

GEOLOGICAL SURVEY OF CANADA
OPEN FILE 6148 (Revised)

Seventeen Measured Sections of Cambrian Mount Clark and Mount Cap formations, northern Mackenzie Mountains and Franklin Mountains, Northwest Territories

C. Serié, C.L. Bergquist, and L.J. Pyle

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INTRODUCTION

Study of Lower to Middle Cambrian stratigraphy in the northern Mackenzie Mountains, Mackenzie Plain, and Franklin Mountains (Figure 1) was undertaken during a three-year field programme (2005-2007) carried out by Devon Energy Corporation, Talisman Energy, and the Geological Survey of Canada (GSC). This programme was conducted in response to a growing interest in hydrocarbon prospectivity of the area with natural gas, condensate, and oil discoveries in Colville Hills (Hamblin, 1990; Dixon and Stasiuk, 1998) and the prospect of a Mackenzie Valley Pipeline. Lower to Middle Cambrian strata occur throughout the Northern Interior Plains which are bordered by the Canadian Shield and the Cordillera to the east and the west, respectively. A general stratigraphic framework for Cambrian strata in Mackenzie Plain is mainly known from outcrops along the Mackenzie Mountains to the south and west, and the Franklin Mountains to the north and east (Aitken et al., 1973; Figure 2). Correlation of Mount Clark, Mount Cap and Saline River formations in the subsurface by Dixon and Stasiuk (1998) refined this framework.

The results from field study of Cambrian rocks during 2005-2007 were published in the original version of GSC Open File 6148 in 2009. Work in the Mackenzie Plain area after 2009 necessitated updating stratigraphic descriptions and accompanying strip logs to produce this current version of the report. Recent work by the GSC, as part of the Geo-Mapping for Energy and Minerals Program (GEM; ESS Project EGM003) in the Mackenzie Plain area, has refined understanding of the outcrop distribution of Lower and Middle Cambrian formations (Fallas and MacNaughton, 2012). In addition, a formal stratigraphic nomenclature for the underlying Proterozoic succession has been proposed (Long and Turner, 2012; Turner and Long, 2012). This revised report includes some changes to text and figures: 1) identification of newly defined Proterozoic units and updating of descriptions where these units were erroneously interpreted as part of the Cambrian succession; 2) identification of Mount Clark Formation where it has been mapped with certainty; and 3) distinguishing between Mount Cap and Mount Clark Formation, where some units of the latter were included with the former (K. Fallas and R. MacNaughton, pers. comm., 2012).

The purpose of this report is to: 1) provide an overview of the regional stratigraphic framework of the Lower to Middle Cambrian succession; and 2) describe 17 measured sections (Figure 3). Some of the 17 sections have been re-visited and sampled by the Northwest Territories Geoscience Office to characterize source and reservoir potential of Cambrian strata (e.g., Pyle and Gal, 2009; Pyle and Gal, 2011; Pyle and Gal, work in progress). These collections are noted on the stratigraphic logs. The aim of this work is to improve the regional understanding of Cambrian stratal distribution, due to the known hydrocarbon potential of this interval northeast of the study area in Colville Hills.

STRATIGRAPHIC FRAMEWORK

Mount Clark Formation

Mount Clark Formation, also known as Old Fort Island Formation (Norris, 1965; Balkwill, 1971) was first defined by Williams (1922) from outcrop near Cap Mountain in the southern Franklin Mountains (Figure 3). The defined type section consists of more than 200.0 m of massive, thick

bedded, very fine to fine-grained quartzite, with granules and pebbles near its base, prominent cross-bedding that decreases upward, and abundant *Skolithos* burrows (Aitken et al., 1973). In the subsurface, Mount Clark Formation consists entirely of quartzose sandstone and local conglomerate with the exception of minor amounts of shale and siltstone. Its maximum known thickness of 88.0 m is from Good Hope A-40 well (Dixon and Stasiuk, 1998).

The lower contact of Mount Clark Formation is unconformable with units of the Proterozoic Mackenzie Mountains Supergroup in the eastern Mackenzie Mountains (Fallas and MacNaughton, 2012). The basal sandstone of the Mount Clark Formation may lie abruptly on carbonate of the Little Dal Group (Aitken et al., 1978; Turner and Long, 2012) or more subtly where it rests on sandstone of the Katherine Group. The upper contact of the Mount Clark Formation is marked by a conformable lithological change to glauconitic sandstone, shale, and dolostone of Mount Cap Formation (Aitken et al., 1973; Pugh, 1993). Fallas and MacNaughton (2012) used the facies transition from resistant, sandstone-dominated Mount Clark strata to recessive, heterolithic Mount Cap strata to map the boundary between the formations.

Mount Clark Formation has been relatively dated as Early Cambrian, constrained by overlying trilobite-bearing shale and limestone units of late Early Cambrian *Bonnia-Olenellus* Zone (Aitken et al., 1973; Fritz, 1974; Figure 2). The unit has been interpreted as mainly shallow marine in origin due to trace fossils and bioturbation (Hamblin, 1990). Macauley (1987) suggested a fluvial origin based on seven cores from Colville Hills area that contained thick sand beds, high angle cross-bedding, shale rip up clasts, and fining-upward sequences. Differentiation between Proterozoic and Cambrian units can be difficult particularly where rocks are quartzitic and lack trace fossils or bioturbation and there is a sandstone-on-sandstone contact such as between the Mount Clark and fluvial-dominated Katherine Group (Fallas and MacNaughton, 2012).

Mount Cap Formation

Mount Cap Formation was defined by Williams (1922, 1923) from a succession located on the flanks of Mount Clark in the McConnell Range southern Franklin Mountains (Figures 1, 3). The formation is made up of glauconitic sandstone, quartzose and glauconitic dolostone and limestone, and noncalcareous, sandy or silty, red, green, dark grey and black shale (Aitken et al., 1973). It is up to 783.0 m thick in the K'Alo B-62 well, located in the Mackenzie Plain (Dixon and Stasiuk, 1998; Figures 1, 3).

The lower contact of Mount Cap Formation is conformable with the Mount Clark Formation or unconformable with underlying Proterozoic rocks at the basin margins where it overlaps Mount Clark Formation. The upper contact is unconformable with the overlying Saline River Formation (Dixon, 1997; Dixon and Stasiuk, 1998); however, the scale of the unconformity is poorly documented.

Fossiliferous intervals containing trilobites indicate that Mount Cap Formation spans the lower-Middle Cambrian boundary and ranges into Middle Cambrian *Bonnia-Olenellus* to *Glossopleura* zones (Aitken et al., 1973; Fritz, 1970, 1971). It is suggested to have been deposited in a low energy marine setting based on extensive bioturbation, carbonate lithologies, and shelly material (Dixon and Stasiuk, 1998).

Saline River Formation

Saline River Formation was first described by Williams (1923) as red and green shale with salt casts and gypsum beds. It was divided into three members by Meijer Drees (1975) and adopted by Dixon and Stasiuk (1998) as: Lower clastic, Evaporite, and Upper clastic member. The Evaporite member mainly consists of salt with interbedded shale, dolostone and anhydrite, whereas the two clastic members consist of interbedded shale, dolostone, and anhydrite. Most outcrop exposures are highly recessive and covered, with obscured contact relationships. The upper contact with the Franklin Mountain Formation is at least locally erosional (Pyle and Gal, 2009), but has also been described as gradational (Aitken et al., 1973). The formation was likely deposited in a restricted marine basin, with evaporites formed under subtidal conditions in relatively shallow water (Meijer Drees, 1986; Dixon and Stasiuk, 1998).

DESCRIPTION OF MEASURED SECTIONS

A total of 17 measured stratigraphic sections containing Mount Clark and Mount Cap formations are included in this report (Table 1, Figure 3). Of these, 13 were measured and described by the authors and assistants during field work in 2006. A further 4 sections (locations 2, 4, 7 and 9 in Table 1) are included that were originally documented by Aitken et al. (1973). Sections in this latter group were visited and checked by the authors but the descriptions and thicknesses are restated from the original work of Aitken et al. (1973).

Location	Name	Latitude	Longitude
1	Inlin Brook	64.282154	-126.546472
2	Little Bear River	64.4791568	-126.7894765
3	Carcajou Canyon	64.6713602	-127.1613386
4	Dodo Canyon	64.937683	-127.265439
5	Sheep River	64.857654	-127.080383
6	Mirror Lake	64.80628	-126.97197
7	Mount Clark	64.43467530	-124.2307016
8	Blackwater Lake	64.046585	-123.45511
9	Cap Mountain	63.408714	-123.23529
10	Fan Creek	65.16602390	-128.3584991
11	Imperial River Canyon	65.1063221	-128.0315875
12	Loretta Canyon	65.0897419	-127.9392029
13	Unnamed Canyon	65.064933	-127.794570
14	Grafe River	64.9926143	-127.6452914
15	Katherine Creek	64.959420	-127.497706
16	Unnamed Creek	64.9420946	-127.5736459
17	Echo Falls	64.900297	-127.3123156

Table 1. List of measured sections of Mount Clark and/or Mount Cap formation(s).

Section 1 Inlin Brook

Section Description: Section includes Mount Clark and Mount Cap formations unconformably overlying Proterozoic Little Dal Group (Figure 4, Photos 4a to 4f). Measurement began at the base of Mount Clark Formation, on the western side of Inlin Brook (~3 km upstream of

confluence with Keele River) where the full section is exposed in an overturned fold and thrust complex. Little Dal Group is thrust over Saline River Formation, with an overturned fold in the hanging wall of the thrust, which does not extend through Keele River fault zone. The fold is cored by Little Dal Group (red nodular and red-banded to grey "Dead End Shale" unit of Aitken et al., 1973; now referred to as the Stoneknife Formation by Turner and Long, 2012) and a white banded interval of quartzite (assigned to Mount Clark Formation) which cuts down about 15-20 m into Little Dal Group. The footwall consists of Mount Cap black shales juxtaposed against Saline River Formation by a poorly exposed through-going thrust fault. Trilobite specimens (C-518658) were collected from outcrop and identified by R. Ludvigsen (pers. comm., 2008) as *Olenellus gilberti* (Meek), *Syspacephalus* sp., *Zacanthoides* sp., *Olenellus* Zone (Dyeran Stage, late Early Cambrian). Section is located in Carcajou Canyon map area (96D/07), and was measured by C. Bergquist and assistants in July, 2006.

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Mount Cap Formation (incomplete)		
4	Shale: black, interbedded with grey sandstone that weathers orange; very fine-grained. Fossil hash is concentrated at top of siltstone/sand intervals. Shale covered by scree from slump block and adjacent fault zone.	18.0	38.2
3	Sandstone: greyish-green, fine-grained, 20.0-45.0 cm thick bed, increasingly bioturbated upwards to scree-covered contact with overlying black shale.	8.7	20.2
	Mount Clark Formation (incomplete)		
2	Quartzite: as below, some cross-bedding; hardground with numerous borings at uppermost contact.	1.5	11.5
1	Quartzite: dark grey to white, very fine-grained, well cemented (similar to down-cutting outcrop across river). Basal 2-3 m across river contains well-rounded cobbles up to 20 cm in diameter. Unit is a white band in between Little Dal Group and Mount Cap Formation, which is regionally thin here.	10.0	10.0

Section 2 Little Bear River

Section Description: Section includes Little Dal Group (Stone Knife Formation of Turner and Long, 2012), overlain by Mount Clark and Mount Cap formations (Figure 5, Photos 5a to 5f). Contact between Little Dal Group and Cambrian units is covered by faulted rocks with drag distortion. Section began in Little Dal Group along north side of Little Bear River and followed downstream to an incomplete section of Mount Cap Formation.

The section description and measurement in feet is restated from Aitken et al. (1973; their section U-13, p. 108-110). Section is located in Carcajou Canyon map area (96D/07), and was

visited by C. Bergquist and assistants in July, 2006. Trilobites from unit 6 are indicative of the *Glossopleura* Zone (Middle Cambrian; identifications by W.H. Fritz, GSC internal report C19-1969-WHF). Section was also sampled by L. Pyle and L. Gal in 2011 and those supplementary sample descriptions are noted on Figure 5 (from Pyle and Gal, 2011).

