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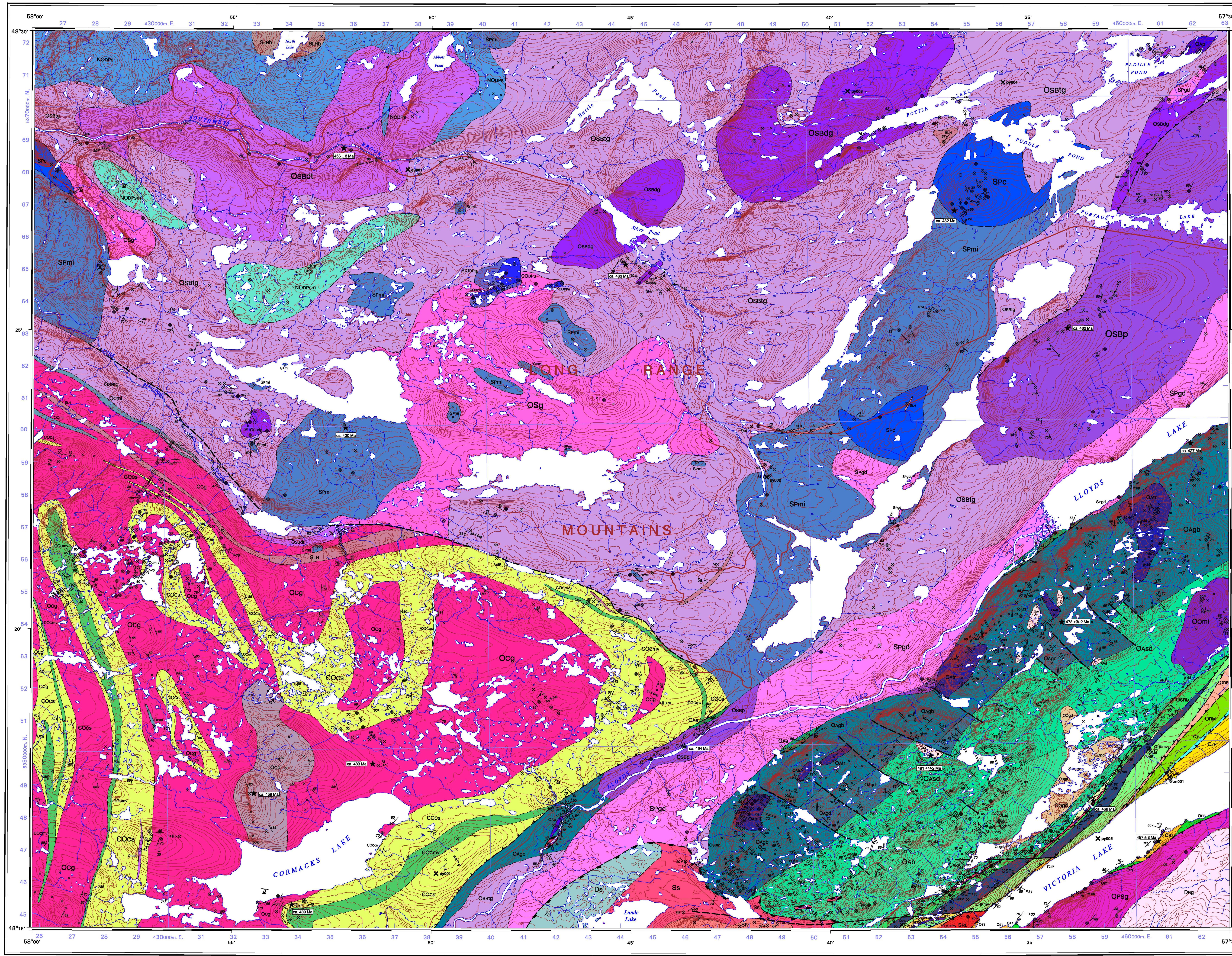
GEOLOGICAL SURVEY OF CANADA / COMMISSION GÉOLOGIQUE DU CANADA



LEGEND

(Ordovician and older rocks are generally foliated and metamorphosed, as are parts of the Silurian and Devonian sequences).

