PUDDLE POND MAP AREA

The Puddle Pond surficial geology map (NTS 12A/05) provides information about the nature and distribution of surficial sediments and landforms, depositional environments, and glacial history of the map area. Some of this work has been documented in previous publications (Organ and Dyke, 2019; Organ, 2014, 2020).

Map Projection
The surficial map represents interpretations from field observations, digital imagery, and airphotos. Field observations were collected by road or helicopter access over approximately 50% the map area and are denoted by an "x" on the map.

A 5-m digital elevation model (DEM) and several sources of aerial photography including 1 50 000-scale black and white airphotos from 1967–1968, digital colour images at a scale of 1:12 500 from 2010, and seamless 30-cm resolution aerial imagery from 2014, were consulted.

Preliminary digital mapping was conducted at a scale of 1:15 000 and consolidated into surficial units for the published 1:50 000 surficial map. The map units are described within the legend and in Organ and Dyke (2019) and Organ (2014, 2020).

Location and Physiography
The Puddle Pond map area is located approximately 43 km east of Stephenville, in west-central Newfoundland. From the Trans-Canada Highway (TCH), the area is accessed by the Harry's Harbour Road (Route 420) and the Main Gut Pond resource road that runs along the north shore of Sexfrick Lake and continues along the Lloyds River valley. The area has a diverse physiography. The western area encompasses the southeastern flanks of the Long Range Mountains having a maximum elevation of 581 m above sea level (asl), while the Annieopsquotch Mountains in the southeast rise to a maximum elevation of 711 m asl. Between the two ranges, there is an undulating landscape between 300-400 m asl.

Glacial History
During the late Wisconsinan glaciation the island of Newfoundland was covered by ice. Major ice-divides within the study area resulted in a complex and commonly overprinted pattern of striae, grooves and depositional features (Shaw et al., 2006). There are few locations where multidirectional striae are preserved. Consequently, only a preliminary ice-flow chronology and three ice-flow events is suggested.

The oldest ice-flow event is reconstructed from a single striation having an unknown direction. It is presumed to indicate initial ice flow from the west. The next ice flow event is the most widely recorded and is represented by striae and grooves throughout the area, and by streamlined features (flutes) in the southwest. The youngest flow is preserved in west to west-southwest-oriented striae in the central and northeastern area, and by streamlined (flute) features in the northern area. The pattern of deglaciation for the island is irregular and transgressive. In the study area, retreat occurred from the west and continued toward the interior. However, hummocky terrain around Portage Lake and north of Cormacks Lake is indicative of ice-stagnation. Ice-marginal positions are poorly constrained. Deglaciation of the Lloyds River valley western part was ice free prior to 11.5-11.3 ka BP (GSC-4498; McNeely and Jorgensen, 1992; GSC-5257; McNeely, 2002).

