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CANADIAN GEOSCIENCE MAP 153

PRECAMBRIAN GEOLOGY

LEITH PENINSULA–RIVIÈRE GRANDIN AREA

Northwest Territories

Map Information Document

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ABSTRACT

The Leith Peninsula map area lies along the western margin of the Canadian Shield (Kidd, 1936a) and is dominated by Paleoproterozoic rocks of Wopmay Orogen (Hoffman, 1980, 1989). The oldest rocks, termed Hottah terrane (Hildebrand, 1981), constitute the metamorphic basement to volcanic, plutonic, and sedimentary rocks of the 1.875–1.843 Ga Great Bear magmatic zone (McGlynn, 1979; Bowring, 1985). Hottah terrane is interpreted as a precollisional arc that collided with Slave Craton and its west-facing passive margin during the 1.88 Ga Calderian Orogeny (Hoffman, 1980; Hildebrand, 1981; Bowring and Grotzinger, 1992; Hildebrand et al., 2010a). Rocks of the Great Bear magmatic zone are interpreted as a postcollisional arc, were folded about northwest to northerly trending axes, and are cut by abundant transcurrent faults (Hoffman and McGlynn, 1977; Hildebrand et al., 1987b, 2010b). A swarm of northwesterly trending diabase dykes, dated at 1740 Ma, cut the faults (Irving et al., 2004).

RÉSUMÉ

La région cartographique de Leith Peninsula, située le long de la marge occidentale du Bouclier canadien (Kidd, 1936a), est dominée par des roches paléoprotérozoïques de l'orogène de Wopmay (Hoffman 1980, 1989). Les roches les plus anciennes, qui définissent le terrane de Hottah (Hildebrand, 1981), forment le socle métamorphique des unités volcaniques, plutoniques et sédimentaires de la zone magmatique du Grand lac de l'Ours, qui remonte à 1,875-1,843 Ga (McGlynn, 1979; Bowring, 1985). Selon les interprétations, le terrane de Hottah constituerait un arc pré-collision qui serait entré en collision avec le craton des Esclaves et sa marge passive à regard ouest lors de l'orogenèse caldérienne survenue à 1,88 Ga (Hoffman, 1980; Hildebrand, 1981; Bowring et Grotzinger, 1992; Hildebrand et al., 2010a). Les roches de la zone magmatique du Grand lac de l'Ours, qui représenterait un arc magmatique continental post-collision, sont plissées autour d'axes de direction nord à nord-ouest et recoupées par de nombreuses failles de coulissage (Hoffman et McGlynn, 1977; Hildebrand et al, 1987b, 2010b). Des dykes de diabase de direction nord-ouest d'un essaim daté à 1740 Ma recoupent les failles (Irving et al., 2004).

LICENCE AGREEMENT

ACCORD DE LICENCE

SHEET 1 OF 1, PRECAMBRIAN GEOLOGY

GENERAL INFORMATION

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Sources of geological data *see* Figure 2.

Geological compilation by R.S. Hildebrand, 2012

Geomatics by A. Morin, P. Brouillette, and K. Lauzière

Cartography by R. Boivin and N. Côté

Joint initiative of the Geological Survey of Canada and Northwest Territories Geoscience Office, conducted under the auspices of the GEM's–IOCG Great Bear project as part of Natural Resources Canada's Geo-mapping for Energy and Minerals (GEM) program

Map projection Universal Transverse Mercator, zone 11. North American Datum 1983

Base map at the scale of 1:250 000 from Natural Resources Canada, with modifications.
Elevations in metres above mean sea level

Mean magnetic declination 2017, 19°06'E, decreasing 26.6' annually. Readings vary from 18°39'E in the SE corner to 19°32'E in the NW corner of the map.

This map is not to be used for navigational purposes.

Title photograph: Eastern shore of Great Bear Lake from Leith Ridge, Northwest Territories. Photograph by R.S. Hildebrand. 2015-107

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Data may include additional observations not portrayed on this map. *See* map info document accompanying the downloaded data for more information about this publication.

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This publication has been scientifically reviewed, but it has not undergone a formal edit.

MAP VIEWING FILES

The published map is distributed as a Portable Document File (PDF), and may contain a subset of the overall geological data for legibility reasons at the publication scale.

