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DESCRIPTIVE NOTES

INTRODUCTION

This map is one of a set of four bedrock geological maps which present initial results of 1:100 000 scale mapping by the Geological Survey of Canada (GSC) and the Canada-Nunavut Geoscience Office (C-NGO) in the MacDonald River (OF 3958), Flint Lake (OF 3959), Nadluardjuk Lake (OF3960), and Wordie Bay (OF 3961) map areas, central Baffin Island (Fig. 1). An overview of the principal Archean and Paleoproterozoic plutonic and supracrustal units mapped during the first summer of the three-year (2000-2002) partnered field project are presented in Corrigan et al. (in press). Field work in 2000 yielded a transect across the project area from 68° to 70° N (approximately 210 kilometres in length) and extending 40 to 100 kilometres inland from the northeastern shore of Foxe Basin (Fig. 2). From north to south, the transect provides a continuous section across the southeastern margin of the Archean Rae Province, the Paleoproterozoic Piling Group and the northern margin of the ca. 1.86-1.85 Ga Cumberland batholith.

The first systematic mapping of the area was undertaken at reconnaissance level between 1965 and 1970 (Jackson 1969, 1978, 1984, 2000; Jackson and Taylor, 1972), and in 1974 and 1975 (Morgan et al., 1975, 1976; Jackson and Morgan, 1978; Morgan, 1983). More detailed work was subsequently initiated in the southeastern portion of the project area, in parts of map sheets NTS 37 A, 27 B, 27 C and 27 D (Tippett, 1980, 1985; Henderson et al., 1988, 1989; Henderson and Henderson 1994). The most recent work in proximity to the current project area consists of bedrock mapping and U-Pb geochronology of Archean rocks in the Eqe Bay area (Bethune and Scammell 1997), and a lake sediment and water regional geochemical survey southwest of the Barnes Ice Cap (Cameron 1986; Friske et al. 1998).

The work presented below is based on systematic bedrock traverses with approximately two to three kilometres spacing.

GEOLOGICAL SETTING

The project area straddles the northern margin of the Trans-Hudson Orogen on Baffin Island (Lewry and Collerson, 1990; Foxe Fold Belt). The orogenic margin extends west onto Melville Peninsula (Fig. 1) and is correlated to the east with the Rinkian Belt in Greenland (Taylor, 1982; Hoffman, 1988). On Baffin Island, the Foxe Fold Belt is flanked to the north by the Archean Rae Province (Fig. 1) and to the south by the Cumberland batholith (Fig. 2). The main lithological assemblage consists of the Piling Group (Fig. 2), which comprises a thin lower sequence of marble, quartzite, schists, and minor iron-formation of platformal facies, and an upper sequence of ferrugenous pelites overlain by a large volume of wacke turbidites interpreted as foredeep flysch (Morgan et al., 1976; Henderson et al., 1988; Jackson, 2000). Mafic volcanic rocks have been recognized within the Piling Group (Bravo Lake Formation) and historically interpreted as mafic and ultramafic flows and sills intercalated with the lower sequence of the Piling Group (Tippett, 1980; Henderson et al., 1988; Henderson and Henderson, 1994). Archean basement is interpreted to occur north of the Piling Group as well as in antiformal culminations in the SSE region of the project area, near Dewar Lakes (Morgan 1983; Henderson and Henderson 1994). New observations outlined below suggest, however, that at least a proportion of what had been initially interpreted as Archean basement in the Flint Lake and MacDonald River area may in fact include Proterozoic intrusions. The following sections outline the results of new geological mapping in 2000, described sequentially from north to south, or from lowermost to highest exposed structural levels.

TECTONOSTRATIGRAPHIC UNITS

Archean basement/Paleoproterozoic (units Agn-Agb)

Archean rocks have previously been interpreted to underlie most of the area north of the Piling Group and to form continuous basement to the latter (e.g., Morgan, 1983; Bethune and Scammell, 1997). However, this past summer, observations in the vicinity of the Archean basement/Paleoproterozoic cover contact suggest that the latter is encumbered by a number of syn- to post-tectonic felsic plutons of likely Proterozoic age, especially in the area around Flint Lake (OF 3959 and OF 3960). Consequently, areas underlain predominantly by Archean rocks seem to be restricted to a more northern part of the project area (OF 3958 and western portion of OF 3959), where they comprise biotite ± hornblende quartzofeldspathic orthogneisses of granodioritic to monzogranitic composition (unit Agn; Fig. 3), pelitic to psammitic rocks with abundant biotite and melt pods (unit AMp), as well as minor hornblende-biotite ± clinopyroxene amphibolite (unit AMa). These rocks extend along strike to the southwest in the Eqe Bay area, where they have yielded U-Pb zircon ages ranging between 2.84 - 2.71 Ga (Bethune and Scammell, 1997). The orthogneisses and supracrustal rocks are pervasively intruded by massive to strongly foliated plutonic rocks of predominantly biotite monzogranite composition (unit Agr), and by distinct bodies of biotite ± hornblende K-feldspar megacrystic monzogranite and granodiorite (unit Agk). Dykes of hornblende-biotite ± clinopyroxene gabbro (unit Agb) cross-cut the biotite monzogranite (unit Agr) northwest and southeast of Lake Gillian (OF 3958 and OF 3959). Similar plutonic rocks and dykes in the Eqe Bay area yield Archean ages (ibid.).

Northern Paleoproterozoic plutonic rocks (units Pqd-Pgr)

In the Flint Lake area (OF 3959 and OF 3960), as well as in the area of the MacDonald River (OF 3958), the distribution of Archean basement is complicated by the presence of biotite-allanite ± hornblende monzogranite (unit Pgr; Fig. 4) that is clearly intrusive into Paleoproterozoic Piling Group sedimentary units (Fig. 5). The younger monzogranite tends to be massive and contain rafts and xenoliths of marble, psammite, quartzofeldspathic orthogneiss (unit Agn) and hornblende-clinopyroxene-biotite quartz diorite (unit Pqd). Commonly the granite sits structurally above the Piling Group it intrudes (Fig. 5). In contrast, plutonic rocks in concordant structural contact with the Paleoprotorozoic supracrustal units are often foliated, completely recrystallized, and/or layered and interpreted as part of the Archean basement (i.e. units Agn and Agr described above). Generally such plutonic rocks sit structurally beneath the Piling Group. Unfortunately these field criteria don't always apply, making the distinction between reworked Proterozoic intrusions and Archean basement less straightforward in some areas. Total field aeromagnetic maps of the Flint Lake area (W. Miles, GSC; unpublished data) seem to indicate a rough correlation between areas of potential Archean basement and regions of high magnetic anomalies (see also Jackson, 2000, p. 231). This may provide a useful tool to place additional constrains on the extent of exposed basement. Systematic sampling for U-Pb geochronology (N. Wodicka, GSC) and tracer isotope geochemistry, as well as reconnaissance gamma-ray spectrometry measurements (K. Ford, GSC) were undertaken this summer in order to further define areas underlain by basement versus Proterozoic plutonic rocks in the northern portion of the project area.

A unique map-scale feature observed in the northern portion of the project area, especially around Flint Lake (OF 3959 and OF 3960), is a marked spatial association between Proterozoic plutons (unit Pgr) and garnet-biotite-muscovite ± tourmaline pegmatite, which occurs in abundance in aureoles surrounding the plutons. These aureoles are a few kilometres thick and consist of numerous, discontinuous pegmatite sills injected in the Piling Group metasedimentary rocks. The pegmatites, as well as the metasedimentary rocks, are structurally concordant with the pluton outlines and suggest the presence of abundant fluids in the immediate metasedimentary wallrock during pluton emplacement. Similar pegmatites as the ones described here have been observed along strike, east of the map area, and have been interpreted as the potential product of shear heating at the interface between Archean basement and Proterozoic cover (G. Jackson; pers.com.).

