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LEGEND - ROBERT'S ARM VOLCANIC BELT AND ADJACENT ROCKS

Newfoundland Labrador
Natural Resources

POST-METAMORPHIC COVER
LATE DEVONIAN TO LATE MISSISSIPPIAN?
TAILINGS POND SEQUENCE

MD:T Variably indurated, terrestrial sedimentary strata

MD:Tcm — Tailings Pond polymictic conglomerate: Generally a poorly exposed redbed molasse, including massive to poorly stratified polymictic conglomerate distinguished by well-rounded clasts of plutonic, volcanic, hypabyssal and metamorphic rocks; in drillcore, boulder and cobble conglomerate having detrital clasts of chloritic metabasalt and quartz-sericite schist together with strongly foliated clasts hosting tightly folded veinlets of quartz, carbonate and pyrite (similar to southeasterly adjacent rocks in the Gullbridge structural tract); abundant clasts of red hematized syenite, pink pyritic microgranite and grey saussuritized granodiorite (similar to rocks in units SD:SHs, SD:Tlgbgt and eS:Tlsb of the Topsails plutonic suite); distinctive outsized clasts of orange ignimbrite (similar to rocks in Unit S:SVf1 of the basal Springdale Group); minor, highly friable, crosslaminated beds of reddish brown siltstone, dark grey mudstone and light green argillite displaying reduction spots and having secondary podiform lenses of brecciated carbonate

Note 1: The Tailings Pond sequence (Unit MD:T) is restricted to a small depocentre located near the South Brook Fault. It was probably deposited nonconformably above several map units of plutonic and hypabyssal rocks within the Topsails igneous terrane of Whalen and Currie (1988). However, in places along the southeast margin of Unit MD:T, the contact with underlying older rocks is observed to be a northwest-dipping, moderately inclined fault. As seen in drillcore from the area northeast of Diamond Pond, such fault structures are associated with graphitic and chloritic zones of random-fabric cataclastite.

Note 2: The conglomerate and mudstone of Unit MD:Tcm are possibly the partial equivalent of some of the Carboniferous redbed sequences found in two pocket basins situated along the trace of the Green Bay Fault, one in the Indian Pond-Black Brook area (Unit MS:sc; O'Brien, 2011) and the other in the King's Point area (Unit MS:mc; O'Brien, 2012). Unit MD:Tcm could possibly be the equivalent of rocks as old as the Tournesian Shanadithit Formation on Red Indian Lake or as young as the Namurian Humber Falls Formation north of Deer Lake.

Plutonic rock units not included in the Robert's Arm volcanic belt
MID PALEOZOIC INTRUSIONS
UNMETAMORPHOSED INTRUSIVE ROCKS

SILURO-DEVONIAN?
TOPSAILS PLUTONIC SUITE

SD:SH and SD:TI Post-lower Springdale Group intrusive rocks

SD:Tlgbgt — Gull Brook granite: Mainly monzonite-hosted graphic granite, hematized syenite, quartz–feldspar porphyry, and diabase dykes; massive, isotropic, light grey to pink, coarse-grained, plagioclase porphyritic, hornblende–biotite monzonite intruded by numerous microgranitic dykes and epidote–chlorite–quartz veins; light grey, very fine-grained graphic granite having rare biotite microlites; medium-grained, dark pink to light red, equigranular, potassium feldspar-phyric syenite displaying biotite and chlorite pseudomorphs after amphibole phenocrysts; brick red quartz syenite having abundant accessory grains of hematite after perthite, particularly near texturally destructive replacement zones dominated by cubic pyrite; sericitized granophyre preserving resorbed quartz prisms and having secondary albite; fault breccia (hosted by silicified microgranite) injected by right-hand en echelon diabase dykes and quartz–carbonate veinlets; dark grey, light green, dark pink and brownish orange (variegated) granite adjacent to very closely spaced joints in multidirectional fracture zones

Note 3: In the map area, plutonic rock units previously included in the Topsails igneous terrane (cf. Whalen and Currie, 1988) or the Topsails igneous suite (cf. Whalen, 1989) have been separated from the constituent volcanic rocks. Here, they are informally assigned to the Topsails plutonic suite.

