



Industry, Energy and Technology

Mines

TILL GEOCHEMISTRY OF THE PUDDLE POND (NTS 12A/05) AND LITTLE GRAND LAKE (NTS 12A/12) MAP AREAS, WESTERN NEWFOUNDLAND

J.S. Organ

Open File 012A/1956



St. John's, NL
December, 2024

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Recommended citation:

Organ, J.S.

2024: Till geochemistry of the Puddle Pond (NTS 12A/05) and Little Grand Lake (12A/12) map areas, western Newfoundland. Government of Newfoundland and Labrador, Department of Industry, Energy and Technology, Geological Survey, Open File 012A/1956, 9 pages.

CONTENTS

	Page
SUMMARY	1
SAMPLING METHODS	1
DATABASE NOTES	1
QUALITY ASSURANCE	3
REFERENCES	3
APPENDICES	6

FIGURE

Figure 1.	Figure showing location of 2019 till geochemical samples (black dots), 202 samples (green dots) released by Organ (2020), 139 samples (blue dots) released by McCuaig <i>et al.</i> (2006), and 46 samples (red dots) released by Smith <i>et al.</i> (2009).....	2
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TABLE

Table 1.	Geochemical variables with analytical method, units, detection limit (D.L.), number of analyses below the detection limit (<D.L.) and range of data values. Detection limits below are reflective of the entire sample batch (Lab numbers 7834576–7834776), while values below detection limit, minimum and maximum values are given for this open file only (Lab numbers 7834576–784713)	4
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SUMMARY

This report describes the results of a till-geochemistry study conducted in the Puddle Pond and Little Grand Lake areas (NTS 12A/05 and 12A/12) in 2019 (Figure 1). Fifty-three till samples were collected from BC and C horizons, and one B-horizon sample as part of the ongoing till-geochemistry and surficial-mapping program across the Island of Newfoundland. The objective is to assist the mineral exploration industry by delineating prospective areas using both till-geochemical anomalies and regional ice-flow history.

Previous surficial mapping and interpretation of the ice-flow history for the study area is summarized in Organ (2024a) and Organ and Dyke (2019) respectively. Previous till geochemistry results for this area were released by Organ (2020), Smith *et al.* (2009) and McCuaig *et al.* (2006).

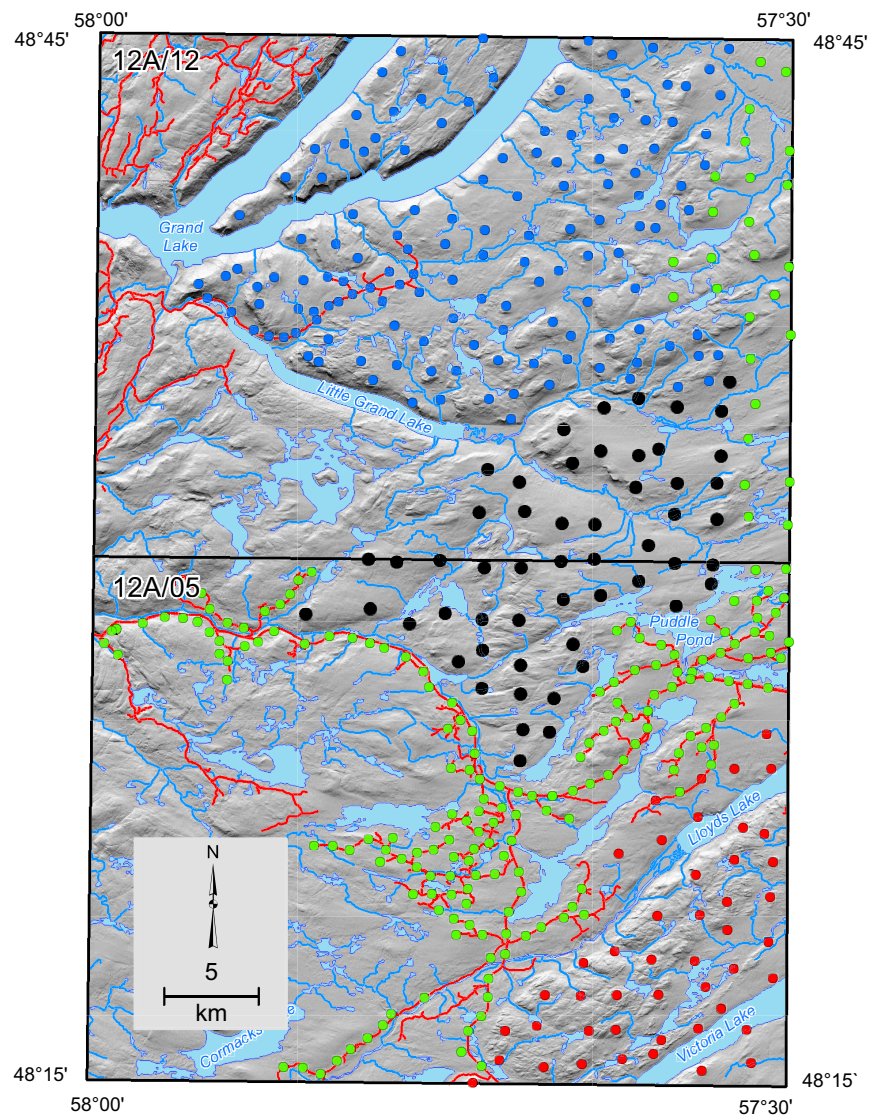
This open-file report comprises descriptions of methods of sampling, followed by notes on the content of the database including analytical methods and quality assurance.

