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Foreword

The Geo-mapping for Energy and Minerals (GEM) program is laying the foundation for sustainable economic development in the North. The Program provides modern public geoscience that will set the stage for long-term decision making related to investment in responsible resource development. Geoscience knowledge produced by GEM supports evidence-based exploration for new energy and mineral resources and enables northern communities to make informed decisions about their land, economy and society. Building upon the success of its first five-years, GEM has been renewed until 2020 to continue producing new, publically available, regional-scale geoscience knowledge in Canada's North.

During the summer 2015, GEM program has successfully carried out 17 research activities that include geological, geochemical and geophysical surveying. These activities have been undertaken in collaboration with provincial and territorial governments, northerners and their institutions, academia and the private sector. GEM will continue to work with these key collaborators as the program advances.

The **Brock Inlier project** (Figure 1), is an activity within the **Shield to Selwyn geo-transect: studying the evolution of sedimentary rocks of the northern mainland NWT to improve exploration success:** This activity will initiate the first regional integrated effort to place Proterozoic to Cenozoic strata of Mackenzie Platform, Selwyn Basin, and adjacent regions into a fully modern tectono-stratigraphic and metallogenic framework, and will better enable industry and Northerners to responsibly find and develop energy and mineral natural resources, maximizing their economic and societal impact

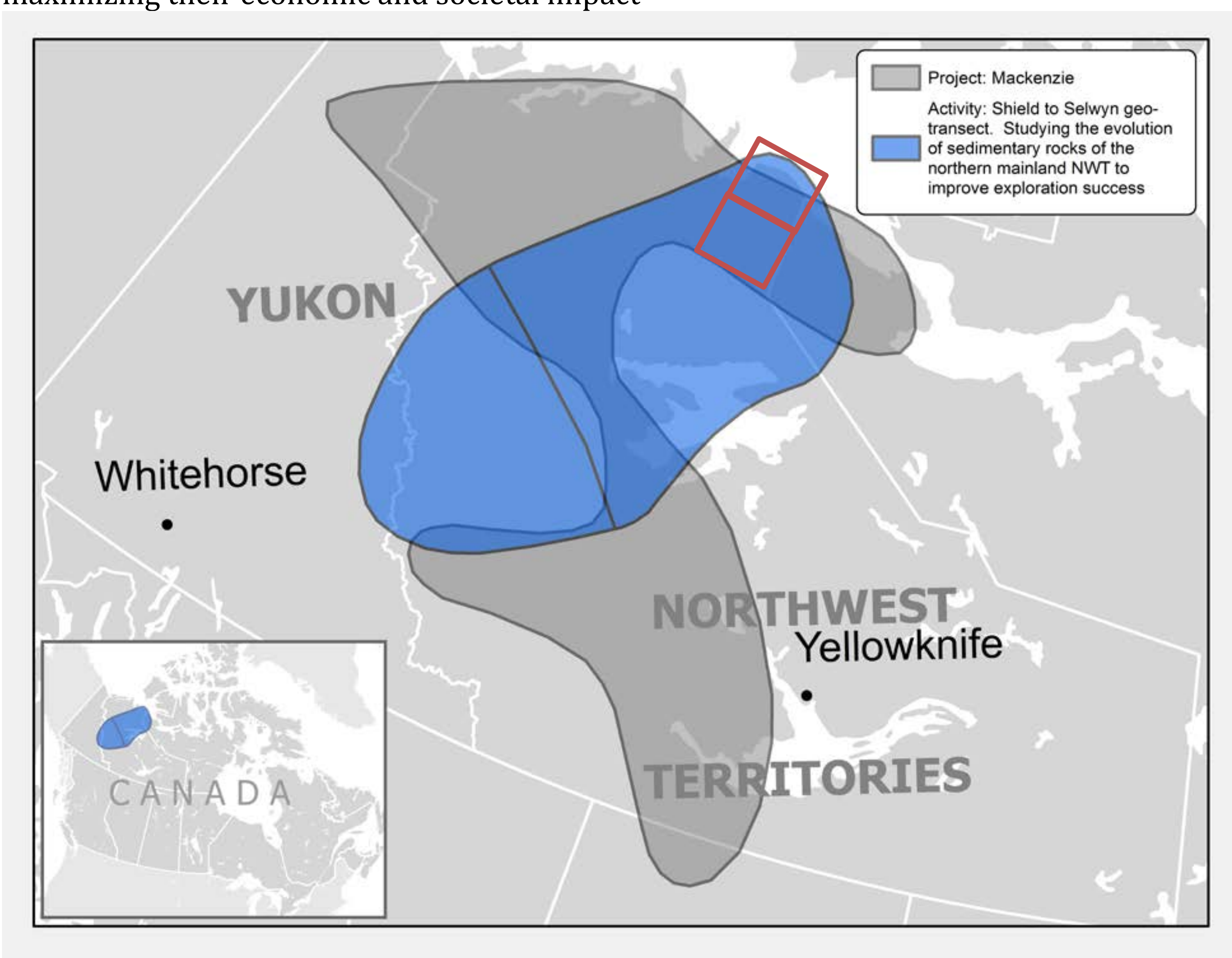

Figure 1. General project location. Boxes show location of NTS 97D and to its south, 97A.

