bedrock geology adapted from "Geological Map of the Province of Nova Scotia", Nova Scotia Department of Mines and Energy, 1979.

SUMMARY STATISTICS

TILL TYPE / ELEMENT	SAULNIERVILLE TILL N=21		BEAVER RIVER TILL									
			Quartzite till facies N=11		Slate till facies N=5		Granite till facies N=29		Basalt till facies N=5		Clay till facies N=9	
	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION
	RANGE	95TH PERCENTILE	RANGE	95TH PERCENTILE	RANGE	95TH PERCENTILE	RANGE	95TH PERCENTILE	RANGE	95TH PERCENTILE	RANGE	95TH PERCENTILE
Cd	.15	.10-.50	1.19	.10-9.50	.10	.10-.10	.19	.10-.60	.16	.10-.30	.11	.10-.20
	.11	.42	2.77	2.07	.00	.11	.14	.50	.09	.30	.33	.19
Ag	.11	.05-.80	.18	.05-.80	.30	.10-.60	.10	.05-.50	.31	.05-.70	.06	.05-.10
	.17	.21	.22	.81	.20	.62	.11	.40	.26	.72	.22	.09
Cu	85	18-275	219	55-480	104	34-160	29	4-82	131	80-218	53	26-74
	66	191	155	299	52	160	19	72	54	218	15	72
Pb	23	9-65	81	31-172	118	44-230	36	20-78	10	4-15	51	20-169
	15	58	46	175	78	227	14	58	4	22	47	89
Zn	103	31-190	164	75-300	92	52-158	102	22-182	53	40-70	99	49-174
	46	192	81	248	47	157	46	168	11	71	43	174
Ni	47	11-96	75	18-174	31	20-46	18	4-54	24	17-37	35	14-64
	26	96	46	148	13	48	11	31	8	37	17	64
Co	25	8-52	58	8-131	20	4-45	18	2-39	22	14-36	26	8-55
	12	48	36	131	20	48	10	37	8	37	14	54
Mo	2	1-4	4	2-6	17	2-40	4	2-11	3	2-4	5	1-16
	1	5	2	8	16	40	2	8	7	5	5	17
U	2.5	9-5.9	3.6	2.0-6.2	6.3	2.6-9.7	8.9	2.9-25.0	2.3	1.6-3.1	2.9	1.4-5.4
	1.4	5.6	1.2	5-9	2.9	9.8	5.0	17.1	.7	3.6	1.3	5.7
Sn	9	1-15	12	5-20	15	10-20	16	1-50	10	1-20	12	5-25
	5	19	4	23	4	24	13	48	7	24	6	28
W	164	1-2000	25	6-80	31	10-36	321	1-2000	5	1-20	295	1-2000
	461	99	22	81	23	62	714	99	8	22	648	99
As	21	6-51	85	49-208	119	60-192	39	5-104	10	3-16	59	8-208
	12	50	54	223	52	194	29	98	5	47	64	228

N = number of samples. All values in ppm.

