DESCRIPTIVE NOTES

The map area (NTS 87-H/06) 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 (late Tonian-early Cryogenian) age. The Neoproterozoic sedimentary strata belong to the Shaler Supergroup, an approximately 4 km-thick succession of shallow marine carbonate rocks and evaporite rocks with interbedded terrigenous rocks that were mainly deposited in a shallow intracontinental epeiric sea, referred to as the Amundsen Basin (Rainbird et al., 1994; Rainbird et al., 1996a; Thorsteinsson and Tozer, 1962; Young, 1981). The basin is considered to have formed within the supercontinent Rodinia and exposures of similar rocks, in what are now the Mackenzie Mountains of the northern Cordillera, suggest that it extended for more than 1000 km to the southwest (Long et al., 2008; Rainbird et al., 1996a). The sedimentary succession is intercalated with mafic sills of the ca. 720 Ma Franklin igneous event (Heaman et al., 1992). The sills are of variable thickness up to 100 m, but most are 20–60 m thick. In many cases, individual sills extend for 20 km or more along-strike with little significant change in thickness. Sills constitute anywhere from 10 to 50 per cent of the stratigraphic section. Sills of similar type and age also occur in the Coppermine Homocline, Brock Inlier and Duke of York Inlier to the south (Rainbird et al., 1996b; Shellnutt et al., 2004) and coeval, geochemically similar intrusions and volcanic rocks associated with the Franklin event extend from Greenland to the western Yukon (Denyszyn et al., 2009; Heaman et al., 1992; Macdonald et al., 2010). The Shaler Supergroup in Minto Inlier is capped by a succession of flood basalt flows and interflow sedimentary rocks (Natkusiak Fm), more than 1 km thick, which are the extrusive equivalent of the sills (Baragar, 1976; Jefferson et al., 1985). 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). Three magma populations are identified in the lavas, which have correlatives in the different sill subtypes. The oldest sills and corresponding basal lavas are enriched in incompatible trace elements and may have olivine-enriched bases. Younger diabasic sills correspond to the major sheet-flow units of the lava succession. Basal strata of the Shaler Supergroup (Rae Group) are exposed only at the northeastern end of 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). The irregular edge of 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). Structurally, the Minto Inlier is relatively simple, composed of the open, northeast-trending Holman Island syncline and a smaller Walker Bay anticline to the northwest. Beds typically dip no more than 10° and there is generally no penetrative cleavage or other apparent outcrop-scale fabric. The origin of the folding is unknown but it occurred after deposition of the early Neoproterozoic rocks and before uplift, erosion and deposition of overlying Lower Cambrian siliclastic rocks, which are weakly folded. All rocks are dissected by east-northeast to east-trending faults that form a horst and graben system with up to 200 of metres of stratigraphic separation on individual faults. The zone of faulting is about 100 km wide and stretches from the head of Minto Inlet in the west to Wynniatt Bay in the east and is spectacularly imaged as prominent lineaments on recently published aeromagnetic maps (e.g. Kiss and Oneschuk, 2010).