Summary:
Natural Resources Canada's Geo-mapping for Energy and Minerals (GEM) program is laying the foundation for sustainable economic development in Canada's north through improved, publically available, geoscience knowledge and mapping of this vast region. As part of the second phase of this program, Rob Rainbird, Valerie Jackson and Elizabeth Turner are leading studies involving detailed stratigraphic (sedimentary rock layer) analyses and bedrock geological mapping of early Neoproterozoic (1,000- to 800 million-year-old) and lower Paleozoic (540-400 million-year-old) sedimentary rocks with mineral resource potential and limited geological information. Their project focuses on the Brock Inlier, an uplifted region of mostly Proterozoic sedimentary rocks surrounded by younger sedimentary rocks, located just east of Darnley Bay, Northwest Territories. The Brock Inlier is also purported to host the largest gravity and magnetic anomaly (deviation from an expected background reading in geophysical measurements) detected in North America, which indicates dense rocks below the surface that may contain metals. Jim Craven is leading a magnetotelluric (MT) geophysical study to trace sedimentary rock layers westward from the Brock Inlier into the subsurface. A related goal of the MT work is to improve our understanding of the nature, size and depth of the Darnley Bay anomaly. The research team uses high-resolution satellite imagery, photographs, and ground-truthing (verifying, in-person, what is seen on imagery) to learn about the spatial extent and composition of rock units. During August 2015 field work in Brock Inlier, the research team examined excellent exposures of mainly carbonate rocks along the Hornaday River (see frontispiece), which is allowing them to learn more about a warm, shallow sea that occupied this area and the broader region nearly a billion years ago. They also studied younger rock units along the lower reaches of the river that include significant deposits of coal. They will use data from this project to produce modern, Geological Survey of Canada (GSC) open file maps, reports, and other technical research publications. The results of these ongoing studies will inform the resource industry, scientific community, and public, as well as provide a geological context for the distinct river canyons that draw visitors to Tuktut Nogait National Park..

Introduction
The goal of this project is to upgrade geoscience knowledge in the Brock Inlier, a large window of mainly late Mesoproterozoic to early Neoproterozoic sedimentary rocks with affinities to the Minto Inlier on Victoria Island (GEM1 activity) and the Mackenzie Mountains to the southwest (Long et al., 2008; Rainbird et al., 2015; Rainbird and Jefferson, 1994; Rainbird et al., 1996). The inlier overlaps the eastern edge of what has been promoted as the largest coincident gravity and magnetic anomaly in North America (a Bouguer corrected anomaly of over 130 mgal and a positive vertical magnetic field anomaly (at 3 km height) of over 800 nT; (Hornal et al., 1970; Stacey, 1971) (Figure 2). The so-called Darnley Bay anomaly has long-been speculated by the mining industry as being due to a deeply buried Ni-Cu-PGE magmatic sulphide deposit on the scale of Sudbury or Noril'sk (Jefferson et al., 1994; Jones et al., 1992). Our work is, in part, intended to decrease potential exploration investment risk by increasing the level of detail of scientific information in the region surrounding the anomaly.

Prior to the 2015 field season, our intention was to: 1) Acquire magnetotelluric data along an E-W transect to see how strata exposed in the Brock Inlier continue westward into the region over the geophysical anomaly, which is covered mainly by Phanerozoic strata. These data would also potentially image the top of the anomaly, thereby providing a more accurate assessment of its depth. 2) Measure and describe unstudied stratigraphic sections of the Cambro-Ordovician sedimentary succession and the Meso-Neoproterozoic Rae and Reynolds Point groups along the Hornaday River. Such stratigraphic information will contribute greatly to our understanding of geological linkages between, and evolution of the Mackenzie Corridor and Arctic Islands. 3) Assess the accuracy and density of previous geological mapping/observations in the Brock Inlier and acquire field observations in the central Brock Inlier to augment reconnaissance field mapping conducted in 2014.