DEVONIAN

Ds — Grey sandstone, minor conglomerate.

NOTRE DAME/DASHWOODS SUBZONES

SILURIAN

Sfv — *Mainly aphyric grey and red rhyolite, volcanic breccia and lapilli tuff. Locally interbedded with red sandstone and limestone.*

Ss — *Red sandstone, minor arkose and conglomerate.*

LAKE OF THE HILLS INTRUSIVE SUITE (circa 430 Ma)

SLH — *Undivided, pink to white granitic to granodioritic rocks.*

SLHb — *Pink to red, medium- to coarse-grained, biotite-amphibole subsolvus granite.*

PUDDLE POND COMPLEX (circa 431 Ma)
Complex includes Main Gut and related intrusions.

SPgd — *Unfoliated to foliated, medium- to coarse-grained, orange to white biotite-hornblende tonalite to biotite granite. Biotite is often replaced by chlorite. Contains locally megacrysts of K-feldspar.*

SPmi — *Foliated to unfoliated, dark grey to green, mainly medium- to coarse-grained, partly amphibolitized equigranular to plagioclase-phyric hornblende diorite, gabbro, or diabase. Gabbro locally contains layers of pyroxenite and pegmatitic pods. Cut by pink felsic dykes of the Lake of the Hills Intrusive Suite (SLH). Mafic rocks commonly have mixed arc to non-arc-like compositions.*

SPc — *Foliated to unfoliated, mainly layered cumulate sequence of anorthosite, troctolite, olivine norite, norite, gabbronorite, olivine gabbro, and gabbro, with minor pyroxenite. Minor alteration to epidote, hornblende and/or actinolite and chlorite.*

ORDOVICIAN–SILURIAN

OSg — *Foliated to unfoliated biotite granodiorite and/or granite, locally with K-feldspar megacrysts. May in part be equivalent to SPgd. Some granites contain muscovite. Also includes biotite-muscovite granite, which may in part be equivalent to the Lake of the Hills Intrusive Complex.*

ORDOVICIAN

SOUTHWEST BROOK COMPLEX (circa 461 Ma)

OSBp — *PORTAGE LAKE GABBRO. Foliated to unfoliated, medium- to coarse-grained, two feldspar porphyritic hornblende monzogabbro to monzonite. Characteristically contains abundant lath shaped, feldspar phenocrysts with variable degrees of haematization and epidote alteration.*

OSBtg — *Generally well foliated, white, medium- to coarse-grained, mainly biotite- and/or hornblende-bearing, tonalite and/or granodiorite. Includes minor quartz-diorite. Commonly contains abundant mafic enclaves or schollen of diorite, amphibolite, and hornblendite. Mafic enclaves or schollen are locally so abundant that the rock appears agmatitic. The mafic enclaves/schollen in part probably represent relict co-mingling structures largely destroyed by continuous veining by tonalite. Commonly displays epidote alteration. Locally include crosscutting pink muscovite-bearing aplite, granite and pegmatite dykes of the Lake of the Hills suite (SHL) and gabbro or diorite of the Puddle Pond Complex (SPmi).*

OSBdt — *Generally well foliated, medium- to coarse-grained, biotite and hornblende-bearing quartz diorite and/or tonalite. Characteristically contains abundant blue quartz eyes and displays various degrees of epidote alteration. Agmatite structure due to enclaves or schollen of amphibolite and hornblendite is common. Contains locally aplite and pegmatite dykes, and massive quartz xenoliths (2–5 cm). Is intruded by members of OSBtg.*

OSBdg — *Generally well foliated, grey, fine- to medium-grained, biotite bearing, hornblende diorite, hornblende gabbro, amphibolite, and rare hornblendite. Locally contains abundant tonalite dykes and veins (OSBtg).*

