GEOLOGICAL SURVEY BRANCH
DEPARTMENT OF MINES AND ENERGY
GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

LEGEND

(Map-unit divisions that are not colour-coded, occur only as individual outcrops or dykes on the map, and are indicated as such)

PLEISTOCENE

13 **13a,** *till and moraine (mostly lodgement till, ribbed moraine and areas of hummocky terrain);* **13b,** *glaciofluvial deposits (eskers, outwash);* **13c,** *lacustrine (raised beach) and possible fluvial or deltaic deposits (bedded coarse-grained, brown sandstone and granule conglomerate)*

PROTEROZOIC II OR YOUNGER

12 **12a,** *diabase dykes;* **12b,** *plagioclase-megacrystic diabase dykes*

PROTEROZOIC II

11 SEAL LAKE GROUP AND EQUIVALENTS: <1325 Ma

11a1	11a2	11a3	11a4	11a5	11b1	11b2	11b3	△11b4

11a, Seal Lake Group: *11a¹, diabase and metagabbro; 11a², metabasalt; 11a³, grey and white quartzite; 11a⁴, predominantly reddish sandstone, pebbly sandstone and granule to cobble conglomerate; 11a⁵, basaltic to intermediate tuff;* **11b,** *equivalent rocks in and around the Smallwood Reservoir; 11b¹,* Windbound Lake area *– red sandstone and coarse breccia; 11b²,* Vollant Lake area *– polymictic breccia dominated by red granitoid clasts; 11b³,* Sail Lake area *– polymictic breccia dominated by orthogneiss or granitoid clasts; 11b⁴,* Michikamau Lake area (not found *in situ*) *– yellow-brown to grey breccia, stromatolite limestone, sandstone and calcarenite (includes stromatolite-coated and algal mat breccias)*

10 MICHIKAMAU INTRUSION: >1460 Ma

10a1	10a2	10b1	10b2	10b3	10b4	10c	10d	10e

10a, Marginal Zone: *10a¹, fine- to medium-grained layered gabbronorite and olivine gabbronorite; 10a², medium-grained augite troctolite and olivine gabbro;* **10b,** Layered Series: *10b¹, coarse-grained troctolite; 10b², leucotroctolite; 10b³, anorthosite layers; 10b⁴, layered leucogabbro;* **10c,** Anorthosite Zone: *anorthosite and minor leucogabbro;* **10d,** Upper Border Zone: *leucogabbronorite;* **10e,** Transgressive Group: *microgranite dykes*

LATE PROTEROZOIC I

9 NORTH POLE BROOK INTRUSIVE SUITE: *ca.* 1650-1570 Ma

9a	9b	9c	9d	9e	9f	9g	9h

9a, *layered and commonly hydrous gabbro and minor anorthosite;* **9b,** *quartz diorite and minor diorite, quartz monzodiorite and tonalite;* **9c,** *plagioclase-porphyritic, K-feldspar-megacrystic (minor) quartz monzodiorite to quartz monzonite;* **9d,** *K-feldspar-megacrystic quartz monzonite to monzogranite;* **9e,** *K-feldspar-megacrystic quartz syenite to granite;* **9f,** *quartz monzodiorite;* **9g,** *granite;* **9h,** *microgranite, aplite, graphic granite*

8 MACKENZIE LAKE GROUP: *ca.* 1650 Ma

8a1	8a2	8a3	8a4	8a5	8b1	8b2	8b3

8a, andesitic volcanic rocks: *8a¹, hypabyssal andesitic porphyry; 8a², porphyritic to microporphyritic andesite; 8a³, andesite and quartz andesite; 8a⁴, quartz andesite and dacite; 8a⁵, plagioclase-porphyritic quartz andesite;* **8b,** clastic rocks (metasedimentary hornfels): *8b¹, red and grey sandstone; 8b², grey sandstone containing minor calcsilicate laminae; 8b³, layered metasedimentary enclaves*

PROTEROZOIC I OR OLDER

7 INCLUSIONS (in the North Pole Brook Intrusive Suite)
Enclaves of foliated and/or annealed biotite-porphyroblastic granitoid rock, in places enclosing, or associated with, layered or homogeneous amphibolite, layered schlieren, weakly foliated tonalite or granodiorite, rodded granitoid rock, and diorite

6 GRANITOID ROCKS (may be equivalent to Unit 2)
Gneissic tonalite dykes intrusive into Unit 5 (Rusty Island in Fraser Lake)