SAMPLING METHODS

The till sampling locations are shown in Figure 1. Approximately 1 kg of till was collected from the BC or C soil horizon exposed in hand-dug pits and placed in Kraft paper bags. Sample spacing was completed on a 4 km² grid and using helicopter. Field duplicates were collected at three sites, at an overall frequency of 1 in 19, to estimate the natural inhomogeneity of the sample medium. The results of the field-duplicate analyses are discussed briefly below and displayed in appendices B, C and D.

DATABASE NOTES

This database includes analytical results of 54 till samples (Lab numbers 7834714–7834776; Appendix A), and three field duplicates (NTS 12A/05 and 12A/12). The <63 µm (silt and clay) fraction of the samples have been analyzed at the Geological Survey of Newfoundland and Labrador's (GSNL) geochemistry laboratory in St. John's, NL, by inductively coupled plasma-optical emission spectrometry (ICP-OES) after a 4-acid digestion (HCl-HNO₃-HClO₄-HF) for 31 elements including: aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, dysprosium, iron, lanthanum, lead, lithium, magnesium, manganese, molybdenum, nickel, niobium, phosphorus, potassium, rubidium, scandium, sodium, strontium, sulphur, titanium, vanadium, yttrium, zinc and zirconium. The GSNL laboratory also determined loss-on-ignition (LOI) gravimetrically, silver by ICP-OES after a nitric acid digestion, and fluoride by ion-selective electrode after alkaline fusion. In addition, 27 elements were analyzed at Bureau Veritas in Mississauga, ON, by instrumental neutron activation analysis (INAA): 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, ytterbium and zirconium. A description of the sample preparation and analytical methods used can be found in Finch *et al.* (2018). Within the database, elements are denoted by a combination of the elemental symbol followed by numeric suffix (*e.g.*, Pb2) identifying the analytical method:



LEGEND

2019 till sample locations

- This report

Previous till sample locations

- Organ, 2020
- McCuaig *et al.*, 2006
- Smith *et al.*, 2009

— Forestry Resource Roads

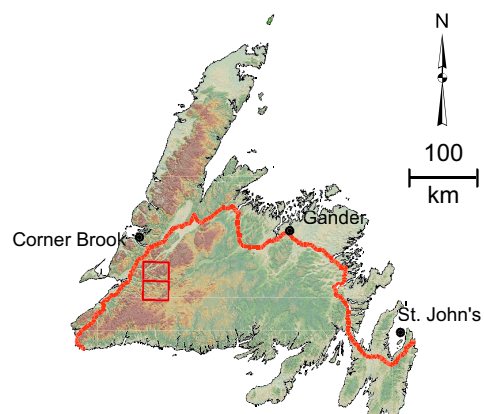


Figure 1. Figure showing location of 2019 till geochemical samples (black dots), 202 samples (green dots) released by Organ (2020), 139 samples (blue dots) released by McCuaig *et al.* (2006), and 46 samples (red dots) released by Smith *et al.* (2009)