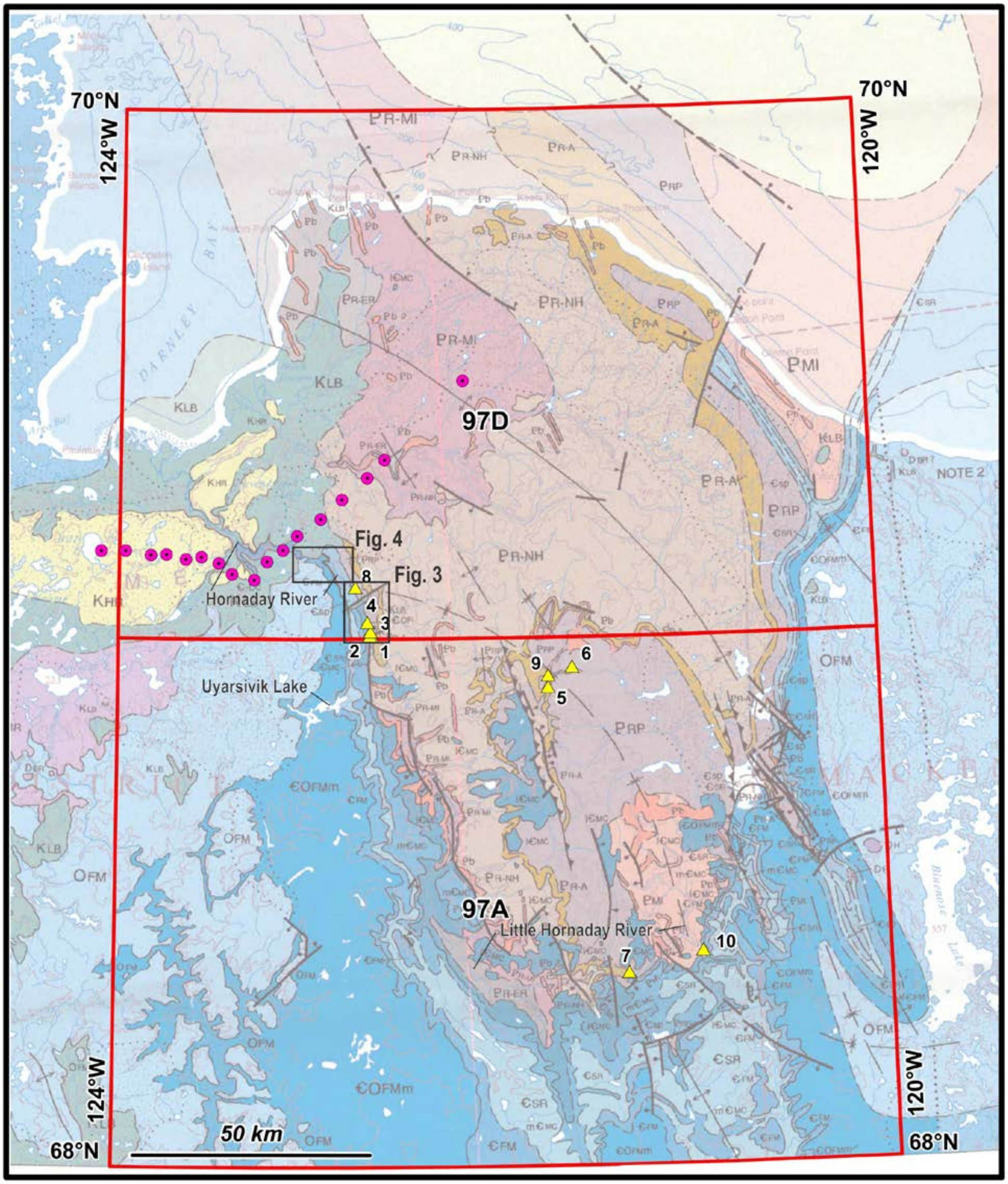

Figure 2. Geology of Brock Inlier (Okulitch, 2000); K, D, S, O, Ꞓ, P = Cretaceous, Devonian, Silurian, Ordovician, Cambrian, and Proterozoic units respectively. Pink dots are 2015 magnetotelluric survey sites and yellow triangles are the sites of stratigraphic sections through the Shaler Supergroup. For location of study area (NTS sheets 97A, 97D) refer to regional location map Fig. 1.

Methodology

Magnetotelluric study

Seventeen co-located audio- and broadband magnetotelluric sites were completed along an east-west transect over the southern margin of the Darnley Bay anomaly and extending into the Brock Inlier (Figure 2). The survey line chosen leveraged an earlier, more shallowly penetrating, novel audiomagnetotelluric dataset collected by Darley Bay Resources, Inc. (S. Reford, Pers. Comm., 2015)(Goldak and Olson, 2015). The GEM-2 MT survey time-series data are currently being processed to responses (i.e. apparent resistivities and phases) that can be subsequently analyzed using 3D inversion techniques to form a subsurface model of electrical resistivity (Craven et al., 2013). Careful processing of the new data is required as the earlier survey suggested the influence of variable near-surface conditions on electrical field measurements could introduce spurious artifacts (termed 'statics') into the responses.

Detailed Stratigraphic and Sedimentological studies

Early Neoproterozoic strata of the upper Rae Group and Reynolds Point Group (Shaler Supergroup; Rainbird et al., 1994; 1996) including the upper Nelson Head, Aok, Grassy Bay and Boot Inlet formations were measured in detail along a ~15 km segment of the Hornaday River canyon (Figure 3). The lowermost part of the measured section is interpreted to belong to the uppermost Nelson Head Formation and so represents the continuation of the stratigraphic succession above that described in our 2014 Activity Report (Rainbird et al., 2015). Other sections were measured along a prominent westerly flowing tributary that drains into the Hornaday River, approximately 15 km southeast of Uyarsivik Lake (Grassy Bay and lower Boot Inlet Formation) and along the Little Hornaday River (middle to upper Boot Inlet Formation).

In the Hornaday River canyon, south of LaRoncière Falls, stromatolitic carbonate rocks of the upper Boot Inlet Formation are unconformably overlain by strata of Cambrian to Ordovician age, including the Mount Clark, Mount Cap, Saline River and Franklin Mountain formations (Balkwill and Yorath, 1971; Cook and Aitken, 1969). These strata were also measured and described in detail.

Stratigraphic sections were measured via bed-by-bed logging of superb canyon-wall exposures. Standard, detailed sedimentological observations were made on each bed and carbonate layers were sampled at 1-2m intervals for petrographic and stable isotope (C-O) analysis.