5 PETSCAPISKAU GROUP (may be equivalent to Unit 1)

5a	5b	5c	5d	5e	5f	5ef

5a, *mafic volcanic rocks (pillow lava, hyaloclastite and banded amphibolite);* **5b,** *metagabbro;* **5c,** *rhyolite-porphyry conglomerate;* **5d,** *metagreywacke;* **5e,** *quartzite, psammite and quartz pebble and polymictic psephite;* **5f,** *semipelite and pelite;* **5ef,** *interbedded pelite and psammite or quartzite*

4 METASEDIMENTARY ROCKS (uncertain affinity)

4a	4b	4c

4a, *red siltstone, sandstone and migmatized red arkose;* **4b,** *grey quartz-cobble conglomerate;* **4c,** *schist*

3 PLUTONIC SUITE

3a	3b	3c

3a, *gabbro and layered gabbro;* **3b,** *pyroxene, hornblende and biotite diorite;* **3c,** *granite, monzogranite and alkali-feldspar granite to syenite*

ARCHEAN

2 SAIL LAKE INTRUSIVE SUITE: *ca.* 2700-2600 Ma

2a	2b	2c	2d	2e	2f	2g

2a, *polyphase tonalite, granodiorite and diorite (dominated by the foliated to gneissic Orma dyke tonalite);* **2b,** *foliated to gneissic granodiorite, quartz monzonite and monzogranite;* **2c,** *diffusely granitoid-layered granodiorite and tonalite gneiss;* **2d,** *quartz diorite and tonalite;* **2e,** *foliated and locally migmatitic monzogranite and granite;* **2f,** *pretectonic mafic, felsic, intermediate, amphibolite, hornblendite and metadiabase dykes;* **2g,** *syntectonic sheets, dykes and veins of granitoid pegmatite and alaskitic granite and monzogranite*

1 SUPRACRUSTAL ROCKS

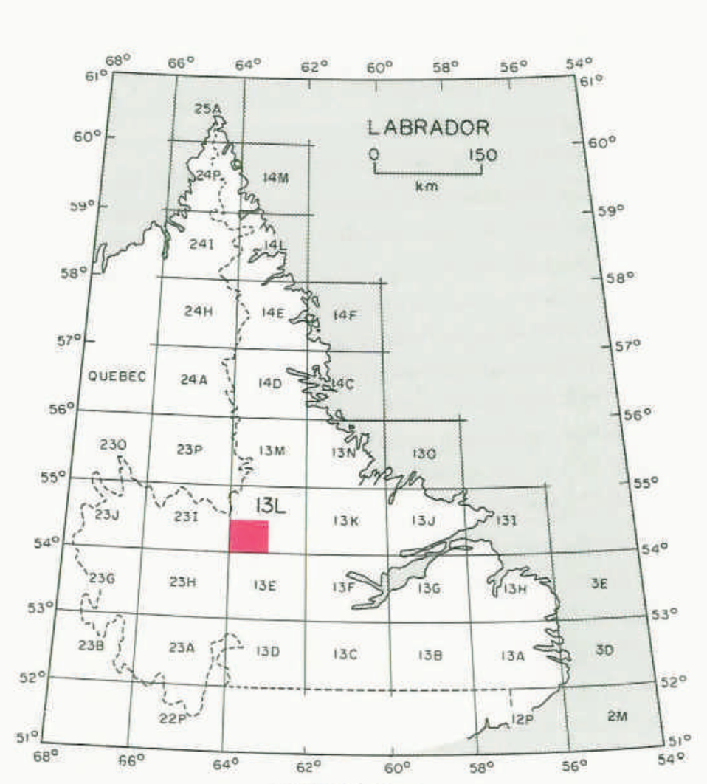
1a	1b	1d	1e	1f	1g

1a, *mafic metavolcanic rocks (pillow lava, mafic tuff and felsic-layered, mafic-banded or massive amphibolite) and minor felsic to intermediate metavolcanic rocks, metasedimentary rocks and metagabbro;* **1b,** *intergranular-textured or plagioclase-cumulate-textured metagabbro;* **1c,** *ultramafic rocks;* **1d,** *felsic metavolcanic rocks (tuff and pillow lava), volcaniclastic and thin-bedded siliceous metasedimentary rocks, and minor mafic metavolcanic rock, greywacke, pelite and psephite;* **1e,** *semipelitic to psammitic metasedimentary rocks, paragneiss and diatexite, and minor metatuff, quartzite and amphibolite;* **1f,** *pelitic paragneiss and minor psammite, semipelite and amphibolite;* **1g,** *quartzite*