Note 4: Although locally faulted against its Carboniferous cover (Unit MD:Tcm), the Silurian or younger Gull Brook granite (Unit SD:Tlgbgt) intruded the Early Ordovician metaplutonic rocks of the Hall Hill and Mansfield Cove complexes and the tectonically adjacent younger rocks of the Robert's Arm volcanic belt after these units had been tectonically stitched by the Early Silurian South Brook granodiorite (Unit eS:Tlsb).

SD:SHs — Skull Hill quartz syenite: Mainly quartz syenite, perthitic granite and granophyre; massive, isotropic, light pink to red, medium- to fine-grained, potassium feldspar-phyric quartz syenite locally displaying porphyritic biotite laths and interstitial quartz; minor, light grey to pink, medium-grained, equigranular, hornblende–biotite quartz monzonite; subordinate, medium- to coarse-grained, potassium feldspar-rich granite having pink perthitic megacrysts; dark red, fine-grained micrographic porphyry; maroon, quartz porphyritic granite net-veined by jasper; brick red hematitized granophyre; each intruded by conjugate dykes of porphyritic and aphanitic diabase, quartz–feldspar porphyry and aplite veins (Skull Hill Quartz Syenite of Kean and Jayasinghe, 1982; Williams et al., 1985; Evans et al., 1994)

Note 5: Based solely on geophysical interpretation, unseparated enclaves of block-faulted sedimentary strata from the Springdale Group (Unit S:SS) may be present within the Skull Hill quartz syenite (Unit SD:SHs) in the area to the south and east of the South Brook granodiorite (Unit eS:Tlsb).

Note 6: In the South Brook valley, rocks assigned to units SD:SHs and SD:Tlgbgt probably intruded both the older granodiorites of the Topsails plutonic suite and the terrestrial volcanic strata of the Silurian Springdale Group.

SD:SHs? — Skull Hill syenite: Mainly subcrop of syenite and granite within an unexposed extension of Unit SD:SHs

SD:SHp — Skull Hill felsic porphyry: Mainly quartz–feldspar porphyry, diabase dykes and aplite veins; massive, isotropic, light grey, fine-grained quartz–feldspar porphyry and porphyritic hornblende–biotite microgranite comprising apophyses and epiphyses of Unit SD:SHs; satellite bodies of saussuritized felsic porphyry having abundant pyrite cubes, sericite overgrowths and secondary albite; in the area southeast of Election Pond, later sheets of fresh gabbro intruded by fractured diabase dykes and offset aplite veins (possibly part of Unit 12a of Evans et al., 1994)

SD:SHd — Skull Hill diorite: Mainly discrete isotropic bodies of saussuritized diorite and amygdaloidal gabbro; massive, dark grey, medium-grained, equigranular diorite and subordinate, coarse-grained, quartz-bearing gabbro occurring as satellite bodies and marginal sheets to the Skull Hill Quartz Syenite (predating units SD:SHs and SD:SHp in certain localities); in places, silicified pyritic diorite displaying hematite−carbonate−sericite pseudomorphs after plagioclase and having common antiperthite; includes part of Unit SD:gd of Swinden and Sacks (1996).

Note 7: A group of northwest-trending bodies of altered diorite and quartz gabbro assigned to Unit SD:SHd predate the Skull Hill Quartz Syenite and the Skull Hill quartz–feldspar porphyry. Although most of these mafic intrusions postdate the Skull Hill Brook granodiorite (Unit eS:Tlsh), some of them may be intruded by Unit eS:Tlsh and correlate instead with the older metagabbros of Unit eS:Tldpgb.