LOWER–MIDDLE ORDOVICIAN

RED INDIAN LAKE GROUP (Arenig–Llanvirn)

OHB — *HEALY BAY FORMATION (Llanvirn): mainly light grey to white, ash to quartz crystal tuff, minor rhyolite, volcanogenic sandstone, and shale. All lithologies are locally interlayered with red shale and/or chert.*

OHRgb, OHRmv₁ — *HARBOUR ROUND FORMATION (Llanvirn): mainly green to red haematized, pillow to massive basalt, pillow breccia, diabase, gabbro (OHRgb), and andesite. All lithologies are interlayered with red chert and shale, whereas the pillow basalt locally contains interstitial limestone. The basaltic rocks are divided into two members separated by a largely volcanogenic polymictic conglomerate. The basalt stratigraphically below the conglomerate exhibit predominantly island-arc to transitional island-arc/back-arc compositions (OHRmv1). The upper basalt is predominantly calc-alkaline.*

OTTER POND COMPLEX (Arenig–Llanvirn)

Oo, Oogd, Oomi — *Mainly white to beige, aphyric, banded, strongly foliated muscovite rhyolite. Locally interlayered with graphitic schist, mica schist and amphibolite. Dated at circa 468 Ma. Oogd: Massive to weakly foliated buff to pink, fine-to medium-grained hornblende ± biotite granodiorite to tonalite (Oomi). Massive to foliated gabbro to diorite characteristically contains brown hornblende oikocrysts and phenocrysts.*

LLOYDS RIVER OPHIOLITE SUITE (Arenig–Llanvirn)

OSRg, OSRd, OSRb — *STAR BROOK IGNEOUS SUITE: Mainly greenschist to amphibolite facies gabbro (OSRg), sheeted diabase (OSRd), pillow basalt (OSRb). Mafic rocks have predominantly MORB-like compositions.*

LOWER ORDOVICIAN

ANNIEOPSQUOTCH (A)
OPHIOLITE COMPLEX (circa 480 Ma)
Mafic rocks have predominantly suprasubduction zone chemical characteristics.

OAt — *Mainly white, medium- to coarse-grained trondhjemite.*

OAb — *Foliated to unfoliated, mainly fine-grained pillow basalt. Variably altered to amphibolite or greenschist-facies assemblages. Contains diabase dykes.*

OAsd — *Sheeted diabase complex. Mainly variably altered to amphibolite and/or greenschist-facies assemblages. Locally includes some transition zone rocks.*

OAgd — *Transition zone between gabbro and sheeted diabase complex (25–75 % dykes). Mainly variably altered to amphibolite and/or greenschist-facies assemblages.*

OAgb — *Mainly foliated to unfoliated, medium-to very coarse-grained, layered to massive gabbro, olivine gabbro and oxide gabbro. Contains locally pyroxenite layers, pegmatitic gabbro, and is cut by diabase to trondhjemite dykes. Variably altered to amphibolite and/or greenschist-facies assemblages.*

OAtr — *Enclaves of mainly layered troctolite, olivine gabbro, and minor anorthosite, included in and cut by gabbro (OAgb) and minor diabase dykes.*

OAa — *Mainly mylonitic to moderately foliated amphibolite, probably highly metamorphosed equivalent of unit OAgb. Commonly interlayered with syntectonic sheets of tonalite and diorite of the Southwest Brook Complex. Locally may include screens of paragneiss.*

OAp — *Mainly peridotite. Commonly metamorphosed to olivine, anthophyllite/cummingtonite, talc and serpentine-bearing assemblages.*

NEOPROTEROZOIC TO MIDDLE ORDOVICIAN

CORMACKS LAKE COMPLEX (> 455 Ma)

OCc — *Weakly to unfoliated, beige medium-grained, pyroxene and locally garnet-bearing granite (charnockite).*