NTS 87-H/06 is underlain by stratigraphic units from the middle to upper Wynniatt Formation, Kilian Formation, Kuujjua Formation and Natkusiak Formation of the Shaler Supergroup. Together with diabase sills, the strata comprise the gently south-dipping northern limb of the Holman Island Syncline, whose axis lies to the south, along the southern edge of the adjoining map area (CGM 155; Rainbird and Bédard, 2014). Exposures of the Wynniatt Formation (black shale member unit nPW2, stromatolitic carbonate member unit nPW3, and upper carbonate member unit nPW4) are confined to the north-western corner of the map area. A good section of the black shale member and stromatolitic carbonate member is exposed in a creek gully at UTM 572396E, 7934167N. Along the shore of Tahiryuaq, on the north side of Qinnguk, is a relatively thick but intermittently exposed section of the upper carbonate member (unit nPW4). The Kilian Formation occupies the central and southern parts of the map area, but it is poorly exposed, mainly as thin, strongly contact-metamorphosed outcrops beneath diabase sills. Some relatively good exposures of the lower evaporite-carbonate member (unit nPK1) are located in cuestas distributed around the southeastern part of Tahiryuaq. A prominent pyritiferous gossan occurs at UTM, 572396E, 7934167N, within unit nPK1, and has been described in detail by Peterson et al., (2014). A small section of the clastic-carbonate member (unit nPK2) is exposed at UTM, 574526E, 7192940N). The upper Kilian Formation (tan carbonate member unit nPK3, and upper evaporite-carbonate member unit nPK4), Kuujjua Formation and basal Natkusiak Formation, are exposed on some prominent hills in the southeastern corner of the map area, especially well at UTM, 604838E, 7912412N. Here, the uppermost Kuujjua Formation exhibits chaotic soft-sediment folding and pocky alteration indicating that the sand(stone) was unlithified, and possibly wet when the lava was erupted on to it (*see* Rainbird, 1993). Across the valley to the southwest, at UTM, 602892E, 79111047N, a hillside exposure of volcanic breccia, containing hydrothermally altered clasts of underlying sedimentary strata (lower member of the Nathusiak Formation unit nPN1), is juxtaposed by a fault against steeply tilted beds of Kuujjua Formation sandstone. Up to 5 thick, diabase sills occur as a series of stepped cuestas that strike across the central part of the map area from southwest to northeast. The thickest sill is exposed along the southern border of the map. Sills are of type 2 (diabasic), as described in the legend. Two prominent, northwest-striking dykes are present near the northern map border where they cut across more than 100 m of upper Wynniatt Formation strata, which is sandwiched between diabase sills. Several steep normal faults and fractures occur in the southern third of the map area. Those associated with the Natkusiak Formation, in the southeast part of the map area, appear not to have affected underlying strata, suggesting that faulting was syn-volcanic, with a shallow accommodation zone. A concentration of west-northwest-striking faults affect sills and strata of the lower Kilian Formation on the western side of the map area. West-southwest block faulting, common in map areas to the north, is evident around Tahiryuaq, where it repeats strata of the upper Wynniatt Formation (unit nPW4).

A narrow (up to ~2km-wide) panel of Lower Cambrian clastic member (unit Ꞓc) and tan dolostone member (unit Ꞓtd) is preserved along the south side of Tahiryuaq and across to Quinnguk. There is a suggestion of a broad, slightly asymmetrical syncline cored by unit Ꞓtd at UTM, 576000E, 7925500N, likely extending east-northeast to UTM, 580500E, 7928000N and UTM, 585500E, 7930300N.

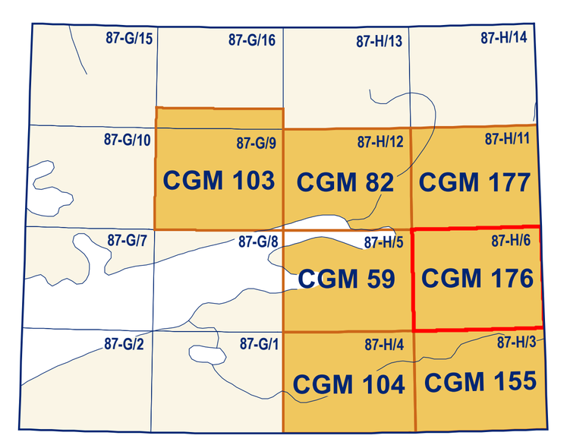
A thick blanket of Late Wisconsinan proglacial and glacial deposits cover more than 60 percent of the map area. Details of the surficial geology are shown on a separate map of the same scale (CGM 45; Hodgson, 2012).

Abstract

NTS 87-H/6 is underlain by the middle to upper Wynniatt, Kilian, Kuujjua and Natkusiak formations of the Neoproterozoic Shaler Supergroup. The Wynniatt Formation is confined to the north-west and the Kilian Formation is intermittently exposed in the central and southern parts of the map area. The upper Kilian, Kuujjua and basal Natkusiak formations are exposed on prominent hills in the southeast. Up to 5, type 2 (diabasic), sills outcrop as stepped cuestas that strike northeast across the centre of the map area. Two, northwest-striking dykes cut across the upper Wynniatt Formation strata in the north. Several steep normal faults occur in the southern third and western side of the map area. Those cutting the Natkusiak Formation do not cut underlying strata, suggesting that faulting was syn-volcanic. West–southwest block faulting, common in map areas to the north, is evident around Tahiryuak, where it repeats strata of the upper Wynniatt Formation (unit nPw4).

