DESCRIPTIVE NOTES

The map area (NTS 87-H/11) lies within the Minto Inlier, a ~300 km long by 100-150 m 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). 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). Shaler Supergroup strata are were injected by tholeitic basaltic sills and dykes of the ca. 720-723 Ma Franklin large igneous province (Heaman et al., 1992; Macdonald et al, 2010). The sills are of variable thickness up to 100m, 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. 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; Dewing et al., 2015). Structurally, the Minto Inlier is composed of the open, NE-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 not folded. All rocks are dissected by east-northeast to east-striking 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).

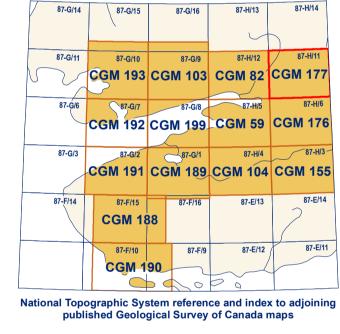
The bedrock geology of NTS 87-H/11 is largely masked by thick blanket of Quaternary glacial till and till veneer, which occupies about 75 percent of the map's area (Hodgson, 2012). The bedrock geology that is exposed comprises stratigraphic units from the Minto Inlet and Wynniatt formations of the Shaler Supergroup (Rainbird et al., 1994) and Cambrian to Early Devonian sedimentary strata of the Arctic Platform (Dewing at al. 2015). Rocks of the Shaler Supergroup are mainly exposed in the southern half of the map sheet. The Minto Inlet Formation crops out weakly in one small area near the western border of the map and where it comprises laminated white gypsum with interbedded grey-green calcisiltite and gypsiferous siltstone. Strata of the conformably overlying lower carbonate member of the Wynniatt Formation are interpreted from satellite imagery (SPOT4) to occur a few kilometres to the south. The stromatolitic carbonate and upper carbonate members of the Wynniatt Formation (see legend for details) are relatively well exposed in a band that runs from the southwest corner of the map area northeastward to the middle of the eastern edge of the map area. These units are repeated southward across several, up-stepping, normal faults (see below). One of the fault panels preserves the generally recessive black shale member of the Wynniatt Formation (W2). In the vicinity of UTM574191E, 7935359N, W2 is cut by at least two, northwesttrending alteration zones, characterized by Fe-oxide alteration and strong silicification of the host rocks causing them to crop out as resistant ridges. The ridges are parallel to two nearby Franklin dykes, suggesting that the alteration is related to their intrusion. The easternmost of the two dykes cuts, or is part of, a broader, irregular intrusion that feeds upward into two, thick diabase sills. The sills are of the type 2 (diabasic) as described in the legend.

Together with diabase sills, the Neoproterozoic strata comprise the gently southeast-dipping northern limb of the Holman Island Syncline. Similar to NTS 87-H/12 (Rainbird et al. 2014), the outcrop pattern of bedrock units on NTS 87-H/11 is strongly influenced by evenly spaced, horst and gräben, with variable along-strike separation and are thus akin to piano keys. Proterozoic strata are uncomformably overlain by Lower Cambrian to Ordovician (?) strata of the recently named, Quyuk, Uvayualuk, and Mount Phayre formations (Dewing et al., 2015), which are preserved in the gräben. The unconformity marks the northern margin of the Minto Inlier. The best exposures of the Paleozoic units are in the northeast corner of the map area; all of the main units can be seen north and south of a short normal fault located near UTM, 604724E, 7956075N. The earliest fault movement preceded deposition of Cambrian strata and occurred at the same time as folding of the Shaler Supergroup, but reactivation during Cambrian time is suggested by thickness variations between adjacent fault panels. The sub-Cambrian unconformity and Cambrian-Ordovician strata are offset across several NE-striking faults indicating significant post-Ordovician (?), probably normal, fault activity. An unexplained, knot-like, circular-feature of 300 m diameter (outlined) occurs in otherwise sub-horizontal homoclinal strata of the upper carbonate member of the Wynniatt Formation, near the eastern edge of the map sheet (UTM, 604444E, 7947034N).