The presence of potential Archean inliers in antiformal culminations in the Dewar Lakes area (east of the area covered by the present set of four maps; NTS 27 B) had been known since the early reconnaissance work of Jackson (1969). This past summer, other potential basement inliers were identified south and east of Nadluardjuk Lake (OF 3960 and OF 3961). They consist of migmatitic orthogneiss and banded gneiss of predominantly felsic composition that are separated from the Longstaff Bluff Formation by a narrow (few tens of metres) unit of banded quartzite, meta-arkose, silicate-facies iron formation and amphibolite, interpreted as Dewar Lakes Formation (see also Henderson et al., 1988).

Piling Group (units PPD-PPB)

The Piling Group is continuously exposed from the Flint Lake area (OF 3959 and OF 3960) to approximately the southern limit of the project area (68° N; OF 3961), as well as in narrow bands between MacDonald River and Flint Lake (OF 3958). In the Flint Lake area, a lower sequence consists of muscovite schist and quartzite intercalated with minor iron-formation (Dewar Lakes Formation; unit PPD), overlain by dolomitic and calcareous marble (Fig. 6) with calc-silicate metasedimentary rocks and minor chert (Flint Lake Formation; unit PPF). An upper sequence consists of a basal assemblage of black pelite (Fig. 7), ferruginous psammites, and sulfide-facies iron-formation (Astarte River Formation; unit PPA) that is overlain by a thick assemblage (few kilometres?) of thin- to thick-bedded psammite (Fig. 8), feldspathic wacke (Fig. 9), with thin intercalations of semipelite and pelite, and local calc-silicate beds and pods after carbonate concretions (Longstaff Bluff Formation; unit PPLb). Mappable wacke intervals (unit PPLa) in the Longstaff Bluff Formation contain euhedral to slightly rounded, medium-sized feldspar crystals and rounded blue quartz (Fig. 9), as well as fine-grained, angular, lithic fragments of supracrustal origin. The association of equidimentional euhedral feldspathic grains and rounded blue quartz suggests derivation, at least in part, from felsic volcanic rocks (Corrigan et al., in press).

Rocks from the lower sequence are mostly found in the Flint Lake area (OF 3959 and OF 3960). However, a relatively thin apron of siliciclastic and chemical sediments that include garnet-biotite schist, quartzite, arkose with sillimanite-quartz nodules (faserkiesel) and iron-formation occurs between the structural culminations cored by potential Archean gneisses (unit Agn) and the psammites of the Longstaff Bluff Formation (units PPLs and PPLg) in the southern portion of the map area (OF 3961). Henderson and Henderson (1994) interpreted a similar association in the Dewar Lakes area (NTS 27 B) as part of the lower sequence.

Mafic to ultramafic volcanic and intrusive rocks and associated sedimentary units occur in an east-west corridor that extends from Straits Bay, to and beyond Western River (Fig. 2). In the area investigated this summer, this package is preserved in a series of isolated klippen structures as a result of F_{2P}-F_{3P} cross-folding (see below). The largest of these klippen, located southwest of Nadluardjuk Lake (unit PPB; OF 3960 and OF 3961) is characterized by a lower unit several hundred metres in thickness of mostly of mafic and ultramafic cumulate layers (Fig. 10) and sills. This unit is overlain by a thick (more than one kilometre) unit of mafic pillowed, fragmental, and massive flows as well as rare mafic to ultramafic sills (D. Francis, pers. com.). Pillow structures are generally very well preserved (Fig. 11), and together with paleo-horizontal indicators such as pillow shelves, consistently indicate upward-younging directions. Volcanic flows are locally intercalated either with banded calc-silicate rock and mafic sedimentary units, finely laminated semipelite (Fig. 12), or rusty psammite and black pelite. The contact between the volcanic rocks and the underlying sedimentary rocks of the upper sequence Piling Group is defined by a sub-horizontal high-strain zone up to 50 metres thick with rare shear-sense indicators suggesting top-to-the NNE displacement (i.e. thrust fault; Corrigan et al., in press). Moreover, a highly heterogeneous, highly sheared rock assemblage resembling a tectonic mélange was identified beneath some of the mafic klippen (H. Helmstaedt, pers. com.). This assemblage, measuring up to a few tens of metres in thickness, contains centimetre- to metre-size blocks of mafic, ultramafic, carbonate, granite and siliciclastic sedimentary rock in a matrix of predominantly psammitic composition and will be further examined next summer as part of an M.Sc thesis study on the structural elements of the project area (F. Berniolles; Queen's University).

The volcanic rocks in the Nadluardjuk Lake area were correlated with mafic and ultramafic rocks east of the Western River (Dewar Lakes area; NTS 27 B) and named Bravo Lake Formation (unit PPB) by Tippett (1984). In the Dewar Lakes area, amphibolite, hornblendite and ultramafic bodies of the Bravo Lake Formation have been interpreted as sills emplaced in the lower sequence of the Piling Group by Tippett (ibid.), Henderson et al., (1988, 1989) and Henderson and Henderson (1994). Field work next summer, as well as a trace and major element geochemical study presently in progress, will test the correlation between the volcanic rocks preserved in the set of klippen west and east of Nadluardjuk Lake (OF 3960 and OF 3961) and the intrusive bodies in the Dewar Lakes area (NTS 27 B) and form part of a Ph.D. thesis study on the petrology and petrogenesis of the Bravo Lake Formation by S. Modeland (McGill University).

Southern Paleoproterozoic plutonic rocks (units PCgk-Pggr)

Plutons that occur in the southern portion of the project area (OF 3960 and OF 3961) are compositionally more diverse and have different relative ages than the Paleoproteorozic plutons mapped to the north in the Flint Lake area and described above. Field relationships suggest that plutons which we correlate with the Cumberland batholith of Jackson and Taylor (1972) form the oldest intrusive bodies. They consist of a number of grey-coloured, medium to coarse-grained, predominantly K-feldspar megacrystic (Fig. 13) elongate plutons of granodioritic to monzogranitic composition (unit PCgk). Rapakivi textures have been observed at many locations. Biotite and local hornblende form the main mafic phases (up to 25 %). Garnet is locally present, mostly near contacts with aluminous metasediments. Plutons of the Cumberland batholith contain enclaves of foliated and folded migmatitic metasedimentary rocks of the Longstaff Bluff Formation (unit PPLg), suggesting that the latter was being deformed and metamorphosed prior to and/or during intrusion by the batholith. Plutons of the Cumberland batholith are themselves intruded by whitish to light pink, medium-grained to pegmatitic garnet-biotite ± muscovite ± cordierite leucogranite dykes and plutons (unit Pggr). The leucogranites (Fig. 14) form several major bodies in the southern region of the map area, the largest of which are in close spatial association with the Cumberland batholith (OF 3961). As explained below in the metamorphic section, field evidence suggests that the leucogranites are entirely derived from partial to total melting of Piling Group metasedimentary rocks. Small bodies of massive, pink, exfoliated, biotite syeno- and monzogranites (unit PCgr) are also found in the southern region of the map area. They were observed cross-cutting the leucogranites.