Unit	Description	Unit thickness feet (m)	Cumulative thickness feet (m)
	Mount Cap Formation (incomplete)		
7	Dolomite: thin-bedded in beds ½ to 6 inches (1.3 to 15 cm) thick, averaging 1 inch thick (2.5 cm) in lower part; interbedded with dark gray shale in beds 1 inch (2.5 cm) thick; upper part of the unit is less than 20% dolomite.	25 (7.6)	165 (50.3)
6	Shale: black, very finely fissile, weathers black to grey and crumbly; contains small, pinhead to granule size, spheroidal pyrite nodules from 30 to 60 feet (9.1 to 18.3 m) above unit base; basal 10 feet (3 m) and locally elsewhere contains layers of dolomite, light grey, aphanitic, hard, with a few flat discoidal pyrite nodules (up to 6 inches, i.e., 15 cm); topmost 20 feet (6.1 m) poorly exposed, no fossils, probably faulted. Trilobites from this unit reported in GSC internal report (C19-1969-WHF) suggest Middle Cambrian *Glossopleura* Zone. At 60 to 86 feet (18.3 to 26.2 m): *Bathyuriscus*? sp., aff. *Glossopleura* sp. (GSC loc. 84400); at 86 to 90 feet (26.2 to 27.4 m): *Amecephalus* sp., *Hyolithes* sp. (GSC loc 84401); at 90 to 92 feet (27.4 to 28 m): aff. *Glossopleura* sp. (GSC loc. 84402); at 92 to 119 feet (28 to 36.3 m): aff. *Glossopleura* sp. (GSC loc. 84403).	80 (24.4)	140 (42.7)
5	Dolomite: weathers dirty black to greenish brown; in beds to 12 inches (30 cm) thick; argillaceous and silty material, high in carbon, bedding planes covered with network of plant-like markings; contains carbonaceous shale partings; sandstone beds at base.	38 (11.6)	60 (18.3)
4	Shale: black, crumbly, poorly exposed.	15 (4.6)	22 (6.7)
3	Dolomite: black; weathers dirty dark green; very finely crystalline, thick-bedded, silty to finely sandy, abundant pyrite and green material (?glauconite) along top inch (2.5 cm) of unit.	7 (2.1)	7 (2.1)
	Mount Clark Formation		
2	Quartzite or quartz sandstone: varies from clean, thick-bedded, fine-grained sandstone, with thin beds of cobble and	±50 (15.2)	±50 (15.2)

	pebble conglomerate to *Skolithos*-burrowed, thin-bedded, less well sorted sandstone, to silty and argillaceous, unsorted, thin-bedded sandstone with argillaceous siltstones, with plant-like markings on bedding planes. Exposed as felsenmeer; upper contact with dolomite obscured; at a nearby exposure, thin dykes of quartzite extend downward into the underlying dolomite of the Little Dal Group.		
	Little Dal Group (Stone Knife Formation; incomplete)		
1	Dolostone: weathers red; massive, stromatolitic in part; interbedded with grey dolostone.	50 (15.2)	50 (15.2)

Section 3 Carcajou Canyon

Section Description: Section includes Mount Clark and Mount Cap formations, and lower part of Saline River Formation (Figure 6, Photos 6a to 6f). Measurement began near the base of Mount Clark Formation (dip 008°, strike 36° NE) above a subtle angular unconformity with Little Dal Group (dip 012°, strike 34° NE; Stone Knife Formation of Turner and Long, 2012). Measured section extends downstream along south side of river from units 1 to 22, and to north side up a shaley side gully from units 23 to 29.

Section was measured by C. Bergquist and assistants in July, 2006. It is located in Carcajou Canyon map area (96D/11). Trilobites (C-518655) were collected from outcrop in the upper part of Mount Cap Formation (unit 26), identified by R. Ludvigsen (pers. comm., 2008) as *Glossopleura boccar* (Walcott), *Bathyuriscus petalus* (Fritz), and *Poliella* sp. of the *Glossopleura* Zone (Late Delamaran Stage, Middle Cambrian). Section was also sampled by L. Pyle and L. Gal in 2011 and those supplementary sample descriptions are noted on Figure 6 (from Pyle and Gal, 2011).

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Saline River Formation (incomplete)		
29	Sandstone: medium grey, weathers orange, occurs in 0.7-1.0 m beds; interbedded with algal laminated dolostone.	1.50	86.30
	Mount Cap Formation		
28	Shale: brown to black, silty.	8.00	84.80
27	Shale: brown to black, silty, muddier towards the top.	28.00	76.80
26	Shale: black, muddy; with trilobites, especially in fist-sized, silty, cemented nodules.	5.00	48.80
25	Shale: black, silty.	2.00	43.80

24	Shale: black, silty; with trilobitic horizons.	4.00	41.80
23	Shale: black, silty.	4.00	37.80
22	Dolostone: grey, weathers light brown, massive.	5.00	33.80
21	Shale: brown to black, silty.	1.20	28.80
20	Dolostone: massive, occurs in 3.0-5.0 cm beds.	1.00	28.60
19	Shale: wavy bedded, interbedded with dolomitic siltstone.	4.00	27.60
18	Siltstone: fine-grained, nodular, ripple-bedded, thoroughly bioturbation; grading up into dolostone, dark grey, weathers black to light brown , flaggy thick beds with hummocky cross stratification.	2.00	23.60
17	Shale: black, interbedded with nodular dolomitic siltstone.	2.00	21.60
16	Siltstone: black, nodular.	1.02	19.60
15	Siltstone: black, 3.0 cm bed with pyrite; conical fossils and trilobite fragments (lag deposit). “Cone” bed marker.	0.03	18.58
14	Siltstone: black, recessive, with multiple 3.0 cm diameter, light brown-weathering nodules.	1.00	18.55
13	Covered: recessive shale.	2.00	17.55
	Mount Clark Formation (incomplete)		
12	Sandstone: grey, weathers light brown, very fine grained, horizontal burrows.	2.00	15.55
11	Sandstone: glauconitic, swaley cross-stratification.	0.25	13.55
10	Sandstone: bioturbated.	0.60	13.30
9	Sandstone: massive, bioturbated.	1.10	12.70
8	Sandstone: weathers light brown, quartzitic**,** swaley cross-stratification.	0.20	11.60
7	Sandstone: quartzitic, swaley cross-stratification.	3.00	11.40
6	Sandstone: quartzitic, partially covered and recessive into fault zone; section is down-dropped, striking 300°, approximately vertical fault with 10.0 m throw, NE	4.00	8.40

	(downstream) side down.		
5	Sandstone: light grey, weathers light brown, quartzitic, fine-grained, swaley cross-stratification.	1.00	4.40
4	Sandstone: green, weathers pink, glauconitic, occurs in irregular to planar 2.0-12.0 cm thick, thoroughly bioturbated.	1.00	3.40
3	Sandstone: dark greenish-grey, weathers rusty orange, bioturbated.	0.20	2.40
2	Sandstone: light brown, swaley cross-stratification.	0.20	2.20
1	Sandstone: glauconitic (?), medium-grained, occurs in 5.0-10.0 cm beds.	2.00	2.00

Section 4 Dodo Canyon

Section Description: Section lies along north side of Dodo Canyon and includes 107.8 m of Mount Cap Formation and incomplete underlying and overlying sections of Proterozoic Little Dal Group and Saline River Formation, respectively (Figure 7, Photos 7a to 7f). Both lower and upper contacts are covered. Underlying unit is the "Dead End Shale" unit of Aitken et al. (1973) now referred to as the Stone Knife Formation by Turner and Long (2012).

The section description and measurement in feet is restated from Aitken et al. (1973; their section MQ-6, p. 125-128). Section is located in Carcajou Canyon map area (96D/14) and was visited by C. Bergquist and assistants in July, 2006. They examined the Little Dal Group along Dodo Creek, approximately 2 km downstream from junction of Echo Creek and Dodo Creek in the Mackenzie Mountain Front. In addition to earlier collections, included in the section description, trilobites (collections C-518650 and C-518651) were collected from outcrop in the upper part of Mount Cap Formation and identified by R. Ludvigsen (pers. comm., 2008), as *Glossopleura* sp. and *Eoptychoparia* sp. (C-518650 only) of the *Glossopleura* Zone (Late Delamaran Stage, Middle Cambrian). The section was also sampled by L. Pyle and L. Gal in 2011 and those supplementary sample descriptions are noted on Figure 7 (from Pyle and Gal, 2011).

Unit	Description	Unit thickness feet (m)	Cumulative thickness feet (m)
	Saline River Formation (incomplete)		
	Covered: light grey gypsum talus; contact with Mount Cap Formation is covered.	40 (12.2)	40 (12.2)
	Mount Cap Formation		
19	Shale: greyish-black to black, papery, in bands ½ inch to 6 inches (13.0 mm to 15.0 cm) thick; non-calcareous.	45 (13.7)	354 (107.8)

	Interbedded with limestone, dolomitic, micritic, dark grey, weathers brownish grey, pelloidal grains, abundant pyrite replacing grains. Unit is recessive; contains about 70% shale, 30% limestone. Top 15 feet (4.5 m) mostly limestone, partly dolomitized. Section continues about 1000 feet (304.8 m) upstream on west side of Dodo Creek. Units 5-18 are exposed in small gully; beds her dip 10ºE. Unit 18 is sharply overlain by Pleistocene sand and gravel of lateral moraine, at top of gully.		
18	Shale: dark grey, weathers medium to dark grey, recessive; minor interbeds of dolostone, calcareous, grey, weathers yellowish brown. Unit is approximately 90% shale, 10% carbonate.	31 (9.4)	309 (94.1)
17	Limestone: light to medium grey, weathers rusty medium grey to yellowish brown, micritic, slightly dolomitic; interbedded with shale, calcareous, dark grey, weathers dark grey to rusty yellowish brown, platy. GSC loc. 84283 (273.5 feet; 83.4 m): *Glossopleura?* sp.	5 (1.5)	278 (84.7)
16	Shale: very dark grey, papery, recessive; non-calcareous; rare interbeds of micritic limestone, argillaceous, dark grey; a persistant unit. At 231 feet (70.4 m), *Cambrotrypa* sp., aff. *Glossopleura* sp. (GSC loc. 84280); at 243 feet (74.1 m), aff. *Bathyuriscus* sp., *Glossopleura* sp. (GSC loc. 84281); at 252 feet (76.8 m), aff. *Bathyuriscus* sp., *Glossopleura* sp., *Hyolithes* sp. (GSC loc. 84282).	61 (18.6)	273 (83.2)
15	Limestone: dark grey, weathers rusty yellowish orange; micritic, dolomitic, argillaceous laminae are permanent and indicate some reworking by infauna.	9 (2.7)	212 (64.6)
14	Shale: dark brownish grey, weathers rusty yellowish orange; recessive, thin interbeds of dolomite as in unit 13.	6 (1.8)	203 (61.9)
13	Dolomite: dark grey, weathers rusty yellowish-orange; calcareous, abundant silt-size to very fine sand-size quartz; evenly laminated (1.0-2.0 mm), a few thin argillaceous partings.	10 (3.0)	197 (60.1)
12	Shale: greyish green, recessive; interbedded with limestone, grey, weathers greenish grey, nodular.	13 (4.0)	187 (57.1)
11	Sandstone: greyish green fresh and weathered surfaces; fine- to medium-grained, contains abundant very fine to coarse-	5 (1.5)	174 (53.1)

