NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY

MAP 87–7

GEOLOGICAL MAP OF WINDSOR

(N.T.S. SHEET 21A/16 EAST HALF)

NOVA SCOTIA

L.J. HAM and R.J. HORNE

SCALE 1:50,000

Miles 1 0 1 2 Miles

Kilometres 1 0 1 2 3 4 Kilometres

NOVA SCOTIA DEPARTMENT OF MINES AND ENERGY

HONOURABLE KEN STREATCH
MINISTER

JOHN J. LAFFIN, P.ENG., FEIC
DEPUTY MINISTER

HALIFAX, NOVA SCOTIA
1987

LEGEND

CARBONIFEROUS (after Moore and Ferguson, 1986)

ECW	WINDSOR GROUP: red shale, arkose and limestone
ECH	HORTON GROUP: sandstone, siltstone, arkose and conglomerate

DEVONO-CARBONIFEROUS

PANUKE LAKE LEUCOMONZOGRANITE:

DClmPL	light grey to buff to reddish, predominantly fine grained, equigranular; biotite (4-7%)*, muscovite (trace-1%), +/- cordierite
DClmPL	whitish-grey to light buff-brown, porphyry with coarse grained phenocrysts of quartz, plagioclase, and K-feldspar +/- biotite +/- cordierite; biotite (‹ 2-5%), muscovite (2- ‹ 5%)
DClmNR	NEW ROSS LEUCOMONZOGRANITE: light- to whitish-grey, pinkish-grey to orange, predominantly medium- to coarse-grained, moderately equigranular to megacrystic (5-40%); biotite (4-6%), muscovite (trace-2%), cordierite (trace-2%); contains minor amount of xenoliths (‹ 1%)
DCmgBI	BIG INDIAN POLYPHASE INTRUSIVE SUITE (BIPI): composed of four texturally variable monzogranite phases which are intimately associated with sharp irregular contacts, characterized by the presence of garnet occurring as ‹ 1.0 cm crystal aggregates.
PHASE A	medium grey to buff, medium- to coarse-grained seriate to slightly megacrystic (‹ 5%) monzogranite; biotite (4-8%), muscovite (trace-3%), cordierite (trace-2%), garnet (trace-2%); xenoliths of DCgd abundant
PHASE B	buff to light grey, medium- to coarse-grained porphyry containing phenocrysts of quartz, plagioclase, K-feldspar +/- cordierite; biotite (3-10%), muscovite (trace-1%), +/- garnet
PHASE C	buff to orange-brown, fine- to medium-grained, equigranular to seriate monzogranite; biotite (3-6%), muscovite (1-4%), cordierite (trace-2%), +/- garnet
PHASE D	buff to white, very fine grained, saccharoidal monzogranite (microgranite); biotite (‹ 5%), muscovite (trace-1%), cordierite (trace-3%), garnet (trace-3%)
DCmgS	SHERWOOD MONZOGRANITE: medium- to whitish-grey to pinkish-red, medium- to coarse-grained, seriate to megacrystic (5-10%); biotite (8-10%), muscovite (trace-1%), cordierite (trace-1%)
DCmgSL	SANDY LAKE MONZOGRANITE: light- to medium-grey, medium- to coarse-grained, megacrystic (5-25%); biotite (8-12%), trace muscovite, cordierite (trace-1%); contains xenoliths (‹ 1%)
DCgd	GRANODIORITE: medium- to bluish-grey, medium- to coarse-grained, megacrystic (5-10%), biotite (13-15%), trace muscovite; contains xenoliths (1%)
DCgd	fine- to medium-grained equigranular (to slightly porphyritic); biotite (12-15%), trace muscovite; megacrysts (‹ 5%)
DCgd	dark grey, medium grained, slightly porphyritic with phenocrysts (‹ 5%) of quartz and plagioclase; biotite (15-20%); contains numerous xenoliths
DCmgmp	MAFIC PORPHYRY: medium- to dark brownish-grey, fine- to medium-grained porphyritic with coarse grained phenocrysts of quartz, plagioclase K-feldspar; biotite (12-20%), muscovite (trace); contains abundant xenoliths

CAMBRO-ORDOVICIAN

MEGUMA GROUP: (after Faribault, 1916, 1931)

€OH	HALIFAX FORMATION: finely laminated slates and siltstones
€OG	GOLDENVILLE FORMATION: greenish-grey metagreywackes and minor interbedded slates

UNKNOWN AGE

gn	GNEISSIC ROCKS: greenish grey to black fine-grained gneiss; containing quartz, plagioclase, biotite, cordierite, muscovite, minor potassium feldspar (+/- sillimanite)

*percentages based on visual modal estimate

SYMBOLS

(not all symbols occur on map)