METAMORPHISM

The lowest metamorphic grade in the map area is upper-greenschist facies and it is characterized by biotite-muscovite assemblages in pelitic beds of the Longstaff Bluff Formation (unit PPLb). The grade increases both northwards and southwards from there, with highest pressure-temperature conditions being reached in the southern part of the map area, where uppermost-amphibolite to incipient granulite facies assemblages occur. To the north, metamorphic conditions reach middle-amphibolite facies at most. With increasing regional metamorphic grade, the Longstaff Bluff Formation acquires biotite-muscovite-cordierite ± andalusite assemblages (melt pods absent) in the more pelitic layers (unit PPLc). The first appearance of melt is noticed along a roughly eastwest isograd south of Nadluardjuk Lake (OF 3960) in pelitic beds of the Longstaff Bluff Formation (unit PPLs) and appears to be produced by the reaction muscovite + plagioclase + quartz = sillimanite + K-feldspar + melt (see Spear, 1993, p. 368; and references therein). Approximately 10 kilometres further south, along an isograd that is roughly parallel to the one above (D.M. Carmichael, pers. com.), breakdown of biotite is observed through the vapor-absent reaction biotite + sillimanite + quartz = garnet + cordierite + K-feldspar + melt (see Spear, 1993, p. 368; and references therein). This reaction eventually leads to production of large quantities of melt (unit PPLg) and we would suggest ultimately the production of garnet ± cordierite bearing granitic plutons (unit Pggr). The spatial relationship between the Cumberland batholith and the highest metamorphic grades observed in the Longstaff Bluff Formation (unit PPLg), together with the emplacement of the garnet ± cordierite leucogranites (unit Pggr), suggests that heat input by advection, during emplacement of the Cumberland batholith, played an important role in the tectonothermal evolution of this region. A similar, southward increase in metamorphic facies has also been reported east of the map area in the Dewar Lakes region (Jackson and Morgan, 1978; Tippett, 1984; Henderson et al., 1988). The field and laboratory study of metamorphic mineral reactions and assemblages in pelitic units of the Piling Group form part of an ongoing Ph.D. thesis study by K. Dubach (Queen's University).

Towards the north, metamorphic grade in the Piling Group gradually increases from greenschist to upper-amphibolite facies, with K-feldspar-sillimanite-melt pod assemblages observed in metapelitic cover rocks located between Flint Lake and the MacDonald River. Corresponding assemblages in marble of the Flint Lake Formation (unit PPF) consist of tremolite-calcite-quartz ± diopside ± dolomite, with the presence of the latter two phases dependant on bulk rock composition. The study of metamorphic mineral assemblages in the Flint Lake Formation marbles is part of an ongoing B.Sc. thesis study by S. Gagné (Université du Québec à Montréal).

In the Archean basement rocks, the assemblages hornblende-plagioclase ± clinopyroxene in rocks of mafic composition (unit AMa) and biotite-melt pod ± sillimanite ± garnet in rocks of pelitic composition (unit AMp) also indicate middle- to upper-amphibolite facies conditions. The fact that granitic plutons, similar to those yielding Archean ages in the Eqe Bay area (Bethune and Scammel, 1997), cross-cut folded migmatitic fabrics in the basement supracrustal rocks suggests that at least part of the upper-amphibolite facies metamorphic assemblage is Archean in age. In the Eqe Bay area, the age of Archean metamorphism and Proterozoic overprint is constrained at pre-ca. 2.73 Ga and ca. 1.82 Ga, respectively (Bethune and Scammell, 1997; Jackson and Berman, 2000). In contrast, monazites in the southern part of the map area yield ca. 1.81 Ga ages (Henderson and Henderson, 1994), suggesting later exhumation and cooling in the orogenic internides.

STRUCTURE

Regional deformation along the northern margin of Trans-Hudson Orogen on Baffin Island can be separated into four specific events. The earliest (D_{1A}) is an Archean-age deformation event that was accompanied by middle-amphibolite facies metamorphism (see above) and produced a strong transposition fabric in plutonic and supracrustal protoliths within the basement. The original orientation and strain distribution of this tectonothermal event is obscured by younger, partitioned Proterozoic reworking and is best observed locally, where late-Archean intrusions (e.g. units Agk, Agr) crosscut high-grade fabrics preserved in the older units (see also Bethune and Scammell, 1997).

In the overlying lower sequence Piling Group, a number of low-angle repetitions of the Dewar Lakes and Flint Lake formations (OF 3959 and OF 3960) attest to an early (D_{1P}) Proterozoic-age thin-skinned deformation event. D_{1P} thrust imbrication of the upper sequence Piling Group is more difficult to document due to the absence of regional stratigraphic markers within the Longstaff Bluff Formation, but it is nonetheless suggested by the presence of sharp, large-scale fold limb truncations (Corrigan et al., in press). Another important structural feature interpreted as D_{1P} is the juxtaposition of mafic/ultramafic units of the Bravo Lake Formation in the hangingwall and psammites of the Longstaff Bluff Formation in the footwall of a regional tectonic contact (OF 3960 and OF 3961). The tectonic contact is characterized by the presence of a shear zone localized at the base of the Bravo Lake Formation (described above), and by a flat-ramp geometry, suggestive of a thrust contact. The D_{1P} event was both accompanied and outlived by regional metamorphic conditions, as suggested by the growth of peak metamorphic minerals. Emplacement of the Cumberland batholith must have occurred during D_{1P} since the two-mica leucogranites (unit Pggr) which are potentially derived by partial melting of the Piling Group metasedimentary rocks, and are in part spatially associated with the Cumberland batholith, intrude the Bravo Lake Formation. Cumulatively, D_{1P} therefore encompasses early thrust imbrication of the Dewar Lakes and Flint Lake formations, folding (and imbrication?) of the Astarte River and Longstaff Bluff formations, overthrusting of the Bravo Lake Formation and emplacement of the Cumberland batholith.

The second Proterozoic event (D_{2P}) was largely coaxial with D_{1P} and involved folding of the Archean basement (i.e., thick-skinned deformation). It produced predominantly EW trending map-scale tight to isoclinal, upright to mostly north-vergent reclined and recumbent folds with shallow, doubly-plunging axes. Garnet-muscovite-biotite ± tourmaline pegmatites associated with the emplacement of biotite granite (unit Pgr) along the northern margin of the Piling Group crosscut the D_{1P} fabric and yet show evidence of transposition and boudinage. The foliation observed in the biotite granite is parallel to the D_{2P} axial-planar foliation developed in the folded Piling Group metasedimentary rocks. Combined, these observations suggest that emplacement of the granite and associated pegmatite overlapped with D_{2P}. Other evidence pointing to D_{2P} being thick-skinned is the strong parallelism observed between F_{2P} folds of the Piling Group cover and map-scale folds of the Archean basement in the north part of the project area (OF 3958). A common deformation event involving both basement and cover is supported by monazite, which yields similar U-Pb ages in pegmatites within the Piling Group sedimentary rocks (ca. 1.81 Ga; Henderson and Henderson, 1994); in reworked Archean basement gneiss inliers (ca. 1.81 Ga; ibid.); and in reworked Archean gneisses immediately to the west of the present map area (ca. 1.82 Ga; Bethune and Scammell, 1997). A question that remains is the absolute timing between (1) the emplacement of the Cumberland batholith, (2) high-grade metamorphism of the Piling Group, (3) emplacement of the northern biotite granite and (4) regional D_{1P} and D_{2P} deformations. These events appear to be strongly inter-related and may have occurred in sequence during a protracted period. Samples that will provide additional constraints on the timing of these events have been collected for U-Pb geochronology (N. Wodicka, GSC).

