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).

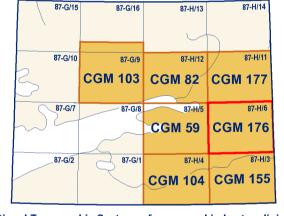
NTS 87-H/06 is underlain by stratigraphic units from the middle to upper Wynniatt Formation, Kilian Formation, Kuujjua Formation and Natkusiak Formation of the Shaler Supergroup. Together with diabase sills, the strata comprise the gently south-dipping northern limb of the Holman Island Syncline, whose 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 northwestern 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 outcropsbeneath diabase sills. Some relatively good exposures of the lower evaporite-carbonate member (unitnPk 1) 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 nPк4), 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-northweststriking 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 €c) and tan dolostone member (unit €td) 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 Ctd at UTM, 576000E, 7925500N, likely extending east-northeast to UTM, 580500É,

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).

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 orientés nord-ouest et à fort pendage, dans les tiers sud not cut underlying strata, suggesting that faulting was et ouest du feuillet. Les failles coupant les laves du in map areas to the north, is evident around Tahiryuak, where it repeats strata of the upper Wynniatt Formation

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 v a plusieurs failles normales syn-volcanic. West-southwest block faulting, common 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

ISBN 978-1-100-23408-3 doi:10.4095/294837 © Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources Canada, 2014

Catalogue No. M183-1/176-2014E-PDF

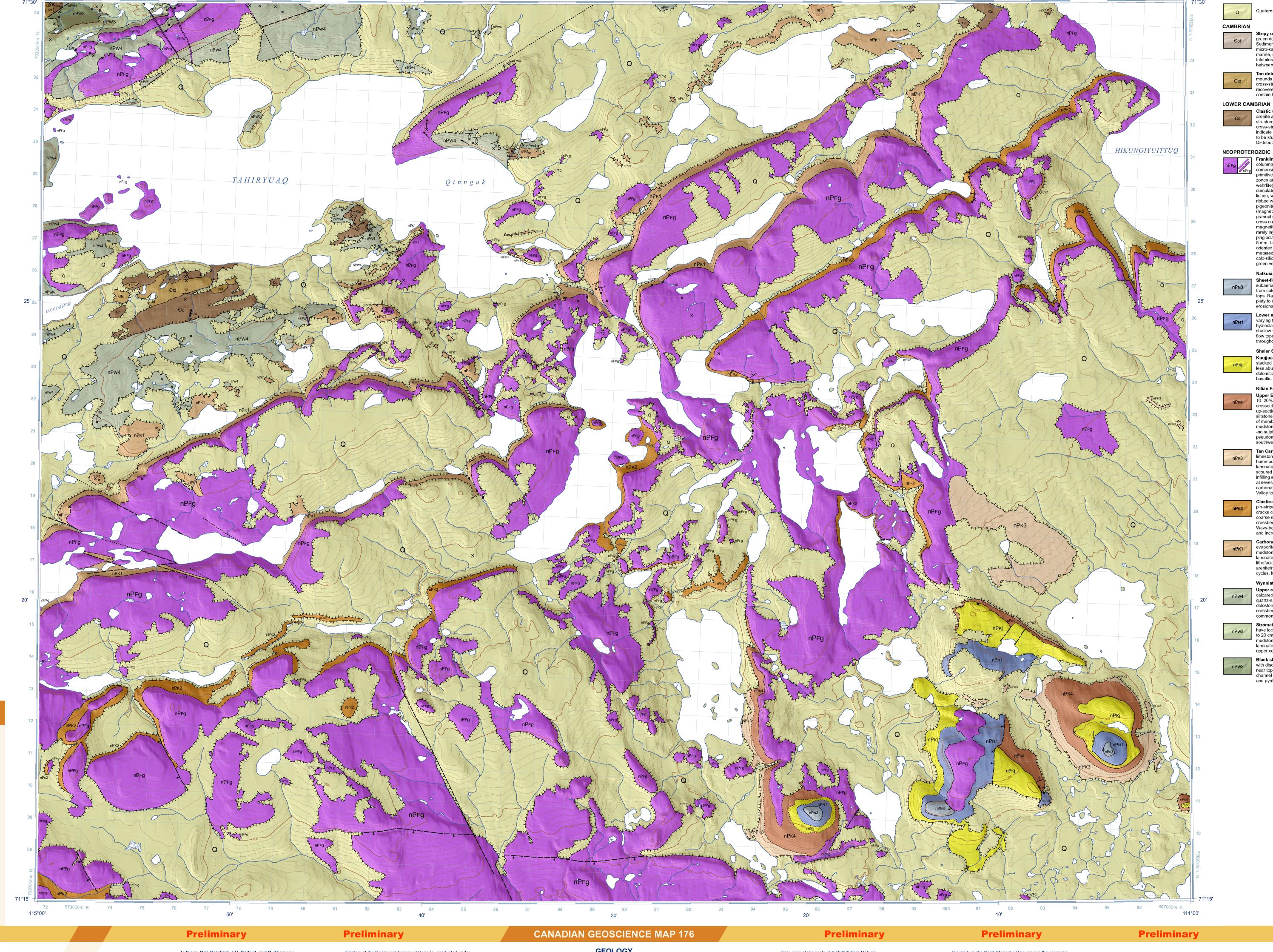
Natural Resources Ressources naturelles du Canada