Résumé

Dans le feuillet SNRC 87-H/6 il y a des roches des formations Wynniatt (membres moyen et supérieur), Kilian, Kuujjua et Natkusiak du Supergroupe Shaler d'âge Néoprotérozoïque. Les affleurements de Wynniatt sont au nord-ouest, alors que le Kilian affleure de façon intermittente au centre et au sud du feuillet. Le Kilian supérieur, le Kuujjua et la base du Natkusiak sont bien exposés à flanc de colline dans le sud-est du feuillet. Au moins 5 filons couches diabasiques de type 2 forment des cuestas successives orientées vers le nord-est qui traversent le centre du feuillet. Deux dykes alignés nord-ouest coupent les roches du Wynniatt supérieur dans le nord du feuillet. Il y a plusieurs failles normales, orientés nord-ouest et à fort pendage, dans les tiers sud et ouest du feuillet. Les failles coupant les laves du Natkusiak n'affectent pas les strates sous-jacentes, suggérant un mouvement syn-volcanique. Des failles normales orientées ouest–sud-ouest (comme sur les feuillets plus au nord) sont bien développées près du Tahiryuak, où des strates du Wynniatt supérieur (unité nPw4) sont répétées.



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

Cover illustration
Looking west toward Minto Inlet with M. Hyrciuk and B. Hayes taking notes on the outcrop. Photograph by P. Behnia. 2014-070

Catalogue No. M183-1/176-2014E-PDF
ISBN 978-1-100-23408-3
doi:10.4095/294837

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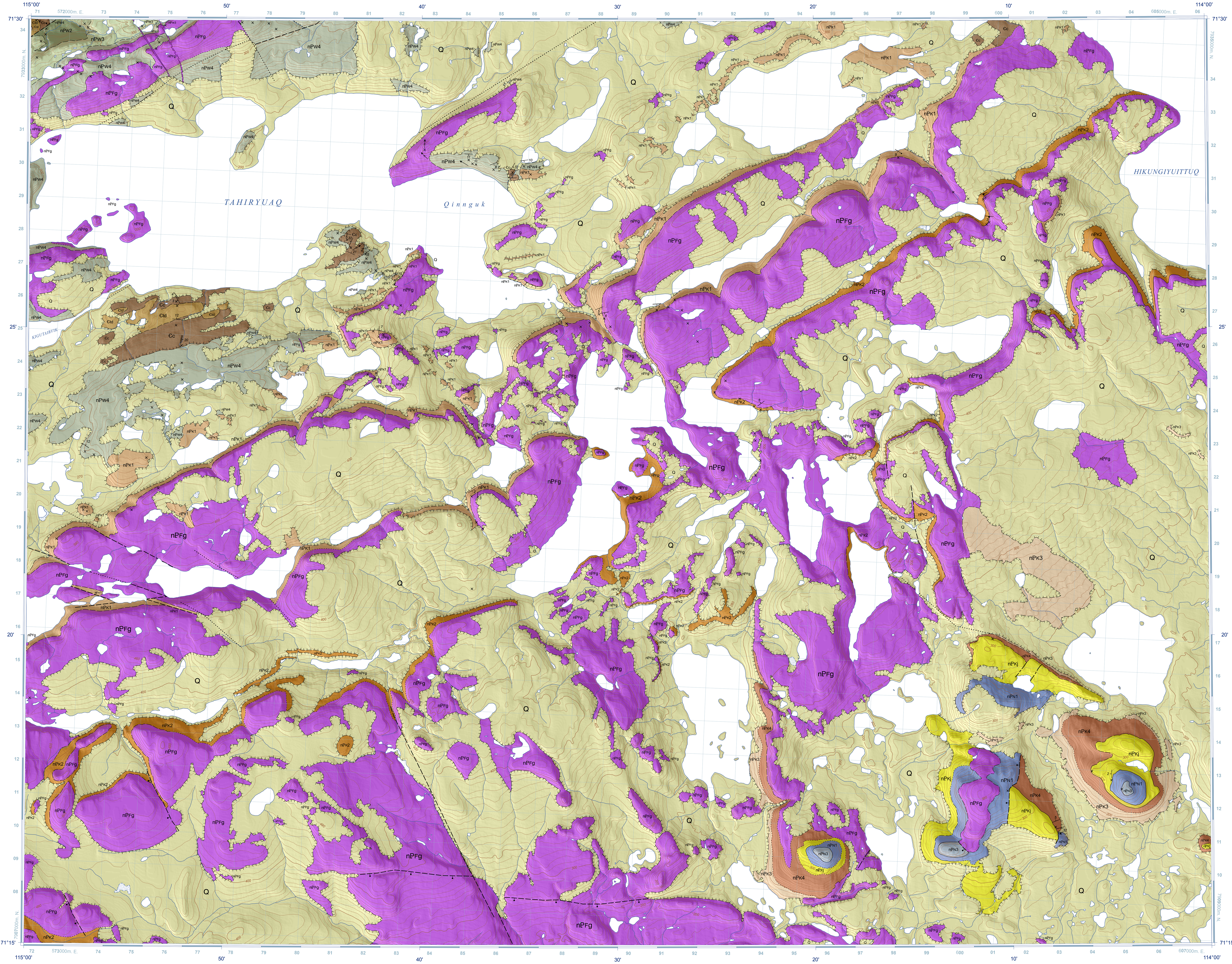
CANADIAN GEOSCIENCE MAP 176

GEOLOGY

QINNGUK

Victoria Island, Northwest Territories

1:50 000



CENOZOIC

Q — Quaternary sediments.