Cartographic Representations Used on Map

This map utilizes ESRI Cartographic Representations in order to customize the display of standard GSC symbols for visual clarity on the PDF of the map only. The digital data still contains the original symbol from the standard GSC symbol set. The following legend features have Cartographic Representations applied:
Fold anticline, upright
Fold syncline, upright

Descriptive Notes

Introduction

This map compiles 1:16 000 scale geological mapping by the author and co-workers during the 1979 and 1980 field seasons supported by the Department of Indian and Northern Affairs (DIAND) and both 1:16 000 and 1:50 000 scale during the 1982–1984 field seasons by the Geological Survey of Canada. Within areas of supracrustal rocks most, if not all, of the existing outcrops were visited, whereas within areas of plutonic rocks irregularly spaced traverses were made and contacts between mappable units were walked. Mapping was plotted on enlargements of black and white aerial photographs. The results of fieldwork were described by Hildebrand (1982a, b, 1984, 1985a, b); Hildebrand et al. (1983, 1984); Hildebrand and Roots (1985); and Reichenbach (1991). Digitalization and publication of the map were supported by the Geo-mapping for Energy and Minerals (GEM) Program, Multiple Metals: Great Bear Magmatic Zone project.

Early reconnaissance mapping in the area was by Kidd (1936a, b, c), followed up by post-war work on possible uranium resources at Beaverlodge Lake by Henderson (1949). More recent geological mapping was done in the 70's (Shegelski and Murphy, 1973; McGlynn, 1976, 1979; Hoffman et al., 1976). Wilson (1979) did a petrographic and geochemical study of basalts at Hottah Lake and Tirrul (1976) studied the Rainy Lake pluton in the Camsell River area. The rich Ag, Ni-Co arsenide, native Bi vein deposits in the Camsell River area were examined by Badham (1972, 1973a, b, 1975), Shegelski (1973), Badham and Morton (1976), Gandhi (1978), Thorpe (1974), and Withers (1979).

Outcrop throughout the parts of the area underlain by Precambrian rocks is good to excellent with few areas of extensive overburden. Leith Ridge and the eastern shores of Great Bear Lake are characterized by greater topographic relief than the area around Hottah Lake. Great Bear and Hottah lakes provide good access by boat and elsewhere, such as Leith Ridge, large lakes are accessible by floatplane during the summer months.

Regional Setting

The Leith Peninsula and Rivière Grandin map areas lie along the western margin of the Canadian Shield and so include Paleoproterozoic rocks of Wopmay orogen and Hornby Bay Group unconformably overlain by Paleozoic sedimentary rocks. The Paleozoic rocks are nearly flat-lying and very poorly exposed so were mapped only where encountered adjacent to the older rocks.

Wopmay orogen is divided into five major zones, from east to west: Coronation margin, Turmoil klippe, the Medial zone, Great Bear magmatic zone, and Hottah terrane. Coronation margin contains basement rocks of the Archean (4.0–2.5 Ga) Slave craton overlain by a tripartite sedimentary succession representing three distinct tectonic regimes: 2014.32 ± 0.89 Ma rift, passive margin, and foredeep (Hoffman, 1973, 1980, 1984, 1989; Hoffman et al., 2011). The supracrustal rocks of the margin were detached from their basement, folded, and transported eastward during the Calderian orogeny. The passive margin to foredeep transition, marking the onset of collision, is dated at 1882.50 ± 0.95 Ma (Bowring and Grotzinger, 1992; Hoffman et al., 2011). The westernmost zone, Hottah terrane, developed remotely from, but in part contemporaneously with, Coronation margin (Hildebrand, 1981; Hildebrand et al., 2010a). It consists of sedimentary and 1.90 Ga calc-alkaline volcanic and plutonic rocks erupted on and intruded into Paleoproterozoic and Latest Archean continental crust (Hildebrand et al., 1983, 1984; Hildebrand and Roots, 1985).

The Great Bear magmatic zone is an ~100 km-wide belt of mostly subgreenschist-facies volcanic and plutonic rocks that crop out over a strike length of 450 km (Hoffman and McGlynn, 1977; Hildebrand et al., 1987a, 2010b). They unconformably overlie and intrude rocks deformed and metamorphosed during the Calderian orogeny. The volcanic and sedimentary rocks of the Great Bear magmatic zone are collectively included within the MacTavish Supergroup, which is divided into three groups. The LaBine Group crops out along the western side of the zone; the temporally correlative Dumas Group along the eastern side; and overlying both in the central part of the zone are intermediate ignimbrites and minor sedimentary rocks of the Sloan Group. All of the plutonic rocks are informally termed the Great Bear batholith. This map area includes rocks of Hottah terrane and the westernmost parts of the Great Bear magmatic zone.