CANADIAN GEOSCIENCE MAP 176 GEOLOGY

QINNGUK

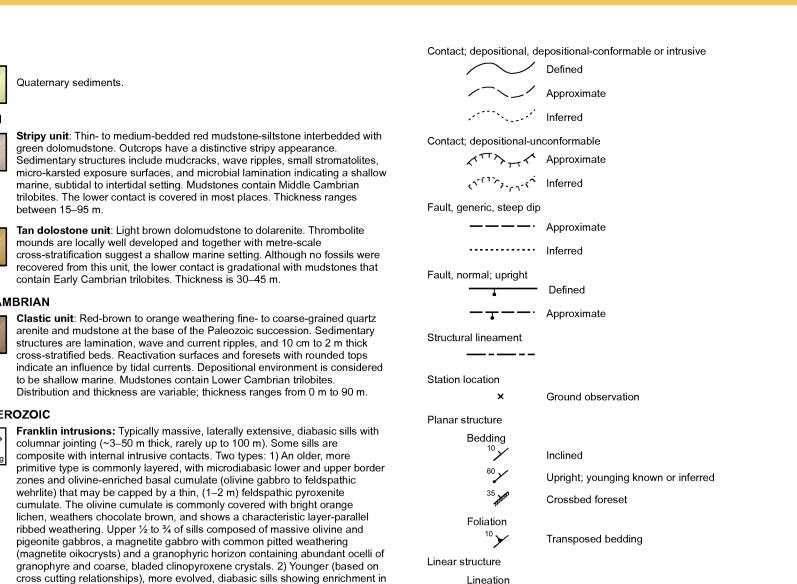
Victoria Island, Northwest Territories





85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 600 01

CANADIAN GEOSCIENCE MAP 176



Denyszyn, S.W., Halls, H.C., Davis, D.W., and Evans, D.A.D., 2009. Paleomagnetism and U-Pb geochronology of Franklin dykes in high arctic Canada and Greenland: A revised age and paleomagnetic pole constraining block rotations in the Nares Strait region; Canadian Journal of Earth Sciences, v. 46, no. 9, p. 689–705. Heaman, L.M., LeCheminant, A.N., and Rainbird, R.H., 1992. Nature and timing of Franklin igneous events, Canada: implications for a late Proterozoic mantle plume and the break-up of Laurentia; Earth and Planetary Hodgson, D.A., 2012. Surficial geology, Qinnguk, Northwest Territories; Geological Survey of Canada, Canadian

Upper Evaporite-Carbonate member: Base is dolosiltite and dololutite with 20% ripple crosslaminated gypsiferous siltite. Bedding-parallel and Geoscience Map 45, (preliminary), scale 1:50 000. doi:10.4095/291578 rosscutting satinspar veinlets and desiccation cracks common. Changes up-section from creamy grey to pinkish grey, reflecting increase in hematitic Jefferson, C.W., 1985. Uppermost Shaler Group and its contact with the Natkusiak basalts, Victoria Island, District siltstone relative to carbonate. Nodular sulphate more common in middle part of Franklin; in Current Research, Part A; Geological Survey of Canada, Paper 85-1A, p. 103–110. of member. Upper consists mainly of parallel-laminated red dolomitic Jefferson, C.W., Nelson, W.E., Kirkham, R.V., Reedman, J.H., and Scoates, R.F.J., 1985. Geology and copper mudstone and wavy- to lenticular-bedded, buff- to pink-weathering dolosiltite occurrences of the Natkusiak basalts, Victoria Island, District of Franklin; in Current Reseach, Part A; -no sulphate. Diagenetic redox horizons, desiccation cracks, halite Geological Survey of Canada, Paper no. 85-1A, p. 203-214. pseudomorphs and tepee structures are ubiquitous. Present only in the Kiss, F. and Oneschuk, D., 2010. First vertical derivative of the magnetic field, Minto Inlier aeromagnetic survey, southwest domain of the Minto Inlier. Approximately 80 m thick. Victoria Island, NTS 87 H/SW, Northwest Territories; Geological Survey of Canada, Open File 6707,