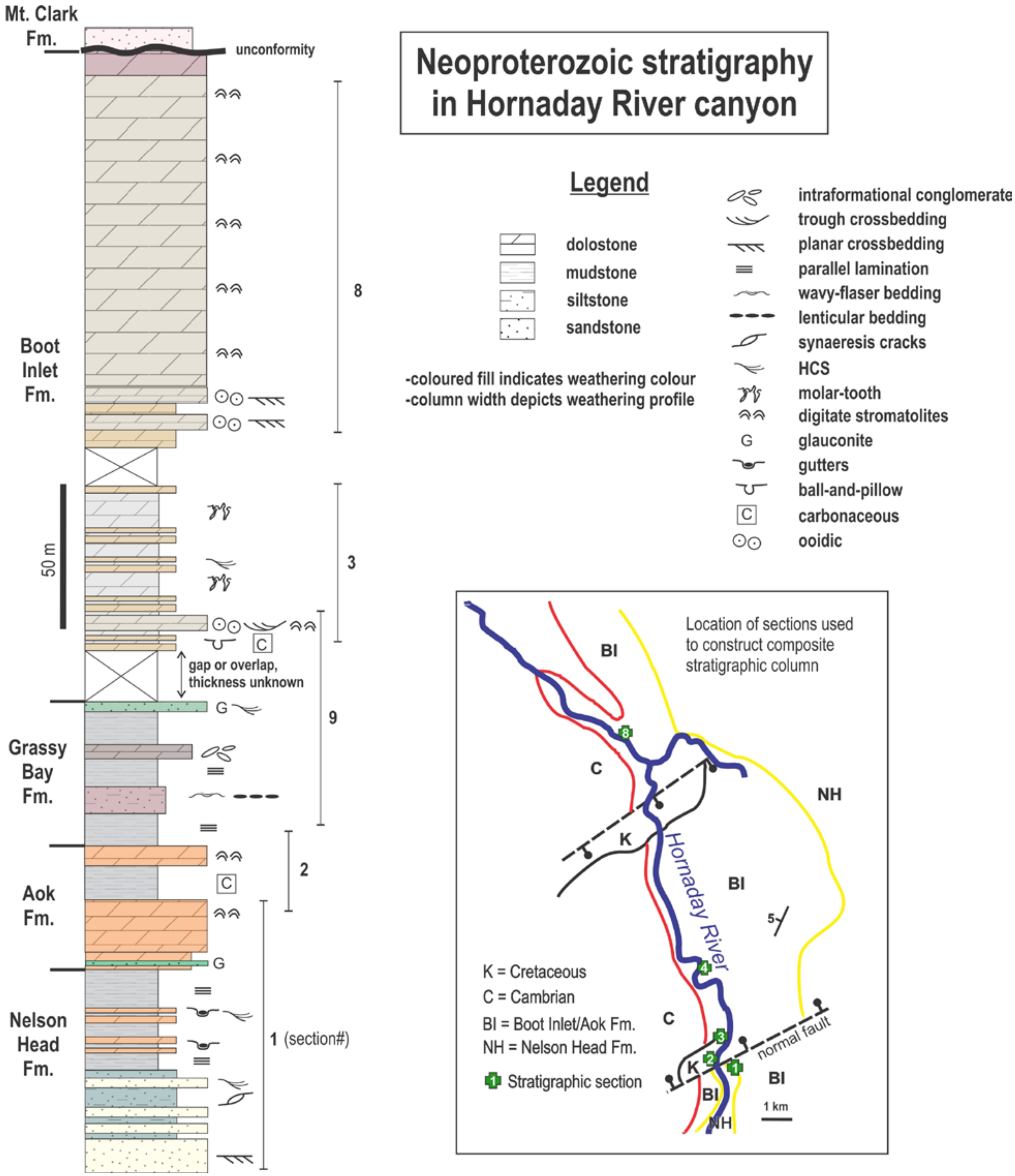

Figure 3. Generalized stratigraphic section of the Shaler Supergroup (upper Rae-Group-Reynolds Point Group transition) from the Hornaday River canyon. See Figure 2 for location of inset map.

Geochronological and Micro-paleontological Studies

Sample sets of organic-rich shale and carbonate were collected for Re-Os geochronology from the middle and lower Boot Inlet Formation, Aok Formation, and Mikkelsen Islands Formation. Absolute depositional ages will constrain the timing and rates of sedimentation in the Amundsen Basin and help to refine tectonic models that incorporate correlations with the Mackenzie Mountains Supergroup in the Mackenzie and Wernecke Mountains, and the Bylot Supergroup on Baffin Island. This work will form part of a doctoral thesis by T. Gibson and is intended to complement similar studies of the upper Shaler Supergroup conducted in the Minto Inlier on Victoria Island (van Acken et al., 2013). Shale and black chert samples were also selected from the upper Nelson Head and Boot Inlet formations for micro-paleontological studies.

Reconnaissance geological mapping
Regional reconnaissance geological surveying was undertaken to assess the need for, and feasibility of, future regional geological mapping. The work was also used to assess the accuracy of previous mapping and to outline the distribution of stratigraphic units that have been amended since the previous geological maps of the area were published. Helicopter traverses were conducted mainly along waterways such as the Hornaday and Little Hornaday rivers (and their tributaries), where the best bedrock exposures occur, and were confined mainly to the NTS 97A (Erly Lake) map sheet. Helicopter-supported mapping of the extreme southern and eastern parts of the map area was hampered by poor weather.