	grained glauconite grains or pellets, and limestone grains (rock fragments?); numerous burrows and bottom markings preserved on basal bed, which indents into underlying shale unit. Thin micritic limestone beds at 172 (52.4 m) and 174 feet (53 m), containing trilobites. At 172 feet, *Amecephalus* sp., dolichometopid or zacanthoidid trilobite, *Micromitra* sp. (GSC loc. 84278); at 174 feet (53.04 m): aff. *Albertella* sp., *Micromitra* sp., (GSC loc. C1763), both collections from Middle Cambrian *Albertella* Zone.		
10	Shale: greyish green, recessive; interbedded with limestone, micritic, grey, weathers greenish grey, nodular. At 167 feet (50.9 m), *Albertella* sp., *Amecephalus* sp., cf. *Kochaspis chares* (Walcott) 1917, *Micrometra* sp., *Spencia* sp. (GSC. Loc. 84277), Middle Cambrian *Albertella* Zone. Remarks on fauna: Collections from GSC localities 84277 to 84283 and C1763 belong to the *Albertella* and *Glossopleura* Zones. The transition between the two zones is not abrupt, and the boundary is placed below the lowest collection (BSC loc. 84281) containing trilobites that can unquestionably be assigned to the genus *Glossopleura*.	13 (4.0)	169 (51.6)
9	Sandstone: greyish green; very fine- to medium-grained, calcareous, argillaceous; in part nodular; interbedded with shale, greyish green, recessive. Top 6 feet (2.0 m) of unit consist predominantly of micritic limestone, greyish green, argillaceous, quartzose. Unit slightly resistant.	17 (5.2)	156 (47.6)
8	Sandstone: greyish green, weathers rusty yellowish brown; fine-grained, argillaceous; reworking by infauna; bottom markings prominent on base of sandstone units indenting shales; thin- to thick-bedded. Minor interbeds of shale, greyish green, recessive; and micritic limestone, grey, containing trilobites. Top 6 feet (2.0 m) of this unit comprise a massive, rusty weathering sub-unit, resistant. At 127 feet (38.7 m), *Olenellus* sp., *"Paedeumias"* sp. (GSC loc. 84276), late Early Cambrian *Bonnia-Olenellus* Zone. Fritz (1970) postulates an unconformity at 128 feet (39 m) based on the apparent absence of the *Plagiura-Poliella* and early *Albertella* zones in strata occupying the interval between 127 and 231 feet (38.7 to 70.4 m) above the base of the section.	16 (4.9)	139 (42.4)
7	Limestone: dark greyish green, weathers greyish green, recessive; micritic; contains abundant very fine to fine-grained glauconitic grains, and "floating" well-rounded fine- to coarse-grained quartz sand (mud supported). Glauconite is	14 (4.3)	123 (37.5)

	closely associated with, and partly replaced by, small pyrite euhedra; unit contains trilobites. Interbedded with shale, greyish green, quartzose, calcareous, recessive. Unit is 40% limestone, 60% shale. Unit forms recessive notch on cliffside. At 116 feet (35.4 m), *Onchocephalus* sp. (GSC loc. 84275); at 123 feet (37.5 m), *Olenellus* sp. (GSC loc. C1762); both collections late Early Cambrian *Bonnia-Olenellus* Zone.		
6	Limestone: greyish olive-green; dolomitic, argillaceous, glauconitic with scattered well-rounded, fine- to medium-grained quartz grains; thin-bedded; interbedded with sandstone, weathers rusty yellowish orange, fine- to medium-grained, calcareous, thin-bedded; minor interbeds of shale, calcareous, weathers papery. Unit is about 85% limestone/sandstone, 15% shale.	34 (10.4)	109 (33.2)
5	Limestone: dark grey, weathers rusty brownish grey to light yellowish grey; thin bedded, micritic; basal 1 foot (30 cm) contains abundant fine quartz grains, well rounded. Skeletal fragments (trilobite?) in upper part; dolomite euhedra.	13 (4.0)	75 (22.8)
4	Covered.	28 (8.5)	62 (18.8)
3	Sandstone: pale olive to greyish olive; weathers rust locally; generally coarse-grained with abrupt changes vertically in grain size from fine- to coarse-grained; sharp contacts. Quartz arenite with well-rounded quartz grains; rare glauconitic grains.	2 (0.6)	34 (10.3)
2	Dolomite: dark grey, weathers greyish orange; very finely crystalline, calcareous, argillaceous; very thin to thin-bedded; minor interbeds of shale, calcareous, dark grey, papery. Unit is 80% dolomite.	7 (2.1)	32 (9.7)
1	Covered: talus is similar to overlying unit. Contact with underlying unit is covered.	25 (7.6)	25 (7.6)
	Little Dal Group (Stone Knife Formation; incomplete)		
	Mudstone: poor fissility; moderate red to dark reddish-brown; abundant calcareous nodules.	5 (1.5)	5 (1.5)

Section 5 Sheep River

Section Description: Section includes part of underlying Proterozoic Little Dal Group (Stone Knife Formation of Turner and Long, 2012) unconformably overlain by Mount Cap Formation (Figure 8, Photos 8a to 8f). Measurement began within Proterozoic shale in a narrow gully in one

of several creeks on the west side of Sheep Mountain. The section is located in Carcajou Canyon map area (96D/15), and was measured by C. Bergquist and assistants in July, 2006.

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Mount Cap Formation (incomplete)		
22	Shale: pale greenish, interbedded with laminated siltstones.	10.00	109.80
21	Shale: black, recessive.	1.00	99.80
20	Siltstone: dolomitic, well cemented; massive, cliff-forming.	0.25	98.80
19	Shale: black, recessive.	1.75	98.55
18	Siltstone: grey, weathers orange, dolomitic, laminated, mm-scale laminae.	1.95	96.80
17	Shale: black, recessive.	0.30	94.85
16	Siltstone: grey, dolomitic, irregular cm-scale bedding, recessive.	0.80	94.55
15	Same as below, but more massive in upper part.	4.50	93.75
14	Shale: silty, laminated; interbedded with dark grey to olive green siltstones, weathers light brown to orange; generally 20.0-25.0 cm thick beds, wavy-laminated in upper part.	1.05	89.25
13	Dolostone, dolomitic siltstone: dark grey, weathers orange and flaggy; wavy-laminated (algal); massive, cliff forming.	1.60	88.20
12	Shale: greenish to black, recessive; fossiliferous (trilobites and brachiopods). Unit varies in thickness as part of small channel deposit down-cutting into underlying nodular siltstone and shale.	0.80	86.60
11	Siltstone: dolomitic, up to 12.0 cm thick, with an average of 2.0-3.0 cm thick beds.	0.80	85.80
10	Dolosiltstone: interbedded with siltstone, argillaceous, dark green to grey; load casts interbedded with mudstone.	3.00	85.00
9	Mudstone and siltstone: organic-rich, laminated, recessive.	2.50	82.00
8	Sandstone: weathers orange, fine-grained, some coarse	4.50	79.50

	siltstone beds; 20.0-40.0 cm thick beds, thin-bedded intervals with mudstone interbeds upwards, thoroughly bioturbated.		
7	Basal channel complex lag: 20.0-45.0 cm thick, accretion surface, trough cross-bedding.	0.20	75.00
6	Siltstone: glauconitic, fissile, recessive.	3.80	74.80
5	Siltstone: greenish brown, thin-bedded, thoroughly bioturbated.	4.00	71.00
4	Siltstone: bioclastic, calcareous, nodular; interbedded with coarse siltstone and bioturbated, very fine-grained sandstone.	4.50	67.00
3	Mudstone: green to grey; silty, fissile; interbedded with sandstone, glauconitic?, medium-grained with some pebble lag layers, thin-bedded. Basal light brown-weathering dolostone.	3.50	62.50
2	Sandstone: fine-grained, interbedded with siltstone; capped by bright lime green, glauconitic? sandstone, very fine- to fine-grained, bioturbated .	9.00	59.00
	Little Dal Group (Stone Knife Formation; incomplete)		
1	Siltstone: uppermost 10.0 m is grey, nodular, massive, interbedded with shale, highly fractured. Note: Major fault zone in north canyon wall is about 1.5-2.0 m wide, striking 130°-310° and vertical, beds dipping 47° NE, striking 44°, with slickensides dipping 80° NE and striking 200°, clear rhombohedral fracturing indicating a reverse fault (i.e., Cambrian side up, interpreted as original normal fault reversed during Laramide compression, similar to the fault on Carcajou Canyon). Bedding in Proterozoic unit at contact with Mount Cap dipping 28° NE, striking 040°. About 200.0 m downstream of sub-Cambrian unconformity, a series of small extensional faults in siltstone interval trending 037°.	50.00	50.00

Section 6 Mirror Lake

Section Description: Section includes part of Proterozoic Little Dal Group (Stone Knife Formation of Turner and Long, 2012) unconformably overlain by Mount Cap Formation (Figure 9, Photos 9a to 9f). Measurement began within Little Dal Group and followed downstream (up section) along a small creek west of Mirror Lake, up to a slump block that represents the highest exposed Mount Cap Formation. Trilobites (C-518657) were collected from Unit 13 and identified by R. Ludvigsen (pers. comm., 2008) as *Eoptychoparia* cf. *piochensis* (Palmer) of the

E. piochensis Subzone (Basal Delamaran Stage, early Middle Cambrian). Section is located in Carcajou Canyon map area (96D/15), and was measured by C. Bergquist and assistants in July, 2006.

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Mount Cap Formation (incomplete)		
16	Brecciated dolosiltstones and black shale: upper part contains phosphatic hardgrounds(?), fine-grained glauconitic sand; burrows enhanced by dolomitization. Interbedded with light greenish-grey shale and siltstone, contains abundant brachiopods.	12.5	122.5
15	Black shale: laminated; dark grey dolosiltstone, weathers orange, thin- to medium-bedded.	30.5	110.0
14	Shale: grey, finely laminated, soft, silty; with 30.0 cm thick silty laminated dolostone at 73.5 m above section base; weathers orange, thinner bedded at top.	15.0	79.5
13	Shale: black, silty, recessive, trilobite-rich; small trilobites in upper part of section, with 0.75 m thick sandstone beds interbedded with greenish shales. Laminated silty dolostone at top of unit, orange/black alternating pinstripes in weathering (similar to those in uppermost Mount Cap Formation at Dodo Canyon); rare ripple-laminated sand.	19.5	64.5
12	Sandstone: light grey, glauconitic, fine-grained; 5.0-10.0 cm thick in base of unit; overlain by dark grey to black siltstone and shale with abundant, bedded 2.0-3.0 cm load cast nodules in discreet beds at the base with green clay between nodules. Nodular dolostone interbeds weather orange; some thin, fine-grained sandstone interbeds.	10.5	45.0
11	Siltstone: recessive, covered.	6.0	34.5
10	Sandstone: thin-bedded, glauconitic, fossiliferous with bioclasts concentrated in burrows; large trace fossils (*Thalassinoides*, *Chondrites*). Shale interbeds are friable. 40% siltstone overall, in 10.0-20.0 cm thick beds, burrow mottled with black mud chips. Burrow mottled dolosiltstone beds, medium grey, weathers orange, interbedded with glauconitic sandstone.	2.5	28.5
9	Sandstone: medium-grained, white, quartz-rich, dense; series	2.0	26.0

	of stacked channels (although small-scale thrust fault is possible, based on E-W trending slickensides on the base of upper "channel" sand).		
8	Siltstone and sandstone: coarse silt, fine-grained sand; friable, thoroughly bioturbated.	2.0	24.0
7	Siltstone and sandstone: weathers brilliant green, shaley siltstone to fine-grained sand, massive.	0.5	22.0
6	Sandstone, siltstone, and shale: interbedded in 20.0-40.0 cm intervals; massive overall (section cut by several normal faults trending both ~N-S and ~E-W).	3.8	21.5
5	Sandstone: green (glauconite?), 20.0 cm thick, medium- to coarse-grained, small scale ripples and mud cracks (syneresis?), mud chip breccia; basal lag sand, sits unconformably on underlying Proterozoic unit with about 5° angularity.	0.2	17.7
	Little Dal Group (Stone Knife Formation; incomplete)		
4	Siltstone and limestone: laminated, fine-grained siltstone; upper 3.0 to 4.0 m contains thin lime mudstone beds, weather light grey.	8.5	17.5
3	Siltstone and limestone: flaggy beds up to 20.0-30.0 cm thick; interbedded, laminated calcareous siltstone at top of unit.	1.5	9.0
2	Limestone: weathers tan and flaggy; soft-sediment deformation and slump structures.	1.5	7.5
1	Limestone and siltstone: grey, massive, very fine-grained siltstone, some red-banding; overlies nodular shale, beds 5.0-25.0 cm thick, weathers brown-orange-grey.	6.0	6.0

Section 7 Mount Clark

Section Description: Section includes Mount Clark (?) and Mount Cap formations (Figure 10, Photos 10a to 10f) located on the north flank of Mount Clark in the McConnell Range, southern Franklin Mountains, in the Fort Norman map area (96C/08). Cook and Morrow (2008) mapped Mount Clark and Mount Cap at this location. The section description and measurement in feet of Mount Cap Formation is restated from Aitken et al. (1973, Section U-15, p. 116-119) who considered the quartzite beds underlying the section to be Mount Clark Formation. Additional descriptive comments from L. Pyle are in *italics* under the restated descriptive notes from Aitken et al. (1973), and suggest the basal beds are either all unassigned Proterozoic, or a basal Proterozoic quartzite overlain by 1.5 m of Mount Clark (?). Section was visited by C. Bergquist

and assistants in July, 2006. Section was also visited and sampled by L. Pyle and L. Gal in 2012; their supplementary sample descriptions are noted on Figure 10 (from Pyle and Gal, in prep.).

