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SURFICIAL GEOCHEMISTRY SURVEY IN THE TWILLINGATE (NTS 2E/10) AND COMFORT COVE (NTS 2E/07) MAP AREAS

H.E. Campbell

Open File 002E/1989

St. John's, Newfoundland
September, 2020

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SUMMARY

This report provides the geochemical data for 49 samples collected from a 2017 surficial geochemistry survey in the Twillingate (NTS 2E/10) and Comfort Cove (NTS 2E/07) map areas (Figure 1). The survey was conducted using a truck and most of the samples were taken from thin (<0.5 m) B, B/C and C-horizon soils overlying bedrock. The objectives of the 2017 study were to investigate the surficial geochemical signatures of the sampled NTS map areas, and to provide data for the provincial till geochemical database, to assist in ongoing natural resources exploration programs and environmental assessment work in the province.

NOTES ON DATABASE

This database includes the results of the geochemical analyses of 31 elements analyzed by inductively-coupled plasma-optical emission spectrometry (ICP-OES) after a 4-acid digestion (HCl-HNO_3-$HClO_4$-HF) of the <63µm sieve fraction of the tills, carried out at the Geological Survey of Newfoundland and Labrador's (GSNL) laboratory in St. John's, NL. The 31 elements are aluminum, arsenic, barium, beryllium, cadmium, calcium, cerium, chromium, cobalt, copper, dysprosium, iron, lanthanum, lead, lithium, magnesium, manganese, molybdenum, nickel, niobium, phosphorus, potassium, rubidium, scandium, sodium, strontium, titanium, vanadium, yttrium,