Hottah Terrane

The most extensive area of rocks classified as part of Hottah terrane occurs within the map area where they comprise a wide variety of Paleoproterozoic metasedimentary and metavolcanic rocks cut by plutonic rocks. In the Conjuror Bay area, metasedimentary and variably deformed granitic rocks occur on Richardson Island, on several islands to the southeast, and on the mainland to the south. The northern part of Leith Ridge is dominated by 1902 Ma gneissic granite (Hildebrand et al., 1983), whereas farther south are strongly deformed sillimanite-bearing migmatitic schist and paragneiss of the Holly Lake metamorphic suite intruded by a variety of gneissic and isotropic granitoids of unresolved age. The gneissic granite is coarse-grained, foliated porphyritic biotite syenogranite and is variably deformed, ranging from virtually undeformed to strongly mylonitic. Most typically the unit is an L/S tectonite with the planar fabric defined by biotite and the lineation by stretched potassium feldspar megacrysts. The lineation is gently plunging, while the foliation is steep to gently inclined.

Within the schists, original compositional layering was completely transposed and primary sedimentary structures obliterated. The transposed fabric is isoclinally folded with shallowly plunging axes and vertical to gently inclined axial planes. Granitic pods are isoclinally folded. The orthogneisses are mainly of hornblende and biotite bearing dioritic, quartz dioritic, quartz monzonitic, and granitic compositions. Many of the gneisses are L/S tectonites with shallowly plunging lineations and steeply to gently inclined planar fabrics. In general the planar element dominates, but locally only a lineation defined by stretched crystals is present. Local zones of gabbro and clinopyroxenite also occur within this unit and are only slightly deformed. Contacts between all rock types parallel the planar fabric and may be tectonic.

A variety of metasedimentary and metavolcanic rocks grouped within Hottah terrane also occur from Fishtrap Lake southward through Hottah Lake area where they are well exposed on the hundreds of small rocky, ice-cleaned islands in the eastern part of the lake as well as on the adjacent mainland (Hildebrand et al., 1984). Exposures also occur on Bell Island. The metamorphic rocks include metsedimentary rocks in northern Hottah Lake, conglomerates with detrital zircons of 2076–2278 Ma age (Bowring, 1985) and in places contain conspicuous cordierite porphyroblasts.

Isoclinally folded and sheared metasedimentary rocks in which bedding has been completely transposed occur on Bell Island and a few small islands to the east. These rocks are fine-grained assemblages of plagioclase-biotite-amphibole-quartz and chlorites. They were intruded prior to folding by swarms of granitoid sills and dykes with compositions ranging from alkali feldspar granite to quartz diorite. Many of the granitoids are protomylonitic and a few are ultramylonitic. Fold axes are generally gently plunging, and foliations, parallel to the nearly vertical limbs of isoclinal folds, strike about 300 degrees on the east side of the island and nearly north-south on the southern part. Most of the folds have been completely disrupted, probably due to extreme elongation after their formation. The fabric in the mylonitic rocks is parallel on horizontal surfaces to the disrupted limbs of folds. One of the deformed granitoids, a strongly flattened granodiorite, was dated at 1914 ± 2 Ma (Hildebrand et al., 1983; Bowring, 1985).

Agmatite-like rocks occur on many islands east of Bell Island. They comprise blocks of fine grained diorite and medium- to coarse-grained gabbro surrounded by fine- to medium-grained quartz diorite. Some of the gabbroic blocks contain clots of clinopyroxene 15 cm in diameter. These rocks range from slightly flattened to intensely flattened with steep foliations. Ultramylonitic zones occur locally and trend parallel to the regional foliation. Numerous bodies of medium- to coarse-grained granodiorite-monzogranite cut the agmatite-like rocks. Their deformation is similar to that of their host rocks.All of the above were intruded by numerous dykes and sills of fine- to medium-grained biotite granite and alkali feldspar granite. Many of the intrusions lie within the foliation or are perpendicular to it. They are undeformed to weakly foliated.

A large body of coarse-grained, leucocratic monzogranite occurs on Bell Island beneath the unconformity, on many islands northeast of there, and on the mainland east of Hottah Lake. It is typically isotropic or at most only weakly foliated.