SILURIAN?
HODGES HILL INTRUSIVE SUITE

S:HI Post-metamorphic plutonic suite in the Robert's Arm volcanic belt

S:HIrpdr — Rocky Pond diorite: Mainly massive, isotropic, dark grey, medium-grained, equigranular diorite, locally displaying a chilled margin against mariolitic granophyre; subordinate, block-faulted pyritic bodies of fine-grained diorite porphyry intruded as multiple sheets into an equigranular diorite host; minor, silicified, carbonatized and sericitized diorite dykes crosscut by fresh porphyritic diabase; diorite-hosted quartz veins preferentially injected along northwest-trending fractures; leucogranitic dykes and dykelets (similar to those within Unit S:HIrpg, see below) emplaced along conjugate joints in Unit S:HIrpdr diorite

S:HIrpg — Rocky Pond granite: Mainly massive, isotropic, light grey to pink, medium-grained, equigranular, potassium feldspar-rich and plagioclase-bearing quartz monzonite having interstitial biotite and minor hornblende, best developed along the northern periphery of the Rocky Pond granodiorite (see below); minor, fine-grained leucogranite having porphyritic biotite and seen in gradational contact with monzonite or as epidotized veins crosscutting monzonite and granodiorite; fresh satellite bodies of leucocratic microgranite and rare aplite dykes in metasedimentary country rocks; chlorite-carbonate-quartz veins hosted by quartz monzonite predominantly along northwest-trending fractures associated with lateral faults; near Tommy's Arm River, a brecciated fluorite-bearing apophyse of the Rocky Pond granite having macroscopic fault gouges cemented by chalcedonic quartz, ferruginous carbonate and pyrite

North Twin Lake granodiorite: Mainly massive, isotropic, light grey, medium-grained, equigranular, hornblende–biotite granodiorite intruded by porphyritic diabase dykes; massive, grey, fine-to medium-grained, plagioclase porphyritic leucodiorite having biotite-rich schlieren; minor, massive, ...

EARLY SILURIAN
HODGES HILL INTRUSIVE SUITE

eS:HI Post-metamorphic plutonic suite in the Robert's Arm volcanic belt

EARLY SILURIAN
TOPSAILS PLUTONIC SUITE (CONTINUED)

eS:TI Post-metamorphic intrusive suite in the Robert's Arm volcanic belt

eS:Tldpgt — Dawes Pond granite: Mainly massive, isotropic, medium-grained, light grey, potassium feldspar-phyric quartz monzonite having abundant biotite, titanite and ilmenite; minor, fine-grained, porphyritic biotite granite, high-silica granite and microgranitic porphyry; variably oriented enclaves of pyrrhotite-bearing cordierite schist (Baker Brook structural tract of the Robert's Arm volcanic belt) in the southeastern part of the Dawes Pond granite and large accidental xenoliths of actinolite schist (Gullbridge structural tract) in the northwestern part of the map unit; all of the above plutonic rocks hosting swarms of minor intrusions, including subvertical sheets of quartz-feldspar porphyry, multiple diabase dykes, and aplite veins; Unit eS:Tldpgt rocks are complexly cross faulted and partially surround the Dawes Pond granodiorite (Unit eS:Tldpgd, see below)

eS:Tldpgd — Dawes Pond granodiorite: Mainly massive, isotropic, medium-grained, light grey to pink, hornblende–biotite granodiorite; a highly magnetic, coarse-grained, hornblende-rich granodiorite marked by copious cognate igneous xenoliths (or mafic restite) and having partially replaced enclaves of biotite-bearing epidiorite; along the margin of Unit eS:Tldpgd, near Powderhorn Lake, non-hornfelsed (unmetamorphosed) granodiorite back veined by porphyritic pillowed gabbro; unaltered sheets of equigranular quartz diorite crosscutting epidotized pillowed gabbro and glomerophyric gabbro having abundant magnetite and secondary titanite; many of the pre-granodiorite mafic intrusions located near the pluton margin are net-veined but unfoliated