Rock outcrop, area of outcrop, probable outcrop, float

Geological boundary (defined, approximate, assumed, defined by till clasts)

Geological boundary-gradational (‹ 100 m; › 100 m)

Exposed intrusive contact (arrow pointing toward younger unit, age relation not determined)

Unconformity (hatching on younger side)

Limit of mineralogical or textural variation

Bedding (horizontal, inclined, vertical, overturned, dip unknown, younging direction unknown)

Anticline (defined, approximate)

Syncline (defined, approximate)

Preferred orientation of feldspar megacrysts (horizontal, inclined, vertical, dip unknown)

Schistosity, gneissosity, cleavage, foliation (horizontal, inclined, vertical, dip unknown)

Breccia

Schlieren banding (horizontal, inclined, vertical, dip unknown) poorly developed isolated bands and well developed (thin and heavy lines respectively)

Lineament (from air photos)

Fault (defined, approximate, assumed, inclined, vertical)

Fault (sinistral, dextral)

Shearing and intense fracturing, fracture cleavage (horizontal, inclined, vertical, dip unknown)

Joint (horizontal, inclined, vertical, dip unknown)

Dyke or vein: ALBI-albitite; APPG-aplite with minor pegmatite; DIAB-diabase; ELVA-elvan; LUGR-leucogranite; LUMZ-leucomonzogranite; LUPO-leucoporphyry; MIAP-mica aplite; PGAP-pegmatite with minor aplite; PEGM-pegmatite; PEGMZ-zoned pegmatite; PORP-porphyry; QTZ-quartz (indicated if mineralized); all unlabelled dykes are aplites; ‹ 1 m-thin lines, › 1 m-heavy lines (horizontal, inclined, vertical, dip unknown)

Stockwork (type indicated) QTZ

Sheeted complex (type indicated) QTZ

Area of abundant dyking (type or map unit indicated) DCgd

Greisen: ‹ 1 m, › 1 m (indicated if mineralized) Cp

Megacryst rich area

Xenoliths (› 1 m, › 10 m, concentration of xenoliths) map unit indicated when known

Diamond drill hole (reference number from N.S.D.M.E. Open File Report) A16-1

Trench, adit, shaft

Mineral occurrence (commodities indicated at top; number on bottom refers to marginal notes or N.S.D.M.E. mineral occurrence cards) U, Cu 1

Mine or Prospect Sn

Quarry

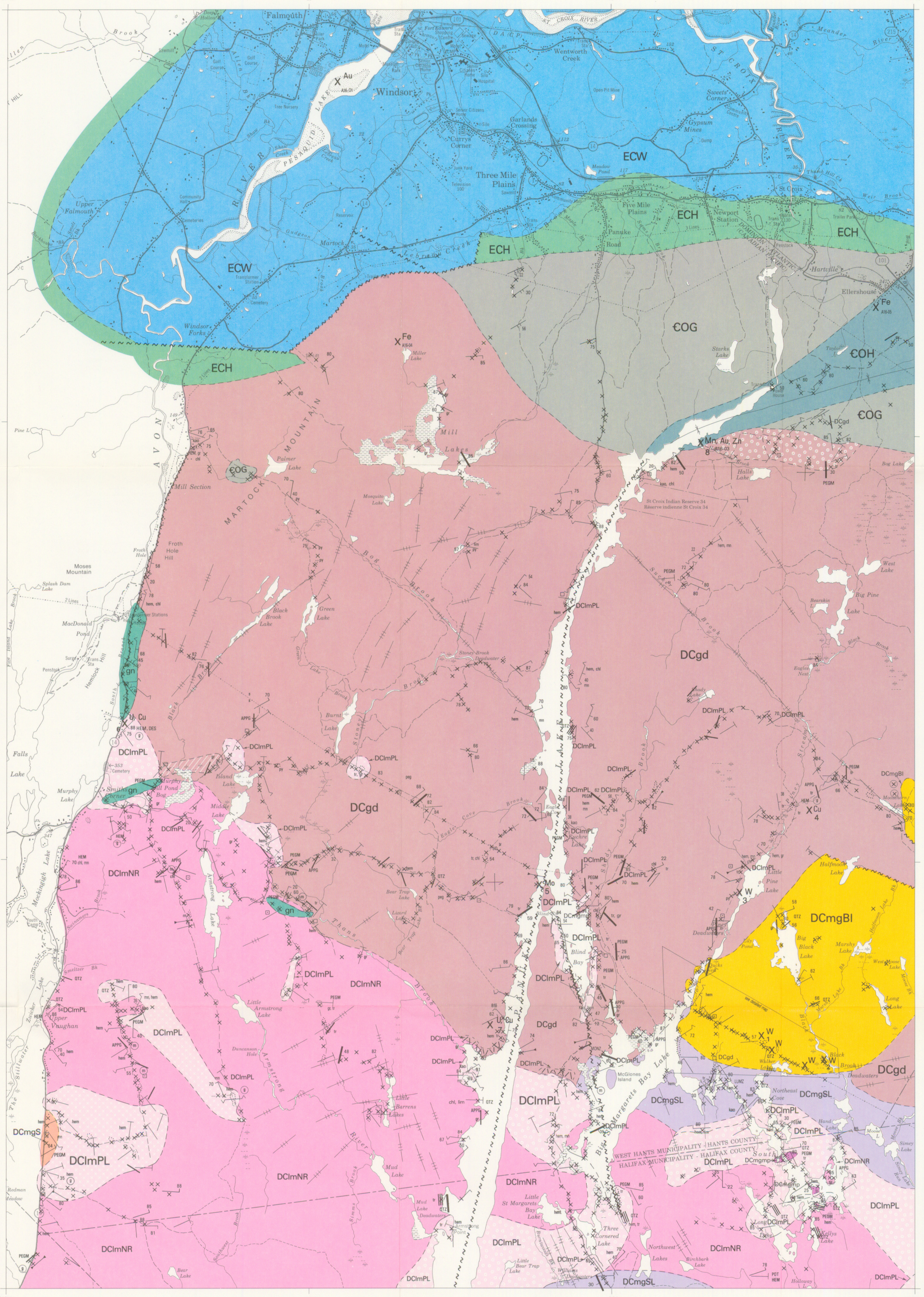
Alteration: ALB-albitization; CHL-chloritization; DES-desilicification; HAA-high alumina; HEM-hematization; KAO-kaolinitization; LIM-limonitization; POT-potassic (which include biotitization and K-feldspathization); SAU-saussuritization; intense and pervasive in capitals, slight to moderate in lower case HEM, hem