On the mainland east of Bell Island and on a few islands to the south, deformed pillow basalts were found. In some places they are only slightly flattened, but elsewhere they are ribbon-like in cross-section and are 1 or 2 cm thick by 3 to 4 m long. Minor deformed breccia is associated with the lavas.

Several plutons of relatively undeformed granitic rock considered to belong to Hottah terrane were mapped in the Stairs Bay-Beaverlodge Lake area. Where we didn't have U-Pb dates, we used several criteria in order to differentiate little to undeformed plutons of the Hottah terrane from those of the Great Bear magmatic zone: (1) they lie unconformably beneath rocks of the Bell Island Group; (2) they are cut by numerous glomeroporphyritic diabase and gabbro dykes identical to sills related to magmatism of the Bloom basalt and Fishtrap gabbro; (3) the original ferromagnesian minerals are recrystallized to clots of tiny biotite and/or chlorite flakes; (4) they are cataclastic; (5) they are extremely leucocratic (<5% ferromagnesian minerals); and (6) they contain blue quartz, a feature which we have not noticed in Great Bear granites. In general, most bodies considered to be Hottah terrane show two or more of the above features.

A large body of medium-grained chlorite syenogranite to alkali-feldspar granite lies unconformably beneath sandstone northeast of Stairs Bay and on Beaverlodge Ridge. The body is variably porphyritic (20–40%) with spherical phenocrysts or snowflake clots of potassium feldspar up to 3 cm in a groundmass of anhedral blue quartz (2–3 mm), anhedral-subhedral plagioclase (3 mm), potassium feldspar and 10–20% chlorite. In many places, most notably at the northeast end of Stairs Bay, the rock has suffered severe cataclasis. The granite is riddled with brittle fractures and potassium feldspar phenocrysts were crushed into tiny angular chips, which are included in a dark chloritic matrix. Another body, one of the largest plutons mapped in Hottah terrane, occurs northwest of Stairs Bay. It is a medium- to coarse-grained leucocratic syenogranite that generally contains less than 5% mafic minerals, mostly chlorite. The pluton weathers various shades of white, pink and red.

A smaller pluton of fine-grained porphyritic syenogranite cuts the above pluton along its southern margin at the west end of Stairs Bay. It contains subhedral-euhedral potassium feldspar phenocrysts (1–5 cm long) and anhedral-subhedral blue quartz (3–5 mm) sitting in a much finer grained groundmass of anhedral plagioclase, quartz, potassium feldspar, and tiny biotite flakes. The pluton is cut by numerous diabase dykes.

Coarse-grained monzogranite outcrops along the east side of the above body. The age relationship with its western neighbour is unknown as the contact was not seen due to poor outcrop. The pluton is characterized by its coarse grained, non-porphyritic, leucocratic nature. It is similar to leucocratic monzogranite mapped directly beneath the Hottah-Great Bear unconformity on eastern Bell Island (Hildebrand et al., 1983).

Rocks of the 1898 Ma Bell Island Bay Group (Hildebrand et al., 1983; Reichenbach, 1991) sit unconformably upon rocks of Hottah terrane in the southern half of the map area. The group is best exposed on Bell Island in Hottah Lake, but is also extensively exposed in hills on the eastern side of the lake, as scattered remnants between younger plutons farther east, and in the south at Beaverlodge Lake. It comprises two formations: a basal fining-upward sequence of conglomerate and sandstone, named the Beaverlodge Lake sandstone, overlain by several km of mostly aphyric to sparsely porphyritic lavas, ignimbrite, block and ash flows, and minor amounts of associated volcaniclastic rocks, known as the Zebulon Formation (Reichenbach, 1991). The best exposures of the basal unconformity and lower parts of the volcanic section occur midway on eastern Bell Island just south of the prominent beach. There, highly strained metasedimentary and intrusive rocks with a near vertical foliation are overlain by a shallowly dipping, cobbly to pebbly, granular arkose that reaches its maximum thickness of about 200 m on the western side of the island. The unit thins rapidly to the east and northeast. The arkose is poorly bedded near its base and fines upward to well bedded, fine-grained arkosic sandstone. The lower part of the unit contains abundant pebbles and cobbles of basement lithologies and undeformed volcanic fragments ranging from subangular to rounded. Locally, there are lenses and 0.5 m thick planar beds holding angular quartz fragments to 20 cm. In general, the lower part of the unit is mostly massive with sparse trough crosslamination, while the upper, fine-grained part of the section is ubiquitously trough-crossbedded with westward directed paleocurrents. Detrital zircons collected from the basal sandstone on Bell Island yielded dates around 1960 Ma (Bowring, 1985).