1. Suffix 1 – Instrumental Neutron Activation Analysis (INAA),
2. Suffix 2 – Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) after multi-acid (HF/HCl/HNO₃/HClO₄) digestion,
3. Suffix 28 – ICP-OES after nitric acid digestion,
4. Suffix 9 – Ion-Selective Electrode (ISE) after alkaline fusion.

Further details regarding suffixes can be found in the Geoscience Atlas till geochemistry help file at https://geoatlas.gov.nl.ca/Custom/help/Till_geochem_help_tables/Table2_AnalyticalMethods.html. Table 1 provides a complete list of elements, analytical method, units, detection limit and range of values. A negative sign is assigned to any value below detection limit.

The location for each sample is reported in Appendix A, as Universal Transverse Mercator (UTM) eastings and northings (Zone 21; NAD 27 datum). Analytical data, along with a short description of each sample and site characteristics, are also included.

QUALITY ASSURANCE

Quality assurance was completed on a batch of samples from two different locations; those with Lab numbers 7834576–7834713 are related to Open File 002D/10/1020 (Organ, 2024b) from Dead Wolf Pond map area (NTS 2D/10) whereas Lab numbers 7834714–7834776 are related to this open file. Quality assurance data including field duplicates, laboratory duplicates and standards are provided in Appendix B for INAA, Appendix C for ICP-OES and Appendix D for F, Ag and LOI. Detection limits listed in Table 1 are reflective of the entire batch, while values below detection limit, minimum and maximum values are given for this Open File data release only (Lab numbers 7834714–7834776).

The quality of the analyses has been checked for acceptable accuracy and precision. Quality assurance was determined by the insertion of one reference standard and one analytical duplicate in every sequence of 20 samples. For the ICP-OES analyses, the standards consisted of the CAN-MET standards TILL-1, TILL-2 and TILL-3 (Lynch, 1996). For the samples submitted for INAA analysis, these same standards were used until their supply was exhausted, at which point they were replaced by till standards OREAS-46 and OREAS-47 (www.ore.com.au). Comparison of known standard and duplicate analyses for INAA and ICP-OES as part of the quality control process were viewed as acceptable.

Table 1. Geochemical variables include analytical method, units, detection limit (D.L.), number of analyses below the detection limit (<D.L.) and range of data values. Detection limits below are reflective of the entire sample batch (Lab numbers 7834576–7834776), while values below detection limit, minimum and maximum values are given for this open file only (Lab numbers 7834714–7834776)