Bedrock geology of NTS 87-H/11 is heavily masked by Quaternary glacial till (~75% of map's area). It is underlain mainly by carbonate rocks and dark shales of the middle-upper Wynniatt Formation of the Shaler Supergroup, which is best-exposed in the southwest corner of the map area. Together with several thick (up to 50 m) diabase sills, these strata comprise the gently south-dipping northern limb of the Holman Island Syncline. The outcrop pattern of bedrock units on this map is strongly influenced by evenly spaced, ENEstriking normal faults that form horst and gräben, with variable along-strike separation and are thus akin to piano keys. Proterozoic rocks are unconformably overlain by Early Cambrian to Ordovician (?) strata of the recently defined, Quyuk, Uvayualuk and Mount

or later times.

La géologie solide du feuillet SNRC 87-H/11 est largement cachée par des tills Quaternaires (~75% de la surface). La géologie est dominée par des calcaires et shales foncés de la formation de Wynniatt (moven et supérieur) du Supergroupe Shaler, avec des filonscouches diabasiques atteignant 50 m d'épaisseur. Les meilleurs affleurements sont dans le secteur sud-ouest de la carte. Les strates pendent doucement vers le sud, constituant le flanc nord du synclinal de Holman Island. La distribution des unités est fortement influencée par une série de failles normales orientées ENE. Le série de horst et gräben à jeu variable, comme les clefs d'un piano. Au cœur des gräben des strates d'âge Cambrien inférieur à Ordovicien sont préservées Phayre formations, which are preserved in the gräben. localement. Elles appartiennent aux Formations de Faults cut all of the bedrock units in the map area Ouvuk Uvavualuk et Mount Phavre (nouvellement définies) qui reposent en discordance sur les roches Protérozoïques. Puisque les failles recoupent tous les unités, leur âge doit être plus jeune que l'Ordovicien.



Cover illustration Oblique aerial view of enigmatic knot-like structure exposed near the eastern border of the map area. Field of view is approximately 500 m. Photograph b R.H. Rainbird. 2015-018

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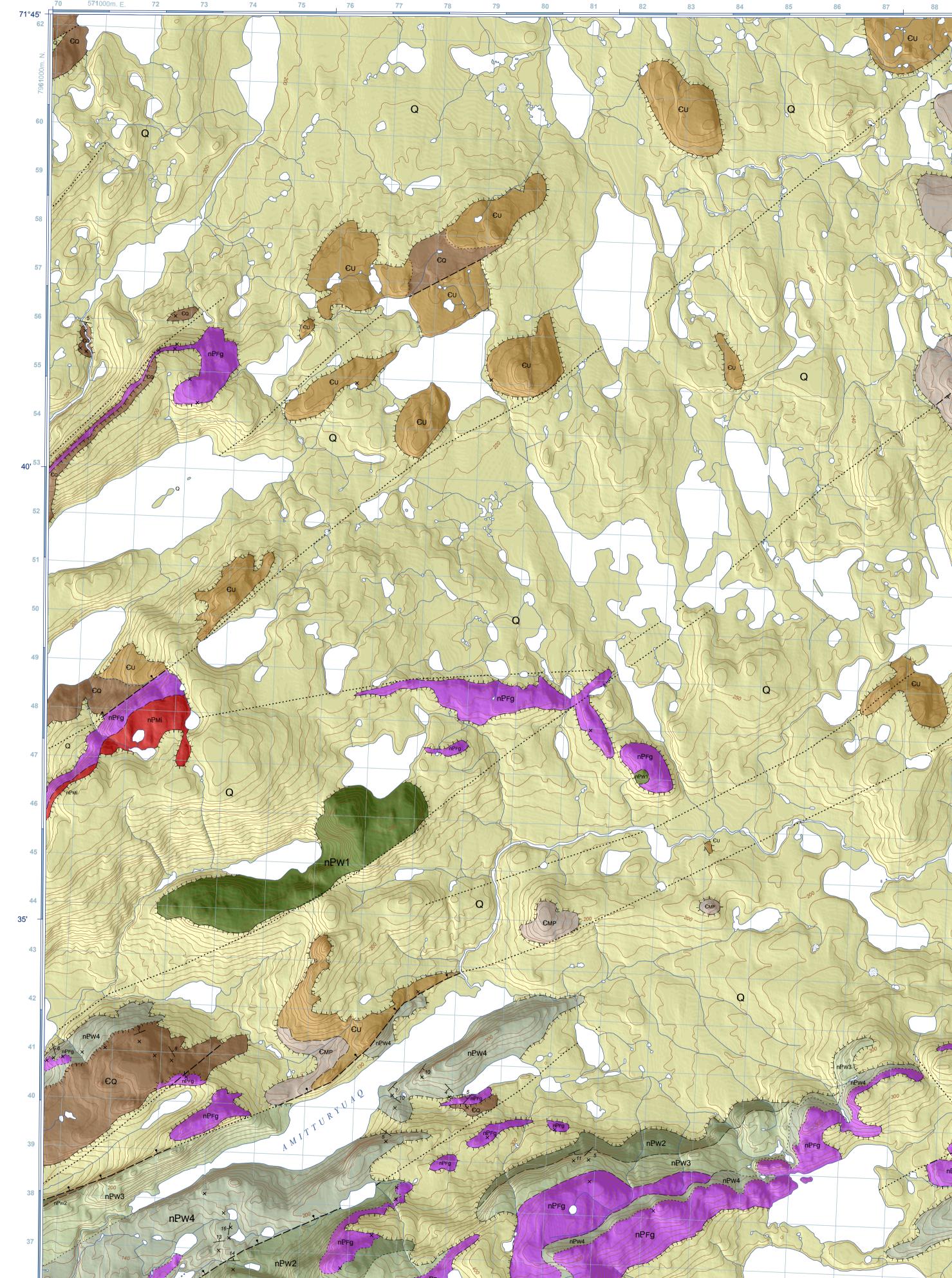
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Natural Resources Ressources naturelles du Canada

