How to read the geological map

The objective of mapping northern Baffin Island in 2017 was to improve the geological knowledge and document the economic potential of the greater Pond Inlet area. Geological maps show the distribution of geological features, including different kinds of rocks and faults. Although the geology of every area is different, all geological maps have several features in common: coloured areas and letter symbols represent the kind of rock unit at the surface; lines show the type and location of contacts and faults; strike and dip symbols show which way layers are tilted; and a map legend explaining the colours and symbols utilized.

The most striking features of geological maps are its colours. Each colour represents a different geological unit. A geological unit is a volume of a certain kind of rock of a given age. Geological units are named and defined by the geologists who make the geological map, based on observations of the rocks in the field and laboratory investigations on the age of the rocks. In addition to colour, each geological unit is assigned a set of letters to uniquely symbolize it on the map. Usually the symbol is the combination of an initial capital letter followed by one or more capital or lowercase letters. The first capital letter represents the age of the geological unit. Geologists have divided the history of the Earth into Eons. All letter symbols begin with a capital letter representing an Eon: for example A (Archean–4000 to 2500 million years ago), mP (Mesoproterozoic–1600 to 1000 million years ago), or Q (Quaternary–2.58 million years ago until today). The capital letters that follow indicate the name of the unit, if it has one. Lowercase letters indicate the type of rock. An example of named rock units on northern Baffin Island are volcanic rocks named "Mary River Group". Therefore, AMv on the map would be the symbol for Mary River Group volcanic rocks (formed in the Archean). Similarly, Amg would be the symbol for an unnamed unit of monzogranite emplaced in the Archean.

The place where two different geological units are found next to each other is called a contact, and this is represented by different kinds of lines on the geological map. When different geological units have been moved next to one another after they were formed, the contact is a fault contact. If one rock was intruded into another (for example a granite intruded into sedimentary strata), then the contact is an intrusive contact. Another kind of line shown on many geological maps is a fold axis. In addition to being moved by faults, geological units can also be bent and warped into folds. A line that follows the crest or trough of a fold is called a fold axis. Where the contact line is precisely located, it is shown as a solid line, but where it is uncertain, it is shown as dashed. The lines on the map may be modified by other symbols on the line (triangles, small tick marks, arrows, and more) which give more information about the line. For example, faults with triangles on them show that the side with the triangles has been moved up and over the side without the triangles. All the different symbols on the lines are explained in the map legend. Tilted layers are shown on a geological map with a strike and dip symbol. The symbol consists of three parts: a long line, a short line, and a number. The long line is called the strike line, and shows the direction in the layer that is still horizontal. Any tilted surface has a direction that is horizontal (think about walking on the side of a hill, there is always a way to go that is neither up nor down, but is level). The short line is called the dip line, and shows which way the layer is tilted. The number is called the dip, and shows how much the layer is tilted, in degrees, from horizontal (flat). The higher the number, the steeper the tilting of the layer. Strike and dip symbols can be modified to give more information about the tilted layers just like lines can be, and these modifications are explained in the map legend. Rocks can also contain linear features, such as stretched vesicles (bubbles) or aligned needle-shaped minerals; these are known as “lineations”. They can be shown on a map with a small arrow: the orientation of the arrow shows the direction of the lineation, whereas the number indicates its plunge, with 0° representing a horizontal lineation and 90° a vertical lineation.

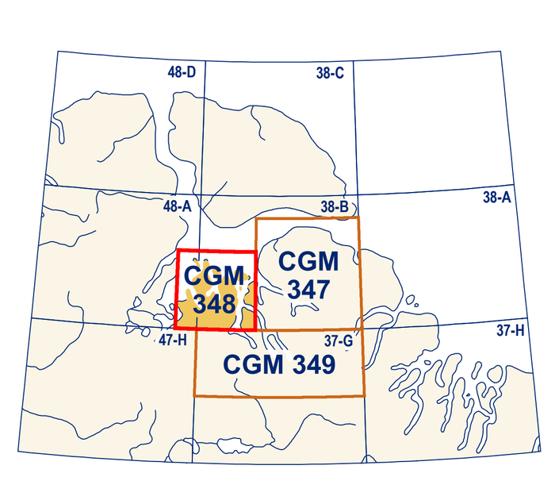
All geological maps come with a table called a map legend. In the legend, all the colours and symbols are shown and explained. The map legend starts with a list showing the colour and letter symbol of every geological unit, starting at the top with the youngest or most recently formed unit, along with the name of the unit (if it has one) and a short description of the types of rock in that unit and their ages. After the list of geological units, all the different types of lines on the map are explained, and then all the different strike and dip symbols. The map legend will also include explanations of any other kind of geological symbols used on a map (for example locations where carving stone is found, locations of deposits of precious metals, and any other geological feature that might be important in the area documented by the geological map). Because the geology in every area is different, the map legend is vital to understanding the geological map.