Results

Magnetotelluric study
Preliminary responses calculated to date have been visually inspected and indicate the overall thickness of the sedimentary succession is considerably greater along the western portion of the profile and suggest a conductive feature in the vicinity of the known anomaly. The depth to this feature and the thicknesses of the main sedimentary packages in the area will be quantitatively determined after processing of the data has been completed, and a model of the subsurface resistivity derived.

Stratigraphy and Sedimentology of the Rae Group-Reynolds Point Group transition in the Hornaday River area
At section WG-1 (Figure 3), the Nelson Head Formation comprises mainly fine-grained sandstones with low-angle crossbedding interpreted as distributary mouth bar deposits, which pass upward into dark, parallel-laminated siltstones with sandstone and sandy carbonate interbeds featuring cross-stratification and intraclast layers indicating storm influence in shallow water. These mainly siliciclastic deposits of the upper Nelson Head Formation pass abruptly upward into thick-bedded dolostones, which are followed by stromatolitic dolostones of the Aok Formation. These, in turn, are overlain by a relatively thin unit (<15m) of recessive dark shales, which are abruptly overlain by a regionally distinctive orange-weathering stromatolite biostrome that represents the top of the Aok Formation (Figure 3). The Aok Formation is overlain by another poorly exposed interval beginning with dark-grey shale chips in scree followed by a section of variegated siltstones with sandy interbeds exhibiting wavy-lenticular bedding with mud intraclast layers. The top of this unit, the Grassy Bay Formation, is composed of glauconitic, medium-grained quartzarenite with small-scale hummocky cross-stratification (HCS).

The contact between the Grassy Bay Formation and the overlying Boot Inlet Formation is precluded by faulting in stratigraphic sections along the Hornaday River (WG-2 to 4; Figure 3) but is preserved in sub-crop at section WG-9 to the southeast (Figure 2), where its base is represented by brown-weathering dolostones containing HCS, nodular bedding and intraformational conglomerate with interbedded, olive-weathering, parallel-laminated siltstone. Above is rubbly, carbonate-cemented quartzarenite that gives way up-section to repetitively interbedded dololutite, dolosiltite with parallel-lamination, cross-lamination, molar-tooth structure and nodular bedding, and dolarenite interbeds with grading, small-scale HCS and scoured bases. This "rhythmite" facies is interpreted to indicate deposition on a shallow marine shelf, above stormwave base, that was affected by storms which transported coarser detritus to deeper water. Rythmite facies is typically overlain crossbedded, ooidic grainstone and packstone interpreted to have been deposited on shallower, higher energy parts of the shelf (Morin and Rainbird, 1993; Narbonne et al., 2000). In some sections (e.g. WG-3,4), oolite is associated with small biostromes composed of digitate stromatolites. Together these facies form thicker cycles that characterize much of the up to 500m (?) of Boot Inlet Formation preserved in Brock Inlier. In the middle part of the formation the rythmite and oolite facies is overlain by a succession, at least 100 m thick, composed almost exclusively of digitate stromatolites packaged in tabular beds, ~10–100 cm thick (sections WG-7; Figure 3). Together, these form extensive biostromes (preserved over the entire Brock Inlier) that exhibit very broad, low-relief, domal morphology. It is difficult to determine whether these domes (up to 500m wide) are rounded or elongate in plan - such mounds can be elongate, normal to paleoshoreline as a consequence of tidal influence, or shoreline-parallel where longshore currents are dominant (Bosak et al., 2013). Stratigraphic continuity above this stromatolitic interval is poor – the Boot Inlet Formation is truncated by the sub-Cambrian unconformity at this level in the Hornaday River canyon. We observed strata of the upper Boot Inlet Formation along a tributary of the Little Hornaday River (section WG-10; Figure 2), but the thickness of stratigraphic section between these rocks and stromatolitic strata preserved at the top of nearby section WG-7 is unknown. At section WG-10, the upper Boot Inlet Formation comprises a roughly 70m-thick succession of rythmite comprising oodic grainstone, nodular-bedded calci-dolosiltite and calci-dololutite with ubiquitous molar-tooth structure. The depositional setting is inferred to be similar to rhythmites exposed lower in the section.

As discussed below, the Boot Inlet Formation is overlain elsewhere in the Amundsen Basin by the Fort Collinson Formation, a quartzarenite-rich unit that is not preserved in the areas of Brock Inlier that we visited. Instead, it is gradationally overlain by the Jago Bay Formation, which is distinguished by its lack of rhythmic layering, stromatolites and grainstones, although stromatolites have been described from the formation in its type area in the Minto Inlier of Victoria Island (Rainbird et al., 1994). The most common lithology is a tan-yellow weathering, thinly microbially laminated dolostone with variably developed nodular, grey to black chert replacement. Lithologically, the Grassy Bay Formation resembles the Mikkelsen Islands Formation (cf. Rainbird et al., 2015).