ANALYSES

SAMPLE	Cd	Ag	Cu	Ni	Pb	Zn	Co	Fe%	Mn	Ca	Mg	Mo	U	As	Sn	W	DEPTH (m)
48A	.50	<.10	23	18	26	55	10	2.25	633	--	--	3	11.00	20	20	--	1.5
48B	.50	<.10	16	7	50	38	4	2.75	400	--	--	3	68.00	20	40	70	1.5
98A	.30	<.10	5	6	20	26	2	1.30	316	--	--	7	--	--	30	>2000	1.5
99A	<.20	<.10	5	4	20	24	2	1.70	348	--	--	3	16.80	--	45	--	1.5
100A	.40	<.10	7	4	23	24	2	.70	290	--	--	3	--	--	50	>2000	1.0
101A	<.20	<.10	11	5	43	22	5	2.15	130	--	--	11	--	--	30	>2000	1.0
253A	.20	.20	39	30	34	115	17	4.40	780	4800	4900	5	5.30	21	10	60	1.5
275A	<.20	.80	69	20	169	53	4	15.50	350	600	4800	40	5.10	152	10	60	1.5
289A	<.20	.60	121	21	53	84	44	4.30	2600	500	12000	3	2.60	100	10	16	1.0
290A	<.20	.20	160	27	70	72	10	15.50	380	400	8000	18	5.30	60	10	36	1.5
291A	1.10	<.10	84	42	142	240	46	5.80	1750	1600	8500	6	2.30	86	10	32	1.5
292A	<.20	<.10	104	82	26	136	24	6.20	900	2200	16000	3	1.80	26	15	20	2.5
293A	.50	<.10	275	88	35	190	34	7.40	2300	2400	20000	2	1.20	34	10	20	2.0
294A	.30	<.10	92	31	30	94	18	3.30	1100	1100	8400	2	1.30	30	10	20	1.5
295A	.30	.30	202	104	74	146	110	4.80	1875	2400	13200	4	3.80	272	<2	8	1.5
296A	.30	<.10	355	174	93	280	88	8.05	2000	1800	17600	3	3.10	53	10	12	2.5
297A	<.20	<.10	390	68	40	95	40	6.30	2500	370	12000	2	4.40	52	10	--	1.5
298A	<.20	.40	34	20	230	58	4	7.60	290	580	6800	24	6.70	192	20	10	1.5
299A	.30	.40	22	10	44	168	47	1.70	1100	580	15200	4	2.80	31	10	8	2.5
300A	<.20	.10	191	94	58	143	52	7.30	1200	1400	18400	1	1.80	23	15	18	2.5
301A	.50	.80	289	98	81	187	85	6.60	2325	2300	12800	4	3.40	55	15	8	2.0
303A	.20	.20	160	78	172	141	33	8.10	470	800	10000	5	3.50	168	10	20	1.5
305A	<.20	<.10	160	72	51	189	47	7.30	1100	1600	15200	3	6.20	54	15	90	1.5
306A	.40	.20	480	86	90	300	70	8.50	1500	1600	19300	3	6.20	54	15	90	1.5
307A	<.20	.30	79	46	198	76	38	6.60	1350	850	13000	2	2.70	29	<2	4	1.5
307A	<.20	.30	175	46	198	76	42	24.00	810	800	9800	11	3.30	120	5	40	1.0
308A	.10	<.10	69	30	57	124	39	7.45	1375	2000	10000	5	5.70	48	<2	40	1.5
309A	.10	<.10	43	22	47	124	24	5.90	1300	1800	8800	5	6.00	28	<2	12	1.5