The last deformation event of regional importance (D_{3P}) resulted in orogen-perpendicular, large-wavelength, upright, open folds of all previously described Paleoproterozoic and Archean units. These folds interfere with F_{2P} folds to produce the current dome and basin map pattern in the project area. This fold interference is responsible for Archean(?) gneiss-cored domes in the southern portion of the transect (OF 3961) and to the southeast (Henderson et al., 1988, 1989) and for the preservation of the Bravo Lake Formation in synformal basin structures or klippen (this study). F_{3P} folds do not appear to have been accompanied by new metamorphic mineral growth. The fold interference pattern in the project area provides key structural relief for a study of the tectonostructural evolution of the orogenic margin by F. Berniolles (M.Sc. thesis; Queen's University) and 3D structural modeling by E. de Kemp (GSC; see also de Kemp et al., in press).

ECONOMIC POTENTIAL

There is potential in the central Baffin area for different types of mineralization, including Pb-Zn in the platformal carbonates of the Flint Lake formation; Ni-Cu-Co-PGEs in the layered mafic-ultramafic sills of the Bravo Lake Formation; and Sn in pegmatitic aureoles surrounding Proterozoic plutons in the Longstaff Bluff Formation. Important Au and As anomalies were reported in the regional lake sediment geochemical survey (Friske et al., 1998), in close association with bedrock exposure of the Longstaff Bluff formation. Evidence for sulphide remobilization in the axial planes of F_{2P} folds in the Astarte Lake Formation was observed, suggesting potential mineral concentration during this deformation event. The layered mafic/ultramafic sills of the Bravo Lake Formation have an identical age, within error, to the Fox River sill in Manitoba (N. Wodicka, pers. com.), and are associated with sulphidic metasediments, providing a context potentially similar to that of the Raglan deposit in the Cape Smith Belt. Although Henderson and Henderson (1994) attribute little economic interest to these sills, it should be noted that occurrences of disseminated and massive sulphides (Fig. 15) were noted in the Bravo Lake Formation during the course of systematic field work in 2000. These occurrences will form part of a metallogenic and petrogenetic M.Sc. thesis study by J. Stacey (University of Calgary).

NEOPROTEROZOIC DIABASE DYKES

Several undeformed northwest-trending Neoproterozoic diabase dykes (NFdb) intrude the supracrustal and plutonic rocks in the project area. The largest and most continuous group of dykes is found northwest and southeast of Lake Gillian and Flint Lake (OF 3958, OF 3959, and OF 3960). A second group occurs southeast of Straits Bay (OF 3960 and OF 3961). The dykes vary in width from tens of metres to approximately 200 meters and are near vertical. Locally they anastomose. Dykelets a few metres in width (Fig. 16) are locally observed branching from the larger intrusions. The dykes generally exhibit a brown-weathered surface and the larger ones, a rectangular joint pattern.

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1985: Geology of a Transect through the southern margin of the Foxe Fold Belt, Central Baffin Island, District of Franklin; Geological Survey of Canada, Open File 1110; 77 p.

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1996: Geological Map of Canada; Geological Survey of Canada, Map 1860A, scale 1:5 000 000.

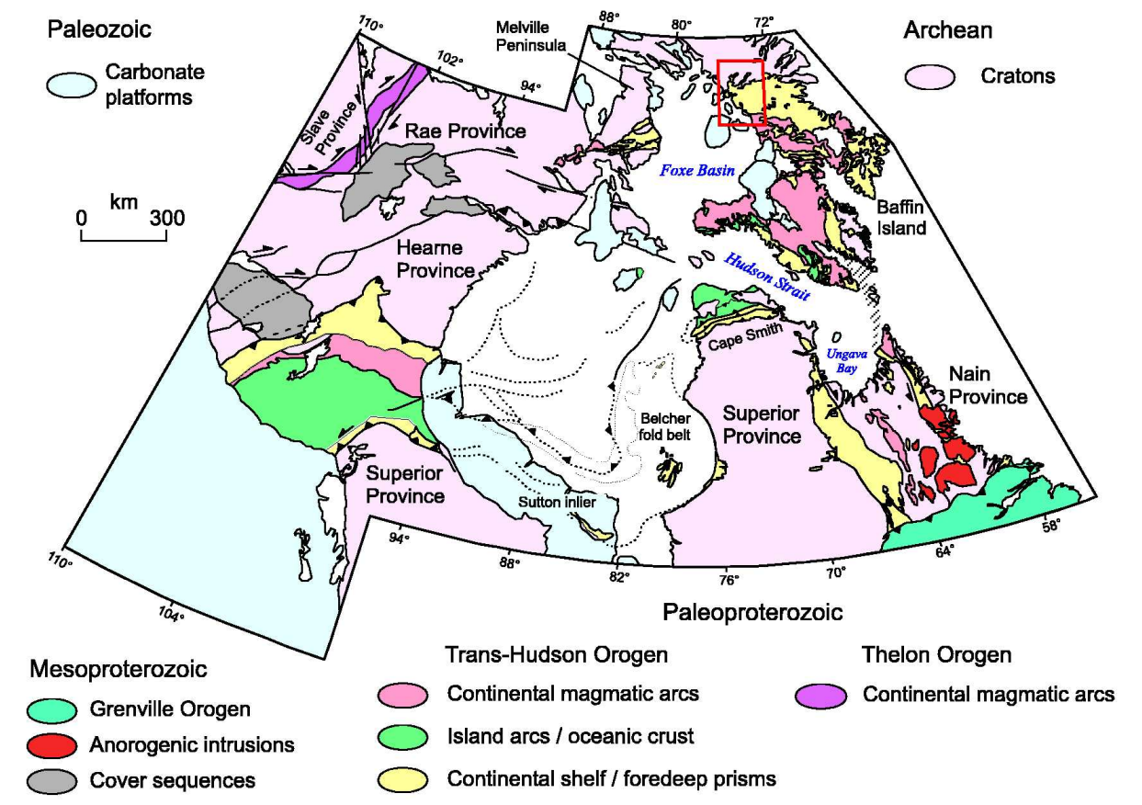

Figure 1. Geological map of northeastern Canada modified after Wheeler et al. (1996) outlining the surface extent of the Trans-Hudson Orogen. Red box outlines location and surface extent of three-year mapping project in central Baffin Island.