Unit	Description	Unit thickness feet (m)	Cumulative thickness feet (m)
	Mount Cap Formation (incomplete)		
25	Siltstone: as unit 23.	8 (2.5)	695 (211.8)
24	Shale: as unit 22.	5 (1.5)	687 (209.3)
23	Siltstone: grey, weathers blocky in alternating deep brown and yellowish-brown colours; slightly argillaceous; coarse-grained; very thin-bedded, bottom markings and burrows (?).	10 (3.0)	682 (207.8)
22	Shale: dark grey; micaceous; very crumbly to poorly fissile.	5 (1.5)	672 (204.8)
21	Siltstone (or very fine-grained sandstone): argillaceous, thin-bedded, recessive in lower half; topmost 3 inches (90.0 cm) contains very thin beds, with interbeds of silty, greenish, non-calcareous shale and a 1 inch (30.0 cm) thick calcareous bed at base.	23 (7.0)	667 (203.3)
20	Shale or mudstone: as unit 18.	21 (6.4)	644 (196.3)
19	Shale or mudstone; dolomitic(?); weathers rusty brown, very crumbly.	42 (12.8)	623 (189.9)
18	Shale or mudstone: grey, weathers very crumbly; silty; non-calcareous.	20 (6.1)	581 (177.1)
17	Limestone: alternating beds of grey, nodular, cliff forming limestone and thinner bedded, nodular, argillaceous limestone and thin-bedded, silty limestone; fossiliferous. At 496 to 516 feet (151.1 to 157.2 m): *Olenellus* sp. (GSC loc. 84406); at 516 to 526 feet (157.2 to 160.3 m): *Nisusia* sp., *Olenellus* sp. (GSC loc. 84407); at 526 to 546 feet (160.3 to 166.4 m): *Bonnia* sp., *Olenellus* sp. (GSC loc. 84408), late Early Cambrian.	65 (19.8)	561 (170.9)
16	Siltstone: dark grey; argillaceous, calcareous; blocky bedding; very crumbly.	15 (4.6)	496 (151.1)
15	Limestone: grey; micritic; nodular; basal 4 feet (120.0 cm) interbedded lithology as in unit below. Trilobites from talus at base of unit: *Bonnia* sp., *Olenellus*? sp., *"Paedeumias"*	10 (3.0)	481 (146.5)

	sp. (GSC loc. 84405), late Early Cambrian.		
14	Sandstone: thinly (< 1 inch; 2.5 cm) and very regularly bedded; well burrowed; very argillaceous; bedding planes covered by a network of interwoven black organic matter (algal?); top 9 feet (2.7 m) thicker bedded, much more argillaceous, more blocky weathering.	26 (8.0)	471 (143.5)
13	Siltstone: argillaceous, dolomitic; dirty dark brownish green; organic black markings on bedding planes; some sandy laminated layers.	30 (9.1)	445 (135.5)
12	Shale: silty; non-calcareous; weathers rusty to dark ochre, greyish brown.	13 (4.0)	415 (126.4)
11	Shale: grey, weathers grey; silty, calcareous.	5 (1.5)	402 (122.4)
10	Limestone: micritic; dark grey; massive; conchoidal fracturing; dolomitic ribs in top 3 feet (90.0 cm), weathers buff; top 3 feet (90.0 cm)weather brown and grey with brown dolomitic ribs and grey pock-like depressions. Trilobites from slabs from 378 to 397 feet (115.2 to 120.9 m): *Onchocephalus* sp., *"Paedeumias"* sp. (GSC loc. 84404), late Early Cambrian.	19 (5.8)	397 (120.9)
9	Shale: dark grey; micaceous; crumbly; weathers dark silvery grey.	9 (2.7)	378 (115.1)
8	Shale: silty; crumbly, non-fissile; weathers reddish brown to rusty brown.	75 (22.9)	369 (112.4)
7	Mudstone: weathers reddish brown; very silty; crumbly.	7 (2.1)	294 (89.5)
6	Siltstone: weathers dark greyish brown to blackish brown; argillaceous with numerous layers of siltstone, laminated; abundant fine mica.	35 (10.7)	287 (87.4)
5	Sandstone: weathers dark rusty to orange brown, medium-grained at top, grading to very fine grained at bottom; medium brown and grey; thinly bedded, and colour banded, limonitic at top; basal 3 feet (90.0 cm) argillaceous.	9 (2.7)	252 (76.7)
4	Siltstone: dark green, weathers blocky and dark brownish-green; dolomitic; thin- to thick-bedded; bedding planes with organic markings, silty to very finely sandy; in lower few feet interbedded with shale, silty, dark grey, thin, rubbly.	66 (20.1)	243 (74.0)

3	Mudstone and sandstone: From 110 feet (33.5 m) above base, to top of unit: sandstone, very fine-grained; top 5 feet (1.5 m) thin-bedded; with black burrow markings distorting laminations; organic debris(?); top 5 feet (1.5 m) weathers nodular, deep brown; from 73 to 74 feet (22.3 m to 22.6 m) above base, a bed of sandstone, very fine-grained, greenish-brown, argillaceous and silty, with black chert granules and fine pebbles (<1/4 inch, 6.0 mm), and thin layers of limonitic nodules. Mudstone is greyish green; dolomitic; silty in upper portion of unit; non-fissile; with interbedded dolomite, argillaceous, green, with carbon markings(?) on bedding planes; above 32 feet (9.8 m) from base interbedded with finely sandy, finely laminated zones; from 63 to 73 feet (19.2 to 22.3 m) above base, mudstone is greenish, more fissile; mudstone weathers brown to dark brown, locally rusty or grey.	162 (49.4)	177 (53.9)
2	Quartzite: purple, medium-grained; one massive bed; abundant oxidized iron and some pyrite at the top; quartz grains rounded; fresh surface with porosity from leaching of iron-rich cement.	10 (3.0)	15 (4.5)
1	Dolomite: argillaceous, green, in beds 4 to 6 inches (10 to 15 cm) thick; interbedded with shale, green. This unit appears to thicken rapidly on the west side of the gully, and to pinch out downdip, as though the Mount Cap basal units overlapped northward or eastward onto the underlying Mount Clark Formation quartzites. Contact disconformable (?) with underlying Mount Clark Formation quartzites, thick-bedded, well indurated, resistant.	5 (1.5)	5 (1.5)

Additional Description by Pyle (2012)

Unit	Description
	Basal Mount Cap Formation
3	*Basal part of unit contains sandstone (sampled as MC12-03): basal bed is whitish orange, weathers orange; thin-bedded; hematitic, very fine to coarse-grained; interbedded with silty dolostone; carbonaceous partings. Unconformably overlies the 1.5 m thick quartzite bed, with cm-scale relief along an irregular surface. Unit contains <5% sandstone.* *Sandstone (sampled as MC12-04): A 36 cm thick bed from 22.3 m above unit base; greenish-brown, weathers greenish brown and rust; thin-bedded; very fine- to very coarse-grained, quartzose with sideritic nodules and lithic pebbles.*

	Mount Clark Formation or Proterozoic (?)	
2	*Quartzite: purple to white, weathers rust locally; medium- to coarse-grained; thick-bedded, within overall massive 1.5 m unit; quartz grains rounded, well sorted (sampled as MC12-02). This bed, however, contains no trace fossils and may be part of the unassigned Proterozoic.*	
1	***Unassigned Dolostone and Shale unit, Proterozoic (?)***	
	Aitken et al (1973) included a 1.5 m thick dolostone unit as part of the basal Mount Cap Formation but it may be Proterozoic (?). This unit is only present on the west side of the gully where they described it between their unit 2 quartzite and the underlying quartzite they assigned to Mount Clark Formation. The dolostone is not present on the east side of creek.	
	Unassigned Proterozoic (?)	
	Quartzite: light grey, weathers rust; massive, resistant and cliff-forming, covered by waterfall. Very fine- to fine-grained, well sorted, subrounded, quartzose; argillaceous; pyritic (sampled as MC12-01).	

Section 8 Blackwater Lake

Section Description: Section includes unassigned Proterozoic quartzite unconformably overlain by Mount Clark Formation and Mount Cap Formation, the latter which was not measured because it is not well exposed (Figure 11, Photos 11a to 11f). Section is located in Blackwater Lake map area (96B/03; mapped by Cook et al., 2007) and was measured by C. Bergquist and assistants in July, 2006. Section was also visited and sampled by L. Pyle and L. Gal in 2012 and their supplementary sample descriptions are noted on Figure 11 (from Pyle and Gal, in prep.).

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Mount Cap Formation		
	Shale and siltstone: Vegetation covered within a gully, but overlies the upper Mount Clark Formation; black shale contains trilobites and brachiopods; talus of orange weathering dolomitic siltstone.	Not well exposed	
	Mount Clark Formation		
8	Sandstone: orangish-white, weathers dark brown to orange; thin- to medium-bedded; quartzitic and hematitic; very fine- to coarse-grained; erosional base of unit, basal bed contains hummocky cross-stratification. Uppermost bedding plane as in unit 5: hematitic sandstone with hematite-filled fractures; very fine-grained to fine gravel; subrounded; poorly to moderately sorted.	16.5	101.0
7	Sandstone: white, weathers orange-light brown with white patches; quartzitic; occurs in massive beds thinning toward	12.0	84.5

	top from 1.5-2.0 m to 0.3 m; bioturbated with long *Skolithos* burrows whiter than host rock.		
6	Covered.	ca.10.0	72.5
5	Sandstone: white, weathers orange to light pinkish-brown; massive beds of 1.5 to 2.0 m thick; quartzitic; very fine- to medium-grained; well rounded; moderately sorted; indurated; abundant long, *Skolithos* burrows. Top sandstone of the unit is a discontinuous bed, 35 cm thick; orange; weathers orange and porous; quartzose with lithic clasts in coarsening upward beds and in lenses (cm-scale); very fine- to coarse-grained; uppermost bedding plane is deeply iron-stained, with hard, hematite cemented sandstone that weathers rust (?hardground).	12.0	62.5
4	Covered.	ca.10.0	50.5
3	Sandstone: reddish-white, weathers pale- to greyish-red and white; medium-bedded; quartzitic; very fine- to medium-grained; well rounded; well sorted; partly covered between 22.5 to 39.0 m; thick-bedded between 39.0 to 40.5 m; horizontal burrows on some beds; extremely long and large *Skolithos* with a central "core" of buff-white sandstone (i.e., >75.0 cm in length and up to 5.0 cm in diameter; most are up to 25 cm long and up to 1 cm wide). Beds striking 120°, dipping 45°W.	19.5	40.5
2	Sandstone: reddish-white, weathers pinkish-red; medium- to thick-bedded, dune cross-bedded; quartzitic; quartz cement; very fine- to medium-grained; very well sorted, well rounded; laminated with concentration of iron in fine-grained laminae. Basal red bed contains clasts of sandstone and has a scoured base, sits disconformably on unit 1; upper part of unit is covered with loose talus blocks, no burrows in this unit.	9.0	21.0
	Unassigned Proterozoic		
1	Quartzite: white, weathers very pale orange, pink, and white; fine-grained, massive, cross-bedded; hard, cemented; liesengang lines and red hematitic spots are common; no bioturbation.	12.0	12.0

Section 9 Cap Mountain

Section Description: Section is located at the type section of Mount Clark Formation, on the north-facing scarp of Cap Mountain in the Franklin Mountains, Wrigley map area (95O/06). This

section was described by Aitken et al. (1973; Section AC 541, p. 148-150) who measured a thickness of 714 feet or 218 m of Mount Clark Formation, and noted that the contact with overlying Mount Cap Formation is covered. An incomplete section of the lower Mount Clark Formation (134.3 m thick) was measured and described by C. Bergquist and assistants in July, 2006 (Figure 12, Photos 12a to 12f).