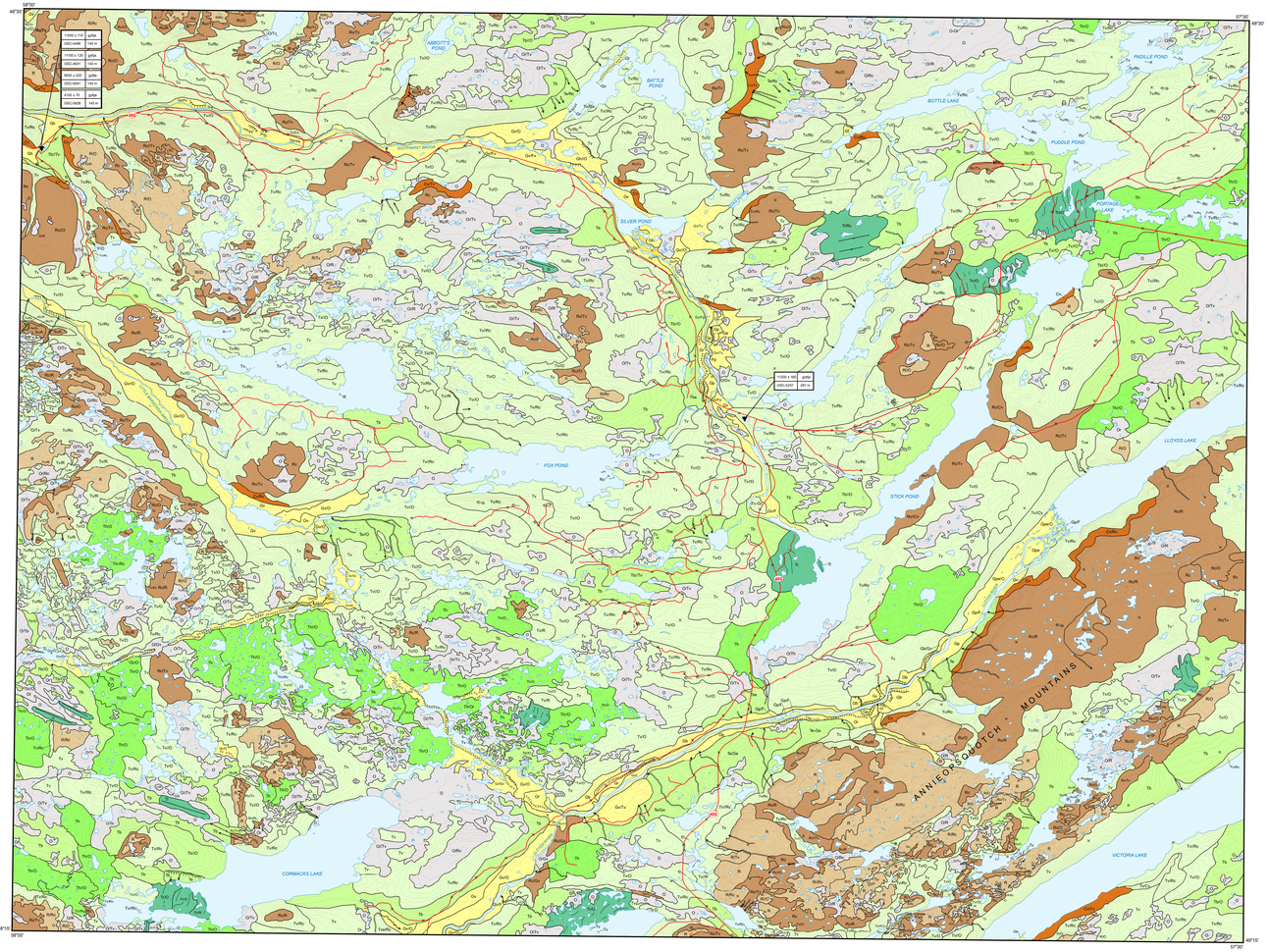
Surficial Materials Descriptive Notes
Mapped surficial materials include varying morphologies of glacial diamicton (till), sand and gravel (glaciofluvial deposits) and postglacial organic deposits (bogs and string bogs).

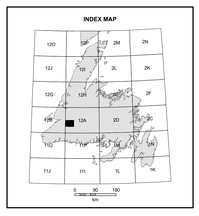
Thin till (< 1.5 m; Tv) is associated with the mountainous regions. Thicker deposits of till (up to 10 m; Tb) were mapped on the flanks of topographic highs or in the undulating landscape between the Long Range and Annieopsquotch mountains. Till ridges (Tr) formed in contact with water ice in an ice-marginal environment. Minor till ridges were mapped on the northeast side of large ponds south of Puddle Pond and in the southwest. Streamlined till (T) comprises flutes mapped west of Silver Pond, and drumlinoid features mapped between Silver Pond and Puddle Pond. Flutes are oriented west-southwest to northwest and west- to west-southwest flow events. Hummocky terrain (Th) was mapped in low-lying areas around Portage Lake and north of Cormacks Lake and is associated with stagnating/inactive ice.

There were no natural exposures of till stratigraphy. The till at surface is matrix-supported and is composed of silty to fine-grained sand. The colour of the diamicton reflects variations in the underlying bedrock and therefore ranges between olive brown (Munsell color 2.5Y 4/3), dark grayish brown (2.5Y 4/2), dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4).

Glaciofluvial sand and gravel deposits occupy well-defined subglacial meltwater corridors that correspond to the major river valleys such as Lloyds River, Southwest Brook, Little Barachois Brook and an unnamed tributary of Lloyds River northeast of Portage Lake. Deposits are typically well sorted and include ice-contact fans (Fc), kame terraces (Gh) or eskers (Gf). These sediments are often variable and ranges from well-sorted sand to clast-supported cobble gravel.

Organic deposits are common, particularly west of Silver Pond, north of Bottle Pond, and east of Cormacks Lake. The thickness of these deposits was not determined.





Digital Hillshade Surface Model (DSM) of the Puddle Pond map area (shaded from the northwest) from ALOS World 3D-30m from the PRISM panchromatic Optical Sensor on the Advanced Land observing satellite complied by the Japan Aerospace Exploration Agency (JAXA). The image provides terrain information not readily illustrated on the surficial map. Terrain variability is evident, with areas of bedrock highlighted as rougher textured (consistent with surficial map), and areas of thicker till shown as smoother textured.