NOTES: *No chronological order is implied within units, either between subunits or subdivisions, except in Units 3, 9 and 10, which broadly pass from older (subunit a) to younger (subunits c, h and e).*
Alternate unit or subunit designations are represented by a slash, e.g., 2e/3c, 5a/b, 5a/10a¹, etc.
Lesser and minor units or subunits are separated from the main rock type by commas and shown in order of decreasing abundance, e.g., 1b,2a or 1e,f.
Intimate mixtures or interlayering of subunits are shown with the major lithology first, e.g., 1bda or 5ef.
Gradational zones or areas are shown a-c, d-c, etc..
Question marks denote uncertainty in the information following the interrogative.

Granitoid terminology follows IUGS recommendations (Streckeisen, A., 1976; Earth Science Reviews, Volume 12, pages 1-33.

Geological cartography and digital color separation by T. Paltanavage, geological cartography by T. Sears, photomechanical and color separation by D. Leonard, cartographic supervisor K. Byrne. Cartographic Section, Geological Survey Branch, Department of Mines and Energy.



INDEX MAP

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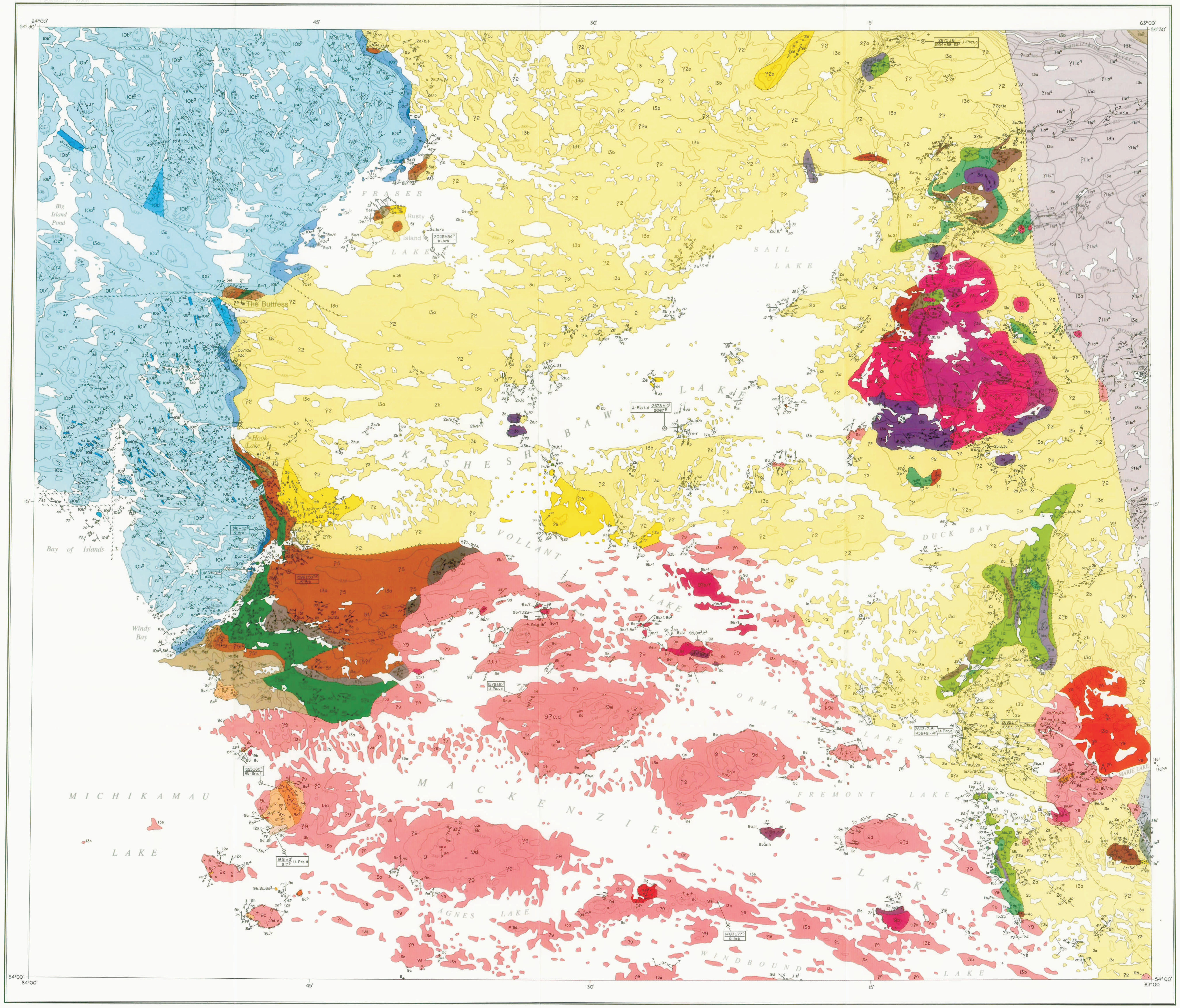