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Mount Clark Formation (incomplete)		
17	Sandstone: deep red to purple; fine-scale trough cross-bedding, with decimetre- scale beds. Lacks *Skolithos*.	4.0	134.3
16	Covered.	12.5	130.3
15	Sandstone: dominantly horizontal/planar-bedded, fine-grained, cm-scale flaggy beds, some trough cross-bedding.	13.0	117.8
14	Sandstone: Beds are thicker, but still flaggy overall and fine-grained, bright maroon.	10.0	104.8
13	Sandstone: Red, fine-grained, flaggy, trough cross-bedded.	9.0	94.8
12	Sandstone: trough cross-bedded, fine-grained, cm-scale beds. Rare *Skolithos* in upper half of interval.	4.0	85.8
11	Quartzitic sandstone: low angle cross-bedding.	5.3	81.8
10	Sandstone: Massive, less flaggy, decimetre-scale, sub-horizontal beds.	12.0	76.5
9	Sandstone: Cross-bedded to planar-bedded, fine-grained, non-pervasive burrows restricted to thinner beds.	8.0	64.5
8	Sandstone: flaggier-weathering, thinner bedded, fine- to medium-grained, trough cross-bedding with rare climbing ripples. Beds are 5.0 cm thick; rare pipestone, some mm-scale *Skolithos* burrows.	5.0	56.5
7	Sandstone: medium-grained, decimetre/centimetre-scale bedsets, low angle trough cross-beds, scour surfaces, low relief gutter casts. Metre-thick piperock intervals alternate with cross-bedded intervals that lack *Skolithos*.	7.0	51.5
6	Sandstone: medium- to coarse-grained, flat bedded pipestone overlying bi-directional trough cross-beds at the base.	16.5	44.5

	Overall a continued repetition (4-5 times) of trough cross-beds overlain by planar beds overlain by massive pipestone. At 31.0 m, well-developed pipestone underlying another cycle of trough cross-bedding. Massive *Skolithos* piperock is mostly medium-grained, all decimetre scale beds (average 20.0 cm).		
5	Sandstone: coarse-grained, planar tabular cross-beds with trough cross-beds at base. Higher energy base of channel at 112.0 m capped by bioturbated pipestone. In lower part an elongate 2.0 m by 10.0 cm straight to curved cementation relic has appearance of massive horizontal burrow trace.	14.0	28.0
4	As below: coarse-grained, orthoquartzite to tight sandstone, some porous lenses especially in coarser fraction, all *Skolithos* piperock, beds are sub-horizontal, some down-cut and average 10.0 cm thickness.	3.0	14.0
3	Sandstone: stained purple to pink, clean quartz sandstone, medium- to coarse-grained. *Skolithos* piperock is visible at top of outcrop, burrows cemented and resistant, and protrude above the top surface at 9.0 m. Below this, if burrows are present, their infill is difficult to differentiate and obscured by lichen-cover. Typically burrows are not stained, perhaps due to early cementation, and are therefore clearly discernable from background matrix.	9.0	11.0
2	Quartzite: pink; medium- to coarse-grained; locally conglomeratic; lichen covered, planar and trough cross-bedding, unidirectional, decimetre-scale bedsets with wavy surfaces, some planar lamination and common channels. Unconformably overlies Proterozoic.	2.0	2.0
	Proterozoic Lone Land Fm.		
1	Underlying sand-shale succession previously defined as Proterozoic "Lone Land" formation; multi-coloured, grading upwards to black shale, recessive in outcrop.	Not measured	

Section 10 Fan Creek

Section Description: Section includes Proterozoic upper Katherine Group (?) unconformably overlain by Mount Clark, Mount Cap and Saline River formations (Figure 13, Photos 13a to 13f). Measurement began in the Proterozoic within a gully west of the main canyon. Upper Mount Cap Formation is exposed in the main canyon, but its lower part is best seen in the west gully. Section is located in Sans Sault Rapids map area (106H/01) and was measured by C. Bergquist and assistants in July, 2006 and also as Section 24 by Pyle and Gal (2007). Section was sampled

by L. Pyle and L. Gal in 2011 and those supplementary sample descriptions are noted on Figure 13 (from Pyle and Gal, 2011).

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Saline River Formation (incomplete)		
7	Shale and gypsum: recessive interval, weathers medium grey-pink-yellow, interbedded on cm-scale.	40.0	91.7
6	Shale: weathers black, recessive; interbedded with sandstone, medium-grained; unconformable lower surface.	3.0	51.7
	Mount Cap Formation		
5	Siltstone: interbedded with shale and fine-grained sandstone; flaggy, weathers ochre-coloured, rare stromatolitic layers.	20.0	48.7
	Mount Clark Formation		
	Sandstone: quartzitic, glauconitic, weathers medium-grey to green, fine-grained; 20.0-30.0 cm thick beds, cross-bedded; interbedded green siltstones. At upper waterfall, small outcrop of medium- to coarse-grained sandstone filled with large leached vugs; horizontal and vertical burrows. Porous and permeable weathered, pale green sandstone.	19.0	28.7
	Unassigned unit		
3	Shale and sandstone: grey-green, cross-bedded sandstone that unconformably overlies Proterozoic "red beds" and black shale; however, lack of trace fossils precludes definitive assignment to Mount Clark Formation.	0.2	9.7
	Katherine Group (?)		
2	Siltstone: weathers red, laminated on mm- and cm-scale; a few extensively developed mudcracks within ripple laminated interval.	5.5	9.5
1	Shale: black, fissile, interlaminated/interbedded with siltstone, weathers greenish-grey and flaggy; siltstones pinch and swell. Beds dipping 29°E and striking 134°NE.	4.0	4.0

Section 11 Imperial River Canyon

Section Description: Section includes Proterozoic upper Katherine Group abruptly overlain by Mount Clark, Mount Cap and Saline River formations (Figure 14, Photos 14a to 14f). Lower Mount Cap is not accessible along the canyon floor. The Proterozoic unit is possibly the McClure Formation or younger Abraham Plains Formation of Long and Turner (2012; K. Fallas

and R. MacNaughton, pers. comm., 2012). Section is located in Sans Sault Rapids map area (106H/01) and was measured by C. Bergquist and assistants in July, 2006.

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Mount Cap Formation		
11	Covered: recessive silty shales to base of overlying Saline River Formation.	11.00	29.45
10	Dolostone: silty; wavy-bedded (stromatolitic); nodular black patches (phosphate?) occur in upper part of unit.	1.10	18.45
9	Siltstone and dolosiltstone: black, weathers light brown; irregular-bedded with beds thinning upwards; brecciated into small clasts in places.	2.00	17.35
8	Siltstone: dark grey to green, weathers light brown, fine-grained; fine laminae of very coarse siltstone, horizontal burrows.	1.90	15.35
7	Siltstone: black, weathers light brown, argillaceous, coarse-grained.	5.20	13.45
6	Dolosiltstone: weathers pink, thoroughly bioturbated, cm-scale burrows.	0.80	8.25
5	Siltstone.	2.55	7.45
4	Sandstone: glauconitic, ripple-laminated.	0.85	4.90
3	Shale: black, recessive.	0.45	4.05
2	Mudstone: silty, glauconitic; thoroughly bioturbated.	1.60	3.60
1	Sandstone: medium-grained grades to fine-grained upward; shale interbeds.	2.00	2.00
	Mount Clark Formation		
4	Sandstone: medium-grained to conglomeratic (red-stained, iron-rich regolith), well-cemented, high angle cross-beds.	1.4	20.4
3	Sandstone: quartzitic, coarse-grained, well-rounded grains, deep red iron stain of red beds; medium- to thick-bedded; *Skolithos* burrows. Interbedded with thin, ooidal ironstone.	3.0	19.0

	In a gully west of the measured section at river level, a thin, discontinuous bed of conglomeratic lag occurs above the sub-Cambrian unconformity (Figures 14a, b); lack of trace fossils precludes definitive assignment to Mount Clark Formation, similar to unassigned beds below unit 1 at the Loretta Canyon section (Figure 15).		
	Katherine Group (incomplete)		
2	Dolostone: weathers light to golden brown, "chicken wire" veins of calcite, stromatolitic, massive; black shale interbeds weather orange; black shale laminae.	6.0	16.0
1	Shale: two units of black shale, west side of stream; syneresis cracks; wavy, thin- to thick-bedded, light grey dolostone upsection, weathers golden brown, wave rippled, burrowed, massive, cliff-forming.	10.0	10.0

Section 12 Loretta Canyon

Section Description: Section includes Proterozoic upper Katherine Group unconformably overlain by Mount Clark and Mount Cap formations and an incomplete section through Saline River Formation (Figure 15, Photos 15a to 15f). The Proterozoic unit is possibly the McClure Formation or younger Abraham Plains Formation of Long and Turner (2012; K. Fallas and R. MacNaughton, pers. comm., 2012). Section is located in Norman Wells map area (96E/4). The section description and measurement in feet is restated from Aitken et al. (1973, Section U-11, p. 98-101). Section was visited by C. Bergquist and assistants in July, 2006.

Unit	Description	Unit thickness feet (m)	Cumulative thickness feet (m)
	Saline River Formation (incomplete)		
	Sandstone: medium- to coarse-grained, quartz arenite; red and green, thin to thick beds; gypsum cemented; separated by 1 inch to 2 feet (2.5 cm to 60.0 cm) thick beds of red, green, and grey shale, sandy shale, siltstone, dolostone, and thin white gypsum; all very finely laminated.	20 (6.1)	33 (10.1)
	Shale: red, green, grey, and black; thin-bedded; interbedded with dolostone, sandstone, siltstone, and gypsum; basal 3 feet (90.0 cm) contains limestone, dark grey to black, thin-bedded, laminated, and dolomite, dark grey, weathers orange. Unit appears to thins to the west along strike (unconformity).	13 (4.0)	13 (4.0)
	Mount Cap Formation		
5	Sandstone: greyish brown; very fine-grained; lamination, cross-lamination, slump or flow structures, wavy bedding,	16 (4.9)	83 (25.3)

	brecciated bedding; sandy dolomite beds in top 4 feet (120.0 cm); partings, laminae, and thin beds of dark grey to black silty shale; black chert abundant in large, coarse lenses up to several feet long and 6 to 8 inches (15.0-20.0 cm) thick; unit weathers orange-brown. Unit characterized by slumped bedding and black and rusty orange banding.		
4	Sandstone: glauconitic, argillaceous, brown; finely laminated, alternating from buff to dark grey or black; broadly cross-bedded; organic markings on bedding planes; silt and claystone conglomerates present; at 17 feet (5.0 m) from top is a 1 inch (30.0 cm) thick bed of argillaceous siltstone or very fine sandstone; unit massive, hard, cliff forming.	25 (7.6)	67 (20.4)
3	Sandstone, siltstone, and shale: top 2 feet (60.0 cm) of shale, silty to finely sandy, black, pyritic, covered with sulphur bloom; below this, 3 feet (90.0 cm) of siltstone, sandy, pale green, iron-stained (rusty yellow); underlain by 1 foot (30.0 cm) of silty-sandy shale and 3 feet (90.0 cm) of quartzite, medium whitish-brownish- yellow, intensely cross-bedded; hard; weathers rusty yellow and red.	9 (2.7)	42 (12.8)
2	Partly covered; shale and sandstone weathers rusty; top 5 feet (150.0 cm) contains shale, silty, dark grey and brown; underlain by 5 feet (150.0 cm) of sandstone, soft, crumbly; deeply iron stained.	13 (4.0)	33 (10.1)
	Mount Clark Formation		
1	Quartzite: white, grey, and mauve, fine- to medium-grained; beds up to 3 feet (90.0 cm) thick, with thinner laminated bands within thicker units; poorly sorted; massive, hard; laminated; occasional 6 inch (15 cm) thick beds of black, very argillaceous, recessive sandstone; abundant *Skolithos* beds. Unconformity clearly seen here (northwest side of the creek) and again on cliff on south-east side where it cuts a deep channel into dolostone of unit below and has a thick, red, coarse conglomerate and red hematitic sandstone filling the channel and occupying about 500 feet (150.0 m) of strike along outcrop. Red, conglomeratic channel-fill is an unassigned unit, excluded from Mount Clark Formation.	20 (6.1)	20 (6.1)
	Katherine Group (incomplete)		
	Dolostone: aphanitic, dull soft purple to pale maroon and grey, weathers pinkish-buff, locally pale orange-buff and pinkish-purple in irregular 2 to 4 inch (5.0-10.0 cm) thick beds; argillaceous.	16 (5.0)	29 (9.0)

	Dolostone: grey, argillaceous and slightly silty, recessive; grades downward to shale, dolomitic, dark grey, slightly calcareous; conchoidal fracture.	13 (4.0)	13 (4.0)

Section 13 Unnamed Canyon

Section Description: Incomplete section of Mount Clark and Mount Cap formations disconformably overlie the Proterozoic Katherine Group (Figure 16, Photos 16a to 16f). Fallas and MacNaughton (2012) and Pyle and Gal (2011) also illustrate the disconformable contact between the Mount Clark and Katherine Group. Red sandstone and conglomerate of units 8 and 9 are the Abraham Plains Formation and the underlying units 1 to 7 are interpreted as the McClure Formation (of Long and Turner, 2012; K. Fallas and R. MacNaughton, pers. comm., 2012). The red sandstone and conglomerate is similar to the unassigned beds at the base of the Mount Clark Formation at Sections 10, 11 and 12. Section is well exposed along north face of the canyon at the front of the Mackenzie Mountains, located in Norman Wells map area (96E/04). Section was measured by C. Bergquist and assistants in July, 2006. Section was sampled by L. Pyle and L. Gal in 2011 and supplementary sample descriptions are noted on Figure 16 (from Pyle and Gal, 2011).