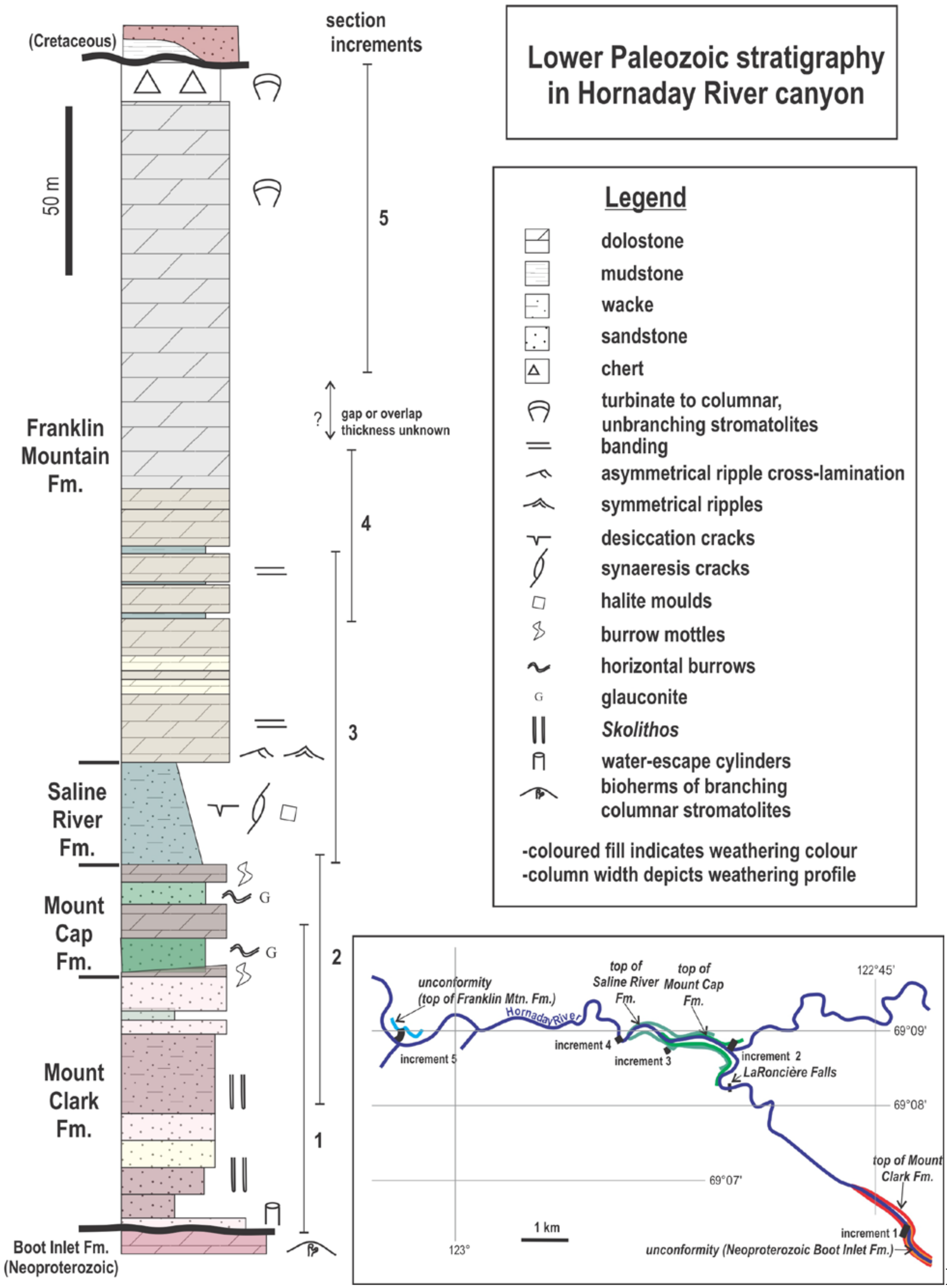

Figure 4. Generalized stratigraphic section of Cambrian and Ordovician strata from the Hornaday River canyon. See Figure 2 for location of inset map.

Stratigraphy and Sedimentology of Cambrian and Ordovician strata in the Hornaday River area
The exposures described here are hundreds of kilometres distant from the areas where these formations were first documented in the Franklin Mountains (Williams, 1922, 1923)and later refined. Consequently, significant differences in thickness, stratigraphic expression, and lithofacies are present in the study area as compared to the better-known areas to the south. Reconnaissance-level stratigraphy in this northern part of the lower Paleozoic exposure area was documented for the Colville Hills and Hornaday - Brock river areas during Operation Norman (Balkwill and Yorath, 1971; Cook and Aitken, 1970). The field component of the present project focused on producing detailed stratigraphic sections that could support both regional correlations and sedimentological analysis.

In this study, Cambro-Ordovician sedimentary rocks were documented in five overlapping sections along the Brock River, beginning from from the Proterozoic-Paleozoic unconformity near LaRoncière Falls and going downstream and up-section through flat to gently northwest-dipping strata (Figure 4). These are the first detailed sections through Cambro-Ordovician strata in this broad region of generally poor Paleozoic exposure. No biostratigraphically useful macrofossils were encountered.