eS:Tlsb — South Brook granodiorite: Mainly silicified granodiorite, quartz diorite, diabase dykes and aplite veins; very poorly exposed, light grey, medium-grained, isotropic, equigranular hornblende–biotite granodiorite; minor, dark grey, fine-grained, melanocratic phase of quartz diorite having poikilitic amphibole in two localities (E551950 N5436551; E549600 N5433062); where magma-sealed joints predominate, grey granodiorite intruded by partially assimilated swarms of back-veined mafic dykes; a light pink to rose (silicified, hematized and pyritized) granodiorite having subvertical fault breccias cemented by coarse-grained red syenite and intruded by aphanitic diabase dykes. Modified from Unit DgT (Dean, 1977d), a small granitic stock purported to be hosted by rocks of the Silurian Springdale Group on the north bank of South Brook

eS:Tlsh — Skull Hill Brook granodiorite: Mainly coeval granodiorite and gabbro crosscut by quartz–feldspar porphyry; massive, light grey, isotropic, medium-grained, equigranular, hornblende–biotite granodiorite displaying commingling relationships with iron oxide-rich pillowed gabbro; in places, fresh granodiorite dykes intruding non-hornfelsed screens of medium-grained equigranular gabbro marked by abundant epidote–quartz veinlets; also locally, granodiorite intruded by partially digested sheets of coarse-grained gabbro transitional to fine-grained xenocrystic gabbro porphyry; in other areas, granodiorite bodies having zones of globular gabbro illustrating disaggregated chilled margins or cuspate and lobate edges; in a few localities, gabbroic dykes belonging to Unit eS:Tlsh displaying straight chilled margins where they crosscut granodiorite and adjacent country rocks; southwest of Dawes Pond, quartz diorite bodies having iron-oxide−amphibole pseudomorphs after orthopyroxene hosted by massive granodiorite assigned to Unit eS:Tlsh; in the same area, northeast-trending intrusive bodies of pyritic quartz–feldspar porphyry, tentatively assigned to Unit SD:SHp, crosscut thin sheets of the Skull Hill Brook granodiorite, the altered diorites and the fault structures in adjacent rocks of the Gullbridge structural tract

eS:Tljg — Little Joe Glodes Pond granodiorite: Mainly poorly exposed granodiorite in the northeastern block-faulted portion of the pluton; massive, light grey to pink, isotropic, medium-grained, equigranular, hornblende-biotite granodiorite; abundant hematite−silica alteration along joints and lineaments in pinkish-red to rose granodiorite; in places, composite mafic-felsic porphyritic dykes forming vertical swarms within Unit eS:Tljg, particularly near the faulted margins of the intrusion; immediately southwest of the limit of this geological map, the posttectonic Little Joe Glodes Pond granodiorite intrudes Ordovician metamorphic rocks from the Hungry Mountain Complex as well as strata from some of the structurally highest tracts of the Robert's Arm volcanic belt (O'Brien, 2009).

Note 14: Unit eS:Tldpgd is here correlated with a regionally extensive subdivision of the Topsails intrusive suite (Unit Sp; Whalen and Currie, 1988) that was initially mapped in the northeastern part of the Topsails igneous terrane and radiometrically dated near the Gaff Topsail at 429+/- 3 Ma. However, Unit eS:Tldpgd has also been assigned to the Hodges Hill intrusive suite and previously considered as a satellite body of that batholith (Dickson, 2001).

Note 15: An radiometrically dated Early Silurian granite (Unit eS:Tldpgt) forms the marginal outer phase of a concentrically zoned pluton that underlies Dawe's Pond. Here, a high-silica granite and related porphyritic microgranite (Dickson, 2004a; b) within Unit eS:Tldpgt directly abuts the more magnetic Dawes Pond granodiorite (Unit eS:Tldpgd), although their original intrusive contact has not been observed. The informal term, Dawes Pond granodiorite (cf. Dickson, 2001), replaces Dawes Pond granite (Swinden and Sacks, 1996).

