DESCRIPTIVE NOTES

The Tatlokak map area consists of NTS 87-G/1 and a thin strip of northernmost NTS 87-F/16. It lies within the Minto Inlier, a ~300 km long by 100–150 km wide belt of gently folded sedimentary and igneous rocks of early Neoproterozoic age (late Tonian-early Cryogenian). The Neoproterozoic sedimentary rocks belong to the Shaler Supergroup, a ~4 km thick succession of shallow marine carbonate and evaporite rocks with interbedded tengerite-rich metasedimentary strata deposited in a shallow intracontinental epeiric sea known as the Amundsen Basin (Thorsteinsson and Tozer, 1962; Young, 1981; Rainbird et al., 1994, 1995a). The basin is considered to have formed within the supercontinent Rodinia during the initial rift phase that preceded the breakup of Laurentia (Cox et al., 2015; Rainbird et al., 1996; Cox et al., 2016; Macdonald et al., 2010). 1500 km to the southwest (Long et al., 2008; Rainbird et al., 1996a) Basal strata of the Shaler Supergroup (Rae Group) are exposed only at the northeastern end of the Minto Inlier, near Hadley Bay, where they unconformably overlie Paleoproterozoic sedimentary rocks, which in turn, unconformably overlie Archean granitic rocks (Campbell, 1981; Rainbird et al., 1994).

Shaler Supergroup strata were injected by tholeiitic basaltic sills of the ca. 723–720 Ma (Heaman et al., 1992; Macdonald et al., 2010) Franklin igneous event. Sills are generally 20–40 m thick, constitute 15–50% of the stratigraphic section, and commonly extend for 20 km or more along-strike with little change in thickness. Rare north-northwest striking dykes are interpreted to have intruded along syn-magmatic normal faults, to feed sills and possibly the flood basalts (Bédard et al., 2012). Sills of similar type and age also occur in the Coppermine Homocline, Brock Inlier and Duke of York Inlier to the south (Jefferson et al., 1994; Rainbird et al., 1996b; Shellnutt et al., 2004) and in the subsurface of southeastern Victoria Island and southern Banks Island, where they have been imaged by petroleum industry seismic surveys (Yukon (Hearman et al., 1992; Dietrych et al., 2009; Macdonald et al., 2010). The Shaler Supergroup in Minto Inlier is capped by Natkusiak Formation flood basalt lava flows and interflow sedimentary rocks (Williamson et al., 2013). The lavas are up to 1 km thick and are the extrusive equivalent of the Franklin sills (Baragar, 1976; Jefferson et al., 1995; Dostal et al., 1998; Dupuy et al., 1995). Two main Franklin magma compositions are identified. Basal lavas and older sills (Type 1) are slightly enriched in very incompatible trace elements (high Ce/Yb), tend to be more primitive (higher MgO), and the sills may have peridotitic bases, with up to 50% olivine (Hayes et al., 2015). These primitive Type 1 sills have potential for Ni-Cu-PGE mineralization (Jefferson et al., 1994). Younger diabasic sills (low Ce/Yb, Type 2) correspond to the major sheet complexes and have compositions that are indistinguishable from the Natkusiak flows. Type 2 intrusions. Note that feldspar porphyries are not observed in Type 1 intrusions, peridotite is never observed in the Franklin intrusions, whereas diabasic or gabbroic textures are undiagnostic of magmatic affinity. Only Type 2 intrusions have been identified in this map sheet.