At the unconformity, the lower Cambrian Mount Clark Formation, overlies reddened stromatolitic dolostones of the Boot Inlet Formation and consists of variably mature white- to pink-weathering trough cross-bedded quartz arenite, and red-, green-, white-, grey-, and yellow-weathering siltstone and wacke, commonly with abundant *Skolithos* burrows and locally with millimetric bedding-plane traces in mudstone, both of which diminish up-section. Stratigraphy of the Mount Clark Formation is inconsistent along strike, attesting to paleoenvironmental complexity in nearshore environments. It is approximately 75 m thick where measured, but thickness is expected to vary considerably according to local and regional differences in the paleotopographic position of the underlying unconformity surface.
The base of the overlying Mount Cap Formation is tentatively placed at the sharp lower contact of the lowest of three, medium-brown-weathering, dolostones with underlying, white-weathering, cross-bedded quartz arenite (Figure 5). This formation consists of three dolostone units (each 0.7 – 9 m thick) separated by two intervals (5 – 9 m thick) of diversely horizontally burrowed glauconitic sandstone. Two of the dolostones are burrow-mottled, and one is cross-bedded and locally intraclastic. The Mount Cap formation is approximately 32 m thick in our section, but the thickness of at least the lowest dolostone is known to vary markedly (0.7 to 5 m) along-strike.

The Saline River Formation sharply overlies burrowed Mount Cap Formation dolostone and is dominated by green, locally ripple-cross-laminated or dolomitic siltstone-sandstone with synaeresis and desiccation cracks; no gypsite layers were encountered, but halite moulds were documented in sandstone float. The Saline River Formation is approximately 30 m thick.
The Franklin Mountain Formation abruptly but conformably overlies green siltstone of the Saline River Formation (Figure 4). The lowest ~20 m consists of sharply defined, metre-scale alternations between (a) banded to laminated pale-brown dolostone with symmetrical and asymmetrical ripples, ripple cross-lamination, and sparse, graded, thin layers of millimetric to centimetric intraclasts, and (b) recessive, slightly silty, greenish to brown dolostone. Two white-weathering marker units containing intraclast grainstone and possible fenestral fabric are present between 25 and 35 m above the formation's base. The overlying ~30 m consist of metre-scale alternations of massive, medium-brown-weathering, centimetrically banded dolostone and centimetric seams of greenish, argillaceous dolostone. Three conspicuous recessive intervals, each 1 to 4 metres thick and consisting of greenish siltstone and brown argillaceous dolostone define a

marker interval that links adjoining section increments. Fifteen metres above the uppermost of these notches, dolostone becomes coarsely crystalline, and depositional lithofacies are difficult to discern. This lithostratigraphically enigmatic interval is at least 130 m thick (Figure 4), and contains rare examples of lamination, banding, bioturbation, green argillaceous seams, and metre-scale turbinate stromatolites. Fractures and vugs lined with rinds of colourless to brown euhedral quartz are common throughout the upper 120 m of section. Chert first becomes conspicuous approximately 10 m below the upper contact of the formation with Cretaceous mudstone and sandstone. The Franklin Mountain Formation is at least 210 m thick in the Hornaday River, but challenges in correlating section increments in the coarsely crystalline, fabric-destructive dolostone unit mean that this is approximate.

Geochronology
Samples of heavy-mineral bearing sandstone collected from the base and the top of the Nelson Head Formation in 2014 yielded an overwhelming component (>90%) of Mesoproterozoic grains that indicate a maximum depositional age similar to that obtained from the Nelson Head Formation in the Minto Inlier (Rayner and Rainbird, 2013). Samples collected from underlying formations yielded an insufficient number of zircon grains to provide a statistically significant sample size, and so they were not analyzed. Samples of organic-rich shale from the top of the Escape Rapids Formation and from the base of the sharply overlying Mikkelsen Islands Formation collected in 2014 yielded data that could not be used to generate meaningful Re-Os isochrons.

Reconnaissance Geological Mapping
Reconnaissance geological mapping was focussed in the central and northern parts of NTS 97A, where the main exposures of the margins of the Brock Inlier are revealed along the Hornaday River and its main tributaries. Previous mapping by Cook and Aitken (1969) does not incorporate the revised stratigraphic nomenclature of the Shaler Supergroup (Rainbird et al., 1994) such that their Proterozoic units 4 and 5 are now divisible into 6 formations, five of which appear to be mappable in this region. From our reconnaissance, we determined that the boundary between Cook and Aitken's map units 3 and 4 coincides with the Nelson Head-Aok formational boundary, as proposed by Rainbird et al. (1994). The Aok Formation is an obvious regional marker because of its resistant nature and the bright orange weathering of its upper stromatolitic unit. Jones et al. (1992) subdivided map unit 4 into 4 subunits (a-d), which appear to coincide with, in ascending stratigraphic order, the Aok, Grassy Bay, Boot Inlet and Fort Collinson formations. We equate the Jago Bay Formation with the lower part of map unit 5 of Cook and Aitken (1969) and place the lower boundary of the Minto Inlet Formation above it, at the first occurrence of sulphate evaporite rocks.

The Fort Collinson Formation, a crossbedded quartz arenite occurring between the Boot Inlet and Jago Bay formations(Rainbird et al.,1994), is not recognized in the Brock Inlier (cf. Morin and Rainbird, 1993). As such, it is difficult to mark with precision the lower contact of the Jago Bay Formation with the underlying Boot Inlet Formation - both are largely composed of dolostone, although the Jago Bay weathers a distinctive yellow and is composed of cherty microbially laminated dolostone, unlike the Boot Inlet Formation. Further detailed work in the region surrounding the upper reaches of the Little Hornaday River and Hornaday Lake to elucidate these stratigraphic relationships is recommended.