Abstract

This map presents the field observations and initial geological interpretations for the Mumiksaa–Milne Inlet area (parts of NTS 38-B and 48-A), Baffin Island, Nunavut. The bedrock geology comprises Archean tonalitic- to monzogranitic gneiss that includes minor mafic to intermediate components, and relatively homogeneous monzogranite-granodiorite intrusions. The Archean Mary River Group forms discontinuous volcano-sedimentary belts, consisting of mafic volcanic rocks interlayered with siliciclastic strata, banded iron-formation, and felsic to intermediate and ultramafic volcanic units. The supracrustal rocks are intruded by monzogranite-granodiorite plutons. Pre-Mesoproterozoic rocks record a complex structural history involving at least two regional deformation events and mineral assemblages indicate metamorphic conditions ranging from upper-greenschist to granulite facies. Mesoproterozoic clastic and carbonate platform sequences of the Bylot Supergroup unconformably overlie Archean units in the central part of northern Baffin Island. These strata were deposited within a graben that forms part of the larger Borden Basin.

Résumé

Cette carte présente les observations de terrain et les interprétations géologiques préliminaires pour la région de Mumiksaa–Milne Inlet (SNRC parties de 38-B et 48-A), île de Baffin, Nunavut. La géologie du substratum rocheux se distingue par la présence de gneiss archéens de composition tonalitique à monzogranitique, incluant des quantités accessoires de composantes mafiques à intermédiaires, et d’intrusions monzogranitiques à granodioritiques relativement homogènes. Le Groupe de Mary River d’âge archéen forme des ceintures volcanosédimentaires discontinues composées de roches volcaniques mafiques interstratifiées avec des roches silicoclastiques, des formations ferrifères rubanées et des unités volcaniques de composition felsique à intermédiaire ou ultramafique. Ces roches supracrustales sont recoupées par des roches plutoniques de composition monzogranitique à granodioritique. Les roches antérieures au Mésoprotérozoïque témoignent d’une évolution structurale complexe impliquant au moins deux périodes de déformation régionale, avec des associations de minéraux qui indiquent des conditions métamorphiques allant du faciès des schistes verts supérieur au faciès des granulites. Dans la partie centrale du nord de l’île de Baffin, les séquences clastiques et carbonatées d’âge mésoprotérozoïque du Supergroupe de Bylot recouvrent en discordance le socle archéen. Ces couches ont été mises en place dans un graben faisant partie du bassin de Borden.



National Topographic System reference and index to adjoining published Geological Survey of Canada maps

Catalogue No. M183-1/348-2018E-PDF
ISBN 978-0-660-24499-0
https://doi.org/10.4095/306579