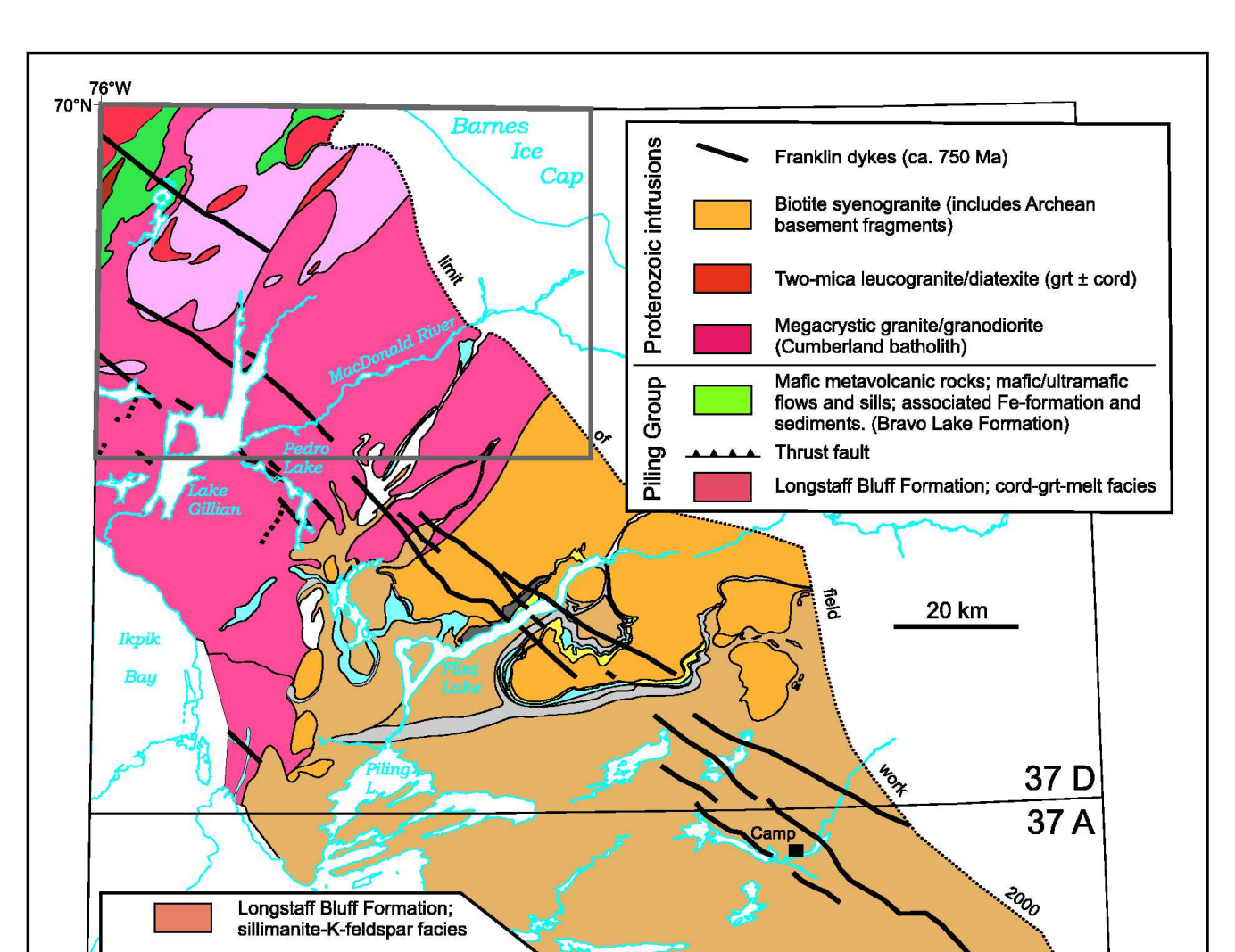

Figure 2. Generalized bedrock geology of the project area along transect mapped in 2000 in central Baffin Island (after Corrigan et al., in press). Gray outline shows map area.

Figure 3. Biotite ± hornblende quartzofeldspathic orthogneiss (unit Agn). Hammer is 35 centimetres long. Location shown on OF 3958.

Figure 4. Biotite-allanite monzogranite (unit Pgr). Pen is 14 centimetres long. Location shown on OF 3960.

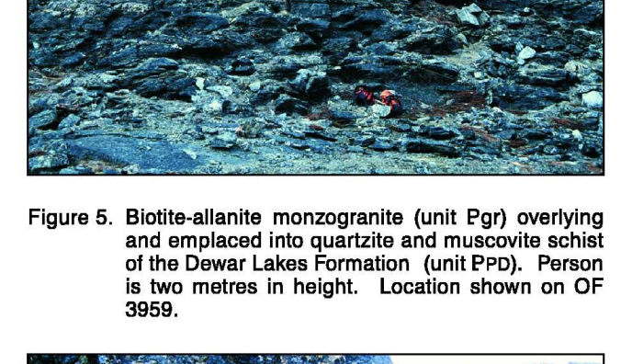

Figure 5. Biotite-allanite monzogranite (unit Pgr) overlying and emplaced into quartzite and muscovite schist of the Dewar Lakes Formation (unit PPD). Person is two metres in height. Location shown on OF 3959.

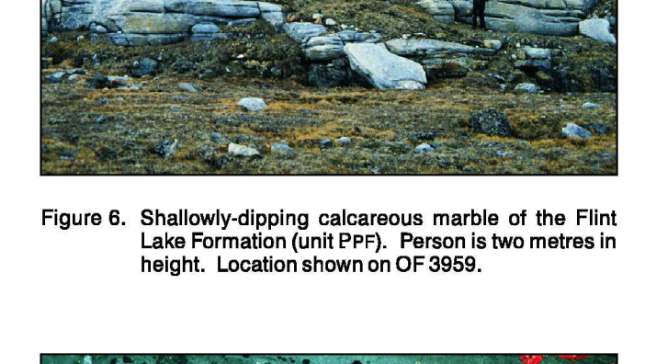

Figure 6. Shallowly-dipping calcareous marble of the Flint Lake Formation (unit PPF). Person is two metres in height. Location shown on OF 3959.

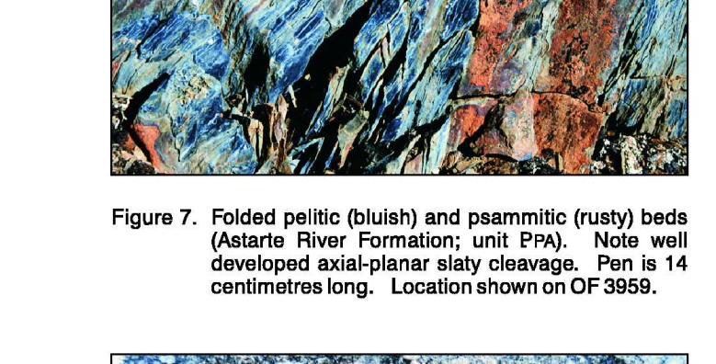

Figure 7. Folded pelitic (bluish) and psammitic (rusty) beds (Astarte River Formation; unit PPA). Note well developed axial-planar slaty cleavage. Pen is 14 centimetres long. Location shown on OF 3959.

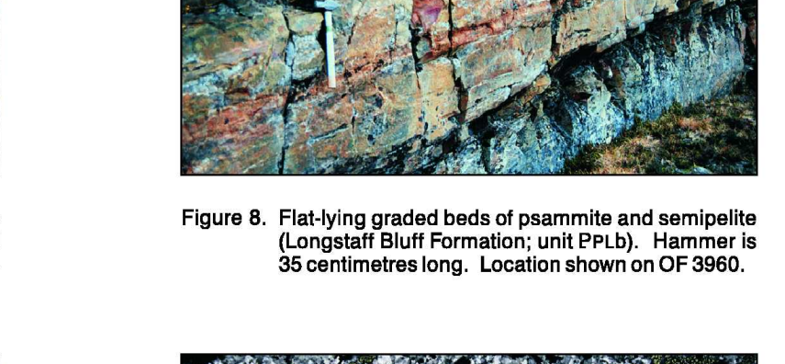

Figure 8. Flat-lying graded beds of psammite and semipelite (Longstaff Bluff Formation; unit PPLb). Hammer is 35 centimetres long. Location shown on OF 3960.