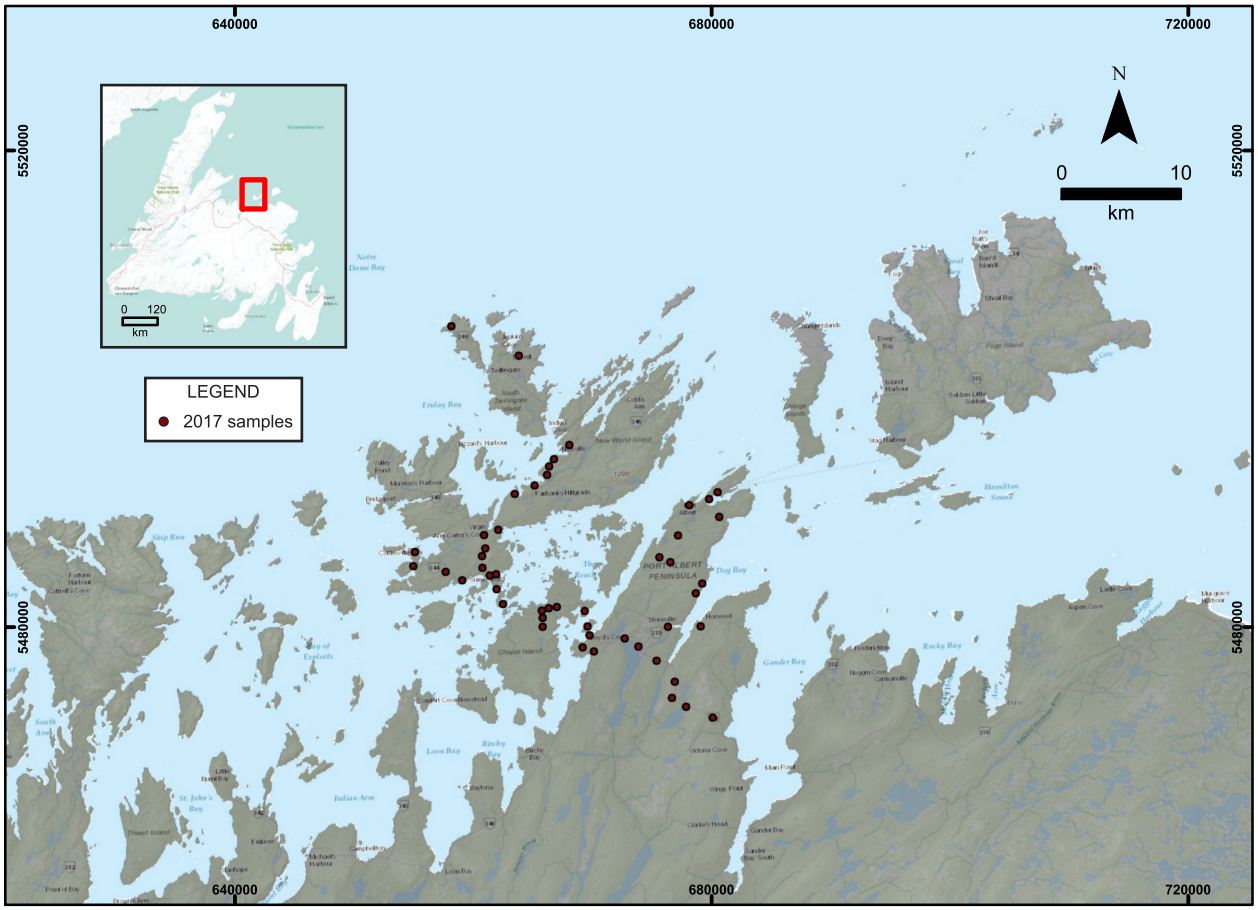

Figure 1. Sample locations throughout the Twillingate and Comfort Cove map areas.

zinc, and zirconium. A further 26 elements were analyzed by instrumental neutron activation analysis (INAA) at Maxxam Laboratories (now Bureau Veritas) in Mississauga, ON; these elements are antimony, arsenic, barium, bromine, cerium, cesium, chromium, cobalt, europium, gold, iron, hafnium, lanthanum, lutetium, molybdenum, rubidium, scandium, samarium, selenium, sodium, tantalum, terbium, thorium, tungsten, uranium and ytterbium. In addition, silver, fluoride and loss-on-ignition (LOI) analyses were also completed at the GSNL laboratory. Silver was analyzed by ICP-OES after nitric acid digestion, fluoride by ion-selective electrode after an alkaline fusion, and LOI by gravimetry. A detailed description of the above analytical methods is provided in Finch *et al.* (2018). To distinguish the different analytical methods, the trace-element variables are labelled with a combination of the element symbol name and a numeric suffix (*e.g.*, Cu2) indicating the type of digestion or preparation and the instrument used to analyze the element:

- Suffix 1 for INAA with no digestion
- Suffix 2 for ICP-OES after 4-acid digestion,
- Suffix 6 for ICP-OES after HNO_3 digestion, and
- Suffix 9 for ion-selective electrode after alkaline fusion

(for further details *see* Geoscience Atlas till geochemistry help file at https://geoatlas.gov.nl.ca/Custom/help/Till_geochem_help_tables/Table2_AnalyticalMethods.html). A complete list of elements, detection limits and range of values is given in Table 1. Values below the detection limits are indicated by a negative sign. The detection limits for certain elements, analyzed by INAA (Au1, Co1, Eu1 and Se1) were elevated in some samples due to low sample weights.

The location data for the samples are given in Universal Transverse Mercator (UTM) eastings and northings (Zone 21; NAD 27). A brief sample and site description is also provided. The field and geochemical data are provided in digital, comma-separated values (csv) format in Appendix A. The quality assurance data, including field duplicates, lab duplicates and standard analysis are included in csv format in Appendices B–H. Internal standards used include the Certified Reference Materials (CRM's) TILL1, TILL2, TILL3 and TILL4. The expected values of analyses of these material are referenced from Lynch (1996), and are available here: https://www.nrcan. gc.ca/our-natural-resources/minerals-and-mining/mining-resources/certified-reference-materials/price-certificates-list/till-1-till-2-till-3-and-till-4-certificate-analysis/8137. The recoveries of elements and the repeatability of the field and lab duplicate analysis are similar to those reported in other till-sampling programs (*e.g.*, Brushett and Amor, 2016; Campbell, 2019) and indicate no analytical-quality issues. Please note that values with negative numbers will require treatment (*e.g.*, change to half the detection limit value) before statistical processing.