Natural Resources Canada / Ressources naturelles Canada

CANADIAN GEOSCIENCE MAP 348

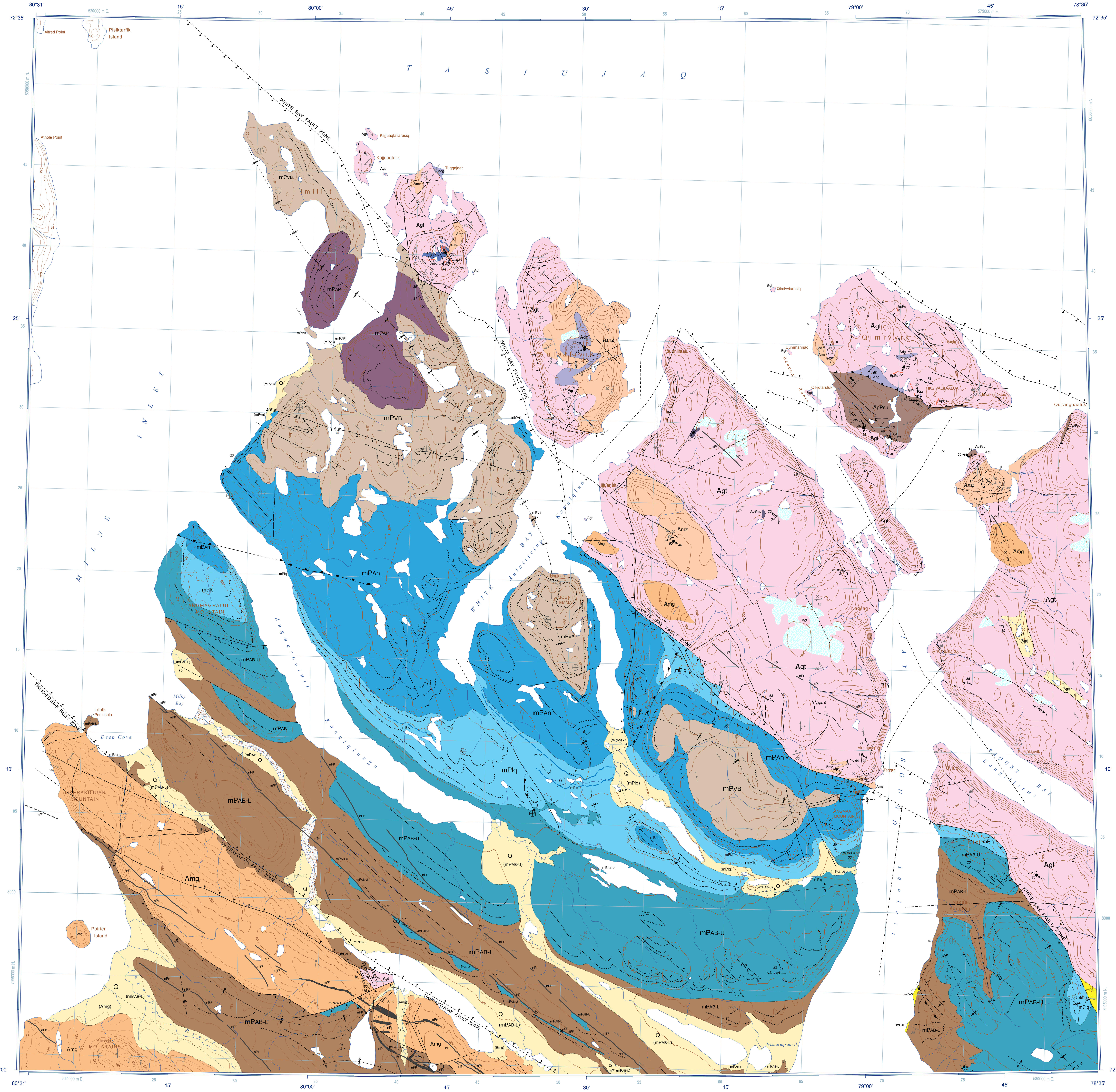
BEDROCK GEOLOGY

MUMIKSAA–MILNE INLET

Nunavut

parts of NTS 38-B and 48-A

1:100 000



This legend is common to CGM 347, CGM 348, and CGM 349. Coloured legend blocks indicate map units that appear on this map.

QUATERNARY

Q — Glacial till (bouldery diamicton), glaciofluvial sand and gravel; glaciolacustrine, glaciomarine, and marine sand, silt, and gravel; alluvial sand and gravel; talus scree bouldery diamicton.

CRETACEOUS

ECLIPSE GROUP (K)

K — Beige to brown, thin- to thick-bedded quartz sandstone, commonly detrital garnet rich; locally contains interbeds of coal or shale.

NEOPROTEROZOIC

nPF — **FRANKLIN DYKE:** Diabase, gabbro, or olivine gabbro; medium- to coarse-grained; 10–50 m wide; subvertical to steeply dipping.

nPF — Thin unit, defined.

nPF — Thin unit, inferred.

MESOPROTEROZOIC

ULUKSAN GROUP (mPAB-L–mPAP)

mPAP — **ATHOLE POINT FORMATION:** Grey to black, thinly bedded argillaceous limestone, calcareous shale and siltstone, locally contains stromatolitic chert, limestone, and sandstone.

mPVB — **VICTOR BAY FORMATION:** Grey to black, thinly bedded to massive argillaceous dolostone, argillaceous limestone and shale, locally contains edgewise conglomerate and breccia; upper sequence contains mostly poorly bedded to massive dolostone; uppermost strata comprise stromatolitic bioherms.

mPAn — **ANGMAAT FORMATION:** Dolostone, mainly comprising cyclic packages of microbial laminate and partly silicified sea-floor precipitates; locally contains horizons with chert nodules.