LIST OF COMMON MINERAL ABBREVIATIONS

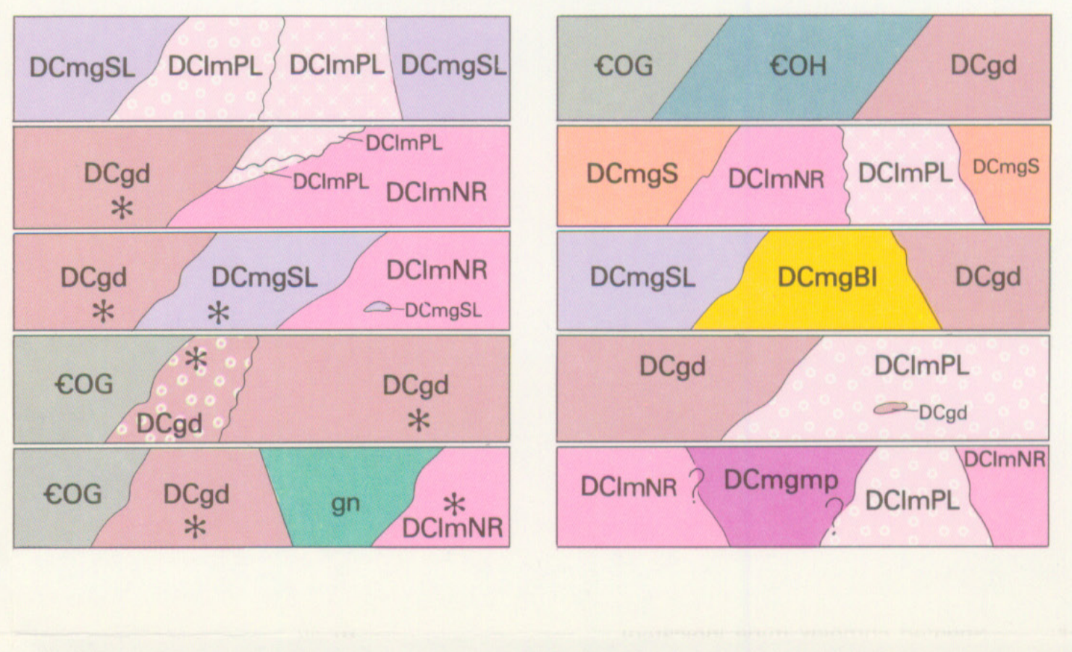
ad-andalusite; am-amethyst; ap-apatite; as-arsenopyrite; au-autunite; bo-bornite; ca-calcite; cc-chalcocite; ks-cassiterite; cp-chalcopyrite; ch-chlorite; cd-cordierite; cy-chrysocola; fl-fluorite; gn-galena; gr-garnet; he-hematite; il-ilmenite; ka-kaolinite; ma-malachite; mn-manganese minerals; mo-molybdenite; mu-muscovite; po-pyrrhotite; py-pyrite; sh-scheelite; sl-sillimanite; sp-sphalerite; se-sericite; to-torbernite; tr-tourmaline; wo-wolframite.