Note 16: North of Powderhorn Lake, vertical satellite dykes of an older altered gabbro and a younger fresh diorite display straight chilled margins where they crosscut flat-lying metamorphic country rocks outcropping between the Dawes Pond granodiorite (Unit eS:Tldpgd) and the Crooked Lake gabbro (Unit eS:HIclgb).

Note 17: Together, the posttectonic plutonic rocks included in units eS:Tldpgt and eS:Tldpgd serve to tectonically stitch the upper and lower structural tracts of the Robert's Arm volcanic belt (thrust stack) in the vicinity of Dawe's Pond.

METAMORPHOSED INTRUSIVE ROCKS
LATE ORDOVICIAN – EARLY SILURIAN

Syn-metamorphic intrusions in schistose and gneissic rocks of the Robert's Arm volcanic belt

eS:Tldpgb — Dawes Pond metagabbro: Mainly grey-green, medium-grained granoblastic metagabbro; marginally foliated metagabbro sheets that crosscut and include screens of previously foliated and folded rocks (particularly as seen in flat-lying metabasites located at the tectonic base of the South Brook structural tract or in the tectonically underlying porphyroblastic metaturbidites of the Baker Brook structural tract); less common, regionally folded bodies of coarse-grained metapyroxenite locally illustrating relict clinopyroxene-rich cumulate bands at high angles to a secondary chloritic foliation; stratigraphically transgressive bodies of porphyritic mafic schist (having a penetrative dynamically recrystallized foliation and less common extension lineation) transitional to mafic granofelsic schist (having a poorly defined schistose foliation overgrown by granoblastic actinolite and biotite); a widespread, light grey, highly siliceous, isotropic mafic granofels (statically recrystallized throughout on the microscopic scale despite being locally fabric retentive on the mesoscopic scale); associated minor intrusions, viz., conjugate sets of composite aphanitic and porphyritic diabase dykes intruded across gently-plunging open folds of porphyritic metapyroxenite sills; viz., epidotized diabase dykes and coeval quartz porphyry intrusions emplaced into fold hinge zones and intruded along vertical fault breccias made up of silicified porphyroclasts of metagabbro and host metasedimentary schist; post-schistosity fibrous veins in metagabbro filled by syntaxial growths of albite–epidote–ferroan carbonate–calcite–clinozoisite–titanite–spessartine–pennite–quartz +/- sphalerite and arsenopyrite

OS:BPog — Tower Hill felsic orthogneiss: Mainly granodioritic orthogneiss, schistose granodiorite, metaporphyritic amphibolite, and nebulitic granite in agmatite; dominantly, light grey, medium-grained, well foliated quartz–plagioclase–hornblende–biotite gneiss having discontinuous dark green layers of hornblende-bearing restite concordant with gneissosity; distorted podiform lenses of epidotized amphibolite within felsic orthogneiss; wispy-foliated granodiorite locally having a preferred alignment of zoned plagioclase phenocrysts; platey-foliated granodiorite having a ribboned shape fabric defined by flattened and dip-lineated grains of blue quartz; schistose granodiorite transitional to biotite-bearing mylonite in shear zones at the margins of country rock enclaves; folded granite dykes intruding across the metamorphic foliation in flaser-banded orthoamphibolites set in agmatite; granodioritic orthogneiss (and injection migmatite) hosting concordant leucogranite stringers and foliated diabase dykes that outline pinch-and-swell structures back veined by intrusive gneiss

Note 18: Regionally metamorphosed intrusive rocks of mid-Paleozoic age are found as enclaves in younger posttectonic intrusions throughout the Topsails and Hodges Hill batholiths; however, in the map area, they are more common along the margin of the Hodges Hill intrusive suite. Though individually discontinuous, these sheared mafic-felsic intrusions form a regionally linear belt that extends from Burnt Pond in the north to Powderhorn Lake in the south.