CANADIAN GEOSCIENCE MAP 177 GEOLOGY

QIKIGTALIK Victoria Island, Northwest Territories





CAMBRO-ORDOVICAN NEOPROTEROZOIC 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 NEOPROTEROZOIC-TONIAN TO CRYOGENIAN Contact; depositional, depositional-conformable or intrusive Defined Approximate Inferred Contact; depositional-unconformable رم^{۲۲۳۲}کک Inferred Fault, generic, steep dip QIKIQTALIK———· Approximate ····· Inferred Fault, normal; upright — → — · Approximate Station location Planar structure See photo 2015-018 on the map's cover ATANIRIIKHIKUNGIYUITTUQ**01 02 03 04** 605000m. E. **78 79 80 81 82** 95 96 97 98 99 83 84 85 86 89 90 91 92 **CANADIAN GEOSCIENCE MAP 177 Preliminary Preliminary Preliminary**

CANADIAN GEOSCIENCE MAP 177

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scale 1:50 000. doi:10.4095/296801

Canadian **Geoscience Maps**

Preliminary

Authors: R.H. Rainbird, J.H. Bédard, K. Dewing, and T. Hadlari Geology by R.H. Rainbird and J.H. Bédard, 2010, 2011 Geomatics by É. Girard

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 QIKIGTALIK 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 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, 17°54'E, decreasing 45' 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

Quaternary sediments

Victoria Island formation: Light grey to almost white weathering, fine to

oarsely crystalline fabric destructive dolostone that is widespread throughout

orthwestern Victoria Island. Locally preserved primary structures include

conglomerate. Fossils are rare but include silicified gastropods. Silicification is

crystalline quartz. Depositional environment is interpreted as a broad, shallow

carbonate platform. The lower contact is gradational with the Stripy unit with

inferred to be unconformable. Lower Ordovician conodonts occur in samples

directly below the upper contact. Thickness is 550 m on the south shore of

Mount Phayre Formation: Thin- to medium-bedded red mudstone-siltstone

appearance. Sedimentary structures include mudcracks, wave ripples, small

stromatolites, micro-karsted exposure surfaces, and microbial lamination

Middle Cambrian trilobites. The lower contact is covered in most places.