Planimetric base produced by the SURVEYS AND MAPPING BRANCH, DEPARTMENT OF ENERGY, MINES AND RESOURCES. Updated from aerial photographs taken in 1980. Culture check 1981. Published in 1983.

MRMS Cartography by:
Maritime Resource Management Service Inc.
Amherst, Nova Scotia



FIELD RELATIONSHIPS



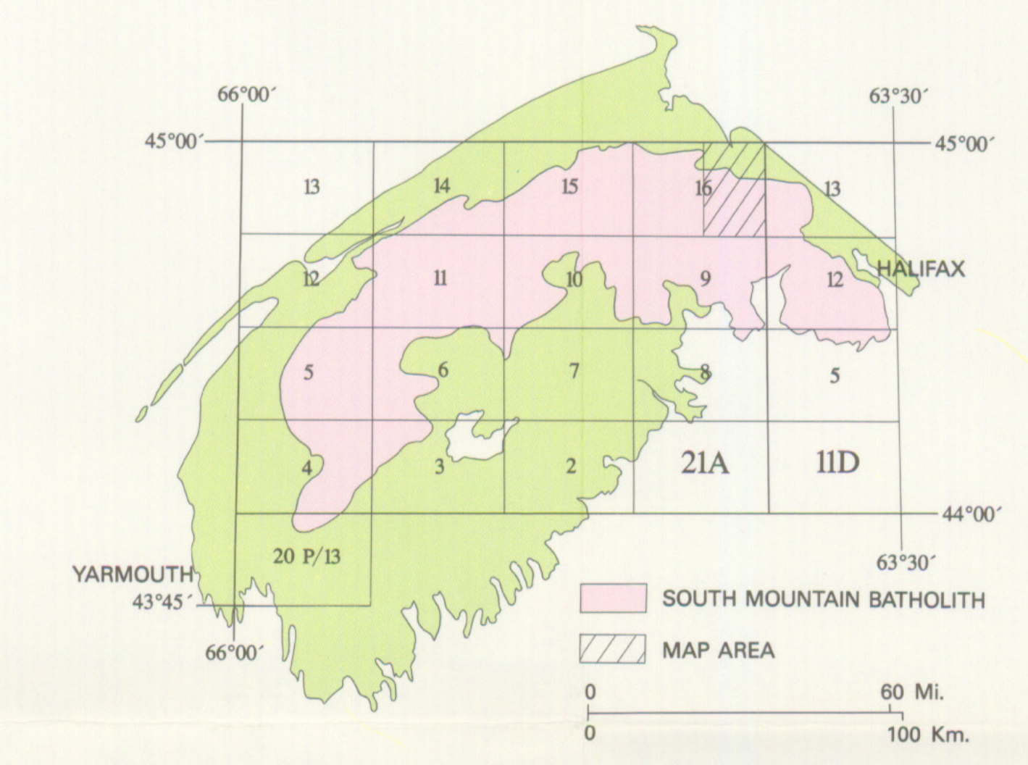
LEGEND
(for field relationships only)