mPIq — **IQQITTUQ FORMATION:** Dolostone with minor interlayered shale of various colours, grades to west into dolostone interbedded with grey shale; locally contains microbial laminate, desiccation cracks; in west, commonly contains ribbon limestone, intraclast conglomerate; upper portions of formation contain gypsum-bearing horizons.

mPIq — Gypsum bed, defined.

mPIq — Gypsum bed, approximate.

mPAB-U — **ARCTIC BAY FORMATION - UPPER MEMBER:** Grey carbonaceous shale interbedded with limey siltstone, quartz sandstone, and brecciated, cherty, or stromatolitic dolostone.

mPAB-L — **ARCTIC BAY FORMATION - LOWER MEMBER:** Dark grey to black shale interbedded with minor siltstone and rare quartz sandstone and dolostone.

EQALULIK GROUP (mPAS)

mPAS — **ADAMS SOUND FORMATION:** Light grey to beige, fine- to medium-grained, laminated to medium-bedded quartz sandstone, basal strata locally contain quartz-pebble to -cobble conglomerate; locally contains shale and siltstone interbeds; commonly crossbedded.

ARCHEAN OR PALEOPROTEROZOIC

ApPs — Biotite±magnetite syenogranite, coarse-grained to pegmatitic; massive; crosscuts deformation fabrics in older units.

ApPs — Syenogranite dyke, defined.

ApPmg — Garnet+biotite±orthopyroxene±hornblende±magnetite monzogranite to granodiorite, moderately foliated; locally contains 1–2 cm K-feldspar megacrysts; locally contains layers of Ag.

ApPsu — Biotite±garnet psammite, semi-pelite, and pelite with rare quartzite, locally sillimanite- or cordierite-bearing; contains leucogranite lenses, sills, and dykes; locally contains minor pyroxenite bodies or layers of mafic-intermediate rocks.

ApPmu — Layered hornblende+clinopyroxene gabbro, leucogabbro, clinopyroxenite, and websterite; 100–500 m thick; contains primary centimetre- to decimetre-scale compositional layering.

ARCHEAN

Aan — Clinopyroxene anorthosite, coarse-grained and massive; locally contains enclaves of tonalitic gneiss and foliated gabbro.

Ag — Hornblende+garnet±clinopyroxene gabbro to leucogabbro to diorite, quartz diorite occurs locally; garnet typically 2 mm to 1 cm in diameter; locally contains orthopyroxene.

Amf — Biotite±hornblende±magnetite monzogranite to granodiorite containing 2–5 cm euhedral feldspar (plagioclase or K-feldspar) megacrysts, massive to weakly foliated and/or lineated; commonly contains enclaves of diorite to gabbro.

Amg — Biotite±hornblende±magnetite monzogranite to granodiorite, weakly to strongly foliated and/or lineated; locally contains enclaves of quartz diorite, diorite, or gabbro; locally contains enclaves of Mary River Group mafic rocks.

MARY RIVER GROUP (AMsu–AMif)

AMif — Oxide-facies banded iron-formation comprised of alternating bands of quartz and magnetite (±hematite), minor silicate-facies iron-formation.

AMv — Mafic volcanic rocks containing mainly hornblende-plagioclase-clinopyroxene, locally with relict volcanic textures, minor psammite, pelite, and quartzite; minor felsic-intermediate volcanic rocks; locally contains ultramafic volcanic rocks (komatiite).

AMsu — Biotite±garnet psammite, semi-pelite, and pelite with rare quartzite, locally staurolite-bearing; locally contains contains mafic volcanic rocks and oxide-facies banded iron-formation.

Amz — Biotite±hornblende±magnetite monzogranitic gneiss, commonly contains layers of quartz diorite to diorite, and locally contains gabbro enclaves.

Agt — Biotite±hornblende±magnetite granodioritic to tonalitic gneiss, commonly contains layers of quartz diorite to diorite, and locally contains gabbro enclaves.

Adg — Hornblende±biotite±magnetite±clinopyroxene quartz-dioritic to gabbroic gneiss, locally contains orthopyroxene.

Stratigraphic or intrusive contacts:
- *Defined (where observed/constrained)*
- *Approximate (where constrained by remote sensed data/imagery)*
- *Inferred (where less precisely constrained by remote sensed data/imagery)*
- *Concealed (by overlying map unit or body of water or ice)*

Offshore faults are interpreted from aeromagnetic geophysical data. Refer to map information document accompanying the downloadable data for details.