On western Bell Island and its faulted equivalent on the northern parts of the island, the sandstone contains minor lenses of lithic tuff and several subaerial basaltic lava flows, probably filling paleovalleys. Overall, the sandstone is interpreted to record deposition in a fluvial environment, probably an alluvial fan complex, with a westward paleoslope.

Overlying, and partly interbedded with, the sandstone is a complex sequence of thinly bedded pyroclastic flows and a variety of siliceous lava flows. The lower member of the formation is composed of mafic to intermediate lava flows interbedded with rhyolitic block and ash flows, well exposed on eastern Bell Island, and bedded tuff. The tuffs are typically inversely graded with respect to size of lithic fragments. Overlying the lower member, are up to 350 m of rhyolitic ignimbrite. The uppermost parts of the formation comprise several rhyolitic dome complexes intercalated with minor mafic and intermediate lava flows.

Northeast of Stairs Bay, the unconformity between rocks of the Bell Island Bay Group and Hottah terrane is well exposed. There, crossbedded cobbly to granular arkose fills paleovalleys cut into granitoid rocks. The best exposed paleovalley has a steep scarp, interpreted as an east side down normal fault and preserved as a buttress unconformity about 15 m high along its western margin. In the lowest part of the paleovalley a thin (1 m) conglomerate containing subrounded to subangular clasts of granite and quartz porphyry overlies a relatively low relief surface of bleached and altered granite. The rest of the paleovalley is filled with crossbedded granular to pebbly arkose, except adjacent to the scarp where angular blocks of granite up to 4 m across were found in the arkose. Apparently, the blocks spalled from the steep escarpment during sedimentation. The arkose occurs only within the paleovalleys and elsewhere the granite is overlain, as is the arkose within the paleovalleys, by 30–40 m of crossbedded and rippled quartz arenite in beds varying in thickness up to 1 m. The quartz arenite is, in turn, overlain by thinly bedded to laminated tuff, siltstone, and mudstone. The total thickness of these units is unknown due to cover and younger plutons, but 50 m are exposed. The tuffs are white to pink fine-grained beds up to 0.3 m thick. They are interpreted as waterlain airfall tuff because they are intercalated with siltstone and mudstone. In general, the siltstones are well-layered rocks with interbedded 1–3 mm greenish, fine sandy layers and 2 cm limy beds. In some places there are abundant slump folds and synsedimentary breccias.

Just to the northwest, amygdaloidal basalt directly overlies intensely weathered granite. The buried erosional surface has up to 1 m of relief and the granite is hematized and more strongly weathered in hollows. The lowermost basalt flow has a 0.5 m thick basal flow breccia containing sparse elongate granite clasts. Locally, basaltic magma flowed down into v-shaped open fractures within the uppermost 0.3 m of basement. The basalt flows are cut by abundant gabbro intrusions, probably sills. Overlying the basalt flows is a complex of siliceous ash-flow tuff and lava. The lava flows have abundant associated flow and talus breccias and the ash-flow tuff is strongly eutaxitic with lineated pumice fragments and minor flow folds.

West of Beaverlodge Lake the unconformity reveals only minor pebbly sandstone and conglomerate, such that intermediate lavas lie, for the most part, directly on granitic basement. The pebbly sandstone fills local depressions up to 1 m deep and is a massive unsorted rock that weathers maroon to dark purple. The lava flows are probably dacitic and weather various shades of purple, steel grey, and brown. They are generally amygdaloidal and in places have well developed devitrification features and flow banding. At the south end of Beaverlodge Ridge minor lenses of sandstone and conglomerate are intercalated with the lava flows. The conglomerates are polymictic aggregates of volcanic and sedimentary clasts, mostly subrounded, in a sandy hematitic matrix. The sandstones vary from quartz arenites to feldspathic wackes. Overlying the sequence of lava flows are thin tuff beds of unknown composition and provenance. Locally, polymictic bouldery conglomerate and gritstone fills channels cut into the tuff and underlying lava flows. Capping the entire section is at least 60 m of white to pink weathering arkose and quartz arenite. The top of the sandstone is not exposed. The sandstones are well-bedded rocks in beds up to 1 m thick. In the few places, where there are bands of heavy minerals, crossbedding was seen, but in most outcrops there was no visible internal stratification, perhaps because the sands are very clean and there is little size variation among grains.