MAP 93-19

GEOLOGY OF THE NORTHEASTERN SMALLWOOD RESERVOIR (NTS MAP AREA 13L/SW), LABRADOR

SCALE 1:100,000 ÉCHELLE

Miles 1 0 1 2 3 4 5 Milles

Kilometres 1 0 1 2 3 4 5 6 Kilomètres

Fieldwork costs for Nunn and assistants were financed under the Canada – Newfoundland Mineral Development Subsidiary Agreement (1977-1981) by contributions from the Government of Newfoundland and Labrador (10 percent) and from the Departments of Regional Economic Expansion (45 percent) and Energy, Mines, and Resources (45 percent) of the Government of Canada. Fieldwork costs for R.F. Emslie and assistants were borne by the Geological Survey of Canada.

This preliminary bedrock geology map is based primarily upon field observations. In areas of poor control, contacts have been extrapolated through drift-covered terrain. This map was compiled at 1:50 000 scale and photographically reduced, and is subject to revision and correction.

Elevation above mean sea level given in metres instead of feet as on the base map original.

Approximate magnetic declination, 1985, was 28°38'W at the centre of the map area; decreasing 7.2' annually.

Some of the names shown on this map are of informal usage and are not shown on NTS maps of the area. Pre-flooding terminology in the reservoir has been preserved to facilitate description.

SYMBOLS

Outcrop, large outcrops
Area of abundant outcrops, with data stations
Outcrops compiled from pre-flooding data or not visited
Outcrop with contact
Geological boundary (defined, approximate, assumed, gradational)
Fault, ± sense of movement (inferred)
Thrust and/or shear zone (approximate)
Major shear zone (approximate)
Bedding [S_0] – tops known (inclined, overturned, subhorizontal)
– tops unknown (inclined, vertical)
Pillow bedding [S_P] – tops known (inclined, vertical, overturned)
– tops unknown (inclined)
Igneous layering – tops unknown (inclined, vertical, dip direction unknown)
Igneous lamination (inclined, dip direction unknown)
Dykes – with unit designations (inclined, vertical, dip direction unknown)
– intersecting, relative ages indicated; net veins
Foliations (see notes)
Archean gneissosity – A_1 (subhorizontal, inclined, vertical, dip direction unknown)
Archean foliation – A_1 (inclined)
Archean or Lower Proterozoic foliation – A_2/LP (inclined, vertical, dip direction unknown)
– A/LP (inclined, vertical)
Late Lower Proterozoic or Middle Proterozoic foliation – L-MP (inclined, dip direction unknown)
Grenvillian foliation – G (inclined)
Foliation generation unknown – L-MP or G (inclined)
Foliation in dykes – generation known [A_1] (inclined), L-MP (inclined)
– generation unknown [S_D] (inclined)
Foliation in shear zone – generation known [A_1] (inclined, vertical)
– generation unknown [S_S] (inclined)
Minor shear zone – sense of movement unknown (inclined, vertical, dip direction unknown)
– sense of movement known (dextral, sinistral, downthrow)
Parallel structures – igneous layering and lamination (inclined)
– S_O + A_1 (inclined, vertical), S_O + A/LP (inclined), S_O + L-MP (inclined)
– S_P + A_1 (inclined), S_P + A/LP (inclined); tops known, unknown
– A_1 + A_2/LP (inclined)
– S_S + A_1 (inclined, vertical), S_S + A_2/LP (inclined)
Sinuous or undulating structures (examples only) – strike (inclined, vertical)
– dip (inclined, vertical)
– both dip and strike (inclined, vertical, subhorizontal)
Syncline, synform (inferred, with plunge direction)
Anticline, antiform (inferred, with plunge direction)
Minor folds, minor fold axes, α and β lineations (see notes)
Minor folds – Z (F_1, F_2, various schematic examples)
– S (F_1, F_2, various schematic examples)
– M, W (F_1, F_2, various schematic examples)
– isoclines (schematic and undifferentiated)
– antiformal (F_1, F_2, F_2)
– synformal (F_1, F_2, F_2)
– interference pattern, with plunge
Minor fold axes – F_1 (inclined, vertical, horizontal)
– F_2 (inclined, vertical, horizontal)
β lineations – F_1 (crenulations, mullions, intersections)
– F_2 (crenulations, intersections)
– F_1 (oblique pitch) on S_O + A/LP, on A/LP, on A_1, on A_1
α lineations – L_1 (inclined, vertical, horizontal)
– L_2 (inclined, vertical, horizontal)
– L_1 (mineral, aggregate, rodding, undifferentiated)
– L_1 (horizontal) on A/LP; (subhorizontal) on A_1; (vertical) on A_1
(oblique pitch) on S_O, S_P, A_1, A_2/LP, A/LP, S_O + A/LP
(down dip) on A_1, A_2/LP, A/LP, L-MP
– in shear zones [L_S] (inclined)
α lineation parallel β lineations or equivalent structures (inclined) L + F_1, L + F_2
Glacial lineations – striae (direction known, unknown)
– roche moutonée
Combined glacial features – roche moutonée + striae
Current direction (foresets)
Younging direction (grading, pillows, cross bedding)
Mineral occurrence (sulphides, magnetite, Fe/Ti oxides, undifferentiated Fe, Cu stain) — py, mt, ox, Fe, Cu
Major gossan (pyrrhotite – chalcopyrite mineralization) — G
Age-date locality, age in millions of years — 1576 ± 10¹ U-Pbz,c