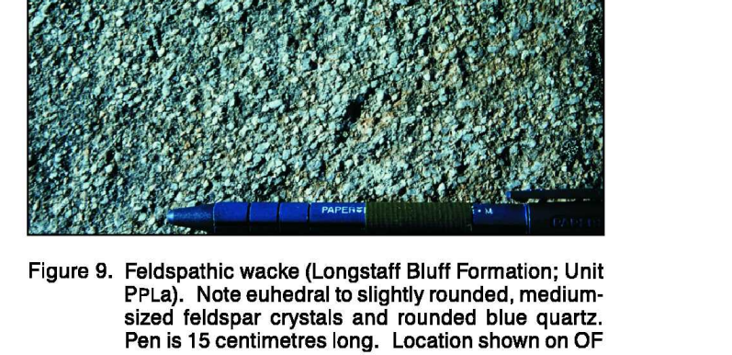

Figure 9. Feldspathic wacke (Longstaff Bluff Formation; Unit PPLa). Note euhedral to slightly rounded, medium-sized feldspar crystals and rounded blue quartz. Pen is 15 centimetres long. Location shown on OF 3960.

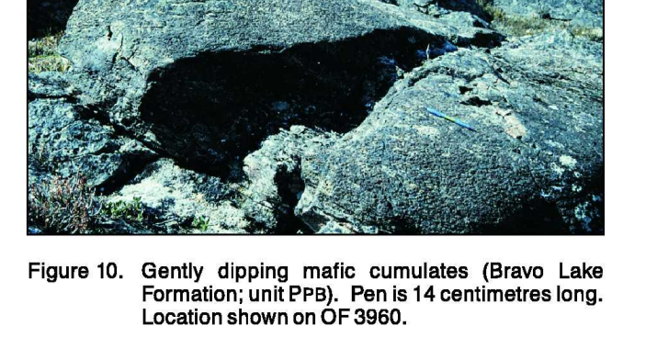

Figure 10. Gently dipping mafic cumulates (Bravo Lake Formation; unit PPB). Pen is 14 centimetres long. Location shown on OF 3960.

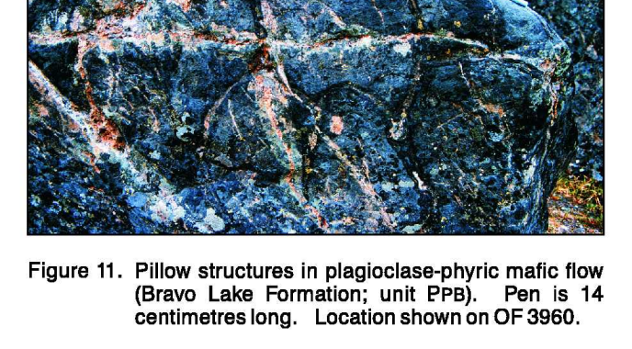

Figure 11. Pillow structures in plagioclase-phyric mafic flow (Bravo Lake Formation; unit PPB). Pen is 14 centimetres long. Location shown on OF 3960.

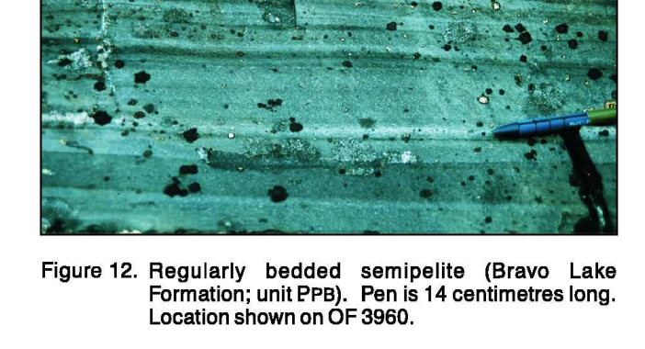

Figure 12. Regularly bedded semipelite (Bravo Lake Formation; unit PPB). Pen is 14 centimetres long. Location shown on OF 3960.

Figure 13. Biotite-garnet K-feldspar megacrystic monzogranite (Cumberland batholith; unit PCgk). Hammer is 35 centimetres long. Location shown on OF 3961.

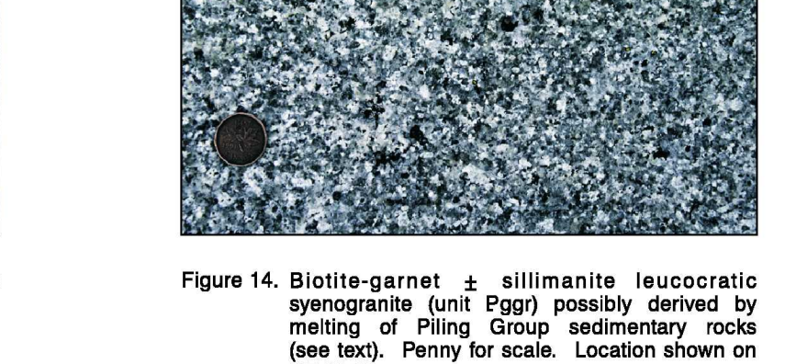

Figure 14. Biotite-garnet ± sillimanite leucocratic syenogranite (unit Pggr) possibly derived by melting of Piling Group sedimentary rocks (see text). Penny for scale. Location shown on OF 3960.

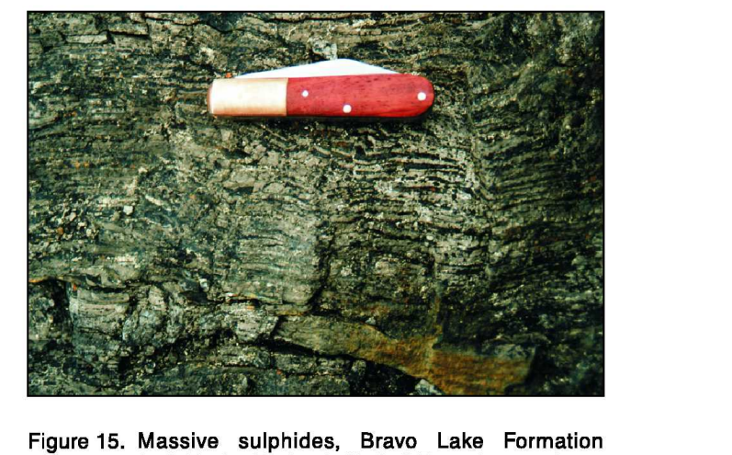

Figure 15. Massive sulphides, Bravo Lake Formation (unit PPB). Pocket knife is 8.5 centimetres long. Location shown on OF 3961.

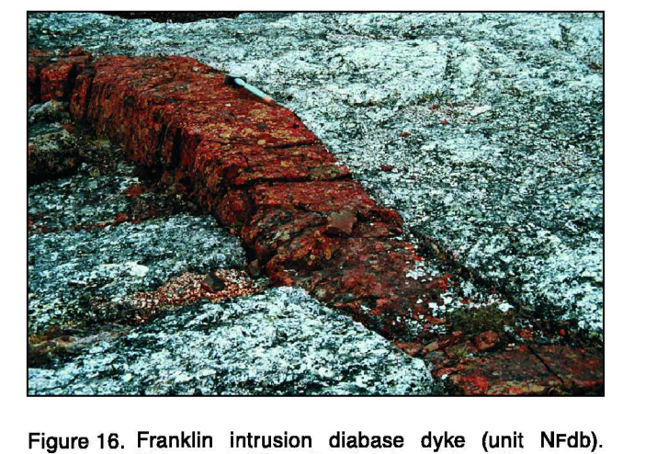

Figure 16. Franklin intrusion diabase dyke (unit NFdb). Hammer is 35 centimetres long. Location shown on OF 3960.