Our field traverses in the area along west side of the Hornaday River, south of Uyarsivik Lake (northern part of NTS 97A/11 and southern part of A/14), where Cook and Aitken (1969) map the unconformity between Proterozoic map unit 6 (Franklin gabbro) and the Cambrian Mount

Clark (unit CK) and Mount Cap (unit CP) succession, revealed a number of inconsistencies. Several areas mapped as Cambrian unit CK are re-interpreted as quartz arenite belonging the Nelson Head Formation (Proterozoic unit 3 of Cook and Aitken, 1969). These rocks are distinguished from Mount Clark Formation by their greater induration and ubiquitous crossbedding deposited by rivers with consistent northwesterly paleoflow (Rainbird et al. 2015; Ielpi and Rainbird, in press). Mount Clark Formation sandstones are relatively soft, sugary weathering, contain *Skolithos* burrows and have inconsistent paleocurrents, suggesting marine deposition. We also observed Mount Clark strata unconformably overlying the Proterozoic map units in this area. Mount Cap Formation, exposed as a number of dolostone ridges, conformably overlies the Mount Clark sandstone. Also in this area, we mapped large outcroppings of cherty, microbially laminated carbonate rocks, which we attribute to the Mikkelsen Islands Formation (see Rainbird et al., 2015), and which do not appear on the map of Cook and Aitken (1969). Furthermore, we do not see evidence for some of the west-side down normal faults mapped in this area. Much of the juxtaposition of Cambrian and Neoproterozoic rocks can be accounted for by paleotopography on the unconformity between them.

Along the major west-flowing tributary of the Hornaday River, near the western border of NTS 97A/15, we confirmed the presence of a west-verging reverse fault placing Nelson Head Formation (P3) over younger strata and identified a steep, north-south striking, fault west of the reverse fault (see Cook and Aitken, 1969). We could not confirm the presence of a steep fault east of the reverse fault. North of the river, the confirmed steep fault juxtaposes Boot Inlet Formation east of the fault with an Aok – Grassy Bay – Boot Inlet succession west of the fault. We re-assigned what was mapped as P4 (Aok Formation) to a succession from Aok Formation through Grassy Bay Formation (part of P4) to Boot Inlet Formation. The Grassy Bay Formation here is largely covered, but is identified by its position between Aok and Boot Inlet formations and by blue-black shale chips in rodent excavations. Blocky weathering quartz arenite that outcrops near the top of the recessive interval was also recognized near the top of Grassy Bay Formation near section WG-9 (Figure 2).

A purported exposure of Nelson Head Formation (P3) along the riverbed in the vicinity of the faults does not exist, although it is exposed downstream. South of the river, a wedge of rock between the reverse and steep faults, previously mapped as P4, was identified as Boot Inlet Formation on the basis of its great thickness of stromatolitic dolostone. West of the reverse fault, a Nelson Head – Aok succession is unconformably overlain by quartz arenite of the Mount Clark Formation. Locally, strata that belong to Grassy Bay Formation are present just under the unconformity. The Mount Clark Formation weathers into unconsolidated, coarse, white, quartz sand that drapes hilltops in this region.

Our fieldwork has shown that miscorrelations are easily made between quartz arenites of the Proterozoic Nelson Head Formation and the Cambrian Mount Clark Formation, and between two Proterozoic dolostones, the Aok Formation at the top of the Rae Group and the Boot Inlet Formation of the Reynolds Point Group. The map compilation by Okulitch (2000) provides some accurate revisions of map unit distributions based on the current stratigraphic nomenclature, although there are still some inconsistencies with what we observed in the field in 2015. Cretaceous strata were examined briefly, in a graben near section WG2 and on the north side of the Hornaday River near the border of NTS 97D/3 and D/4 (Figure 3). Notable are coal seams <1 – 1.5 m thick and consisting of brittle, black coal in which dense arrangements of cm-scale vascular plant debris form a planar fabric. Overlying the coal is unconsolidated, weakly indurated, fine-grained quartz arenite. These strata comprise the “lower division” of the “Silty zone” (Ks) mapped by Balkwill and Yorath (1971). Overlying the “lower division” is a sticky, grey, argillaceous, cross-laminated siltstone with pyrite nodules that may belong to the “upper division” of Balkwill and Yorath (1971). These nodules consist of up to 70% fine-grained quartz sand cemented by pyrite.

Conclusions

Preliminary responses from 17 magnetotelluric survey stations along an E-W profile across the Brock Inlier and the Darnley Bay geophysical anomaly indicate that the overall thickness of the sedimentary succession above it is considerably greater along the western portion of the profile and suggest a conductive feature in the vicinity of the known anomaly. Our stratigraphic work has documented the first complete record of the Neoproterozoic and early Paleozoic sedimentary rocks exposed along the Hornaday River. Samples of these rocks have been collected for paleontological, geochronological and geochemical analysis. Helicopter-supported regional geological reconnaissance of NTS 97A and selected ground traverses in key areas of good exposure will allow us to produce new and improved geological maps. This work, in tandem with analysis of newly acquired, high resolution, remotely sensed and video imagery, will provide the materials for “training areas”, which can be applied and then correlated to areas not visited in the field, as well as help delineate regional structures such as dykes and faults.

Acknowledgments

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