Normal fault (solid circles indicate downthrown side):
- *Defined*
- *Approximate*
- *Inferred*
- *Concealed*

Thrust fault (teeth indicate hanging-wall side):
- *Defined*
- *Approximate*
- *Concealed*

Reverse fault:
- *Defined*
- *Approximate*
- *Concealed*

Strike-slip fault, dextral, approximate

Strike-slip fault, sinistral:
- *Defined*
- *Approximate*

Oblique-slip fault, normal, dextral (solid circles indicate downthrown side):
- *Approximate*
- *Concealed*

Oblique-slip fault, normal, sinistral, approximate (solid circles indicate downthrown side)

Fault, motion undefined:
- *Defined*
- *Approximate*
- *Inferred*
- *Concealed*

Fold, anticline, upright:
- *Approximate*
- *Concealed*

Fold, syncline, upright:
- *Defined*
- *Approximate*
- *Inferred*
- *Concealed*

Fold, antiform, upright:
- *Approximate*
- *Concealed*

Fold, synform, upright:
- *Defined*
- *Approximate*
- *Inferred*

Structural form line

Black or red structural symbols on map pertain to observations made in 2017. Grey symbols on map pertain to legacy measurements.

Axial plane

Bedding:
- *Inclined*
- *Inclined, younging known*
- *Horizontal*

Foliation

Gneissosity

Fold hinge:
- *General*
- *Minor S*
- *Minor U*

Glacial striae

Mineral lineation

Stretching lineation

Station:
- *Fieldwork 2017*
- *Legacy*

References for legacy information and interpretations incorporated into the map compilation are provided in the map information document accompanying the downloadable data.

Recommended citation

Saumur, B.M., Skipton, D.R., St-Onge, M.R., Wodicka, N., Bros, E.R., and Weller, O.M., 2018. Bedrock geology, Mumiksaa–Milne Inlet, Nunavut, parts of NTS 38-B and 48-A; Geological Survey of Canada, Canadian Geoscience Map 348, scale 1:100 000. https://doi.org/10.4095/306579

CANADIAN GEOSCIENCE MAP 348

Geological Survey of Canada
Canadian Geoscience Maps

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Geological interpretation by B.M. Saumur and notes by D.R. Skipton, B.M. Saumur, and M.R. St-Onge, 2017

Geology conforms to Bedrock Data Model v. 2.8

Geomatics by A. Morin, P. Brouillette, L. Robertson, and G. Buller

Cartography by N. Côté

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This map is part of the Geo-mapping for Energy and Minerals (GEM) Program on Baffin Island led by the Geological Survey of Canada (GSC) in collaboration with the Nunavut Arctic College, the University of Alberta, the University of Oxford, and the Government of Nunavut Department of Economic Development and Transportation (GN EDT), with support from Government of Nunavut Housing, the Hamlet of Pond Inlet, the Hunter’s and Trapper’s Organization of Pond Inlet, Parks Canada (Sirmilik National Park of Canada), Baffinland Iron Mines Corporation, and the Qitiktani Inuit Association.

Logistical support provided by the Polar Continental Shelf Program as part of its mandate to promote scientific research in the Canadian north, PCSP 06117

BEDROCK GEOLOGY
MUMIKSAA–MILNE INLET
Nunavut
parts of NTS 38-B and 48-A
1:100 000

2 0 2 4 6 8 km

Map projection Universal Transverse Mercator, zone 17
North American Datum 1983

Base map at the scale of 1:250 000 from Natural Resources Canada, with modifications
Elevations in metres above mean sea level

Proximity to the North Magnetic Pole causes the magnetic compass to be erratic in this area.
Mean magnetic declination 2018, 35°02'W, decreasing 44.5' annually
Readings vary from 33°49'W in the SW corner to 36°09'W in the NE corner of the map.

This map is not to be used for navigational purposes.

Title photograph: Mesoproterozoic Angmaat Formation dolostone (white) juxtaposed against Archean granodioritic gneiss (light pink) along the northwest-southeast-striking White Bay normal fault. Facing north-northwest; width of field of view is ~10 kilometres. Aulattivik (formerly Curry Island) observed in the background (centre-right). Photograph by B.M. Saumur. 2017-103

The Geological Survey of Canada welcomes corrections or additional information from users.

Data may include additional observations not portrayed on this map. *See* map info document accompanying the downloaded data for more information about this publication.

This publication is available for free download through GEOSCAN (http://geoscan.nrcan.gc.ca/).

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Canada