The irregular edge of the exposed Minto Inlier is defined by an erosional unconformity that separates the Neoproterozoic rocks from lower Cambrian sandstone and siltstone that passes upward into a thick succession of mainly dolomitic carbonate rocks ranging in age from Cambrian to Devonian (Thorsteinsson and Tozer, 1962; Dewing et al., 2015). Minto Inlier rocks are affected by open folds with northeast trending axial traces. Beds typically dip no more than 10° and there is generally no penetrative deformation fabric. The origin of the folding is unknown but it occurred after 720 Ma, before uplift and erosion of the Proterozoic rocks and prior to deposition of overlying lower Cambrian siliciclastic rocks (Dorbano et al., 2015), which are not folded, but dip gently toward the northwest. Two main generations of faults are present in the map area. The oldest faults are high-angle, north-northwest striking normal faults that dip steeply to the west and are truncated by gently to east trending normal faults that cut all rocks in the area. The normal faults form broad and graben systems with up to 200 of metres of stratigraphic separation on individual faults, although throws are generally much less than this. A wide zone of intense east-northeast to east trending normal faulting stretches from Bloot Inlet in the west to Wynniatt Bay in the east. This regional-scale, en-echelon, stepping normal fault system records sinistral transtensional motion (Harris, 2014). Observed contacts and lithologies were extrapolated and/or inferred using aeromagnetic data and satellite imagery (e.g. orthorectified air photos, Landsat7, SPOT5, and Google Earth™). Many linear structures visible on air photos and linear discontinuities on the 1st derivative aeromagnetic maps (Kras and Oneschuk, 2010) are interpreted to be faults, although significant throws cannot always be demonstrated. Late Wisconsinan proglacial and glacial deposits cover about 50% of the map's area. The extent of Quaternary cover shown on this map is not meant to be comprehensive, but to highlight areas where bedrock attributions are uncertain.

NTS 87-F/16, 87-G/1 (Tatlokak) extends from the shore of Kangiryuaqthluk / Minto Inlet southwest, across a series of lakes (Tahkaluk, Qullig, and Aimaqqattaq) strung along the course of the Kuugua River. Southerly younging metasedimentary rocks of the upper Wynniatt, Kilian, and Kuugua formations strike east to east-northeast and dip gently to the south, defining the northern flank of the Holman Island Syncline. They are injected by seven thick Type 2 sills. Carbonate rocks located near sill contacts are generally transformed to pale marble. In the south, resistant Kuugua Formation sandstone and Natkusiak Formation lavas form a high plateau.

The northwestern corner of the map area (just south of Kangiryuaqthluk / Minto Inlet), is underlain by grey microbially laminated limestone of the Wynniatt Formation stromatolitic carbonate member (Thomson et al., 2014; unit nPw3), well exposed near UTM 5535000m, 7900670m), which is injected by a thick sill (Sill 1, numbered in ascending stratigraphic order; UTM, 5535000E, 7904500m). The contact between units nPw2 and nPw4 is intermittently exposed (e.g. UTM, 5537BE, 7903300m) beneath Sill 2, which intrudes dark nodular limestone of the upper carbonate member (unit nPw4). This dolman is cut by many east-northeast-trending faults (e.g. UTM, 5516SE, 7902120m; 5535000m, 7900670m; 5537000m, 7900500m).