310A	.10	<.10	51	22	49	102	36	5.00	1475	1500	7300	6	8.40	40	10	4	1.5
311A	.10	<.10	38	22	47	136	18	4.70	820	4000	8400	3	4.80	15	10	24	2.0
313A	.10	<.10	18	13	31	93	12	4.20	810	2000	8400	3	7.10	8	10	2	2.0
314A	.20	.10	18	12	24	70	9	3.00	530	4800	3400	3	6.70	13	20	18	1.5
315A	.10	<.10	12	6	29	32	5	2.70	640	1700	3000	3	9.80	18	20	10	1.5
316A	.20	<.10	51	21	39	72	19	6.60	920	480	7600	6	2.70	80	10	60	1.5
317A	.30	<.10	107	42	38	91	54	6.80	2300	650	9200	2	2.00	48	<2	40	1.0
317A	.50	<.10	74	56	27	102	33	5.50	1100	320	12800	2	1.40	25	10	60	1.5
318A	.10	.20	138	44	44	158	38	7.65	880	380	8800	2	9.00	92	--	--	1.5
320A	<.20	.10	82	28	60	165	25	6.50	1200	1300	12400	2	2.80	24	15	10	1.5
321A	<.20	<.10	60	42	20	93	29	5.95	1850	320	11600	2	1.70	13	15	>2000	2.5
322A	<.20	<.10	36	56	15	107	20	4.00	640	2700	20000	1	1.40	10	15	>2000	2.5
323A	<.20	<.10	39	18	28	82	17	4.00	1000	1100	9800	12	2.50	100	20	60	2.5
324A	<.20	<.10	58	44	28	122	47	6.80	2200	980	10800	2	4.80	28	5	300	1.5
325A	<.20	<.10	58	21	29	72	19	6.60	920	480	7600	6	2.70	80	10	60	1.5
326A	.10	<.10	69	17	33	49	8	19.00	680	800	6800	16	4.00	208	10	<2	1.5
327A	9.50	<.10	55	38	35	105	30	5.00	1275	3800	8000	3	5.90	51	10	24	2.5
328A	.10	<.10	30	18	47	93	14	4.85	1300	1900	9200	3	13.10	25	10	8	1.5
329A	<.20	<.10	460	139	108	220	131	7.85	2850	1900	16000	3	5.40	10	5	8	1.5
330A	<.20	<.10	58	64	72	174	55	7.40	1700	600	9600	3	2.70	33	10	50	1.5
331A	<.20	<.10	20	9	24	58	16	4.80	1100	1100	4800	3	5.70	28	30	40	1.0
332A	.10	<.10	20	23	22	160	36	9.90	3750	1100	10400	3	4.80	17	10	24	1.0
333A	.10	<.10	28	26	20	146	18	6.00	980	1000	11800	2	4.80	19	10	>2000	1.5
334A	.10	.20	22	24	33	160	24	5.60	770	1200	12000	2	3.30	8	15	32	1.0
335A	.30	.20	75	24	22	84	14	3.55	740	2400	18000	2	2.60	16	15	4	0.5
337A	.20	.10	36	11	12	31	8	2.70	600	1400	5800	3	3.00	11	5	4	2.5
338A	.20	.30	218	22	10	40	20	3.30	840	3200	13200	3	2.20	7	10	<2	2.0
339A	.10	.10	147	23	12	56	19	4.00	1125	3000	14000	3	1.60	10	10	20	1.5
340A	<.20	<.10	53	26	15	70	14	3.50	470	1900	20100	1	.90	14	15	<2	1.5