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Mount Cap Formation (incomplete)		
18	Siltstone: dolomitic, bioturbated.	13.00	77.95
17	Siltstone: coarse-grained, glauconitic, thick-bedded.	1.60	64.95
16	Siltstone: weathers orange to light brown and flaggy, dolomitic, bioturbated in middle of unit; 1.0 cm clasts, trace of glauconite and biotite (?) grains.	3.20	63.35
15	Siltstone: light grey, fine- to medium-grained, grading upwards to irregular 3.0-5.0 cm beds; few red/purple mm-scale interbeds of mudstone.	1.70	60.15
	Mount Clark Formation		
14	Sandstone: light green, weathers flaggy upwards.	4.00	58.45
13	Sandstone: thoroughly bioturbated.	0.30	54.45
12	Sandstone: coarse-grained to granular at base, fining upwards to fine-grained, blocky to lens-shaped bedsets 20.0-30.0 cm thick, trough cross-bedded.	2.00	54.15
11	Sandstone: weathers light brown, fine-grained, well cemented in beds up to 30.0 cm thick, cross-bedded,	0.65	52.15

	bioturbated with horizontal *Planolites* burrows on underside of resistant beds and minor amount of vertical *Skolithos* burrows.		
10	Sandstone: medium- to coarse-grained, glauconitic layers contain abundant horizontal burrows, cross-bedded. Base of unit is erosional.	0.20	51.50
	Katherine Group (Abraham Plains Formation)		
9	Sandstone: medium- to coarse-grained, quartzitic, high angle cross-beds and intersecting planar cross-beds; well-cemented, non-bioturbated, nodular cementation with common zones of black cements(?).	5.90	51.30
8	Conglomerate: gravelly channel fills, lateral accretion surfaces and abundant cross-bedding; clasts up to pea gravel in size, well sorted in several basal channel lags; coarse-grained ironstone interbed near top.	1.70	45.40
	Katherine Group (McClure Formation; incomplete)		
7	Siltstone: weathers purplish-red, coarse siltstone to fine-grained sand, interbedded with shale; small 3.0-4.0 mm diameter syneresis cracks. Thin-bedded with cross-laminations and wave ripples at base. Grading and coarsening upwards to thicker 3.0-5.0 cm beds with mm-scale shaley interbeds. Upper unit contains more massive beds with high angle cross-bedding and sandier overall with less mudstone. Unit (beds dipping 25°E, striking 018°) is about 20.0 m thick, measured 200.0 m NW upslope from measured section along stream bed.	9.60	43.70
6	Siltstone and shale: black, weathers rusty brown in upper third of section; interbeds of thin, bioturbated siltstone, weathers light brown. Measured 200 m NW upslope from measured section along stream bed.	17.00	34.10
5	Dolostone: weathers brown, abundant finger-scale stromatolites at top.	3.00	17.10
4	Siltstone: sideritic, weathers red-purple-green, interbedded with dolomitic siltstone, mottled.	8.00	14.10
3	Dolostone: weathers golden brown, finely crystalline, megabreccia, abundant chert replacive nodules; elongate clasts aligned horizontally.	1.800	6.10

2	Dolostone: massive breccia, irregular blocks part of large slump?	2.00	4.30
1	Dolostone: very finely crystalline, non-bioturbated; massive, cliff-forming, stromatolitic.	2.30	2.30

Section 14 Grafe River

Section Description: Section includes the Proterozoic Katherine and Little Dal groups overlain by Cambrian Mount Clark, Mount Cap, and Saline River Formation along the length of Grafe Canyon (Figure 17, Photos 17a to 17f). Measurement began within the McClure Formation and overlying Abraham Plains Formation of the Katherine Group, through the Dodo Creek Formation of the Little Dal Group (units of Long and Turner, 2012 and Turner and Long, 2012). Trilobites (collection C-518652) collected from unit 32 in the Mount Cap Formation were identified by R. Ludvigsen (pers. comm., 2008), as *Poliella germana* (Resser) of the *Albertella* Zone (Early Delamaran Stage, lower Middle Cambrian). Section is located in Carcajou Canyon map area (96D/13) and was measured by C. Bergquist and assistants in July, 2006.

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Saline River Formation (incomplete)		
34	Sandstone, siltstone and shale: weathers light brown, thin-bedded, forms prominent ribs in outcrop. Overlying middle and upper Saline River Formation consists of multi-coloured pink, light green and yellow evaporites, plus upper Saline River siltstone, shale and sandstone. Unit is in possible fault contact with Mount Cap Formation.	12.0	150.0
	Mount Cap Formation		
33	Siltstone and shale: greenish to grey, thin-bedded, burrowed and rippled just above underlying dolostone, recessive and covered except in near-vertical cliffs on opposite side of creek, dipping 20°, striking 062°NE.	6.0	138.0
32	Shale: black to dark grey, thin-bedded, grading upwards to interbedded shale and light brown-weathering silty dolostone. Interbedded shale and dolostone show pinch and swell and boudinage of dolostones, indicating slumping and small-scale gliding.	6.0	132.0
31	Sandstone: dark grey, weathers light brown, in 20.0-40.0 cm beds, extensive bioturbation with horizontal burrows.	2.0	126.0
30	Sandstone: weathers green (glauconitic), medium to coarse-grained, trough cross-bedded in regular 10.0-30.0 cm beds,	18.0	124.0

	interbedded with very fine-grained sandstone to coarse siltstone; abundant horizontal and vertical burrows. Sands become coarser-grained upwards.		
29	Sandstone: white, weathers orange, fine-grained, cross-bedded with lateral accretion surfaces.	4.0	106.0
28	Sandstone: extensively iron-stained, weathers dark brown to orange, thick-bedded, glauconitic, blocky fracturing, generally massive with some shaley interbeds.	8.0	102.0
27	Sandstone and siltstone: grey, very fine to fine-grained, generally flat-bedded but some down-cutting. Upper 3.0 m partially covered.	7.0	94.0
26	Siltstone: olive green, thin-bedded, as Unit 24.	1.0	87.0
25	Sandstone: dark brown to black, fine- to medium-grained, cemented, thoroughly bioturbated, erodes into underlying siltstones, thin-bedded at base, more massive upwards.	2.0	86.0
24	Siltstone: olive green and brown, finely laminated; beds 1.0-5.0 cm thick. At 82.0 m on the south wall, a 65° SE-dipping fault, striking 027° NE, with the SE side down 30.0 cm.	6.0	84.0
	Mount Clark Formation		
23	Sandstone: pink to green, 5.0-40.0 cm thick beds, fining upwards, fine- to coarse-grained; limited to no bioturbation in upper two metres; rippled to mega-rippled near top.	6.0	78.0
22	Sandstone: medium to coarse-grained, bioturbated, 25.0-30.0 cm beds thin to 4.0-10.0 cm beds in upper part; 7.0 cm thick granule conglomerate beds, sharp-based with poor sorting.	6.0	72.0
21	Sandstone: dark grey, weathers light brown to dull orange, rusty brown staining cross-cuts bedding; medium-grained, zones of cross-bedding, extensive burrowing, including *Planolites* in pink-weathering sandstone.	2.0	66.0
20	Sandstone: medium- to coarse-grained, thoroughly bioturbated, horizontal burrows 0.4 m	8.0	64.0
19	Sandstone: channelized, medium- to coarse-grained to cobble conglomerate at base of channel; horizontal and vertical (*Skolithos*) burrow; cross-bedded.	2.0	56.0
	Little Dal Group (Dodo Creek Formation)		
18	Dolostone: dark grey, weathers light brown, stromatolitic	2.0	54.0

	layering with interbedded sideritic siltstone and dark red granular ironstones 15.0 and 30.0 cm thick.		
17	Siltstone: black, weathers dull orange, 5.0 to 25.0 cm beds, flat-bedded (dipping 18°, striking 064° NE). Resistant, cliff-forming unit, river cuts narrow slot that is impassable along streambed.	2.0	52.0
16	Siltstone and dolomitic siltstone: grey to dark grey, weathers light brown; flat surfaces extensively mud-cracked; gutter casts at base filled with fine-grained sand. Cm-diameter horizontal burrow-like "concretions". Fault breccia along small 1 m displacement fault, vertical to sub-vertical, trending 292°, very little to no offset of beds, 0.4 m north side down, fault breccia with sparry calcite along fault plane, no slicken-sided surfaces.	4.0	50.0
15	Black shale: horizontal-burrow-like structures, interbedded with rippled thin-bedded siltstones and red-green shales, finely laminated and generally flat-bedded.	4.0	46.0
14	Sandstone: light pink to white, two 40.0-60.0 cm beds; bioturbated, trough cross-bedded, fine- to medium-grained. Cross-beds have north-dipping troughs which show east-dipping mega-ripples on upper surface.	1.0	42.0
1	Shale: mottled, greenish grey to red, finely laminated with intercalated fine siltstone interbeds, extensively mud-cracked. Section is faulted in adjacent cliff-face which appears to be syndepositional slumping.	2.0	41.0
	Katherine Group (Abraham Plains Formation)		
12	Sandstone: weathers light pink to light brown, thin-bedded, trough cross-bedded and hummocky cross stratification (HCS).	2.0	39.0
11	Sandstone: weathers light brown, high angle cross-beds, 20.0-60.0 cm thick bedsets.	6.0	37.0
10	Sandstone: light brown, weathers orange-brown, medium-grained; 20.0-40.0 cm thick bedsets.	4.0	31.0
9	Sandstone: weathers light pink to white, very fine to fine-grained; mud clasts in layers, coarser grains on inclined 'avalanche' slopes, bi-directional low-angle cross-bedding.	4.0	27.0

8	Sandstone: cross-bedded, topped by conglomerate and bicuspate rippled, fine-grained sandstone (dipping 13°, striking 044° NE).	2.0	23.0
7	Sandstone: medium grey with purple-red staining throughout, medium-grained, interbedded conglomerates in beds up to 10.0 cm thick.	2.0	21.0
6	Sandstone: weathers mottled light brown to purplish-pink; channelized cross-bedded, fine-grained.	2.0	19.0
5	Sandstone: weathers pink to red; fine- to medium-grained; channel-form bedding with 2.0 m high accretion surfaces.	2.0	17.0
4	Sandstone: as below, trough cross-bedded.	2.0	15.0
3	Sandstone: weathers pink and purple, interbedded conglomerate up to granule-sized, fine- to coarse-grained, normal grading, trough cross-bedded, some ripples.	6.0	13.0
2	Sandstone: weathers purplish-pink, medium- to coarse-grained, trough cross-bedded, 10.0-30.0 cm beds. Unconformable base in which sandstone erodes into underlying shale.	2.0	7.0
	Katherine Group (McClure Formation; incomplete)		
1	Shale: black-brown.	5.0	5.0

Section 15 Katherine Creek

Section Description: Section includes upper part of the Mount Clark Formation and lower part of the Mount Cap Formation (Figure 18, Photos 18a to 18f). Measurement began on a side cliff of Katherine Creek Canyon, and up to a covered interval that obscures the contact with overlying Saline River Formation. Along this part of Katherine Creek, the Mount Clark overlies the Stone Knife Formation of the Little Dal Group (of Turner and Long, 2012; K. Fallas, pers. comm., 2012). Section is located in Carcajou Canyon map area (96D/13), and was measured by C. Bergquist and assistants in July, 2006.