The central part of the map area is occupied by a series of prominent sills emplaced into rocks of the Kilian Formation. A thick (~100 m) lower sill (Sill 3) has poorly exposed lower contacts against fissile limestone and sulphate evaporite rocks of the basal Kilian member (Rainbird, 1993; unit nPk1). Fault-guided dykes are exposed beneath Sill 3 at UTM 5254SE, 7901200m, where a thick (~80 m) section of unit nPk1 strata are exposed. This sill is very prominent east and south of Tatlokak (lake), but is covered by Quaternary deposits toward the west. Near the eastern edge of the map area, Sill 3 appears to give way to a series of northwest trending dykes. One dyke, which I have informally named the sulphide city dyke (SCD; UTM, 5315SE, 7900540m) contains abundant mm- to cm-sized nodules of recrystallized anhydrite (nodular anhydrite) and contains a large block of country rock carbonate breccia. Nodular anhydrite is rare in the Kilian Formation, but nodules similar in size occur in the Duke of York Inlier, approximately 150 km southeast (Sill 6 in the eastern map). Sill 4 (UTM, 5315SE, 7900740m) is the thickest sill (~120 m) and consists of strata of units nPk1 and nPk2 separate Sills 3 and 4. Exposures of unit nPk1 are typically of poor quality, but nodular, stromatolitic limestone is exposed at UTM, 5306SE, 7900360m and near the base of the slope, while good exposures of fissile blue-grey, shaly siltstone of the Kilian clastic carbonate member (unit nPk2) can be seen at UTM, 5263SE, 7894000m. A thin, parallel, Type 2 sill (not numbered) is emplaced near the contact between units nPk1 and nPk2 at UTM, 5317SE, 7900130m. Sill 4 is about 100 m thick, forms a prominent cliff, and can be traced across the entire map area. Underlying strata of map unit nPk2 are well exposed in the east, with thin wavy-lenticular bedded fine sandstone in tidal channels and cross-cutting features (e.g. clastic dykes and dish structures). Rare stromatolitic carbonate interlayers become more common up-section toward the contact with overlying Sill 4. Sill 4 is overlain by a prominent, well-bedded, dark grey, laminated limestone (Kilian carbonate member; unit nPk3) (lakes). Upper contacts of Sill 4 against the unit nPk3 strata are exposed at UTM, 5088SE, 7888390m, but only 20–30 m of strongly contact-metamorphosed unit nPk3 rocks separate Sills 4 and 5. Sill 5 is about 60 m thick and forms a spectacular cliff (cover illustration) near UTM, 5140SE, 7889180m. This sill can easily be traced across the western half of the map area, but its southeast extension across Amaujaqtaq (lake) and the Kuugua River are uncertain, whereas extensive Quaternary deposits cover it towards the south. A thin, contact-metamorphosed screen of the Kilian Formation upper evaporite member (unit nPk4) underlies the southeast end of Sill 5 (Sill 6 in the eastern panel) of the map area (UTM, 5051SE, 7880120N). Sill 6 is intermittently exposed toward the east (to UTM, 5190DE, 7884370N). It is not clear if the sill is present or absent in the Kuugua River (UTM, 5343SE, 7890880N), and south of Amaujaqtaq (UTM, 5250DE, 7887750N) it is correlative with Sill 5 or Sill 6.

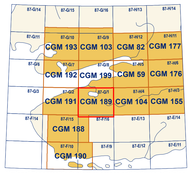
Toward the south, a cliff exposes buff sandstone and green to red siltstone and shale, with local nodular gypsum of the upper Kilian Formation (unit nPk4); thick, compound crossbedded, quartz arenite of the Kuugua Formation (Rainbird, 1992); and basaltic lavas of the Natkusiak Formation (Jefferson et al., 1995; Williamson et al., 2013). A columnar-jointed sill (Sill 7) follows the contact between the Kilian and Kuugua formations in the east (UTM, 5351170E, 7884040N); but to the west this contact is recessive (UTM, 5284170E, 7882880N; 5219S0E, 7880280N). A thin sill injected the Kuugua Formation at UTM, 5355D0E, 7883890N. The lowermost rocks of the Natkusiak Formation were assigned to a basal member (unit nPn1) on the basis of their rubbly-flat weathering appearance (Williamson et al., 2013). The base of the unit nPn3 member is interpreted to correspond to the appearance of massive, columnar-jointed flows. The location of this transition is only approximate towards the west.

Abstract

NTS 87-G/1 is underlain by shallowly dipping sedimentary rocks of the upper Wynniatt, Kilian, and Kuugua formations of the Neoproterozoic Shaler Supergroup, intercalated Franklin sills, and by basaltic lavas of the Natkusiak Formation, which define the northern flank of the Holman Island Syncline. Carbonate rocks of the upper Wynniatt Formation are well exposed near the coast of Minto Inlet, where they are cut by two thick diabase sills, and by prominent east-northeast striking normal faults. Carbonate, shale, and evaporitic rocks of the Kilian Formation are exposed beneath thick capping sills that form a series of cuestas. A northwest-trending fault zone near the eastern edge of the map truncates sills and guided ascent of basaltic dykes, some of which have meter-scale semi-massive sulfides concentrated at their contacts. Rocks of the Upper Kilian and Kuugua formations are well exposed in a cliff near the southern edge of the map area. The cliff top and plateau to the south expose basal and sheet flow units of the Natkusiak Formation.