341A	.10	.40	107	37	4	70	36	5.50	1000	12800	40000	2	1.60	5	20	<2	1.0
342A	<.20	.40	107	37	4	70	38	5.50	1000	12800	40000	2	1.60	5	20	<2	1.0
343A	<.20	.20	36	35	10	77	18	3.30	700	3200	24000	2	1.10	15	5	400	2.0
344A	.20	.10	39	28	40	95	24	4.50	1475	1700	8800	3	5.40	13	5	>2000	1.5
345A	.20	.50	24	14	55	137	18	4.00	880	1500	9600	4	7.80	45	10	20	0.0
345B	1.00	.50	238	44	157	728	75	8.60	1800	520	16000	3	46.00	8	10	20	0.0
346A	.60	.20	49	23	47	188	24	6.80	1500	3	13.80	5	15	24	2.0		
347A	.80	.20	43	23	43	152	22	6.90	2100	1000	9600	3	11.20	5	20	>2000	1.5
348A	<.20	<.10	22	18	22	77	18	4.55	880	1500	6800	4	5.20	26	10	50	1.5
350A	.10	<.10	47	35	36	91	32	4.40	1375	2700	11000	2	1.80	21	<2	20	1.5
351A	<.20	<.10	55	28	15	86	16	4.00	440	1500	17600	2	1.90	32	5	20	1.5
352A	<.20	<.10	58	29	18	88	18	4.00	640	1500	17600	2	5.90	32	5	20	1.5
353A	.40	<.10	18	8	27	41	13	3.20	740	1300	4000	4	5.90	74	5	32	1.5
354A	.10	<.10	20	12	18	78	12	6.00	980	1000	11800	2	4.80	19	10	>2000	1.5
355A	.10	<.10	22	18	22	77	18	4.55	880	1500	6800	4	5.20	26	10	50	1.5
356A	.10	<.10	20	12	18	78	12	6.00	980	1000	11800	2	4.80	19	10	>2000	1.5
358A	.10	<.10	20	12	78	100	18	6.00	2850	980	7200	4	9.10	86	5	32	1.5
359A	.10	<.10	26	14	22	149	18	5.20	1375	1700	12000	3	13.60	66	10	40	1.5
360A	.10	<.10	30	18	47	93	14	4.85	1300	1900	9200	3	13.10	25	10	8	1.5
367A	<.20	.10	37	24	14	78	22	4.60	825	2100	17200	1	2.20	10	<2	24	1.5
368A	<.20	.20	76	40	11	71	19	4.60	710	790	16800	1	1.20	7	5	8	1.5
369A	<.20	<.10	46	40	18	87	20	4.65	730	1000	15200	2	3.50	5	5	<2	1.5
370A	<.20	<.10	18	40	9	42	26	5.90	910	800	40000	2	3.30	33	5	<2	1.5
371A	.40	<.10	72	48	18	86	32	4.85	875	8900	42000	2	1.60	8	5	<2	0.0
372A	<.20	<.10	103	47	10	68	14	2.60	750	6300	16000	4	3.10	14	<2	4	1.5
373A	<.20	<.10	120	49	14	116	20	5.15	1030	3000	22000	1	4.00	13	10	4	1.5
374A	.30	.10	48	35	12	116	19	4.35	925	1300	9800	3	9.80	36	10	<2	1.0
376A	.40	.10	35	26	39	108	19	4.65	1200	1000	12000	2	25.00	79	--	38	1.5
376A	<.20	<.10	55	18	24	80											