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Table 1. Elements, analytical methods, units, detection limits, number of samples below detection limits (n=49), units, maximum and minimum values for samples collected in 2017. Note: * indicates variable detection limits

Element	Method	Units	D.L.	<D.L.	Max	Min	Element	Method	Units	D.L.	<D.L.	Max	Min
Ag6	ICP-OES	ppm	0.1	29	0.9	<0.1	**Lu1**	INAA	ppm	0.05	0	1.00	0.17
Al2	ICP-OES	%	0.01	0	10.71	3.30	**Mg2**	ICP-OES	%	0.01	0	5.82	0.32
As1	INAA	ppm	0.5	0	165.0	1.6	**Mn2**	ICP-OES	ppm	1	0	8348	147
As2	ICP-OES	ppm	2	0	154	2	**Mo1**	INAA	ppm	1	32	32	<1
Au1*	INAA	ppb	1	19	30	<1	**Mo2**	ICP-OES	ppm	1	12	31	<1
Ba1	INAA	ppm	50	0	700	91	**Na1**	INAA	%	0.10	1	3.70	<0.05
Ba2	ICP-OES	ppm	1	0	773	94	**Na2**	ICP-OES	%	0.01	0	4.20	0.02
Be2	ICP-OES	ppm	0.1	0	3.2	0.2	**Nb2**	ICP-OES	ppm	1	2	75	<1
Br1	INAA	ppm	1	0	246	2	**Ni2**	ICP-OES	ppm	1	0	156	5
Ca2	ICP-OES	%	0.01	0	3.15	0.02	**P2**	ICP-OES	ppm	1	0	3014	115
Cd2	ICP-OES	ppm	0.1	23	0.9	0.1	**Pb2**	ICP-OES	ppm	1	3	49	<1
Ce1	INAA	ppm	3	0	280	13	**Rb1**	INAA	ppm	5	2	160	<5
Ce2	ICP-OES	ppm	1	0	224	10	**Rb2**	ICP-OES	ppm	1	0	167	7
Co1*	INAA	ppm	2	7	100	<2	**Sb1**	INAA	ppm	0.1	1	24.4	<0.1
Co2	ICP-OES	ppm	1	0	122	2	**Sc1**	INAA	ppm	0.1	0	96.7	8.6
Cr1	INAA	ppm	10	1	250	<10	**Sc2**	ICP-OES	ppm	0.1	0	115.7	10.3
Cr2	ICP-OES	ppm	1	0	283	7	**Se1***	INAA	ppm	1	47	6	<1
Cs1	INAA	ppm	0.5	1	27.0	<0.5	**Sm1**	INAA	ppm	0.1	0	14.9	1.6
Cu2	ICP-OES	ppm	1	0	231	3	**Sr2**	ICP-OES	ppm	1	0	244	12.3
Dy2	ICP-OES	ppm	0.1	0	10.9	1.3	**Ta1**	INAA	ppm	0.2	2	5.6	<0.2
Eu1*	INAA	ppm	0.5	23	4.6	<0.5	**Tb1**	INAA	ppm	0.5	6	2.2	<0.5
F9	ISE	ppm	40	0	496	78	**Th1**	INAA	ppm	0.5	0	15.2	<0.5
Fe1	INAA	%	0.1	0	20.4	1.0	**Ti2**	ICP-OES	ppm	1	0	21454	1936
Fe2	ICP-OES	%	0.01	0	20.61	1.00	**U1**	INAA	ppm	0.1	0	15.0	0.4
Hf1	INAA	ppm	1	0	24	1	**V2**	ICP-OES	ppm	1	0	485	69
K2	ICP-OES	%	0.01	0	2.69	0.08	**W1**	INAA	ppm	1	13	3	<1
La1	INAA	ppm	1	0	55	3	**Y2**	ICP-OES	ppm	1	0	61	7
La2	ICP-OES	ppm	1	0	61	4	**Yb1**	INAA	ppm	1.2	0	6.2	1.4
Li2	ICP-OES	ppm	0.1	0	162.3	2.9	**Zn2**	ICP-OES	ppm	1	0	270	16
LOI	Gravimetric	%	0.1	0	37.7	2.2	**Zr2**	ICP-OES	ppm	1	0	256	9

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APPENDICES

Appendices A–H are available as digital comma-separated files (.csv) through this link.

Appendix A: Site Data and Geochemistry

Appendix B: Field Duplicates

Appendix C: Standards INAA

Appendix D: Standards ICP-OES

Appendix E: Standards Ag, F and LOI

Appendix F: Summary of Recoveries for CRM Standards

Appendix G: Lab Duplicates INAA

Appendix H: Lab Duplicates ICP-OES