Résumé

Le sous-sol du feuillet 87-G/1 du SNRC est constitué de roches sédimentaires faiblement inclinées de la partie supérieure de la Formation de Wynniatt et des formations de Kilian et de Kuugua du Supergroupe de Shaler du Néoprotérozoïque, de filons-couches intercalés de l'événement de Franklin, ainsi que des basaltes de la Formation de Natkusiak, qui définissent le flanc nord du synclinal de Holman Island. Les roches carbonatées de la Formation de Wynniatt supérieure sont bien exposées près de la côte de l'Inlet Minto, où elles sont recoupées par deux épais filons-couches de diabase ainsi que par d'importantes failles normales de direction est-nord-est. Les roches carbonatées, les shales et les roches évaporitiques de la Formation de Kilian affleurent au-dessous d'épais filons-couches sommitaux, qui forment une série de cuestas. Près de la bordure est de la carte, une zone de failles de direction nord-ouest tronque les filons-couches et semble avoir guidé la montée de dykes basaltiques, dont certains présentent des concentrations semi-massives de sulfures d'échelle métrique, près de leurs contacts. Une falaise près de la bordure sud de la région cartographique offre une bonne coupe des roches de la Formation de Kilian supérieure et de la Formation de Kuugua. La coulée basale et les unités de coulée en feuillets de la Formation de Natkusiak sont exposées au sommet de la falaise et dans le plateau au sud.



National Topographic System reference and index to adjoining published Geological Survey of Canada maps

Cover illustration
View to southeast of two sills emplaced into rocks of the Kilian Formation, Victoria Island, Northwest Territories. Photograph by J.H. Bédard, 2014-142

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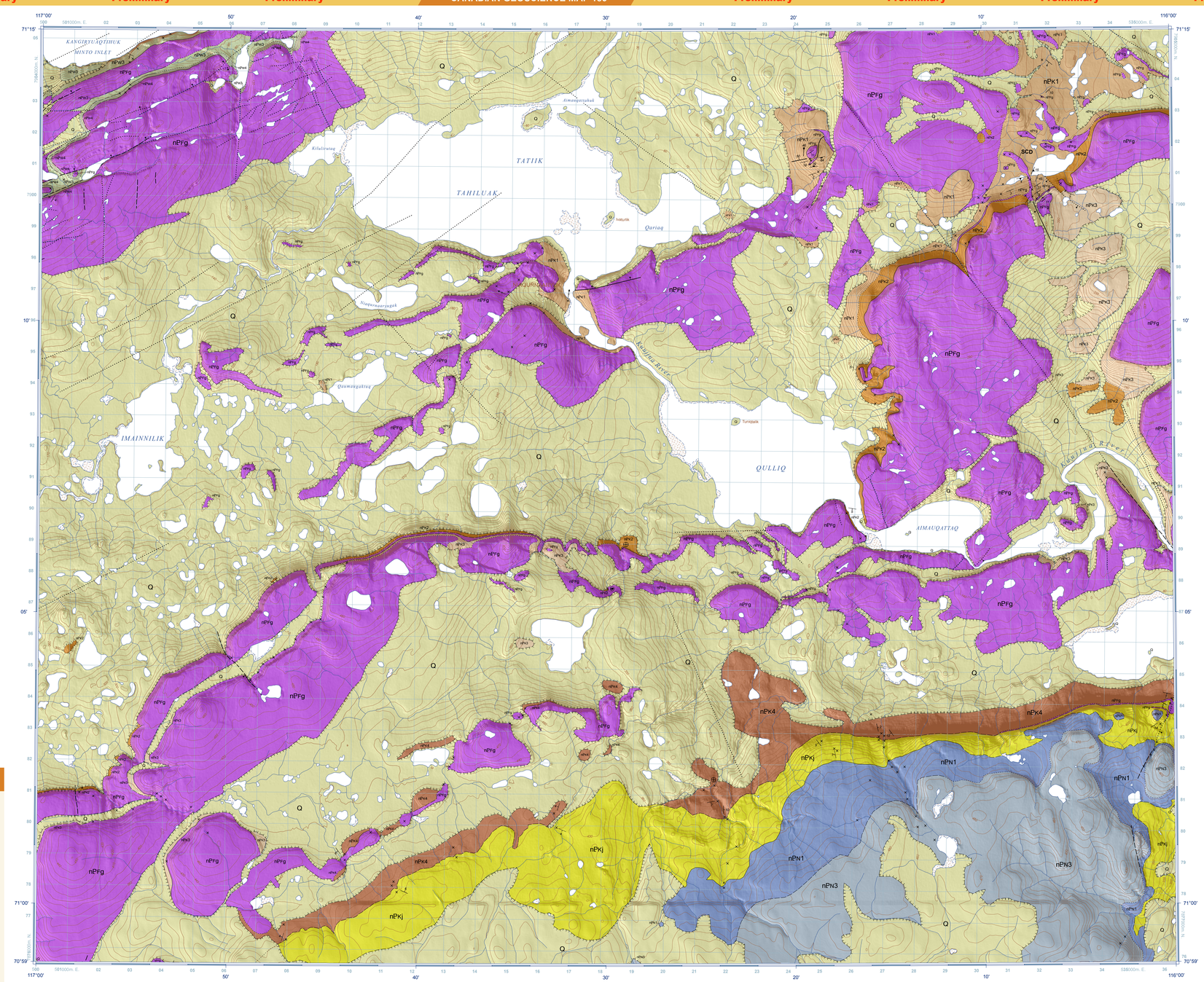