Great Bear magmatic zone

Unconformably overlying rocks of the Bell Island Bay Group are sedimentary and volcanic rocks included within the McTavish Supergroup. The oldest rocks are an informal grouping of three formations: a basal sedimentary unit, the Conjuror Bay formation, overlain by a thick succession of pillow basalts (Bloom basalt) cut by glomeroporphyritic gabbro sills (Fishtrap gabbro). The volcanic pile is at least 1 km thick but contains numerous mafic sills, which make thickness estimates unreliable. The pillow basalts are of three main types: aphyric, plagioclase porphyritic, or plagioclase glomeroporphyritic, which form mappable, wedge-shaped to planar units. Many of the pillows have round hollow cores partially filled with silica and epidote. Spectacular 3-dimensional exposures of these lavas, showing the typical branching bulbous form, occur along the western shoreline of the largest island north of Bell Island. The highest stratigraphic unit in the pile is a flow-banded dacitic lava, also cut by Fishtrap gabbro, and dated by U-Pb zircons to be 1875 ± 2 Ma (Reichenbach, personal communication).

Fishtrap gabbro is dominated by plagioclase glomeroporphyritic intrusions of ophitic to subophitic gabbro and diabase. Where they intrude rocks of the Hottah Terrane they most commonly form dykes, but where they intrude supracrustal rocks of the McTavish Supergroup they form sills (Hildebrand et al., 1983, 2010b). The glomeroporphyritic clots are typically 1–2 cm in diameter, normally consist of 2–5 intensely fractured and saussuritized plagioclase crystals, and commonly make up to 60 per cent of the rock. In a few places fist-size clots are common and in one locale northeast of Bell Island a football-shaped clot 20 cm long was found. Locally a weakly developed mineralogical banding occurs in the groundmass and in areas rich in glomeroporphyritic clots there are typically irregular to planar zones in which there are no clots. One large sill, which occurs at the base of the thick pile of pillow basalts north of Bell Island, contains oikocrysts of pyroxene up to 3 cm across in its lower half while the upper half contains clots of plagioclase. This sill has a fine-grained upper border phase several tens of metres thick, which contains sparse silica filled cavities up to 15 cm in diameter. The occurrence of identical plagioclase clots in both the sills and the pillow basalts suggests that the two are comagmatic.

Within the map area the LaBine Group is dominated by rocks of the Black Bear cauldron, which is the oldest collapse structure known in the Great Bear magmatic zone (Hildebrand, 1984, 1985a, b). The cauldron formed upon the older pile of tholeiitic pillow basalts (Bloom basalt) and marine sedimentary rocks (Conjuror Bay formation).These rocks had been uplifted and eroded prior to ash flow eruptions, but the erosion surface is not well enough exposed to discern its nature. Only one major ash flow sheet, Moose Bay Tuff, is known to have been erupted from Black Bear Cauldron, and it ponded to thicknesses in excess of 1 km within the cauldron. The topographic depression remaining after ash flow volcanism ended was filled by fluvio-lacustrine sedimentary rocks of the Terra Formation and intermediate lava flows, tuff, and breccias, grouped as the Camsell River Formation. A partial cross-section of the cauldron is exposed on the northeast-dipping, south limb of the prominent syncline in the area and both the structural and topographic margins are well exposed (Hildebrand, 1984, 1985a, b).

Outflow facies White Eagle tuff, erupted from Clut caldera to the east, sits atop Moose Bay tuff on the mainland northwest of the mouth of the Camsell River and on other islands in Conjuror Bay (Hildebrand, 1984, 1985a, b). The tuff apparently ponded within the topographic depression of Black Bear cauldron.

A few outflow sheets of ignimbrite collectively grouped as "younger ash flow tuffs" occur on islands within Conjuror Bay where they also appear to have ponded within Black Bear cauldron. Thicknesses of individual cooling units ranges from 100–250 m and are distinguished by the presence of sedimentary intercalations and nonwelded zones. They are described in greater detail *in* Hildebrand (1984).

In both areas the tuff and the "younger ash flow tuffs" were cut by a distinctive potassium feldspar-quartz-plagioclase porphyry that intruded along unconformity at the base of the Moose Bay tuff and followed the unconformity of the topographic margin of the caldera on the mainland and islands northward through Conjuror Bay.