Thickness ranges between 15–95 m.

indicating a shallow marine, subtidal to intertidal setting. Mudstones contain

Uvayualuk Formation: Light brown dolomudstone to dolarenite. Thrombolite

mounds are locally well developed and together with metre-scale cross-

ecovered from this unit, the lower contact is gradational with mudstones

Clastic unit: Red-brown to orange weathering fine- to coarse-grained quartz

structures are lamination, wave and current ripples, and 10 cm to 2 m thick

indicate an influence by tidal currents. Depositional environment is considered

cross-stratified beds. Reactivation surfaces and foresets with rounded tops

Distribution and thickness are variable; thickness ranges from 0 m to 90 m.

composite with internal intrusive contacts. Two types: 1) An older, more

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

pigeonite gabbros, a magnetite gabbro with common pitted weathering

lichen, weathers chocolate brown, and shows a characteristic layer-parallel

ribbed weathering. Upper ½ to ¾ of sills composed of massive olivine and

(magnetite oikocrysts) and a granophyric horizon containing abundant ocelli of

granophyre and coarse, bladed clinopyroxene crystals. 2) Younger (based on

crosscutting relationships), more evolved, diabasic sills showing enrichment in

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

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.

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

Upper carbonate member: Base characterized by distinctive nodular, black

calcareous shale, overlain by thin, rhythmically bedded and normally graded.

crossbedded quartz arenite and microbially laminated lime mudstone. Chert is

ave local synoptic reliet of several meters; main build-up contains oncolds u

quartz-sandy calcarenite. Upper, metre-scale alternations of stromatolitic

Stromatolitic carbonate member: Stromatolitic dolostone with build-ups that

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

Lower carbonate member: Lower parallel-laminated dolosiltite and calcilutite

carbonaceous siltstone capped by regionally extensive orange-weathering stromatolitic dolostone, up to 10 m thick. Approximately 120 m thick.

maroon-green gypsiferous siltstone-calcilutite, dark grey limestone, bedded white gypsum, and cyclical calcisiltite to nodular gypsum. Evaporite lithofacies include laminated to thin-bedded and cross-laminated white gypsite and grey

anhydrite, red gypsiferous siltstone and buff to grey calcisiltite. Chickenwire, nodular anhydrite and crosscutting satinspar veinlets common in upper evaporite as are up to 2 m thick beds of crystalline gypsum. Carbonate lithofacies includes dark grey to buff-grey laminated to thin-bedded dolosiltite

with molar-tooth and fine-grained dolarenite with hummocky

cross-stratification. Approximately 250 m thick.

Ground observation

Igneous layering

Glacial striation or groove

with mudcracks, teepee structures and chert; minor carbonaceous mudstone. iddle hummocky cross-stratitified dolarenite and calcilutite with scours, rip-ups and molar-tooth structure; stromatolitic dolostone, intraclast dolograinstone. Upper stromatolitic dolostone, intraclast dolograinstone and

Minto Inlet Formation: Four informal members in ascending stratigraphic order:

to 20 cm. Interbedded intraclast grainstone with rip-ups and scours;

mudstone/dololutite with molar tooth structure. Parallel or microbially

olostone and crossbedded intraclast grainstone. Local herringbone

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

Shaler Supergroup (nPMi-nPK1) Kilian Formation (nPK1-nPK4)

cycles. Molar-tooth structure common.

Wynniatt Formation (nPW1-nPW4)

common. Approximately 300 m thick.

upper contact. Approximately 160 m thick.

primitive type is commonly layered, with microdiabasic lower and upper border

to be shallow marine. Mudstones contain Lower Cambrian trilobites.

arenite and mudstone at the base of the Paleozoic succession. Sedimentary

stratification suggest a shallow marine setting. Although no fossils were

that contain Cambrian trilobites. Thickness is 30–45 m.

interbedded with green dolomudstone. Outcrops have a distinctive stripy

the contact at the highest shale interbed. The upper contact is sharp and

horizontal bedding, crossbedded oolitic grainstone beds, thrombolite and

widespread in the upper two-thirds of the unit. Chert occurs as prominent

white-weathering beds and nodules, 5 to 60 cm thick, and composed of

microcrystalline chert or as silicified stromatolites. Some vugs contain

stromatolite bioherms, microbial lamination, and intraformational

Preliminary publications in this series have not been **CANADIAN GEOSCIENCE MAP 177** scientifically edited.