Canada

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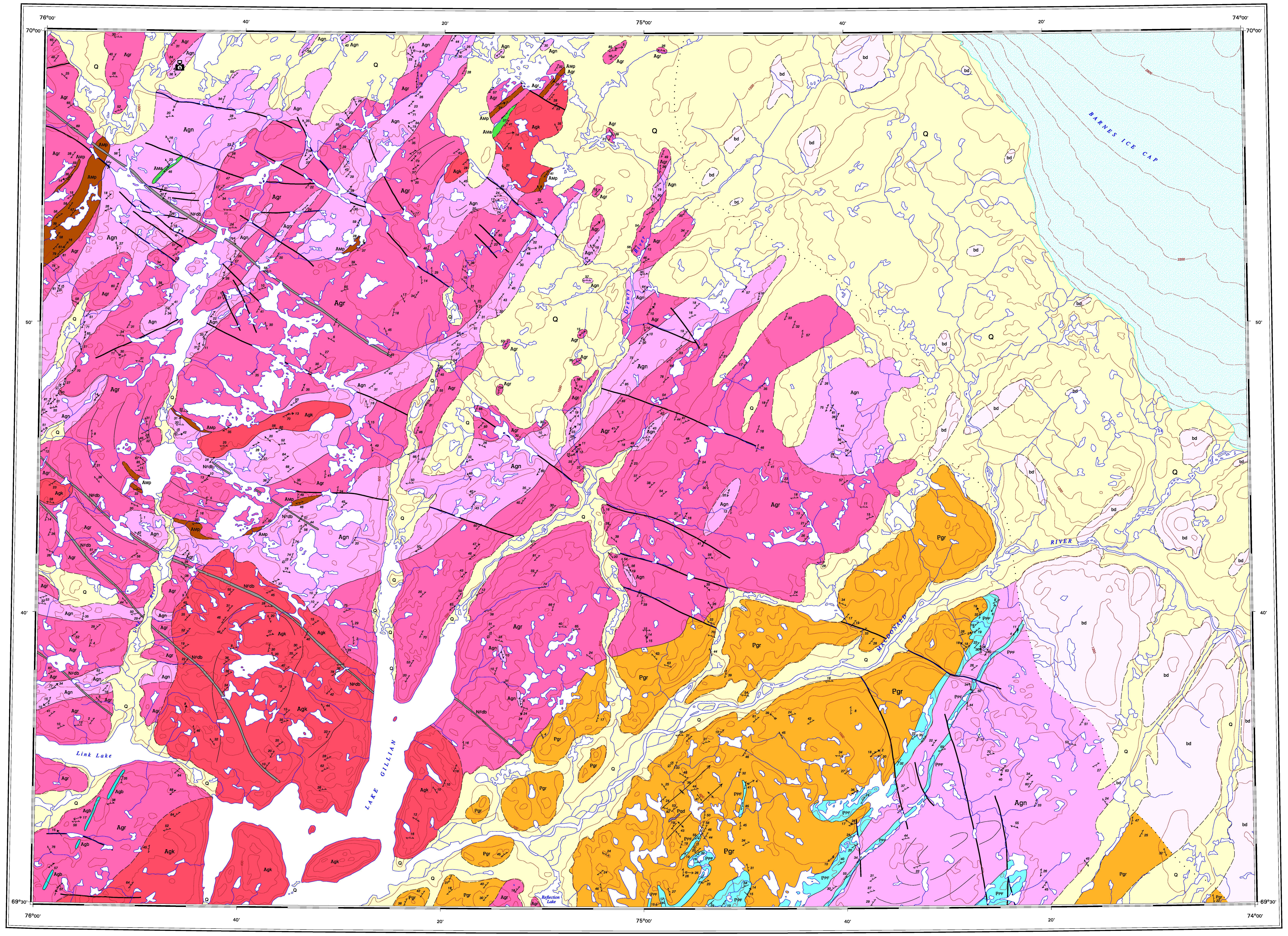


LEGEND

This legend is common to maps OF 3958, OF 3959, OF 3960, and OF 3961. All units and symbols may not appear on all maps. The prefix 'meta' applies to all lithologies in units PPB to Agn

CENOZOIC

QUATERNARY
PLEISTOCENE-RECENT

Q	*Unconsolidated glacial drift with associated marine, lacustrine, fluvial, and bog deposits. Chiefly marine muds on coastal areas. Includes extensive felsenmeer in proximity to Barnes Ice Cap*

unconformity

PALEOZOIC

ORDOVICIAN
UPPER MIDDLE AND UPPER ORDOVICIAN

Ols	*Dolomitic limestone; minor calcareous dolostone*

UPPER LOWER AND LOWER MIDDLE ORDOVICIAN

Os	*SHIP POINT FORMATION: dolostone, in part sandy, silty, argillaceous; dolomitic flat-pebble conglomerate; minor dolomitic sandstone, siltstone, breccia, quartz-cemented sandstone*

unconformity

PROTEROZOIC

NEOPROTEROZOIC

NFdb	*FRANKLIN INTRUSIONS: tholeiitic diabase dykes; medium-grained with ophitic texture; narrow chilled margins*

intrusive contact

PALEOPROTEROZOIC

Pum	*Ultramafic rocks; serpentinized peridotite and hornblendite; foliated to schistose; dark green or brown weathering*
Pgr	*Biotite-allanite ± hornblende monzogranite, granodiorite; commonly grades into biotite-allanite ± hornblende syenogranite; massive, fine- to coarse-grained, pink to white; abundant crosscutting veins and sheets of associated biotite-muscovite-garnet ± tourmaline pegmatite; locally contains inclusions of layered orthogneiss (unit Agn), quartz diorite (unit Pgd), psammite (unit PPD), and marble (unit PPF); local weak foliation*
Pqd	*Hornblende-clinopyroxene-biotite quartz diorite; biotite-hornblende monzogranite veins; massive, medium- to coarse-grained, black and white peppered texture; locally foliated to amphibolite*
Pggr	*Biotite-garnet ± muscovite ± sillimanite (fibrolite) ± cordierite syenogranite; leucocratic, medium-grained to pegmatitic, white to light pink; weakly to moderately foliated; contains abundant inclusions and rafts of high grade psammite, semipelite (unit PPLg); possibly derived by partial to total melting of Piling Group sedimentary rocks (see descriptive notes)*

CUMBERLAND BATHOLITH (units PCgk - PCgr)

PCgr	*Biotite ± garnet monzogranite; commonly grades into biotite syenogranite; massive, medium- to coarse-grained, grey to pink; varies from weakly to strongly foliated; locally contains rafts and inclusions of K-feldspar megacrystic monzogranite (unit PCgk)*
PCgk	*Biotite ± hornblende ± garnet K-feldspar megacrystic monzogranite, granodiorite; dark to buff; K-feldspar megacrysts in a finer-grained matrix of plagioclase, quartz, biotite; varies from weakly to strongly foliated; K-feldspar megacrysts commonly rimmed by plagioclase (Rapakivi texture); contains inclusions of high-grade psammite (unit PPLg) (Longstaff Bluff Formation)*

intrusive contact

PILING GROUP (units PPD - PPB)
Upper Sequence

PPB	*BRAVO LAKE FORMATION: basalt; pillowed, fragmental and massive flows; light to dark green; mafic and ultramafic cumulates; metre-scale layers, dark green to brown; volcaniclastic sedimentary beds; millimetre- to centimetre-scale laminations, dark grey to white; minor quartzite and semipelite; gabbro; peridotite; layered peridotite-gabbro sills*

tectonic contact

LONGSTAFF BLUFF FORMATION (metamorphic mineral units PPLb - PPLg)