Two members of the "early intermediate intrusive suite" (Hildebrand et al., 1987a, 2010b) outcrop within the map area: the Balachey and Rainy Lake plutons. Most of the Balachey pluton occurs to the east and its distribution and descriptions are detailed *in* Hildebrand (1984, 1985a, b) and Hildebrand et al. (2010b, 2014).

The Rainy Lake Intrusive Complex is a compositionally and mineralogically zoned, sheetlike pluton about 1.5 km thick and 10 to 11 km across (Hoffman et al., 1976; Tirrul, 1976). The pluton was folded after intrusion and is now exposed in oblique cross-section on the limb of a major syncline. It has a flat roof that is roughly concordant with bedding of the country rocks and a floor that is slightly convex downward, such that the thickest parts occur near the center. The pluton is intruded by the younger unrelated Longtom Lake syenogranite in the southeast, and therefore, the lower contact of the Rainy Lake Intrusive Complex is not preserved there. The pluton is mineralogically and compositionally zoned parallel to its flat roof. From top to bottom they are: a monzonitic border phase, a pseudosyenitic upper part, a central monzonite, and a lower monzodiorite. In addition, there is a lower border monzonite that presumably was connected to the upper border phase prior to intrusion of younger plutons and erosion. The pluton and its alteration are more completely described *in* Hildebrand (1986).

One of the largest plutons of the Great Bear magmatic zone, the Yen pluton, occurs in the map area. Throughout most of its area of outcrop, the pluton is a homogeneous body of medium-grained biotite-hornblende granodiorite to monzogranite with ferromagnesium content varying between 10 and 25%. Characteristic of the pluton is the presence of euhedral prisms of hornblende up to 1 cm long. Biotite is mostly fresh, forms plates up to 5 mm across, and often occurs as clots or aggregates up to 1 cm in diameter. Plagioclase is slightly greenish on the fresh surface, subhedral to euhedral, and ranges up to 8 mm long. Quartz and potassium feldspar are mostly interstitial. However, in some areas potassium feldspar phenocrysts up to 2 cm long occur, but they never constitute a large enough percentage to shift the modal composition into the syenogranite field. The contact of the pluton with its wall rocks is very irregular and there is a narrow metamorphic aureole of hornblende hornfels developed in the country rocks. In places adjacent to the outer contacts the hornblende crystals define a lineation, but it is not consistent, even over a single outcrop. It probably originated during convective flow within the magma body and the variability of the lineation may reflect turbulent eddies adjacent to the chilled marginal zone. Occurring locally at the contact are discontinuous layers, 1–10 cm thick, of variable composition. They are more or less parallel to the margin and truncations by successive layers are common.

Although it is irregular in detail and cuts up and down section along strike, the southwesternmost contact of the pluton is its floor as the contact and bedding in wall rocks dip northeastward. The western parts of the body occupy a syncline whereas the eastmost parts, located south of the Camsell River define an anticline. The synclinal core is defined there by the southeastward trending lobe of Longtom pluton and farther south by the prominent lobe of Yen pluton sitting in the broken core of the syncline as defined by Hottah basement and its overlying sandstone. A prominent zone of intrusion breccia occurs at its base on the southwestern limb of the syncline there. Continuous north-south strips, or zones, of breccia are made up of blocks of similar rock type, such as schist or diorite with little or no rotation of individual enclaves. That is, the foliation varies little in direction from block to block, yet in the two-dimensional view seen on the outcrops each block is surrounded by granodiorite. In general, diorite and quartz diorite enclaves are angular whereas schist enclaves are elongate and irregular in shape. Where the pluton intrudes older gabbro, veins of granodiorite fill fractures: enclaves occur only immediately next to the contact. The Yen pluton must be a fairly thin sheet as it is some 80 km long and, based on exposed sections and its location within the stratigraphic section appears to be just a few kilometres thick.

The Tla pluton is a composite body comprising medium-grained hornblende-biotite monzogranite and quartz monzonite with fine-grained patches holding potassium feldspar phenocrysts. The Longtom Lake pluton is generally a coarse-grained porphyritic biotite granite.

Porphyritic dykes are common, especially in the area east of Conjuror Bay, where a prominent north-trending swarm, named the Grouard porphyries occurs. They are too small to show on the map but typically comprise variable amounts of plagioclase, hornblende, biotite, quartz, and alkali feldspar in a pink to brick-red aphanitic matrix. Another cluster of similar siliceous dykes occurs east of northern Hottah Lake.