OCg — *Mainly well-banded granodiorite to tonalite orthogneiss (circa 483 Ma).*

OCmi — *Metagabbro.*

ЄOCmv — *Strongly foliated; locally pillowed or layered mafic volcanic rock. Probably also includes minor diabase and gabbro. Generally intensely metamorphosed into garnet and/or clinopyroxene-bearing amphibolite. Some mafic rocks contain layers rich in gedrite, which suggest that some volcanic rocks experienced pre-metamorphic hydrothermal alteration.*

ЄOCs, ЄOCcs — *Strongly foliated, generally strongly migmatitic sillimanite-garnet schist commonly interlayered with abundant gedrite ± cordierite rock, minor metapsammite, and rare calcsilicate (ЄOCcs). Sequence in part has a felsic volcanic protolith dated at circa 489 Ma. Locally interlayed with ЄOCmv.*

DENNIS POND COMPLEX (> 488 Ma)

ЄODPg — *Mainly gabbro. Includes minor troctolite and trondhjemite.*

ЄODPu — *Mainly layered ultramafic rock. Includes dunite, harzburgite, lherzolite, wehrlite, websterite, pyroxenite. Locally contains chromite-rich layers. Also includes minor gabbro and trondhjemite. Variably metamorphosed and altered to antophyllite, cummingtonite, serpentine, talc, and chlorite.*

NODPsm — *Characteristically unlayered and chaotic, strongly metamorphosed and migmatitic mélange, consisting of abundant large blocks and cobbles of mafic rocks in a pelitic to semipelitic matrix.*

NODPs — *Mainly meta psammite and pelite. Layering generally poorly preserved, in part due to strong migmatization and possibly partly due to mélange formation prior to metamorphism and migmatization. Locally includes lenses of mafic and/or calc-silicate rocks. Generaly correlated with parts of the Fleur de Lys Supergroup.*

EXPLOITS SUBZONE

SILURIAN

BOTWOOD GROUP

SRL — *ROGERSON LAKE FORMATION (Lower Silurian): mainly red to grey, polymictic conglomerate, and minor micaceous sandstone and siltstone. Rare limestone beds. Clasts are dominantly derived from underlying volcanic and plutonic rocks, but also include jasper, shale and red sandstone. Locally includes diabase and gabbroic dykes.*

CAMBRIAN–MIDDLE ORDOVICIAN

Omi — *Generally well foliated amphibolitic gabbro and diabase.*

RED CROSS GROUP (Arenig–Caradoc)

OPF — *PINE FALLS FORMATION (Llanvirn–Caradoc): mainly light greyish-green to green basalt.*

OST — *STORM BROOK FORMATION (Arenig–Llanvirn): mainly felsic tuffaceous sandstone, conglomerate, siltstone and shale; locally pyritiferous, rare limestone, quartz and feldspar porphyritic to aphyric felsic to intermediate volcanic rock, and minor basalt and associated gabbro ranging in composition from E-MORB-like to alkalic. The volcanic rocks are designated as the Carter Lake Member. The clastic sedimentary rocks are commonly graded and locally contain abundant dark grey to black quartz xenocrysts.*

VICTORIA LAKE SUPERGROUP
WIGWAM BROOK GROUP

ODP — *DRAGON POND FORMATION (Arenig–Caradoc): mainly grey to light brown, felsic pyroclastic (ash tuff, tuff, lapilli tuff, and tuff breccia) and epiclastic rocks.*

SUTHERLANDS POND GROUP (Llanvirn–Caradoc)

OTC — *TIMS CREEK FORMATION (Llanvirn–Caradoc): black shale, minor limestone and volcanogenic siltstone and sandstone. In part transformed into broken formation or mélange.*

ORM — *VICTORIA RIVER MOUTH FORMATION (Llanvirn–Caradoc): green, tholeiitic pillow basalt, compositionally E-MORB-like, locally interlayered with limestone. Contains minor rhyolite.*