Intrusive contact (younger unit underlies sloping contact) old unit / young unit

Gradational contact or textural equivalent

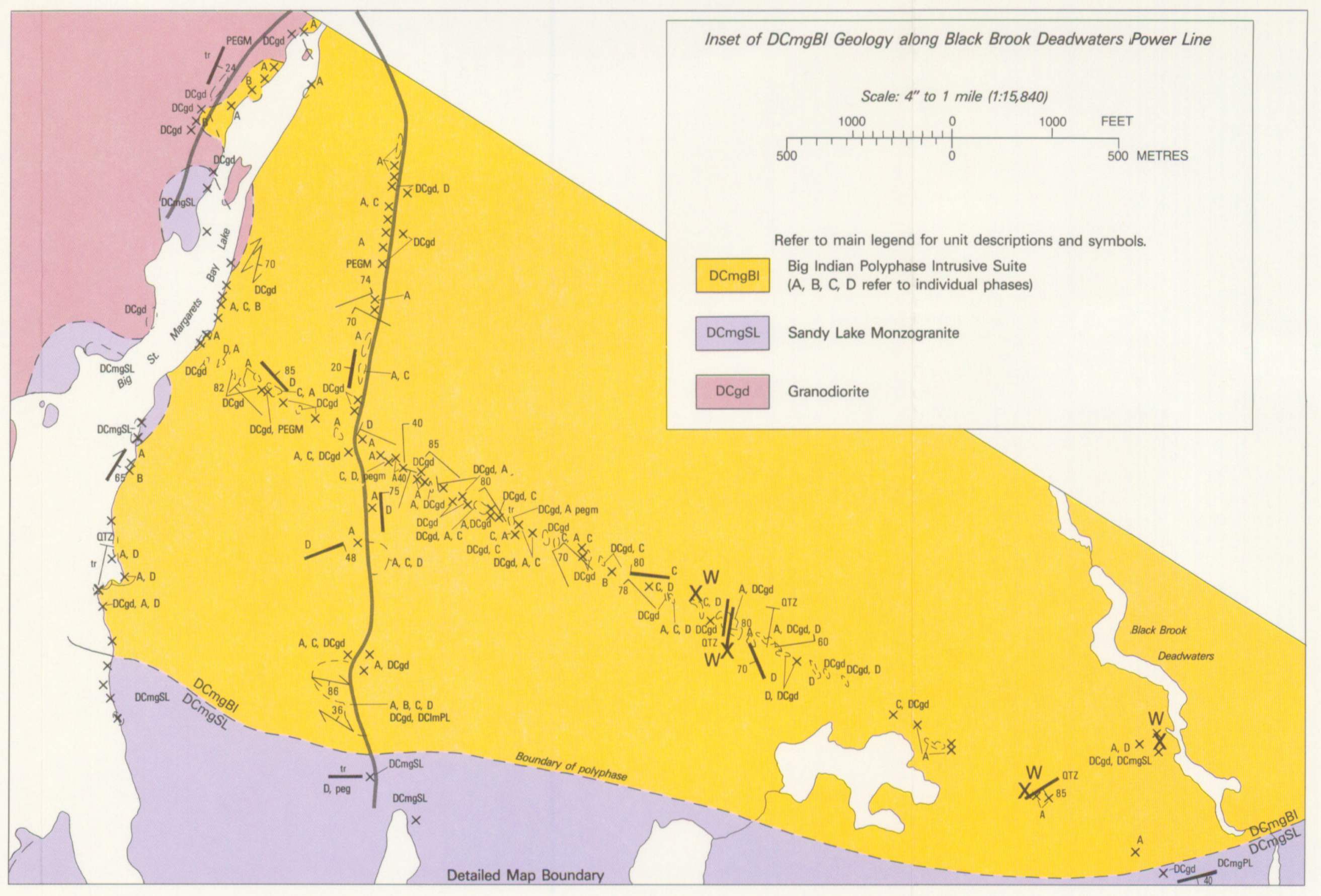
Xenoliths of metasediments? (sizes generally <1 m) *

Granitic Xenolith (map unit indicated, sizes generally >1 m) DCmgSL



SOUTH MOUNTAIN BATHOLITH

MAP AREA



Inset of DCmgBI Geology along Black Brook Deadwaters Power Line

Scale: 4" to 1 mile (1:15,840)

1000 0 1000 FEET

500 0 500 METRES

Refer to main legend for unit descriptions and symbols.

DCmgBI	Big Indian Polyphase Intrusive Suite (A, B, C, D refer to individual phases)
DCmgSL	Sandy Lake Monzogranite
DCgd	Granodiorite

Location Map

DESCRIPTIVE NOTES

Introduction

Geological mapping for this survey focused on the granitic rocks of the South Mountain Batholith. They range in composition from granodiorite[1] to monzogranite[1] to leucomonzogranites[2]. Systematic staining with sodium cobaltinitrite for granitic composition is necessary for the determination of various granitic units.

Pre-granitic rocks on the map sheet comprise the Cambro-Ordovician metasedimentary rocks of the Meguma Group including metagreywackes and slates of the Goldenville Formation and slates and siltstones of the Halifax Formation (Schenk, 1982). The geology of these rocks on the map sheet is modified after Faribault (1916, 1931). The granitic rocks are in sharp intrusive contact in the northern portion of the map sheet with these metasedimentary strata. Contact metamorphic minerals (biotite, cordierite, andalusite) are apparent adjacent to the granite/metasediment contact.

Sedimentary rocks of the Horton (ECH) and Windsor (ECW) Groups of Carboniferous age lie unconformably on the Meguma Group and granitic rocks in the northwestern portion of the study area. Geology and contact relationships were compiled from Moore and Ferguson (1986).

Unit Descriptions and Field Relationships

MAFIC PORPHYRY[3] (DCmgmp):

These distinctive rocks are characterized by (i) a high biotite content (10-18%), (ii) brown to blackish-grey colour and (iii) an abundance of biotite-rich xenoliths (2-20%). Limited in extent, the mafic porphyries are usually spatially associated with DClmPL in the southeastern portion of the map sheet, but also occur as dykes in DCgd in the Blind Bay area of Panuke Lake. Locally, field relations show this unit to postdate DCgd and predate DClmNR.