GENETIC CLASSIFICATION

Category	Depositional Environment	Origin and Material Characteristics
O	Bog	Poorly drained accumulations of peat, peat moss and other organic matter; developed in areas of poor drainage
F	Fluvial	Alluvium consisting of silt and clay to bouldery gravel, forms terraces and plains associated with modern stream channels, their floodplains and deltas, usually less than 1 m thick, deposited by fluvial action at, or below, maximum flood levels
C	Colluvial	Coarse-grained bedrock-derived materials; may include sand, silt or clay; accumulates on the lower parts, or at the base of steep rock faces; transported by gravity
E	Aeolian	Medium- to fine-grained sand and silt, well sorted, poorly compacted; commonly forms dunes up to 10 m high; transported and deposited by wind
G	Glaciofluvial	Fine-grained sand to coarse-grained cobbly gravel; forms plains, ridges (eskers), hummocks, terraces and deltas; generally greater than 1 m thick; deposited as outwash in an ice-contact or proglacial position
L	Lacustrine	Silt, clay, gravel and sand; forms as plains and blankets; silt and clay is deposited in freshwater lakes from suspension, sand and silt by lake-floor currents; gravel and sand by shoreline wave action
M	Marine	Clay, silt, gravel and diamicton; sand is present in some places, generally moderately to well sorted and commonly stratified, but may be massive; forms beach ridges, deltas, terraces and bars deposited in a marine environment; gravel and sand are formed by shoreline wave action; may include shells, clay and silt deposited from suspension and turbidity currents; gravel is generally a wave washed lag
Tv Tb, Te, Tp, T Td, Tl, Tr Th, Tx	Glacial	Includes all types of till; composed of diamicton; transported and subsequently deposited by/in from glacial ice; forms a thin veneer (discontinuous to < 1 m thick); may include relatively thin (Tv) or thicker (Tb, Te, Tp, T) till with little or no surface expression; features produced by actively flowing ice (Td, Tl, Tr) or sediment deposited through ice disintegration (Th, Tx)
R Rc	Rock	Bedrock, either exposed (R) or concealed by vegetation (Rc)

MORPHOLOGY

Modifier	Morphology	Description
a	apron	A relatively gentle slope at the foot of a steeper slope, commonly used to describe colluvium at the base of a rock escarpment; consists of materials derived from the usually steeper upper slope
b	blanket	Any deposit greater than 1.5 m thick; minor irregularities of the underlying unit are masked but the major topographic form is still evident
c	concealed by vegetation	Vegetation mat developed on either colluvial surfaces or a thin layer of angular frost-shattered and frost-heaved bedrock fragments overlying bedrock; includes areas of shallow (less than 1 m), discontinuous overburden
d	drumlinoid	Elongate ridge(s) between 1.5 and 20 m high, 20 and 300 m wide, and 200 to 5000 m long; ridges have a rounded end pointing in the up-ice direction and gently curving sides that taper in the down-ice direction; may be symmetrical, asymmetrical or have irregular shapes; composed of till and the direction consist of subglacially formed cavities shaped in a streamlined form parallel to the direction of glacial flow; commonly consist of till, although some may contain stratified drift; may have a rock core
e	eroded and dissected	A series of closely spaced gullies or deeply incised channels; can have a dendritic pattern or may be a single straight or arcuate channel; gullies and channels may contain underfit streams
f	fan	A gently sloping accumulation of debris deposited by a stream issuing from a valley onto a lowland; has its apex at the mouth of the valley from which the stream issues; the fan shape results from the deposition of material as the stream swings back and forth across the lowland; fluvial fans are usually derived from eroded glacial and glaciofluvial deposits; glaciofluvial fans (deltas) are deposited in standing water rather than in a terrestrial environment; colluvial fans are derived from bedrock and are usually steeper (i.e., cone shaped)
h	hummock	An apparently random assemblage of knobs, mounds, ridges and depressions without any pronounced parallelism, significant form or orientation; formed by glacial melting during ice stagnation and disintegration; includes subglacial, englacial, supraglacial and stratified materials
k	kettle	A basin or bowl-shaped closed depression or hollow in glacial drift; results from the melting of a large, partly buried detached block or lens of glacier ice; commonly occurs in association with hummocks
l	lineated	Elongate spindle-shaped ridge(s) between 6 and 60 m high, 75 and 300 m wide and up to 4000 m long; ridges are commonly straight sided, taper at one or both ends, and have a flat longitudinal profile; consists of subglacially formed cavities shaped in a streamlined form parallel to the direction of ice flow; commonly consist of till, although some may contain stratified drift; may have a rock core; includes slope lineated ridge (Ol)
p	plain	A comparatively flat, level, or slightly undulating tract of land; materials are either till, glaciofluvial, alluvial, marine, lacustrine or organic sediments; bedrock features are commonly masked by the overlying sediments
r	ridge	Narrow, elongated and commonly steep-sided feature that rises above the surrounding terrain; materials are either rock, till, glaciofluvial, fluvial, marine, lacustrine, aeolian, or organic sediments; includes string bogs (Or)
t	terrace	Long, narrow, level or gently inclined step-like surface, bounded along one edge by a steeper descending slope or scarp and along the other by a steeper ascending slope or scarp; materials are either till, glaciofluvial, fluvial, marine or lacustrine sediments; generally formed by fluvial and glaciofluvial erosion or marine wave action
v	veneer	Any deposit less than 1.5 m thick; morphology of the underlying unit is evident
w	weathered	A thin layer, generally less than 1 m thick, of frost-heaved and frost-shattered bedrock fragments
x	complex	Commonly used to indicate numerous esker ridges that are closely spaced; can be used where any genetic category exhibits numerous surface expressions in a small area, and in which no single element can be defined at the map scale