Tan Carbonate member: Tan to green-grey, flaggy weathering dolostone and imestone. Gradation between parallel-laminated lutite and flat to wavy and nummocky bedded siltite. Lutite-rich layers are generally plane parallel laminated with rare siltite lenses (starved ripples?). Bed bases typically 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.

magnetite, ilmenite, quartz, and alkali feldspar towards their cores, but are

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

plagioclase>clinopyroxene>olivine phenocrysts and glomerocrysts up to

metasediments. Dykes commonly connect to sills; some associated with

calc-silicate contact metamorphic rocks (reddish garnet rimmed by bright

Sheet-flow member: Blue-green to orange-weathering, laterally extensive,

subaerial basalt flows; individual flows 15 to 50 m thick. Flow structure varies

ops. Rare interflow scoria, spatter, fumarolic concretions, volcanic necks and

om colonnade-entablature to a massive base with typically vesicular flow

platy to disseminated native copper. Maximum thickness of 200 m, limited by

Lower member: Dark green to grey weathering, dominantly subaerial flows,

arying from fine massive basalt to coarse sub-ophitic basalt. Pillowed and

aloclastic breccia are common at unit's base indicating emplacement into

shallow water. Thin (1 to 10 m) sheet flows with massive bases and vesicular

Kuujjua Formation: Two principal lithofacies: coarse quartzarenite typified by stacked tabular co-sets of simple and compound planar crossbedding and a

flow tops, or discontinuous lobate flows. Degree of vesicularity varies

ess abundant fine-grained assemblage of interbedded fine sandstone,

dolomitic siltstone and mudstone forming lenses up to 20 km wide. Rare

rarely layered. Some sills are porphyritic and contain 10–15%

green vesuvianite), black Fe-oxide skarns, and minor sulphides.

Natkusiak Formation (nPN1-nPN3)

throughout. Thickness 40 to 70 m.

Shaler Supergroup (nPK1-nPKj)

Kilian Formation (nPK1–nPK4)

basaltic peperites. Approximately 120 m thick.

erosional preservation.

Clastic-carbonate member: Variegated (red, green, grey, and black) oin-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.

Carbonate-evaporite member: Alternating, decametre-scale subunits of evaporite and carbonate-dominant lithofacies; evaporite: laminated red nudstone and dolomitic mudstone with interbedded nodular anhydrite and aminated 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.

CENOZOIC

Wynniatt Formation (nPW2-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 olostone and crossbedded intraclast grainstone. Local herringbone crossbedded quartz arenite and microbially laminated lime mudstone. Chert is common. Approximately 300 m thick.

Stromatolitic carbonate member: Stromatolitic dolostone with build-ups that have local synoptic relief of several meters; main build-up contains oncoids up o 20 cm. Interbedded intraclast grainstone with rip-ups and scours; udstone/dololutite with molar tooth structure. Parallel or microbially upper contact. Approximately 160 m thick.

and pyrite are present throughout. Up to approximately 200 m thick.

aminated dololutite with mudcracks, and teepee structures. Sharp, erosive 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

REFERENCES Baragar, W.R.A., 1976. The Natkusiak basalts, Victoria Island, District of Franklin; in Current Research, Part A; Geological Survey of Canada Paper 76-1A, p. 347–352. $B\'{e}dard, J. H., Naslund, H. R., Nabelek, P., Winpenny, A., Hryciuk, M., Macdonald, W., Hayes, B., Steigerwaldt, K., Winpenny, A., Hryciuk, M., Waldonald, W., Waldonald$ Hadlari, T., Rainbird, R., Dewing, K., and Girard, É., 2012. Fault-mediated melt ascent in a Neoproterozoic continental flood basalt province, the Franklin sills, Victoria Island, Canada; Bulletin of the Geological Society Campbell, F.H.A., 1981. Stratigraphy and tectono-depositional relationships of the Proterozoic rocks of the Hadley Bay area, northern Victoria Island, District of Franklin; in Current Research, Part A; Geological Survey