GRANODIORITE (DCgd):

The granodiorite is predominantly a bluish-grey, medium- to coarse-grained, megacrystic[4] rock. Biotite content ranges from 13-15% and trace amounts of muscovite are found as alteration products of biotite and feldspars. Alkali feldspar occurs both as a minor groundmass constituent and as megacrysts (5-10%). Compositional variations within the main body of the granodiorite, demonstrated by changing feldspar ratios which result in localized outcrop areas of monzogranite compositions, occur on the western side of Panuke Lake (Green Lake and Stony Brook). In parts of the southwestern portion of the study area at the southern contact of DCgd and the monzogranitic rocks, the composition of the granodiorite is locally monzogranitic.

Two variations of this unit occur within the study area. The first variation is distinguished from DCgd by a predominantly equigranular (to slightly porphyritic) texture with some megacrysts (‹ 5%, often ‹ 2%). This occurs in the northeastern portion of map study area at the contact with the Meguma Group metasedimentary rocks. The western side of this variation is medium-grained while the eastern side is finer grained. The second variation is dark grey, medium-grained, slightly porphyritic with phenocrysts of quartz and plagioclase and contains a high biotite content (15-20%). Quartz grains are typically dark, heightening the characteristic dark colour of the rocks, and numerous xenoliths (metasedimentary?) are common. This variation occurs in the west-central map area at the contact between DCgd and the New Ross monzogranite unit to the south.

Small xenoliths (generally ‹ 30 cm) of varying shapes and degrees of assimilation comprise 1% of most DCgd outcrops. The xenoliths are of variable composition (metasedimentary?), and some show intense deformation and compositional banding.

SANDY LAKE MONZOGRANITE (DCmgSL) and SHERWOOD MONZOGRANITE (DCmgS):

These whitish-grey, medium- to coarse-grained megacrystic (5-25%) monzogranites contain biotite (8-12%), minor muscovite and trace to 1% cordierite. Minor amounts of xenoliths (‹ 1%) are found within both these units. Similarities in biotite and megacryst content and general resemblance of textures between DCgd and DCmgSL make field distinction difficult, particularly in the contact area, between these two units. A sharp intrusive contact is exposed on the northern shores of Big St. Margarets Bay Lake. Elsewhere the contact appears to be gradational, with the percentage of biotite increasing and percentage of megacrysts decreasing within DCmgSL when approaching DCgd. DCmgS contains a slightly lower biotite content (8-10%) than DCmgSL and has a seriate to megacrystic (5-10%) groundmass.

BIG INDIAN POLYPHASE INTRUSIVE SUITE (BIPI suite) (DCmgBI):

This unit is defined as an intrusive suite composed of highly aluminous monzogranite phases that are texturally variable and display sharp irregular contacts and intimate spatial relationships with each other. The complexities of the polyphase suite were first recognized by Corey (1986) on the map sheet to the east, 11D/13, who tentatively divided the BIPI into four rock phases, which are:

A) medium- to coarse-grained monzogranite: this phase contains biotite (4-7%), muscovite (trace-2%), cordierite (trace-2%) +/- garnet. It ranges in texture from moderately equigranular to seriate to slightly megacrystic (5%).

B) quartz-feldspar porphyry: this phase is characterized by a fine- to medium-grained groundmass with phenocrysts of quartz, plagioclase, biotite and garnet. The biotite content is variable (2-8%) and muscovite occurs in trace amounts (trace-1%). Garnet occurs as reddish-brown aggregates ‹ 1 cm.

C) fine to medium-grained microgranite: This phase is equigranular to seriate monzogranite with a low biotite content (3-6%), muscovite (1-4%) and cordierite (trace-2%). Garnet occurs only in trace amounts.

D) fine grained microgranite: This phase is saccharoidal, leucocratic microgranite with a low biotite content (‹ 5%), muscovite (trace-4%), cordierite (1-3%) and abundant garnet aggregates (1-4%) similar to those described above. The abundance of garnets distinguishes it from phase C, where garnet occurs only in trace amounts. Cordierite is almost invariably altered to pinite.

The phases are characterized as containing variable amounts of the hyperaluminous mineral assemblages and the presence of garnets readily distinguishes the suite from other monzogranites on the map sheet. Xenoliths of DCgd are common within the suite. Alteration within the BIPI suite includes variable degrees of hematization, albitization, biotization, greisenization and chloritization.

The BIPI suite intrudes DCgd on the eastern side of Panuke Lake. Two separate outcrop areas of DCmgBI occur within the study area. One extends westward from 11D/13 near Moosehorn Lake approximately 400 metres and is parallel to a major NW trending lineament which occurs on both map sheets. A second area is found to the southwest where it is terminated on its northern side by an east-west trending fault. Some displacement of the intrusive body along one or both of these major structural features is suggested.