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Mount Cap Formation (incomplete)		
9	Covered: recessive.	4.0	42.0
8	Sandstone: weathers light brown, fine-grained, interbedded with dolomitic siltstones; ripple-laminated, with dark grey to black fissile shale.	9.7	38.0

7	Shale/mudstone: dark grey to black, recessive.	6.0	28.3
6	Sandstone: weathers light brown, very fine-grained, glauconitic with coated grains(?), nodular, cross-bedded; shell-hash in basal beds, thin ironstone bed at base sands, monoplacophorans(?) seen in fine-grained sandstones/ siltstones near base of section. Below resistant bed is a thin (~5.0-8.0 cm) shale (black), underlain by a thin (~3.0-6.0 cm) horizon of light grey siltstone (dolomitic?) with dark ooids throughout, interbedded with mudstones.	5.0	22.3
5	Shale/mudstone: dark grey to black, recessive.	4.0	17.3
4	Sandstone: weathers light brown, fine-grained, interbedded with dolomitic siltstone, ripple-laminated; capped by algal stromatolitic dolostone. Lateral accretion surfaces at unit base, complex of down-cutting sandstones, load casts in base of the channel.	4.0	13.3
3	Shale: greenish to grey, laminated, recessive.	2.0	9.3
2	Conglomerate: medium- to coarse-grained, contains rounded clasts.	0.3	7.3
	Mount Clark Formation (incomplete)		
1	Sandstone: clean, blocky, fine-grained, cross-bedded, beds average 20.0-40.0 cm thickness (Strike 000° and dip 20°E).	7.0	7.0

Section 16 Unnamed Creek

Section Description: Section includes part of Mount Clark Formation underlain by Dodo Creek Formation of the Little Dal Group and Abraham Plains Formation of the Katherine Group (units of Long and Turner, 2012 and Turner and Long, 2012) (Figure 19, Photos 19a to 19f). Measurement began within the Abraham Plains Formation along a small unnamed side creek joining Katherine Creek, and terminated in a box canyon where the highest exposed Mount Clark Formation was exposed. Section is located in Carcajou Canyon map area (96D/13), and was measured by C. Bergquist and assistants in September, 2006.

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Mount Clark Formation (incomplete)		
8	Sandstone: white to tan, fine to medium-grained, some coarse pebble lag at bed bases; thick-bedded at base of cliff section (average 2.0 m) becoming thinner-bedded upwards (average 20.0 cm). Slab overhangs and fallen slabs on valley	22.0	98.0

	floor contain abundant horizontal burrows. Rare glauconite in base of beds. Bioturbation concentrated in upper third of beds. Trough cross-bedding truncates *Skolithos* burrows.		
	Little Dal Group (Dodo Creek Formation)		
7	Siltstone and sandstone: dark brown, fine-grained, lacks bioturbation.	2.0	76.0
6	Sandstone, siltstone, and shale: weathers orange, parallel-laminated, fine-grained sandstone; thin-bedded; cross-bedded; lacks bioturbation. Unit becomes shalier upwards. upper part partially covered.	14.0	74.0
5	Covered.	10.5	60.0
4	Shale and sandstone: predominately covered; recessive, dark red and grey-green shale interbedded with 10.0 cm thick, coarse-grained, porous sandstone that is wave-rippled on top. Upper part contains 15.0 cm thick, finely-laminated sandstone, and greyish-green mudstone with salt casts.	6.0	49.5
	Katherine Group (Abraham Plains Formation; incomplete)		
3	Sandstone: cross-bedded, conglomeratic, up to cobble-sized, rounded clasts.	0.5	43.5
2	Sandstone: light brown, beds up to 30.0 cm, cross-bedded, cemented, quartzitic.	8.0	43.0
1	Sandstone: weathers light pink to red and splotchy (iron staining), tightly-cemented to quartzite, ripple laminations and swaley cross-stratification (SCS).	35.0	35.0

Section 17 Echo Creek

Section Description: Section possibly includes Proterozoic Little Dal Group (Stone Knife Formation of Long and Turner, 2012) overlain by Mount Cap Formation (Figure 20, Photos 20a to 20f). The basal units 1 to 3 may in fact also be Mount Cap Formation. Measurement began within Little Dal Group along Echo Creek, up to the top of waterfalls representing the highest exposed Mount Cap Formation. Section is located in Carcajou Canyon map area (96D/14), and was measured by C. Bergquist and assistants in July, 2006.

Unit	Description	Unit thickness (m)	Cumulative thickness (m)
	Mount Cap Formation (incomplete)		
13	Dolostone: interbedded with siltstone, resistant section	1.90	40.15

	(waterfall).		
12	Sandstone: very fine-grained sandstone beds, glauconitic, recessive. Interbedded with dolosiltstone.	3.00	38.25
11	Sandstone: fine-grained, thin-bedded.	4.00	35.25
10	Sandstone: argillaceous, fine-grained, bioturbated, beds 3.0-5.0 cm thick.	4.00	31.25
9	Sandstone: white, medium-grained, quartzitic, well-cemented.	0.25	27.25
8	Siltstone: dolomitic, recessive.	0.80	27.00
7	Siltstone: dolomitic, thoroughly bioturbated, horizontal burrows.	2.00	26.20
6	Siltstone: black.	0.40	24.20
5	Siltstone: weathers dark green to black, flaggy, thoroughly bioturbated.	1.80	23.80
4	Siltstone: dolomitic, weathers orange to light brown, wave-rippled.	2.00	22.00
	?Little Dal Group (Stone Knife Formation; incomplete)		
3	Dolostone: stromatolitic mounds typically 0.5-1.0 m but up to 3.0-4.0 m in diameter. Overlying thin-bedded dolostone, pinch and swell, thinning over top of mounds.	2.00	20.00
2	Dolostone: weathers light brown to orange, microcrystalline, includes mud chip layer. Planar ripples with slickensides (striking 222°, dipping 10° NE).	2.00	18.00
1	Dolosiltstone: grey, thin-bedded, overlying nodular red shales.	16.00	16.00

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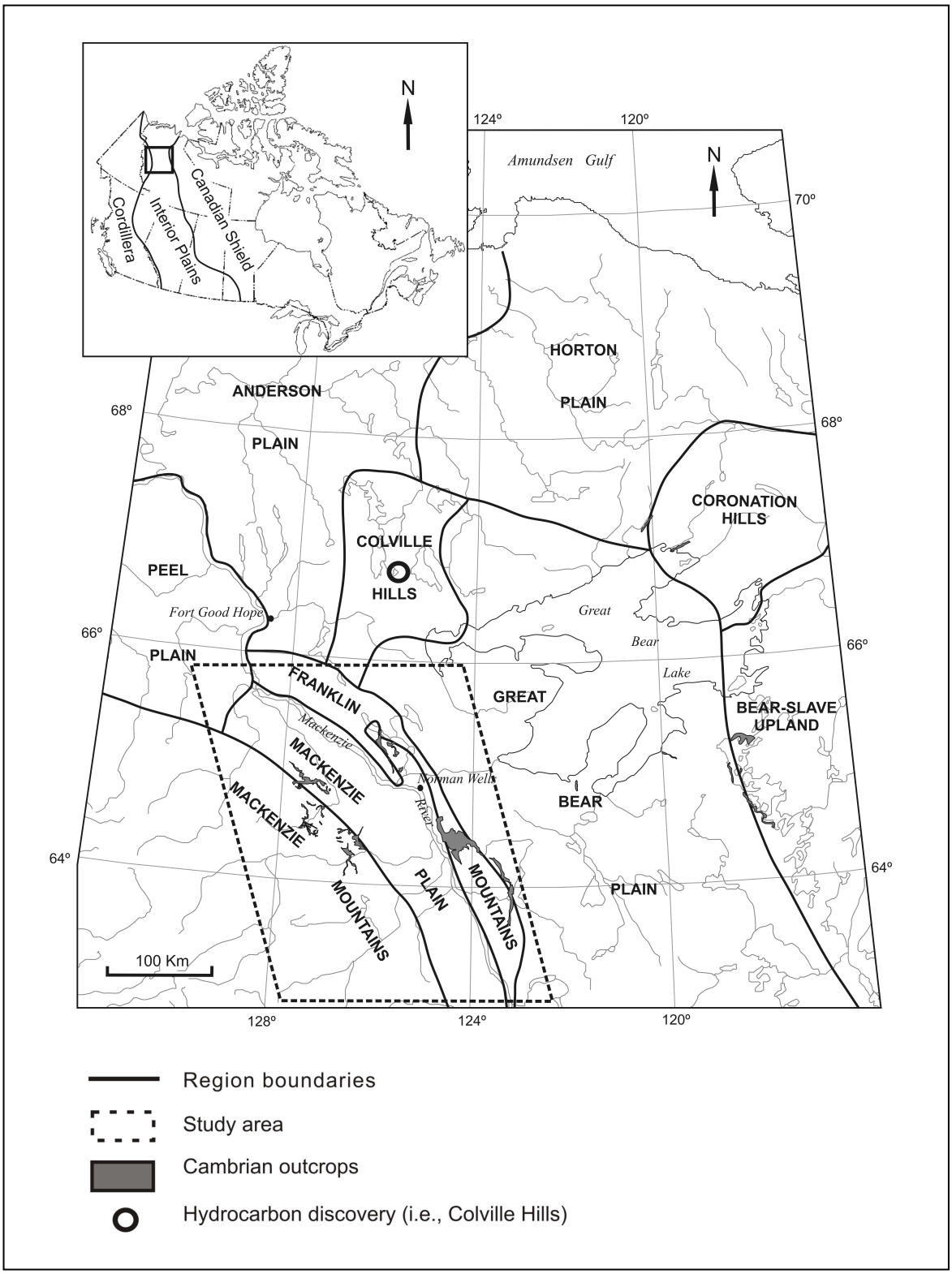


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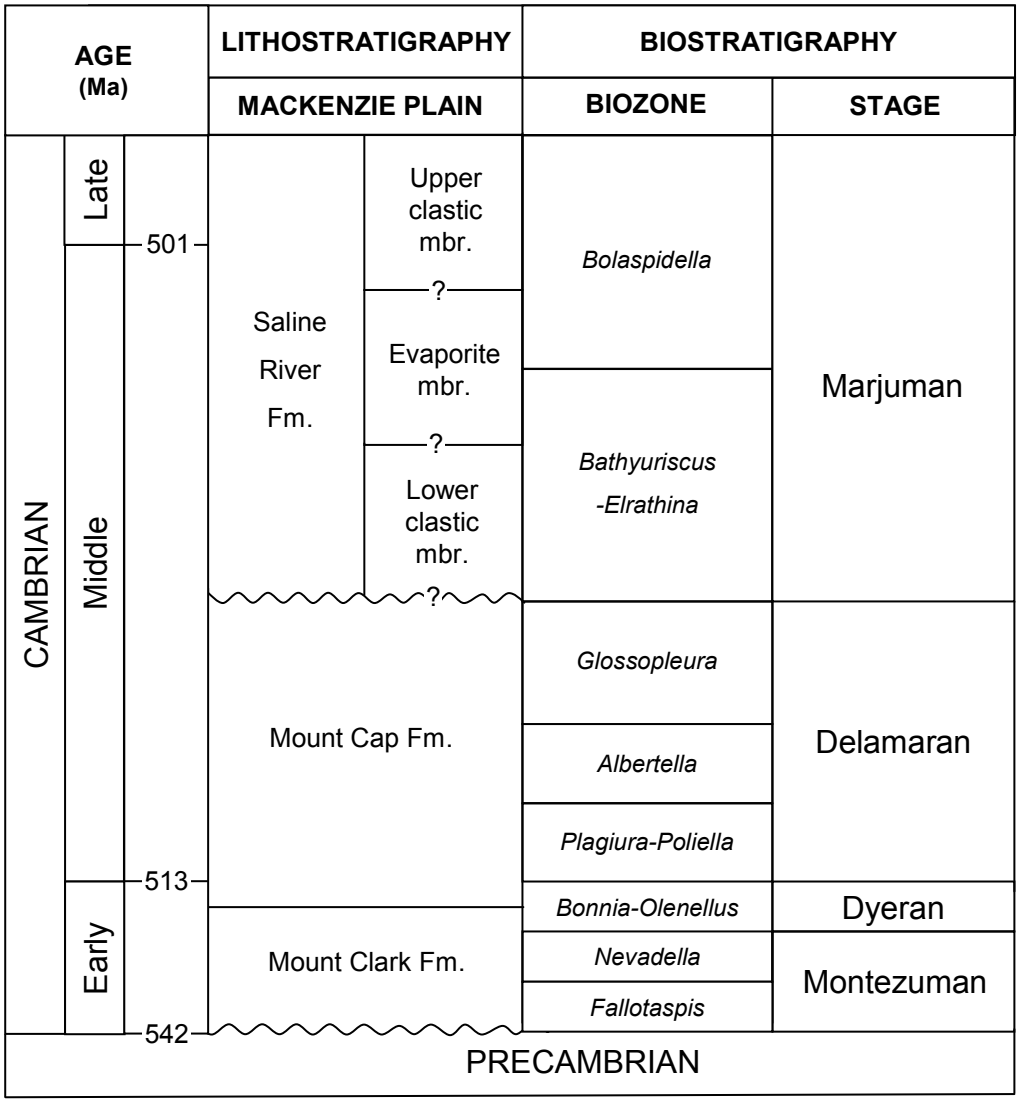