U – Pb......Uranium – lead	*z.......zircon*	*c.......concordia age*
Rb – Sr....Rubidium – strontium	*t........titanite*	*d.......discordia age*
K – Ar......Potassium – argon	*w......whole rock*	*i........isochron age*
	h.......hornblende	
	b.......biotite	

upper intercept / lower intercept — 2682 ± 7¹ / 1638 ± 12³ U-Pbzt,d

Authors' current interpretations (see superscripts), for example — 2045 ± 54⁶ K-Arh
1 *Emplacement crystallization*
2 *Emplacement or thermal metamorphism*
3 *Approximate Pb-loss time*
4 *Possible early Middle Proterozoic metamorphism or heating*
5 *Incomplete re-equilibration*
6 *Uncertain*

Stromatolite-bearing float — △–11b⁴
Summer road
Earth-filled dyke

NOTES: *g, m and s respectively denote gentle, moderate and steep estimated readings. Wavy strike lines and dip ticks denote generalized measurement of undulating structures.*

Foliations: A_2/LP postdates A_1 but may be Archean or Lower Proterozoic; A/LP may be equivalent to A_1 or A_2/LP, or may be younger; L-MP is thought to be late Lower Proterozoic and to relate to the regional stress system at the time of emplacement of the North Pole Brook Intrusive Suite, but may be early Middle Proterozoic.

Minor folds, minor fold axes, α and β lineations; F_1 and L_1 are synchronous with the main foliation in the rock in which they occur; F_2 and L_2 relate to the refolding of the main foliations.

Locally, greater structural detail is to be found on Newfoundland Department of Mines and Energy Map 90-127 (Nunn, 1990).

Compiled by G.A.G. Nunn, 1990, 1991. Modifies Newfoundland Department of Mines and Energy Map 90-127 (Nunn, 1990).

Geology by R.F. Emslie (1962, 1963, 1967) and R.F. Emslie and R. Wares (1966) of the Geological Survey of Canada, Department of Energy, Mines and Resources, Ottawa, Ontario, and G.A.G. Nunn (1980, 1984) and G.A.G. Nunn, N. Noel and T. van Nostrand (1981) of the Geological Survey Branch, Department of Mines and Energy, Government of Newfoundland and Labrador, St. John's, Newfoundland.

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Copies of this map may be obtained from the Publications and Information Section, Geological Survey Branch, Department of Mines and Energy, P. O. Box 8700, St. John's, Newfoundland, A1B 4J6.

This map accompanies Geological Survey Branch Report 93-3, by G. Nunn.

Base maps, at 1:250 000 (NTS 13L) published in 1968 and converted to digital form in 1989 by the Surveys and Mapping Branch, Department of Energy, Mines and Resources, Ottawa (contours at 100 foot intervals).