NEW ROSS LEUCOMONZOGRANITE (DClmNR):

This leucomonzogranite is distinguished from DCmgSL and DCmgS primarily by (i) a generally lower biotite content (4-6%), (ii) a higher proportion of muscovite (trace-2%) and cordierite (trace-2%) and (iii) increased saussuritization and/or hematization of the feldspars, giving the rock generally a pinkish appearance. Slightly higher biotite contents (7-8%) are typical in areas near the contact with the granodiorite (DCgd). Most of the unit is light- to whitish-grey, with reddened feldspars and orange-pink matrix evident in the southern and eastern portions on the study area. Local concentrations of megacrysts are observed within this unit, comprising 30-40% of the rock volume. This is best seen southwest of Murphy Mill Pond Bog. Porphyries are present within DClmNR and may represent textural variations. The contact between DCmgSL and DClmNR is not exposed, but xenoliths of the former are present within DClmNR. The contact between DClmNR and DCgd is inferred to be sharp from abrupt changes east of Armstrong Lake. In the contact areas between DClmNR and DCgd, and DClmNR and DCmgS, pods of fine grained monzogranite, aplite, pegmatite and porphyry are common intruding all units.

PANUKE LAKE LEUCOMONZOGRANITE (DClmPL):

Two variations of this leucomonzogranite occur within the study area.

1) The first is light grey to buff, fine-grained, equigranular, and contains biotite (4-6%) and muscovite (trace-2%). It occurs predominantly in the southeastern corner of the map sheet, in close association with DClmNR. Minor development of a porphyritic texture occurs as pods within this otherwise homogeneous leucomonzogranite. Moderate to locally intense pervasive hematization is common. Locally, rocks altered to episyenite composition are found within a mineralized (U) outcrop along Highway #14 north of Vaughan. Dykes of DClmPL occur extensively in the contact zone with DCgd, best exposed in the Blind Bay area of Panuke Lake. Similar extensive dyking is also seen along the shores of Panuke Lake and in the areas between its eastern shore and Big St. Margarets Bay Lake. Isolated dykes are also common in the main mass of DCgd, DCmgSL and DClmNR.

2) The second variation is light grey to buff porphyry with a fine- to medium-grained groundmass and phenocrysts of alkali feldspar, plagioclase, quartz eyes and less commonly biotite and cordierite. Biotite contents are 3-5% and muscovite is generally present in amounts ranging from trace-2%. Locally many of these rocks are spatially associated with the finer grained equigranular variation of DClmPL and these porphyries may represent a textural variation.

APLITE AND PEGMATITE:

Aplite dykes, rarely with pegmatite, are common within DCgd. Minor aplites and aplite/pegmatite dykes have been noted within the coarser-grained monzogranitic units. These dykes are usually less than one metre in thickness. Tourmaline occurs within aplites and pegmatites within all units, although relatively most abundant in dykes cutting DClmPL.

Gneissic Rocks

GNEISSIC ROCKS (gn):

Three small inliers of greenish-grey to black gneissic rocks are found included within the granitic rocks on the western side of Panuke Lake. These inliers, approximate sizes 2.5 km x 0.3 km, 1.5 km x 0.3 km and 1 km x 0.2 km, are elongate north-south, northeast-southwest and northwest-east respectively. They occur in the area of the contact between DCgd to the north and DClmNR to the south and were previously mapped as Meguma Group metasedimentary rocks (Faribault, 1931). Although some rocks of these inliers resemble the metagreywackes and slates of the Goldenville Formation in general appearance and mineralogy, at least four stages of intense local deformation and gneissic banding occur within some outcrops. This style and intensity of deformation is not known to occur within the Meguma Group rocks (Ham and Horne, 1986).

Structural Geology

Airphoto interpretation of the map area (Finck, 1985) shows two general directions of lineaments, one northeast trending and one northwest trending. Jointing in DCgd generally trends north-northeast. On the northwestern side of Panuke Lake, a number of slightly curved lineaments were observed. This area roughly corresponds to an area in which the granodioritic rocks approach monzogranite in composition.

Panuke Lake is presumed to represent a fault, although only sporadic evidence of movement (shearing, slickensides) is apparent. Highly fractured and sheared rocks occur (325° and 200°) on the eastern side of the lake but cannot be traced on the western side. At the north end of the lake where it turns toward the northeast, the granodiorite is highly fractured along a 45/82° S trend on the eastern shore. This fracturing cannot be traced on the western shore. In the Blind Bay area, increased north-south fracturing occurs within DCgd and DClmPL. Displacement (up to 1 metre) is seen within some of the DClmPL dykes which intrude DCgd.