CAMBRIAN

Ꞓst — **Stripy unit**: Thin- to medium-bedded red mudstone-siltstone interbedded with green dolomudstone. Outcrops have a distinctive stripy appearance. Sedimentary structures include mudcracks, wave ripples, small stromatolites, micro-karsted exposure surfaces, and microbial lamination indicating a shallow marine, subtidal to intertidal setting. Mudstones contain Middle Cambrian trilobites. The lower contact is covered in most places. Thickness ranges between 15–95 m.

Ꞓtd — **Tan dolostone unit**: Light brown dolomudstone to dolarenite. Thrombolite mounds are locally well developed and together with metre-scale cross-stratification suggest a shallow marine setting. Although no fossils were recovered from this unit, the lower contact is gradational with mudstones that contain Early Cambrian trilobites. Thickness is 30–45 m.

LOWER CAMBRIAN

Ꞓc — **Clastic unit**: Red-brown to orange weathering fine- to coarse-grained quartz arenite and mudstone at the base of the Paleozoic succession. Sedimentary structures are lamination, wave and current ripples, and 10 cm to 2 m thick cross-stratified beds. Reactivation surfaces and foresets with rounded tops indicate an influence by tidal currents. Depositional environment is considered to be shallow marine. Mudstones contain Lower Cambrian trilobites. Distribution and thickness are variable; thickness ranges from 0 m to 90 m.

NEOPROTEROZOIC

nPFg — **Franklin intrusions:** 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 border zones and olivine-enriched basal cumulate (olivine gabbro to feldspathic wehrlite) that may be capped by a thin, (1–2 m) feldspathic pyroxenite cumulate. The olivine cumulate is commonly covered with bright orange lichen, weathers chocolate brown, and shows a characteristic layer-parallel ribbed weathering. Upper ½ to ¾ of sills composed of massive olivine and pigeonite gabbros, a magnetite gabbro with common pitted weathering (magnetite oikocrysts) and a granophyric horizon containing abundant ocelli of granophyre and coarse, bladed clinopyroxene crystals. 2) Younger (based on cross cutting relationships), more evolved, diabasic sills showing enrichment in magnetite, ilmenite, quartz, and alkali feldspar towards their cores, but are rarely layered. Some sills are porphyritic and contain 10–15% plagioclase>clinopyroxene>olivine phenocrysts and glomerocrysts up to 5 mm. Less common, 1–40 m wide dykes. Irregular to very linear (generally oriented NNW). Commonly associated with fault breccias or drag folds in host metasediments. Dykes commonly connect to sills; some associated with calc-silicate contact metamorphic rocks (reddish garnet rimmed by bright green vesuvianite), black Fe-oxide skarns, and minor sulphides.

Natkusiak Formation (nPN1–nPN3)

nPN3 — **Sheet-flow member:** Blue-green to orange-weathering, laterally extensive, subaerial basalt flows; individual flows 15 to 50 m thick. Flow structure varies from colonnade-entablature to a massive base with typically vesicular flow tops. Rare interflow scoria, spatter, fumarolic concretions, volcanic necks and platy to disseminated native copper. Maximum thickness of 200 m, limited by erosional preservation.

nPN1 — **Lower member:** Dark green to grey weathering, dominantly subaerial flows, varying from fine massive basalt to coarse sub-ophitic basalt. Pillowed and hyaloclastic breccia are common at unit's base indicating emplacement into shallow water. Thin (1 to 10 m) sheet flows with massive bases and vesicular flow tops, or discontinuous lobate flows. Degree of vesicularity varies throughout. Thickness 40 to 70 m.

Shaler Supergroup (nPK1–nPKj)

nPKj — **Kuujjua Formation:** Two principal lithofacies: coarse quartzarenite typified by stacked tabular co-sets of simple and compound planar crossbedding and a less abundant fine-grained assemblage of interbedded fine sandstone, dolomitic siltstone and mudstone forming lenses up to 20 km wide. Rare basaltic peperites. Approximately 120 m thick.