PATS POND GROUP (Upper Cambrian–Tremadoc)

ЄOPPfv — *Mainly light green, bimodal volcanic breccias; minor fine-grained basaltic dacitic tuffs and quartz and feldspar porphyritic dacitic rocks.*

TULKS GROUP (Upper Cambrian)

ЄJP — *JACKS POND FORMATION: mainly light grey to brown quartz- and/or feldspar-phyric tuff, lapilli tuff, volcanic breccia (Daniels Pond pyroclastics) and aphyric, locally flow-banded rhyolite (Mount Joshua rhyolite). Locally includes massive and/or disseminated sulphide mineralization.*

MEELPAEG SUBZONE

DEVONIAN

NORTH BAY GRANITE SUITE

DBg — *Medium- to coarse-grained, generally light red to grey K-feldspar porphyritic to equigranular biotite granite (Buck Lake phase dated at circa 404 Ma) and granodiorite. Locally contains grey to white, equigranular hornblende-bearing quartz diorite to granodiorite and muscovite ± garnet granite. Planar and linear structures are generally moderately to weakly developed or absent. Foliation is generally well developed close to shear zones. Locally includes patches of migmatite and screens of paragneiss.*

CAMBRIAN–MIDDLE ORDOVICIAN

PETER STRIDES GRANITOID SUITE

OPSg — *Grey to light red, generally strongly foliated, medium-grained biotite granodiorite and granite (circa 467 Ma).*

SYMBOLS

- *Geological boundary (approximate, assumed)*
- *Fault, undefined (approximate or assumed)*
- *Thrust fault, undefined (approximate or assumed)*
- *Normal fault (approximate or assumed)*
- *Unconformity (approximate or assumed)*
- *Outcrop: this study (single, area)*
- *Outcrop compiled (Dunning, 1984; Herd and Dunning, 1979; van Berkel and Currie, 1988)*
- *Bedding, top known (inclined)*
- *Bedding, top unknown (inclined)*
- *Bedding, top known, from pillow lavas, dip if known (inclined)*
- *Foliation: S_1, main and/or composite (inclined, vertical)*
- *Foliation (generation – S_2, S_3, S_4)*
- *Lineation: main, mineral or extension*
- *Lineation: hinge or intersection (L_1, L_2)*
- *S-fold, plunge and plunge direction (generation - F_2)*
- *M-fold, plunge and plunge direction (generation - unknown, F_2)*
- *Sense of fold asymmetry*
- *Dyke (inclined, vertical)*
- *Shear zone (sense of motion - dextral, sinistral)*
- *Igneous Layering*
- *U-Pb zircon age determination* — 456 ± 3 Ma
- *Mineral occurrence; National Mineral Inventory Number* — Au002

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Table 1. U-Pb geochronology

Sample number	NL geochron database	UTM (zone 21, NAD 83) easting	UTM (zone 21, NAD 83) northing	Crystallization age / Ma	Year of analysis	Laboratory	Reference
80-HPAD-222	8051	453669	5349618	481 +4/-2	1985	ROM	Dunning and Krogh (1985)
80-HPAD-223	8052	457769	5353718	478 +3/-2	1985	ROM	Dunning and Krogh (1985)
81-GD-219	8106	435669	5368618	456 ± 3	1989	ROM	Dunning et al. (1989)
MRB01-005 (z7508)		457960	5362618	ca. 462	2002	GSC	Lissenberg and McNicoll, unpublished
MRB01-007 (z7099)		435635	5359962	ca. 430	2002	GSC	Lissenberg and McNicoll, unpublished
PQB01-007 (z7138)		433868	5344937	ca. 489	2002	GSC	McNicoll and Pehrsson, unpublished
PQB01-017 (z7139)		436730	5349260	ca. 483	2002	GSC	McNicoll and Pehrsson, unpublished
VL01-9107		460700	5346900	457 ± 3	2002	GSC	Valverde-Vaquero et al. , 2005
VL01-A258 (z7313)		458607	5348154	ca. 468	2002	GSC	Zagorevski and McNicoll, unpublished
VL01-J016 (z7153)		446038	5349989	ca. 464	2002	GSC	Lissenberg et al., in press b
VL01-J120 (z7508)		458040	5362821	ca. 462	2002	GSC	Lissenberg et al., in press b
VL02-021A (z7506)		444364	5364923	ca. 463	2003	GSC	McNicoll and van Staal, unpublished
VL02-J185 (z7644)		461784	5359353	ca. 427	2003	GSC	Lissenberg et al., In press b
VL02-J294 (z7517)		454561	5366499	ca. 432	2003	GSC	Lissenberg et al., in press b
VK87-NF2		432660	5348662	ca. 459	2005	GSC	McNicoll and van Staal, unpublished