Northwest trending shearing occurs at several localities along the shores of Big St. Margarets Bay Lake within DClmPL. Local areas of shearing (northeast and northwest) also occur in the southeastern portion of the study area. Highway #14 north of Vaughan parallels a fault or fault zone as evidenced by fracturing and slickensides within both the granitic and gneissic rocks.

Sheeted quartz veins and mineral banding occur on the western side of Panuke Lake in the contact area between DClmNR and DClmPL. Abundant quartz veins are also apparent in DClmPL on the eastern side of Panuke Lake.

Alteration

Widespread deuteric alteration effects such as chloritization, saussuritization, sericitization and kaolinization occur to varying degrees throughout all intrusive rock units. Increased saussuritization and hematization of the feldspars relative to the other units is common within the leucomonzogranites. Localized intense hematization occurs, often localized along fractures or shear zones, within DClmNR and both variations of DClmPL. Examples of this hematization are seen in the vicinity of Vaughan on Highway #14 and around Blind Bay on Panuke Lake. This alteration is often suggestive of areas hosting uranium mineralization in the New Ross area (O'Reilly *et al.*, 1982).

Mineral Occurrences

1/ This showing (Powerline Showing) consists of quartz-wolframite veins cutting the microgranite phase (Phase D) of DClmBI. This showing is located approximately 1.7 km east of Big St. Margarets Bay Lake along the powerline which traverses the north end of the lake and is displayed in the detailed inset map of the area. Four parallel quartz veins between 3 and 9 centimetres wide occur over a width of 4 metres and appear to be restricted to the microgranite phase. Aggregates of coarse bladed wolframite crystals have been noted in one of these veins as elongate pods up to 2 centimetres wide by 15-20 centimetres in dimension.

2/ This occurrence consists of a small wolframite and scheelite-bearing quartz vein (5mm wide) in a microgranite dyke. This dyke occurs within a xenolith of DCmgSL incorporated within the BIPI suite approximately 2 km southeast of the Powerline Showing.

3/ Just west of Little Pine Lake, a subangular boulder (1 m x 1 m) of fine-grained, equigranular monzogranite (similar to DClmPL) contains a wolframite-bearing pegmatite vein. Within the pegmatite, wolframite occurs as small blades 1 cm long. This area is underlain by DCgd. The source of the boulder is not known.

4/ At the north end of Little Pine Lake, a leucocratic aplite dyke 10-15 cm wide has intruded DCgd. The dyke can be traced for 20 metres and contains approximately 5% tourmaline, pyrite and minor chalcopyrite. Localized rusted, muscovitized and greisenized areas and miarolitic cavities occur in the dyke over several metres.

5/ On the western shore of Panuke Lake, a large, subangular boulder of granodiorite (1.5 m x 1.5 m) contains several small flecks (2mm) of molybdenite within a concentration of quartz and K-feldspar. The area is underlain by DCgd and the boulder is presumed to be of local origin.

6/ A U-Cu occurrence is documented (Chatterjee, 1983) on the western edge of the map area north of Vaughan. This showing consists of autunite and torbernite within fractures within hematized episyenites of DClmPL. Elevated scintillometer readings are also typical of fractures within the inlier of gneissic rocks (gn) on the western side of the highway at this same location.

7/ (A16-15)[5]: A U-Cu showing is located on the western side of Panuke Lake, in the contact area between DCgd and DClmNR.

8/ (A16-03)[5]: A Mn-Au-Zn showing is documented within the Halifax Formation metasedimentary rocks near Ellershouse near the contact with the granodiorite.

[1] GRANODIORITE-MONZOGRANITE-SYENOGRANITE: After Streckeisen (1976).

[2] LEUCOMONZOGRANITE: A rock of monzogranitic composition with less than 6% combined mafic minerals.

[3] PORPHYRY: A rock with a predominantly fine grained groundmass and medium- to coarse-grained phenocrysts (i.e. bimodal grain size distribution). Phenocrysts rarely exceed 2.5 cm. adj. porphyritic.

[4] MEGACRYST: A nongenetic term for a crystal that is significantly larger than the surrounding groundmass. In the South Mountain Batholith megacrysts are predominantly subhedral to euhedral K-feldspar, and rarely plagioclase, crystals (generally between 2.5-7 cm in length) in medium- to coarse-grained rocks. adj. megacrystic.

[5] Nova Scotia Department of Mines and Energy mineral occurrence card number.

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Nova Scotia
Department of
Mines and Energy

Energy, Mines and Resources Canada
Energie, Mines et Ressources Canada

Geological Survey of Canada
Commission géologique du Canada

Canada — Nova Scotia
Mineral Development Agreement