PPLg	*Psammite, semipelite, pelite, arkosic- and lithic-wacke; interbedded; thin to thick bedded, light to dark grey; graded beds; minor hornblende- bearing calcsilicate beds and concretions; garnet-cordierite- K-feldspar-melt pod mineral assemblages*

mineral isograd

PPLs	*Psammite, semipelite, pelite, arkosic- and lithic-wacke; interbedded; thin to thick bedded, light to dark grey; graded beds; minor hornblende-bearing calcsilicate beds and concretions; biotite-sillimanite-K-feldspar ± melt pod mineral assemblages*

mineral isograd

PPLc	*Psammite, semipelite, pelite, arkosic- and lithic-wacke; interbedded; thin to thick bedded, light to dark grey; graded beds including inverse metamorphic grading; minor hornblende-bearing calcsilicate beds and concretions; biotite-muscovite-cordierite ± andalusite metamorphic assemblages*

mineral isograd

PPLb	*Psammite, semipelite, pelite; minor arkosic- and lithic-wacke; interbedded; thin to thick bedded, light to dark grey; graded beds; minor hornblende-bearing calcsilicate beds and concretions; biotite-muscovite ± garnet mineral assemblages*
PPLa	*LONGSTAFF BLUFF FORMATION: Arkosic- and lithic-wacke; interbedded with psammite, semipelite, pelite; thin to thick bedded, white, gritty surface; graded beds; minor hornblende-bearing calcsilicate beds and concretions; biotite-muscovite ± garnet mineral assemblages*
PPA	*ASTARTE RIVER FORMATION: sulphidic schist; rusty weathering; graphitic, pyrrhotite-pyrite schist and slate; sulphide facies iron formation*

Lower Sequence

PPF	*FLINT LAKE FORMATION: marble, dolomite and calcsilicate; chiefly white to grey or buff weathering; may include semipelite, pelite, quartzite and carbonate facies iron formation*
PPD	*DEWAR LAKES FORMATION: quartzite and feldspathic quartzite, semipelite; grey, white, and black; laminated, bedded and massive, locally cross-bedded; may include magnetite rich laminae; locally includes iron formation; chiefly oxide facies with silicate facies; metallic grey; fine- to coarse-grained; laminated to bedded*

unconformity

ARCHEAN

NEOARCHEAN

Agb	*Hornblende-biotite ± clinopyroxene gabbro; dark, medium- to coarse-grained; ophitic- to sub-ophitic texture; locally foliated to amphibolite*
Agk	*Biotite ± hornblende K-feldspar megacrystic monzogranite, granodiorite; pink to buff; K-feldspar megacrysts in a finer-grained matrix of plagioclase, quartz, biotite ± hornblende; varies from weakly to strongly foliated, locally an L-tectonite; gradational into granitic and granodioritic rocks lacking megacrysts*
Agr	*Biotite monzogranite, syenogranite; pink, fine- to medium-grained; massive to moderately foliated; locally grades into megacrystic granite*

MARY RIVER GROUP (units AMa - AMp)

AMp	*Psammite, semipelite; grey- to rusty-brown, flaggy; centimetre- to metre-scale laterally continuous layers; abundant melt pods; local interlayers of quartzite, pelite and iron formation*
AMa	*Hornblende-biotite ± clinopyroxene amphibolite; fine- to medium-grained; alternating millimetre- to centimetre-scale black and green layers; metre-scale layers of coarser-grained amphibolite, semipelite and pelite; may be derived from a volcanic protolith and associated sedimentary rocks*
Agn	*Biotite ± hornblende quartzofeldspathic orthogneiss; leucocratic gneiss of plutonic origin; granodioritic to monzogranitic; alternating grey to white, black, pink, fine- to medium-grained; moderately to well foliated, locally layered with concordant syenogranitic leucosome; locally contains amphibolite and tonalite bands, gabbro/anorthosite boudins; locally migmatitic*

limit of field work, 2000

bd	*Bedrock areas not mapped during the summer of 2000*

Geological contact (defined, approximate)
Limit of field work, 2000
Form lines
D_{1P} thrust fault (defined, approximate); teeth on hanging wall
Oblique-slip fault (defined)
Normal fault (approximate); solid circle on hanging wall
Bedding (upright, tops known) 10
Bedding (overturned, tops known) 20
Bedding (tops unknown) 30
Bedding (transposed) 40
Cleavage 50
Schistosity 60
Foliation 10
Gneissosity 20
Mineral lineation 30
Crenulation axis 40
Mesoscopic S fold axis 50
Mesoscopic M fold axis 60
Mesoscopic Z fold axis 10
Mesoscopic fold axial plane 20
Syncline (upright, overturned)
Anticline (upright)
Synform (upright)
Antiform (upright)
Glacial straie; direction of ice movement undetermined
Location of field photograph with corresponding Figure number 2

Geology by M.R. St-Onge, D. Corrigan, F. Berniolles, K. Dubach, S. Modeland, J. Robillard, J. Stacey, J. Chakungal, S. Gagné, C. Hogue, C. Huebert, A. Simmons, E. de Kemp, and D. Snyder (2000), Geological Survey of Canada; D.J. Scott (2000), Canada-Nunavut Geoscience Office; D.M. Carmichael and H. Helmstaedt (2000), Queen's University; D. Francis (2000), McGill University

Geological compilation by M.R. St-Onge, D.J. Scott, and D. Corrigan, 2000

Digital cartography by E. Everett, Earth Sciences Sector Information Division (ESS Info)

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

Proximity to the North Magnetic Pole causes the magnetic compass to be erratic in this area
Mean magnetic declination 2001, 47°33'E, decreasing 23.6' annually. Readings vary from 46°23'W in the SW corner to 48°35'W in the NE corner of the map

Elevations in feet above mean sea level

OPEN FILE 3958

GEOLOGY

MACDONALD RIVER

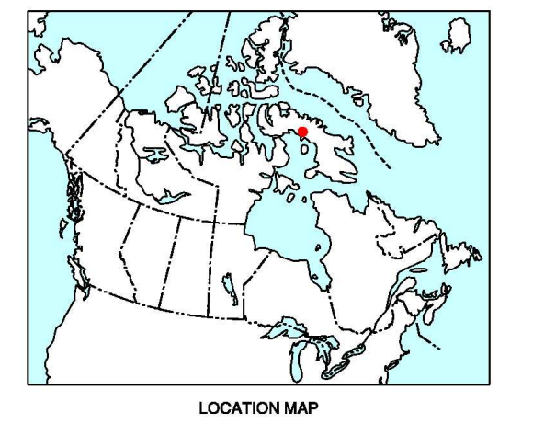
NUNAVUT

Scale 1:100 000/Échelle 1/100 000

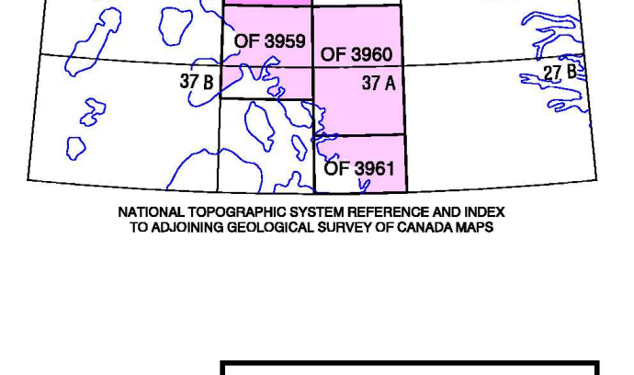
kilometres 2 0 2 4 6 8 kilomètres

Universal Transverse Mercator Projection
North American Datum 1983

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



LOCATION MAP



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

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3958
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
OTTAWA
03/2001

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2001: Geology, MacDonald River, Nunavut; Geological Survey of Canada, Open File 3958, scale 1:100 000.