GSC - Geological Survey of Canada, Ottawa, Canada
ROM - Royal Ontario Museum, Toronto, Canada

Table 2. Mineral occurrences

Mineral Occurrence[1]	UTM (zone 21, NAD 83) easting	UTM (zone 21, NAD 83) northing	Name	Commodity	Status
Cu001	437645	5367930	Southwest Brook	Cu, Au, Ag	Indication
py001	438300	5346110	Cormacks Lake East	py	Indication
py002	448670	5358300	Burgeo Road	py	Indication
py003	451290	5370230	Bottle Lake North	py, Fe	Indication
py004	456110	5370465	Bottle Lake	py	Indication
py005	458820	5347000	Victoria Lake Northwest	py	Indication
Zn001	461060	5348880	Unnamed Brook	Zn, Pb	Showing

Notes:
Modified after the Mineral Occurrence Data System (MODS) of the Geological Survey of Newfoundland and Labrador.
1 - National Mineral Inventory Number has the form 012A/05/Cu 001

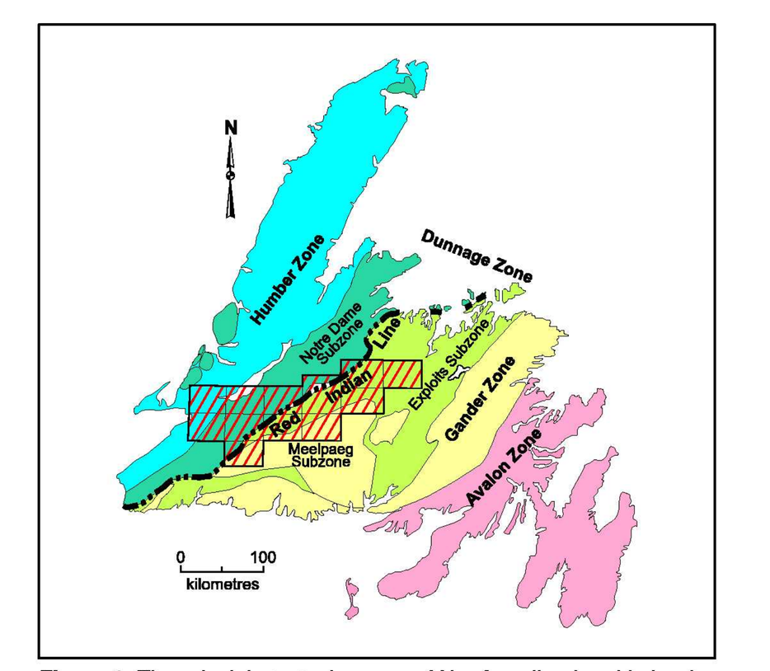
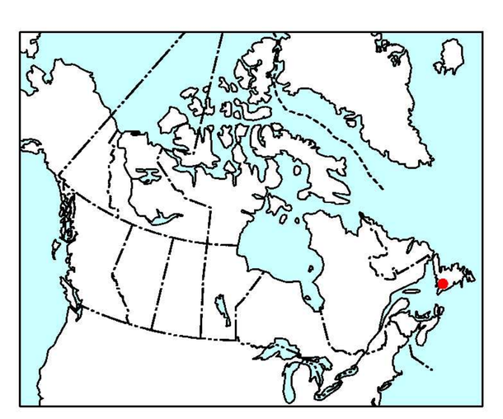


Figure 1. The principle tectonic zones of Newfoundland and Labrador and the position of the Red Indian Line.