CENOZOIC

Q — Quaternary sediments.

NEOPROTEROZOIC

nPfg — **Franklin intrusions (ca. 720 Ma):** Typically massive, laterally extensive, diabasic sills with columnar jointing (~3–50 m thick, rarely up to 100 m). Some sills are composite with internal intrusive contacts. Two types: 1) An older, more primitive type is commonly layered, with microdiabasic lower and upper borders and olivine-enriched basal cumulate (olivine gabbro to feldspathic wehrlite) that may be capped by a thin, (1–2 m) feldspathic pyroxene cumulate. The olivine cumulate is commonly covered with bright orange lichen, weathers chocolate brown, and shows a characteristic leopard-skin rubble weathering. Upper one-half to three quarters of sills composed of massive olivine and pigeonite gabbros, a magnetite gabbro with common granophyric intergrowths (magnetite-quartz) and a granophyric horizon containing abundant cavities filled with euhedral clinopyroxene crystals. (Type 1 intrusions. Note that feldspar porphyries are not observed in Type 1 intrusions, peridotite is never observed in the Franklin intrusions, whereas diabasic or gabbroic textures are undiagnostic of magmatic affinity. Only Type 2 intrusions have been identified in this map sheet.

nPN1 — **Natkusiak Formation** (nPn1–nPn3)

Sheet-flow member: Blue-green to orange-weathering, laterally extensive, subaerial flood basalt lava flows, typically 10 m to 50 m thick. Flow structure varies from colonnade-entablature to a massive base with typically vesicular flow tops. Rare interflow scoria, spatter, funnelfill, concretions, volcanic necks and platy to disseminated native copper. Maximum thickness of 200 m, limited by erosional preservation.

Lower member: Dark green to grey weathering, dominantly subaerial flows, varying from fine massive basalt to coarse sub-ophitic basalt. Pillowed and hyaloclastic material is common at unit's base. Hyaloclastic material also common in shallow water. Thin (1 to 10 m) sheet flows with massive bases and vesicular flow tops, or discontinuous tabular flows. Degree of vesicularity varies throughout. Thickness 40 to 70 m.

NEOPROTEROZOIC-TONIAN TO CRYOGENIAN

nPN3 — **Kilian Formation** (nPk1–nPk4)

Upper Evaporite-Carbonate member: Base is dolosiltite and dolostone with ~20% triple crossbedded quartz arenite (lenticular) bedded parallel and crosscutting satinspar veinlets and desiccation cracks common. Changes up-section from creamy grey to brown weathering, increase in hematitic siltstone relative to carbonate. Nodular sulphate more common in middle part of member. Upper contains many rows of parallel-oriented, red-dolomitic mudstone and wavy- to lenticular-bedded, buff- to pink-weathering dolosiltite -to sulphate. Diagenetic redox horizons, precipitation cracks, halite pseudomorphs and tepee structures are ubiquitous. Present only in the southwest domain of the Minto Inlier. Approximately 80 m thick.