Note 19: The mid-Paleozoic granodiorite and granite sheets of the Tower Hill orthogneiss (Unit OS:BPog) preferentially intrude the rocks of the Burnt Pond structural tract of the Robert's Arm volcanic belt, although some of them do also occur in tectonically adjacent strata within the Robert's Arm thrust stack. Consequently, country rock enclaves and accidental xenoliths of well-layered metasedimentary gneiss and migmatitic paragneiss (infiltrated by metagabbro) are commonly preserved within these regionally deformed and metamorphosed felsic intrusions.

Note 20: Synmetamorphic gabbros assigned to Unit eS:TI dpgb are infolded with schistose granodiorite from Unit OS:BPog and crosscut porphyroblast-rich paragneiss and hornfelsic schist from Unit mO:BPpg and Unit mO:BPhs, respectively. As observed in the section along the northern shore of Burnt Pond, each of the granofelsic varieties of Dawes Pond metagabbro is locally crosscut by undeformed veins of unmetamorphosed granodiorite. Unit eS:Tldpgb is thus distinguished from unmetamorphosed pillowed gabbros that are coeval with the posttectonic granodiorite bodies exposed near Skull Hill Brook (Unit eS:Tlsh), eastern Dawes Pond (Unit eS:Tldpgd) and the outflow of Rocky Brook into Paul's Lake (Unit eS:HIclgb).

Stratified rock units not included in the Robert's Arm volcanic belt
PRE-CARBONIFEROUS TERRESTRIAL COVER SEQUENCE
REGIONALLY METAMORPHOSED ROCKS (SILURIAN OR YOUNGER EVENT)

EARLY – MIDDLE SILURIAN
SPRINGDALE GROUP (lower part)

S:S Volcanosedimentary basin fill (Kings Brook sequence)

PRE-MIDDLE SILURIAN MARINE OVERSTEP SEQUENCES
REGIONALLY METAMORPHOSED ROCKS (SYN-SILURIAN EVENT)

LATE ORDOVICIAN – EARLY SILURIAN
BADGER GROUP (lower part)

OS:B Synorogenic turbidite basin fill (Badger Brook sequence)

LATE ORDOVICIAN
SHOAL ARM FORMATION

lO:SA Transgressive high-stand sedimentary cover (post-arc)

ROCKS FORMED IN THE IAPETUS OCEAN
Stratified rock units from the Exploits Subzone of the Dunnage Zone
REGIONALLY METAMORPHOSED ROCKS (SYN-SILURIAN EVENT)

MIDDLE ORDOVICIAN
WILD BIGHT GROUP (upper part)

mO:WP Arc-related turbidites (younger Wild Bight sequence)

Pennys Brook Formation (middle and upper division)

mO:GB Arc-related mafic sill complex (younger Wild Bight sequence)

Gummy Waters intrusive suite

ROCKS OF THE ROBERT'S ARM VOLCANIC BELT
EARLY ORDOVICIAN – LATE ORDOVICIAN
Stratified rock units from the mid-Iapetan realm of the Dunnage Zone
REGIONALLY METAMORPHOSED ROCKS
(LATE ORDOVICIAN – EARLY SILURIAN AND YOUNGER EVENT)

MIDDLE AND LATE ORDOVICIAN
Robert's Arm volcanic belt (southeast part)

REFERENCES

This legend is part of Open File NFLD/3268 which includes the following:

O'Brien, B.H.
2016: Geology of the Tommy's Arm River – Loon Pond area (parts of NTS 12H/08 and NTS 02E/05), central Newfoundland; Robert's Arm Volcanic Belt and Adjacent Rocks: Map 1 of 3. Scale 1:25 000. Government of Newfoundland and Labrador, Department of Natural Resources, Geological Survey, Map 2016-01, Open File NFLD/3268.

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2016: Geology of the Great Gull Lake – North Twin Lake area (parts of NTS 12H/01, NTS 02E/04 and NTS 02E/05), central Newfoundland; Robert's Arm Volcanic Belt and Adjacent Rocks: Map 2 of 3. Scale 1:25 000. Government of Newfoundland and Labrador, Department of Natural Resources, Geological Survey, Map 2016-02, Open File NFLD/3268.

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