Each outlined area is assigned a classification consisting of up to two genetic categories and modifiers that designate the types of deposits and landforms. The dominant (i.e., most abundant) genetic category is listed first, followed by the subordinate category, if present (e.g., Tv/R). Generally, the areas are divided up so that up to three landforms or deposit types are identified within a given area. The classification system is also used to denote the approximate percentage of landforms occurring within an outlined area, but those that form less than 5 percent of the area are not included in the classification. Three variations of the landform system are as follows:

1. Where two landforms are included in a single map unit, a double slash (//) or single slash (/) is used to separate them, and their relative percentages are (65 - 90) // (5 - 15) for double slash, or (60 - 85) / (10 - 40) for a single slash.
2. A hyphen between two landform types indicates that they are approximately equal in area. For example, Tv-Rc indicates that till veneer and rock concealed by vegetation or a thin regolith are equal in area.
3. A composite symbol is used to show combinations of the above cases. For example, "T" indicates that about 60 - 85 percent of the area is covered by fluvial sediment, 15 - 40 percent by glaciofluvial sediments, and is underlain by till.

LEGEND

SYMBOLS

Geological boundary
Terrace scarp
Cirque
Esker (flow direction known or assumed, unknown)
Meltwater channel (small, direction known; small, direction unknown; large)
Crestline of major moraine ridge
Trend of ribbed moraine or minor moraine ridges
Beach ridges
Sand dunes
Avalanche track
Small landslide (scar, slope movement)
Large landslide (scar, slope movement)
Drumlin (direction known, unknown)
Crag-and-tail hill
Till ramp
Fluting
Rôche moutonnée
Striation (direction known, unknown) (numbers indicate relative age)
Kettle hole (small, large)
Sinkhole (small, large)
Observation site
Delta
Radiocarbon date

Date	Material
Lab. No.	Elevation

Note: All symbols and classifications may not occur on this map.

Surficial geology by J.S. Organ

GIS/Digital cartography by C. Hamlyn

The digital topographic database map NTS 12A/05 used here is available from the Surveyor General Branch, Natural Resources, Canada.

Radiocarbon age (GSNL, 2022a) and previously released glacial striae (GSNL, 2022b) shown on this map have been obtained from the respective databases in the Geoscience Atlas http://geoatlas.gov.nl.ca (see references above). Radiocarbon ages shown here are normalized to the VPDB (Vienna Pee Dee Belemnite) standard and are reported as "C years before present BP and have not been calibrated to calendar years. Uncorrected ages can be found in the database. NR = Not Recorded.

Copies of this map may be obtained from the Department of Industry, Energy and Technology, Government of Newfoundland and Labrador, P.O. Box 8700, St. John's, NL, Canada A1B 4J6

This map is subject to revision and modification. Symbols for site location and striations may not be plotted directly at exposure site due to overlap of symbols.

Magnetic declination at the centre of the map is 17.69° ± 0.39° West (declination is negative) calculated using World magnetic Model (WMM2025) https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml (October, 2025).

North American Datum (NAD) 1927, Zone 21.

Open File 012A/05/1938
This map supercedes Map 88-204, Open File NFLD/1693.

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Recommended citation
Organ, J.S.
2024. Surficial geology of the Puddle Pond map area (NTS 12A/05). Geological Survey, Department of Industry, Energy, and Technology, Government of Newfoundland and Labrador, Map 2024-02, Open File 012A/05/1938.

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MAP 2024-02

SURFICIAL GEOLOGY OF THE PUDDLE POND MAP AREA (NTS 12A/05)

OPEN FILE 012A/05/1938

Scale 1:50 000

0 1 2 3 4 5
km

Elevations are in metres above sea level. Contour interval is 10 m.