Kilian Formation (nPK1–nPK4)

nPK4 — **Upper Evaporite-Carbonate member:** Base is dolosiltite and dololutite with 10–20% ripple crosslaminated gypsiferous siltite. Bedding-parallel and crosscutting satinspar veinlets and desiccation cracks common. Changes up-section from creamy grey to pinkish grey, reflecting increase in hematitic siltstone relative to carbonate. Nodular sulphate more common in middle part of member. Upper consists mainly of parallel-laminated red dolomitic mudstone and wavy- to lenticular-bedded, buff- to pink-weathering dolosiltite -no sulphate. Diagenetic redox horizons, desiccation cracks, halite pseudomorphs and tepee structures are ubiquitous. Present only in the southwest domain of the Minto Inlier. Approximately 80 m thick.

nPK3 — **Tan Carbonate member:** Tan to green-grey, flaggy weathering dolostone and limestone. Gradation between parallel-laminated lutite and flat to wavy and hummocky bedded siltite. Lutite-rich layers are generally plane parallel laminated with rare siltite lenses (starved ripples?). Bed bases typically scoured grading up to lutite-rich tops. Intraformational clast breccia commonly infilling swales and gutters. Black chert nodules throughout and stromatolites at several horizons. One distinctive bioherm, from the middle of the tan carbonate member, is laterally traceable from Ulukhaktok along the Kuujjua River Valley to where it cuts across the Natkusiak plateau. Approximately 60 m thick.

nPK2 — **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-fine sandstone interlayers. Wavy-flaser bedded and small-scale crossbedded, 4 m thick, buff-weathering, fine-grained quartzarenite near top. Wavy-bedded dolosiltite and laterally linked stromatolite interbeds are common and increase upsection. Approximately 120 m thick.

nPK1 — **Carbonate-evaporite member:** Alternating, decametre-scale subunits of evaporite and carbonate-dominant lithofacies; evaporite: laminated red mudstone and dolomitic mudstone with interbedded nodular anhydrite and laminated gypsite and anhydrite, minor stromatolitic dolostone. Carbonate lithofacies: dolostone and minor limestone lutite/siltite rhythmite capped by arenite/rudite laterally linked stromatolites, forming repetitive metre-scale cycles. Molar-tooth structure common.

Wynniatt Formation (nPw2–nPw4)

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/dololutite with molar tooth structure. Parallel or microbially laminated dololutite with mudcracks, and teepee structures. Sharp, erosive upper contact. Approximately 160 m thick.

nPw2 — **Black shale member:** Dark grey parallel-laminated siltstone and silty mudstone with discontinuous to continuous beds of ripple-topped quartz arenite common near top. Structures include flute and gutter casts, ball and pillow structures, channel and fill structures, and climbing ripples in siltstone. Carbonate nodules and pyrite are present throughout. Up to approximately 200 m thick.

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

Contact; depositional-unconformable: Approximate; Inferred

Fault, generic, steep dip: Approximate; Inferred

Fault, normal; upright: Defined; Approximate

Structural lineament

Station location: Ground observation

Planar structure
- Bedding: Inclined; Upright; younging known or inferred; Crossbed foreset
- Foliation: Transposed bedding

Linear structure
- Lineation: Glacial striation or groove

Sedimentary structure: Symmetrical ripple crest

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Recommended citation
Rainbird, R.H., Bédard, J.H., and Thomson, D., 2014. Geology, Qinnguk, Victoria Island, Northwest Territories; Geological Survey of Canada, Canadian Geoscience Map 176 (preliminary), scale 1:50 000. doi:10.4095/294837

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Canadian Geoscience Maps

Authors: R.H. Rainbird, J.H. Bédard, and D. Thomson

Geology by R.H. Rainbird and J.H. Bédard, 2010, 2011

Geomatics by É. Girard

Cartography by N. Côté

Initiative of the Geological Survey of Canada, conducted under the auspices of the Victoria Island PGE/Base Metals 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

GEOLOGY

QINNGUK

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

Some geographic names on this map are not official.

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

Proximity to the North Magnetic Pole causes the magnetic compass to be erratic in this area.
Magnetic declination 2014, 18º41'E, decreasing 53' annually.

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 digital data.

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Preliminary publications in this series have not been scientifically edited.

Canada

CANADIAN GEOSCIENCE MAP 176
GEOLOGY
QINNGUK
Victoria Island, Northwest Territories