Glacial striation or groove

Symmetrical ripple crest

Sedimentary structure

Minto, Île de Victoria, SNRC 87 H/SW, Territoires du Nord-Ouest; Commission géologique du Canada, Dossier public 6707, échelle 1/100 000. doi:10.4095/287181 Long, D.G.F., Rainbird, R.H., Turner, E.C., and MacNaughton, R.B., 2008. Early Neoproterozoic strata Atlas of the Northern Canadian Mainland Sedimentary Basin; Geological Survey of Canada, Open File 5700. Macdonald, F.A., Schmitz, M.D., Crowley, J.L., Roots, C.F., Jones, D.S., Maloof, A.C., Strauss, J.V., Cohen, P.A., Johnston, D.T., and Schrag, D.P., 2010. Calibrating the Cryogenian; Science, v. 327 no.5970, p. 1241–1243. Peterson, R.C., Williamson, M.-C., and Rainbird, R.H., 2014. Gossan Hill, Victoria Island, Northwest Territories:

scale 1:100 000/Dérivée première verticale du champ magnétique, levé aéromagnétique de l'enclave de

An analogue for mine waste reactions within permafrost and implication for the sub-surface of Mars; Earth Rainbird, R.H., 1992. Anatomy of a large-scale braidplain quartzarenite from the Neoproterozoic Shaler Group, Victoria Island, Northwest Territories, Canada; Canadian Journal of Earth Sciences, v. 29, p. 2537–2550. Rainbird, R.H. 1993. The sedimentary record of mantle plume uplift preceding eruption of the Neoproterozoic Natkusiak flood basalt; Journal of Geology, v. 101, p. 305–318. Rainbird, R.H. and Bédard, J.H., 2014. Geology, Diamond Jenness Peninsula, Victoria Island, Northwest Territories; Geological Survey of Canada, Canadian Geoscience Map 155 (preliminary), scale 1:50 000.

Rainbird, R.H., Jefferson, C.W., Hildebrand, R.S., and Worth, J.K., 1994. The Shaler Supergroup and revision of Neoproterozoic stratigraphy in the Amundsen Basin, Northwest Territories; in Current Research 1994-C; Geological Survey of Canada, p. 61–70.

Rainbird, R.H., Jefferson, C.W., and Young, G.M., 1996a. The early Neoproterozoic sedimentary Succession B of northwest Laurentia: correlations and paleogeographic significance; Geological Society of America Bulletin, Rainbird, R.H., LeCheminant, A.N., and Lawyer, J.I., 1996b. The Duke of York and related inliers of southern Victoria Island, District of Franklin, Northwest Territories.; in Current Research 1996-E; Geological Survey of

Shellnutt, J.G., Dostal, J., and Keppie, J.D., 2004. Petrogenesis of the 723 Ma Coronation sills, Amundsen basin, Arctic Canada: Implications for the break-up of Rodinia; Precambrian Research, v. 129(3-4), p. 309–324. Thorsteinsson, R. and Tozer, E.T., 1962. Banks, Victoria and Stefansson Islands, Arctic Archipelago; Geological

Williamson, N., Cousens, B., Bédard, J.H., and Zagorevski, A., 2013. Volcano-stratigraphy and significance of the southern lobe of the Natkusiak Formation flood basalts, Victoria Island, Northwest Territories; Geological Survey of Canada, Current Research 2013-16, 15 p. doi:10.4095/292706 Young, G.M., 1981. The Amundsen Embayment, Northwest Territories; relevance to the upper Proterozoic evolution of North America; in Proterozoic Basins of Canada, (ed.) F.H.A. Campbell; Geological Survey of

> 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

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

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 225°, altitude 45°, vertical factor 1x

Proximity to the North Magnetic Pole causes the magnetic compass to be erratic in this area. Magnetic declination 2014, 18°41'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. This publication is available for free download through GEOSCAN (http://geoscan.nrcan.gc.ca/).

Preliminary publications in this series have not been scientifically edited.

Preliminary