Note: all values in ppm except Fe%

PLEISTOCENE GEOLOGY

UNIT	DESCRIPTION	TOPOGRAPHIC EXPRESSION AND STRATIGRAPHIC RELATIONS	CLAST LITHOLOGY AND PROVENANCE	THICKNESS
RAISED BEACH	Gravelly-sand, imbricated pebbles, well-rounded clasts.	Forms a thin mantle over other units and pinches out inland.	A homogenization of local till clasts.	1-5 m
OUTWASH	Waterlaid sand and gravel, parallel and X-bedding.	Pitted plains; flat plains (outwash plains), elongate discontinuous mounds and ridges (valley trains).	A homogenization of local till clasts.	1-10 m
ICE CONTACT STRATIFIED DRIFT	Waterlaid sand and gravel, abrupt changes in grain sizes between beds, faulting, cut and fill stratification.	Sinuous ridges (eskers), knob and kettle topography on valley margins, (kame terraces, kames).	A homogenization of local till clasts.	3-15 m
ABLATION TILL	Sandy matrix, rounded and angular clasts, sand inclusions and beds, surface boulders may represent matrix-free 'ablation till'.	Knob and kettle topography, (hummocky moraine); overlies other tills.	Usually contains a greater % of far-travelled (allochthonous) clasts than the underlying basal melt-out or lodgement phase (15-30%)	2-10 m, av. 5 m
BEAVER RIVER TILL 1 2 3 4 5 Lithological Facies 1: quartzite till facies including drumlin facies 2: granite till facies including drumlin facies 3: slate till facies including drumlin facies 4: basalt till facies Textural Facies 5: clay till facies	1: Light bluish grey (5 B 7/1), loose, sandy, angular clasts, largely cobble-sized, silt/ser matrix in metamorphosed terrane, (drumlin facies - can be relatively compact.) 2: Greyish orange (10 YR 7/4) to yellowish brown (10 YR 5/6), loose, sandy, angular, cobble-sized clasts (drumlin facies - similar colour, but in some cases compacted with a finer matrix). 3: Light olive brown (5 Y 5/6), loose, sandy with angular pebble-sized clasts. (drumlin facies- greyish olive (10 Y 4/2), moderately compact, fissile.) 4: Yellowish grey (5 Y 7/2), loose, sandy, with many boulders, sand rims around clasts, inclusions of older tills. 5: Olive grey (5 Y 3/2), compact, fissile, clasts facetted, demonstrates strong fabric mode.	The Beaver River Till is generally thin and mantled over bedrock topography. This till also occurs as a hummocky mantle on drumlins and other thick till masses of older tills. The drumlin facies may in part be lateral facies of older tills. The clay till facies is found in areas of thick till exposure in upland regions underlain by Paleozoic bedrock.	Beaver River Till: oligomictic, contains up to 95% locally derived clasts (i.e. 1-4 km transport); drumlin facies: locally enriched in allochthonous clasts (10-70 km transport) The lithological facies of the Beaver River Till demonstrate rapid transition over bedrock contact zones; in these areas the tills form hybrids containing varying proportions of the bedrock listed below. granite till facies: 1. biotite granodiorite 2. biotite muscovite granite — Devonian granitic rocks basalt till facies: 1. tholeiitic basalt — North Mountain Formation quartzite till facies: 1. meta-greywacke 2. gneiss 3. quartzite — Meguma Group (Cambro-Ordovician) White Rock Formation (Silurian) slate till facies: 1. slate 2. schist — Meguma Group clay till facies: Oligomictic, contains clasts of shale, silt/stone and sandstone (Meguma Group rocks 80-95%), locally with a high percentage of reworked components (e.g. from Saulnierville Till.)	Beaver River Till Lithological facies: 1-10 m, av. 3 m Drumlin facies: 2-20 m Clay till facies: 1-5 m
SAULNIERVILLE TILL (including drumlin facies)	A composite of one or more till sheets and oxidized upper phases. Upper phase: Moderate brown (5 YR 4/4) to reddish brown (10 R 4/6), moderately compact, fissile, silty, Fe-Mn oxide staining on fissility planes. Basal phase: Dusky yellowish brown (10 YR 2/2), compact, massive, locally with sand and silt inclusions, bolder sediments.	Together with older drifts underlies and forms cover of drift mounds and drumlins that have been carved by later ice movements; underlies the Beaver River Till and overlies the Red Head Till and older sediments.	The upper phase tends to have a higher percentage of far-travelled material (10-70 km transport) than the basal phase which is dominated by locally derived Meguma Group lithology.	2-15 m
R.H.T. RED HEAD TILL (seen in section only)	Greyish red (10 R 4/2) to reddish brown (10 R 4/6), very compact, massive, locally with subconchoidal fracturing, silty, some sandy partings.	Forms the bulk of thick blanketing drift bodies that have been molded by later ice movements. Generally underlies one or more surface till sheets.	Polymictic, largely made up of comminuted Triassic red bed material from the Bay of Fundy as matrix, with indicator erratics such as basalt from the North Mountain, hornblende bearing pink granites and green conglomerates from New Brunswick, and shells from Quaternary and pre-Quaternary marine sediment in the Bay of Fundy.	5-7 m
L.B.T. LITTLE BROOK TILL (seen in section only)	Greyish brown (5 YR 3/2), compact, massive, silty matrix.	Only very locally preserved as cores on lee side drift buildups and drumlinoid features, typically underlies the Red Head Till.	Oligomictic, mainly greywacke and slate from the Meguma Group.	?
BR BEDROCK OR THIN TILL VENEER	40% of the area is bedrock exposure thin till veneer and boulders.			

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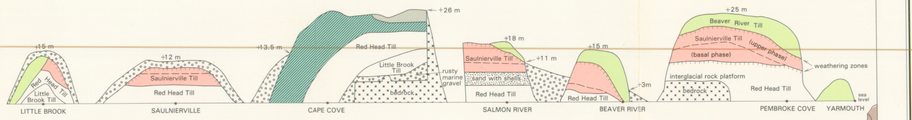
SUMMARY OUTLINE OF GLACIAL GEOLOGY