nPN2 — **Tan Carbonate member:** Tan to green-grey, flaggy weathering dolostone and limestone. Gradation between parallel-laminated mudite and flat to wavy and hummocky, bedded siltite. Lower half has laminae generally plane parallel laminated with rare siltite lenses (starved ripples?). Bed bases typically scoured giving rise to flat-pebble conglomerate. Abundant clast breccia commonly infilling swales and gutters. Black chert nodules throughout and stromatolites at several horizons. Conspicuous chert bands in the middle of the tan carbonate member, is laterally traceable from Ulukhaktok along the Kuugua River Valley where it cuts across the Natkusiak plateau. Approximately 60 m thick.

nPN1 — **Clastic-carbonate member:** Variegated (red, green, grey, and black) pin-stripe-laminated mudstone and siltstone, particularly at its base. Desiccation cracks common in mudstone and wavy bedding and ripple crosslamination in coarse siltstone interbedded with siltstone interlayers. Wavy-flaser bedded and small-scale crossbedded, 4 m thick, buff-weathering, fine-grained quartzarenite near top. Wavy-lenticular bedded and laterally linked stromatolite interbeds are common and increase upsection. Approximately 120 m thick.

nPn3 — **Carbonate-evaporite member:** Alternating, decametre-scale subunits of stromatolitic dolostone and laminated mudstone. Stromatolite consists of mudstone and dolomitic mudstone with interbedded nodular anhydrite and laminated quartz arenite. Rare intraclast grainstone. Conspicuous tepee structures. Approximately 300 m thick.

nPn2 — **Wynniatt Formation** (nPw3–nPw4)

Upper carbonate member: Base characterized by distinctive nodular, black calcareous shale, overlain by thin, rhythmically bedded and normally graded, quartz-sandy calcarenite. Upper, metre-scale alternations of stromatolitic dolostone and crossbedded intraclast grainstone. Local herringbone crossbedded quartz arenite and microbially laminated lime mudstone. Chert is common. Approximately 300 m thick.

nPw3 — **Stromatolitic carbonate member:** Stromatolitic dolostone with build-ups that have local synoptic relief of several meters; main build-up contains oncoids up to 20 cm. Interbedded intraclast grainstone with rip-ups and scours; mudstone/dolulutite with molar-tooth structure. Parallel or microbially laminated mudstone with mudcracks, and tepee structures. Sharp, erosive upper contact. Approximately 160 m thick.

Contact; depositional, depositional-conformable or intrusive
- Defined
- Approximate
- Inferred

Contact; depositional-unconformable
- Defined
- Approximate
- Inferred

Fault, generic; steep dip
- Defined
- Approximate
- Inferred or concealed

Fault, normal; upright
- Defined
- Approximate
- Inferred

Station location
- Ground observation

Planar structure
- Bedding: Inclined; Horizontal
- Intrusive contact: Inclined; Horizontal
- Fault: Upright
- Jointing: Inclined

Linear structure
- Lineation: Fault striae, fault grooves, slickensides, or mineral growth fibres; Glacial striation or groove

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Canadian Geoscience Maps

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

Canada

CANADIAN GEOSCIENCE MAP 189
GEOLOGY
QULLIQ
Victoria Island, Northwest Territories
1:50 000

1 0 1 2 3 4 km

Base map at the scale of 1:50 000 from Natural Resources Canada, with modifications.
Elevations in metres above mean sea level

Shaded relief image derived from the digital elevation model supplied by GeoBase.
Illumination: azimuth 225°, altitude 45°, vertical factor 1x

Proximity to the North Magnetic Pole causes the magnetic compass to be erratic in this area.
Magnetic declination 2015, 19°37'E, decreasing 44.1' annually.

This map is not to be used for navigational purposes.

The Geological Survey of Canada welcomes corrections or additional information from users.

Data may include additional observations not portrayed on this map. See documentation accompanying the data.

This publication is available for free download through GEOSCAN (http://geoscan.nrcan.gc.ca/).

Preliminary publications in this series have not been scientifically edited.

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