LOCATION MAP

Authors: C.R. van Staal, C.J. Lissenberg, S. Pehrsson, A. Zagorevski, P. Valverde-Vaquero, R.K. Herd, V.J. McNicoll, and J. Whalen

New geology and interpretation by C.R. van Staal, C.J. Lissenberg, S. Pehrsson, A. Zagorevski, P. Valverde-Vaquero, and J. Whalen (2000–2003)

Additional unpublished geological and geochronological data from R. Herd (1979) and V.J. McNicoll (2001–2003)

Geological compilation by C.R. van Staal and N. Rogers (2003)

Pre-existing geological data presented on map compiled from Dunning, (1984), Herd and Dunning, (1979), and van Berkel and Currie, (1988)

Distribution of units and position of geological boundaries in part inferred from geophysical data (Oneschuk et al., 2001, 2002)

OPEN FILE 1664

GEOLOGY

PUDDLE POND

NEWFOUNDLAND AND LABRADOR

Scale 1:50 000/Échelle 1/50 000

kilometres 1 0 1 2 3 4 kilomètres

Universal Transverse Mercator Projection
North American Datum 1983

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983

Digital cartography by P. St-Amour, Earth Sciences Sector Information Division (ESS Info)

This map was produced from processes that conform to the ESS Info Publishing Services Subdivision Quality Management System, registered to the ISO 9001: 2000 standard

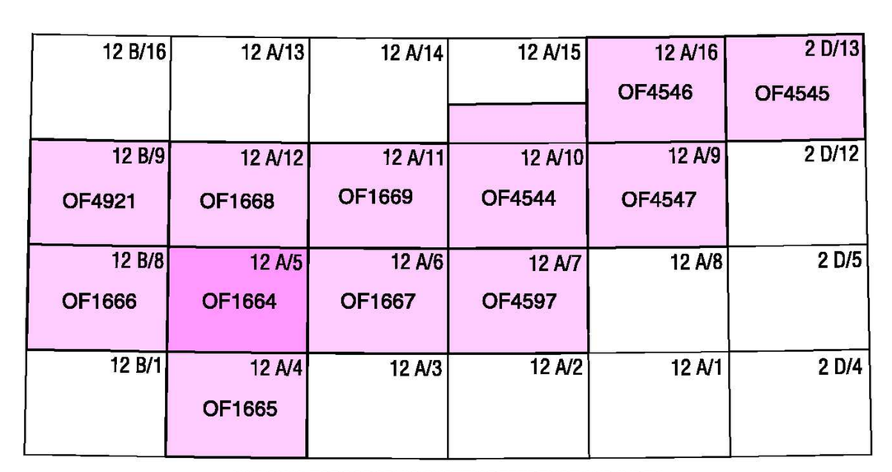
Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

Digital base map from data compiled by Geomatics Canada, modified by ESS Info

Some geographical names subject to revision

Mean magnetic declination 2005, 21°27′W, decreasing 10.1′ annually

Elevations in metres above mean sea level



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

The Targeted Geoscience Initiative is a federally funded program of the Geological Survey of Canada (GSC), carried out with the collaboration and in-kind support of the Geological Survey of Newfoundland and Labrador (GSNL).

The Red Indian Line Project has been conducted by the GSC in areas previously mapped by the GSNL and the GSC. Results of the project have been combined with existing geological and geophysical maps, and unpublished industry data, to produce a new compilation of the geology.

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