Element	Method	Units	D.L.	<D.L.	Max	Min	Element	Method	Units	D.L.	<D.L.	Max	Min
Ag28	ICP-OES	ppm	0.1	54	0.1	<0.1	Mn2	ICP-OES	ppm	1	0	1198	487
Al2	ICP-OES	%	0.01	0	10.71	5.7	Mo1	INAA	ppm	1	54	<1	<1
As1	INAA	ppm	0.5	3	8.7	<0.5	Mo2	ICP-OES	ppm	1	53	1.05	<1
As2	ICP-OES	ppm	1	16	7	<1	Na1	INAA	%	0.05	0	2.0	0.93
Au1	INAA	ppb	1, 2, 3	45	4	<1	Na2	ICP-OES	%	0.01	0	2.04	0.94
Ba1	INAA	ppm	50	0	660	110	Nb2	ICP-OES	ppm	1	0	11.23	3.45
Ba2	ICP-OES	ppm	1	0	660	117	Ni2	ICP-OES	ppm	1	0	83	18.07
Be2	ICP-OES	ppm	0.1	5	1.9	0.9	P2	ICP-OES	ppm	1	0	3447	191
Br1	INAA	ppm	1	0	210	4	Pb2	ICP-OES	ppm	1	4	14.1	<1
Ca2	ICP-OES	%	0.01	0	4.13	1.73	Rb1	INAA	ppm	5	5	55	<5
Cd2	ICP-OES	ppm	0.1	0	0.4	0.1	Rb2	ICP-OES	ppm	5	0	59.1	8
Ce1	INAA	ppm	3	0	110	21	S2	ICP-OES	ppm	100	7	622	<100
Ce2	ICP-OES	ppm	5	0	100.0	24.7	Sb1	INAA	ppm	0.1	3	0.6	<0.1
Co1	INAA	ppm	2, 4.3, 4.9	3	27	<2	Sc1	INAA	ppm	0.1	0	33.9	11.6
Co2	ICP-OES	ppm	1	0	35.0	9.3	Sc2	ICP-OES	ppm	0.1	0	35.8	12.3
Cr1	INAA	ppm	2	0	200	50	Se1	INAA	ppm	2, 2.1, 2.2, 2.5, 3.4	54	<1	<1
Cr2	ICP-OES	ppm	10	0	180	53.3	Sm1	INAA	ppm	0.1	0	9.5	2.5
Cs1	INAA	ppm	0.5	11	1.8	<0.5	Sr2	ICP-OES	ppm	1	0	350	123
Cu2	ICP-OES	ppm	1	0	75	12.8	Ta1	INAA	ppm	0.2	1	1	<0.2
Dy2	ICP-OES	ppm	0.5	0	7.7	2.3	Tb1	INAA	ppm	0.5	2	1.4	<0.5
Eu1	INAA	ppm	0.5, 1.5	6	3.3	<0.5	Th1	INAA	ppm	0.1	0	12.6	2.8
F9	ISE	ppm	5	0	384	69	Ti2	ICP-OES	ppm	5	0	7629	3180
Fe1	INAA	%	0.1	0	7.4	2.8	U1	INAA	ppm	0.1	5	3.3	0.7
Fe2	ICP-OES	%	0.01	0	7.07	2.9	V2	ICP-OES	ppm	1	0	218	85
Hf1	INAA	ppm	1	0	16	2	W1	INAA	ppm	1	39	2	<1
K2	ICP-OES	%	0.01	0	1.58	0.13	Y2	ICP-OES	ppm	1	0	38	12
La1	INAA	ppm	1	0	42	10	Yb1	INAA	ppm	0.5	0	3.7	1.2
La2	ICP-OES	ppm	1	0	45	9.3	Zn2	ICP-OES	ppm	1	0	70	36
Li2	ICP-OES	ppm	0.1	0	11.4	2.3	Zr1	INAA	ppm	100, 200, 220	22	610	<200
LOI	Gravimetric	%	0.1	0	29.1	2.5	Zr2	ICP-OES	ppm	1	0	86	20
Lu1	INAA	ppm	0.05	0	0.61	0.19							
Mg2	ICP-OES	%	0.01	0	2.53	0.78							

Notes: INAA analyses for seven elements had multiple detection limits, due to low sample weight, and are listed separately in the detection limit column. The suffix “1” denotes INAA analysis; “2” denotes ICP-OES analysis after multi-acid digestion; “28” denotes ICP-OES after nitric acid digestion; and “9” denotes ISE after alkaline fusion

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APPENDICES

Appendices A–E are included in the OF_012A_1956 zip folder as Excel (.xlsx) files.

APPENDIX A: Formatted Site, Sample and Analytical Results for Till Samples Collected in the Puddle Pond and Little Grand Lake Areas in 2019

APPENDIX B: Raw Geochemical Data for Instrumental Neutron Activation Analysis (INAA).

APPENDIX C: Raw Geochemical Dataset for a Four Acid (HCl-HNO₃-HClO₄-HF) Digestion with Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) Finish for 32 Elements

APPENDIX D: Results of Fluoride Analysis Using Ion-Selective Electrode (ISE) after Alkaline Fusion, Silver Analysis Using ICP-OES after Nitric Acid Digestion and LOI was Determined Gravimetrically

APPENDIX E: Metadata for this Open File 012A/1956