The Yarmouth-Digby area, especially along the coast, is deeply mantled with a complex sequence of Quaternary deposits. Inland the drift cover is much shallower, but the transport sequence of till units is equally complex. Thirteen lithostratigraphic units are recognized; these record four marine phases intercalated with four glacial events of greatly different age and widely ranging provenance and dynamic style. Individual till sheets have characteristic lithology, texture and maturity. Lodgement, melt-out, subaquatic and ablation phases are represented and their contacts, both horizontally and vertically, range from abrupt to transitional. The older tills, largely in the subsurface, but locally outcropping in windows, have truncated profiles of weathering (subaerial oxidation). This horizontal and vertical variation in physical attributes, is also manifested in the till geochemistry and therefore important in the application of surficial geology to mineral prospecting and environmental geochemistry.

Present landscape morphology and drainage reflects several phases of glacial deposition over bedrock features. Preglacial relief has been largely obscured by infilling, though a largely buried system of valleys may still be discerned trending westward and southward whereas present drainage has been diverted southward. As a result, much of the local relief is glacio-depositional and rock outcrops mainly in lower areas if at all.

Most of the drift cover is relict from early ice movements from New Brunswick. The surface till is thin and locally derived deposited by an inland ice cap. Four main till forming movements are recognized: the first, from the east and possible pre-Wisconsinan, laid down a grey locally derived till (Little Brook); the second, a regional southward ice flood from New Brunswick, produced a thick blanket of red shelly drift (Red Head Till) of mostly offshore provenance; an intermediate-age flow, parallel to the coast presumably from ice over Nova Scotia, produced a hybrid mixture of local and distant components (Saulnierville Till); and, after an interval of subaerial exposure when tills and associated sediments were weathered, a final episode of weak shortlived dispersal from a Southern Upland ice cap, which deposited a loose, sandy immature drift (Beaver River Till).

DIAGRAMMATIC CROSS-SECTION OF THE PLEISTOCENE SEDIMENTS ALONG THE YARMOUTH - DIGBY COAST



SYMBOLS

- Bedrock geological boundary
- Surficial geological boundary
- Fault
- Glacial striae (sense of ice movements known, unknown. Note: numbers indicate relative age, 1 being older)
- Stoss and lee bedrock forms
- Drumlin
- Moraine (ribbed)
- Esker (direction of flow unknown)
- Multiple till section
- Spot thickness of Pleistocene cover (metres) +12
- Mineral occurence Co
- Bedrock outcrop

BEDROCK GEOLOGY

JURASSIC	EARLY	TJNM NORTH MOUNTAIN FORMATION basalt
TRIASSIC	LATE	lTB BLOMIDON FORMATION siltstone, shale, claystone
		lTW WOLFVILLE FORMATION red conglomerate, arkose, sandstone, shale
CARBONIFEROUS	LATE	
	EARLY	
DEVONIAN	LATE	
	E	lDT TORBROOK FORMATION shale, siltstone, quartzite, limestone, iron formation
SILURIAN	LATE	OSw WHITE ROCK FORMATION quartzite, slate, siltstone with rhyolitic tuff and basalt at base
	MID	
	E	
ORDOVICIAN	LATE	
	E	MEGUMA GROUP; COH HALIFAX FORMATION slate, siltstone, rare limestone
CAMBRIAN	LATE	COG GOLDENVILLE FORMATION greywacke, slate
	MID	
	E	

PLUTONIC ROCKS

- DCgt granitoid
- DCmg monzo-granite
- Dgd granodiorite

MINERALS

Antimony	Sb	Iron	Fe
Arsenic	As	Lead	Pb
Barite	Ba	Manganese	Mn
Beryllium	Be	Molybdenum	Mo
Cobalt	Co	Silver	Ag
Copper	Cu	Tin	Sn
Fluorine	F	Tungsten	W
Gold	Au	Uranium	U
Gypsum	gyp	Vanadium	V
Zinc	Zn		

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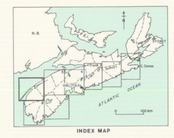
SHEET 7

PLEISTOCENE GEOLOGY

SOUTHWESTERN NOVA SCOTIA

1982

Scale = 1:100 000

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