Several undated plutons occur on Leith Ridge and may be part of the Great Bear batholith. The most common rock type there is potassium feldspar porphyritic biotite granite. Its age relations with respect to rocks of the Great Bear magmatic zone are unknown. The granite contains 10–30% potassium feldspar phenocrysts up to 5 cm long enclosed in a fine- to medium-grained groundmass of quartz, plagioclase, alkali feldspar, and biotite. The more porphyritic phases are syenogranite, while the less porphyritic phases are monzogranite. Biotite, commonly forming clots to 1 cm, constitutes up to 10% of the rock. A few local zones contain a per cent or two of muscovite. In many places around Tuchay Lake the potassium feldspar phenocrysts define a weak lineation. The orientation is variable but trends from 90 to 150 predominate.

Sheets of fine-grained biotite granite up to 10 m thick intrude the porphyritic granites north of Tuchay Lake. Local pegmatites contain books of muscovite 2–3 cm across. South of Tuchay Lake, a porphyritic granite is intruded by a medium grained muscovite-biotite granite containing sparse tabular potassium feldspar phenocrysts to

3 cm. The sharp irregular contact abruptly truncates the lineation of phenocrysts in the older porphyritic granite, and dips shallowly toward the porphyritic granite. Numerous dykes and sills of the muscovite-bearing granite cut the porphyritic granite adjacent to the contact.

The muscovite-bearing intrusion is itself cut by a fine-grained equigranular biotite granodiorite. The contact is razor sharp and very irregular in detail. Locally, the granodiorite contains potassium feldspar phenocrysts adjacent to the contact, probably plucked from the muscovite-bearing intrusions. A large number of angular to rounded enclaves of the muscovite-biotite granite also occur within 10 m of the contact.

On the north side of Tuchay Lake a biotite-muscovite to muscovite-biotite syenogranite intrudes porphyritic biotite granite and cuts abruptly across the trend of lineated potassium feldspar phenocrysts. The contact is sharp. This intrusion contains sparse tabular phenocrysts of potassium feldspar.

All of the rocks of the Great Bear magmatic zone were apparently folded prior to transcurrent faulting. The folds, which now trend north-northwest, were more likely oriented more northerly prior to rotation on the northeasterly trending faults, which in the Great Bear zone rotated about vertical axes in a counter-clockwise direction.

The area was cut by a swarm of northeast trending trascurrent faults after 1843 Ma and prior to 1740 Ma, the age of diabase dykes, which cut the faults. The faults are part of a much larger group of transcurrent faults related to E-W shortening and N-S extension (Hoffman and Hall, 1993; Hildebrand, 2011).

Younger rocks

An east- to northeast-trending swarm of diabase dykes, named Cleaver diabase, intruded rocks of the Great Bear magmatic zone after transcurrent faulting and were dated to be 1740 +5/-4 Ma (Irving et al., 2004). They are too thin to show at the scale of this map.

On Leith Ridge, rocks of Wopmay orogen and Cleaver dykes are unconformably overlain by arenite and minor conglomerate of the pre 1663 ± 8 Ma Hornby Bay group (Ross and Kerans, 1989). Based on geophysical methods there was a minimum of 2 km northwest side down movement on the northwest bounding fault of Leith Ridge (McGrath and Hildebrand, 1984). Many of the transurrent faults of the western Great Bear magmatic zone appear to have been reactivated as west-side-down normal faults during sedimentation of the Hornby Bay group.

Two intrusions emplaced during the Gunbarrel magmatic event occur within the map area and are the 779.6 Ma Gunbarrel gabbro and the 779.5 Ma Calder sheet, both of which are rather typical coarse-grained tholeiitic gabbro (Harlan et al., 2003).

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COORDINATE SYSTEM
Projection: Universal Transverse Mercator
Units: metres
Zone: 11
Horizontal Datum: NAD83
Vertical Datum: mean sea level

BOUNDING COORDINATES
Western longitude: 119°31’00”W
Eastern longitude: 118°00’00”W
Northern latitude: 66°00’00”N
Southern latitude: 64°35’00”N

SOFTWARE VERSION
Data has been originally compiled and formatted for use with ArcGIS™ desktop version 10.2.2 developed by ESRI®.

DATA MODEL INFORMATION
No Model
This Canadian Geoscience Map does not conform to either the Bedrock or Surficial Mapping Geodatabase Data Models. The author may have included a complete description of the feature classes and attributes in the Data\Data Model Info folder.