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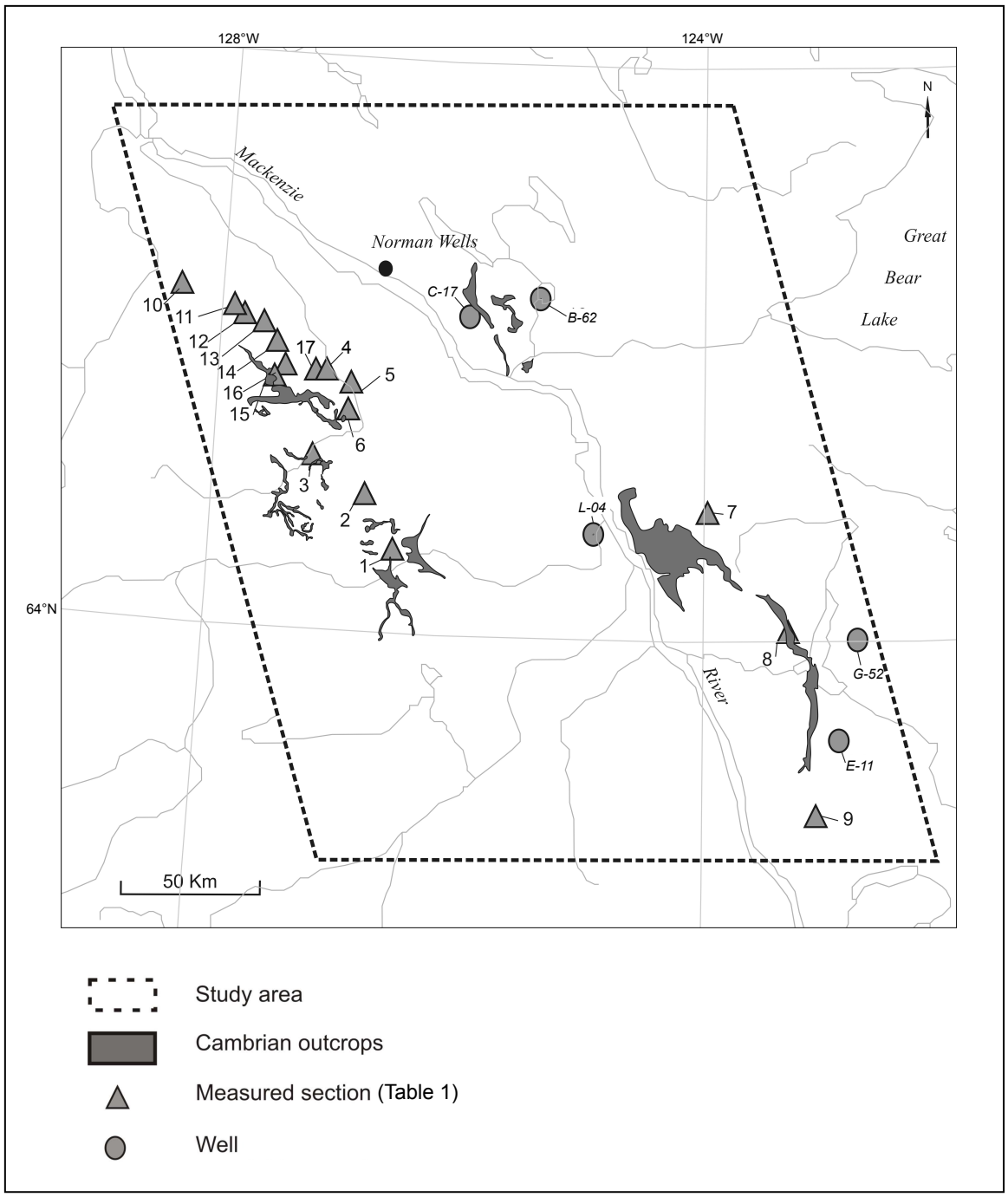


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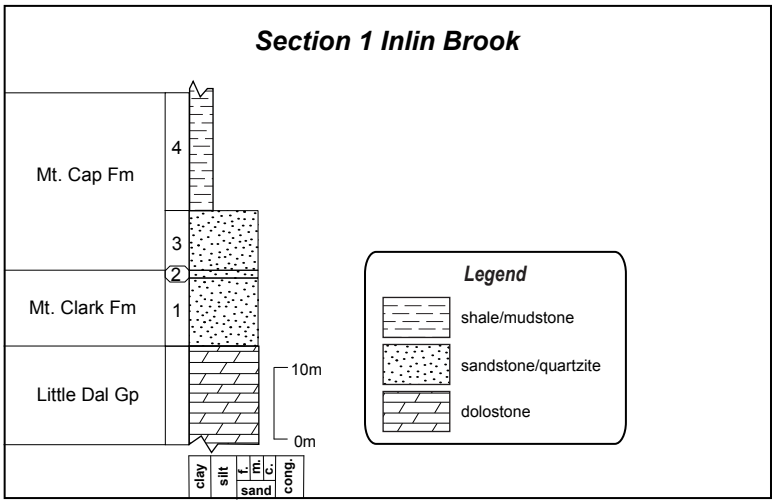


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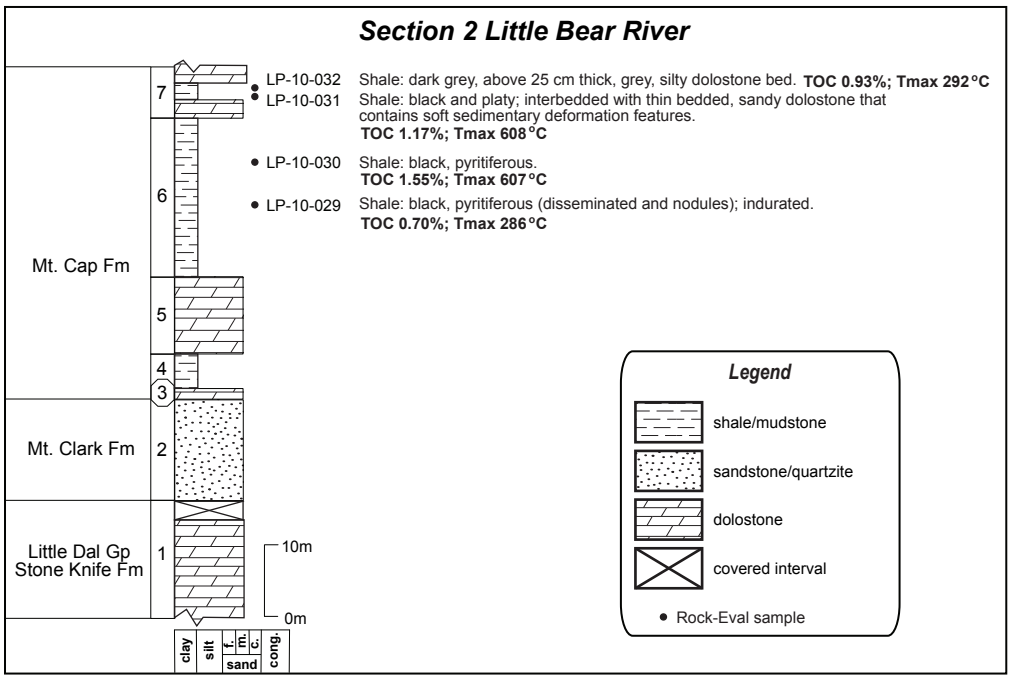


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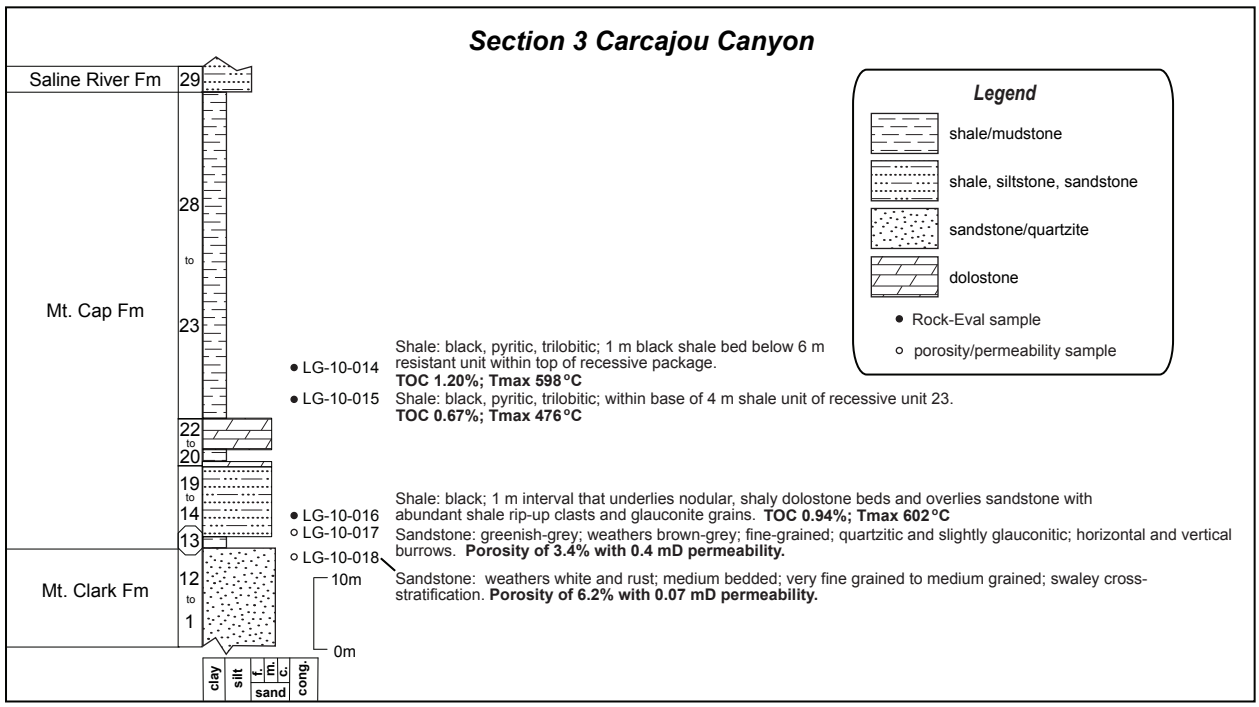


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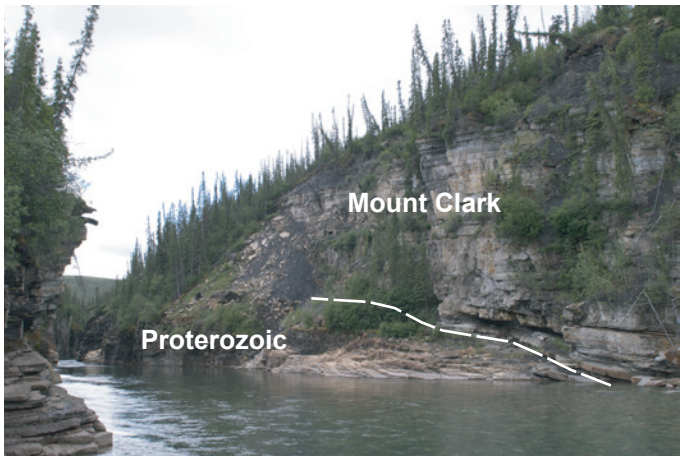


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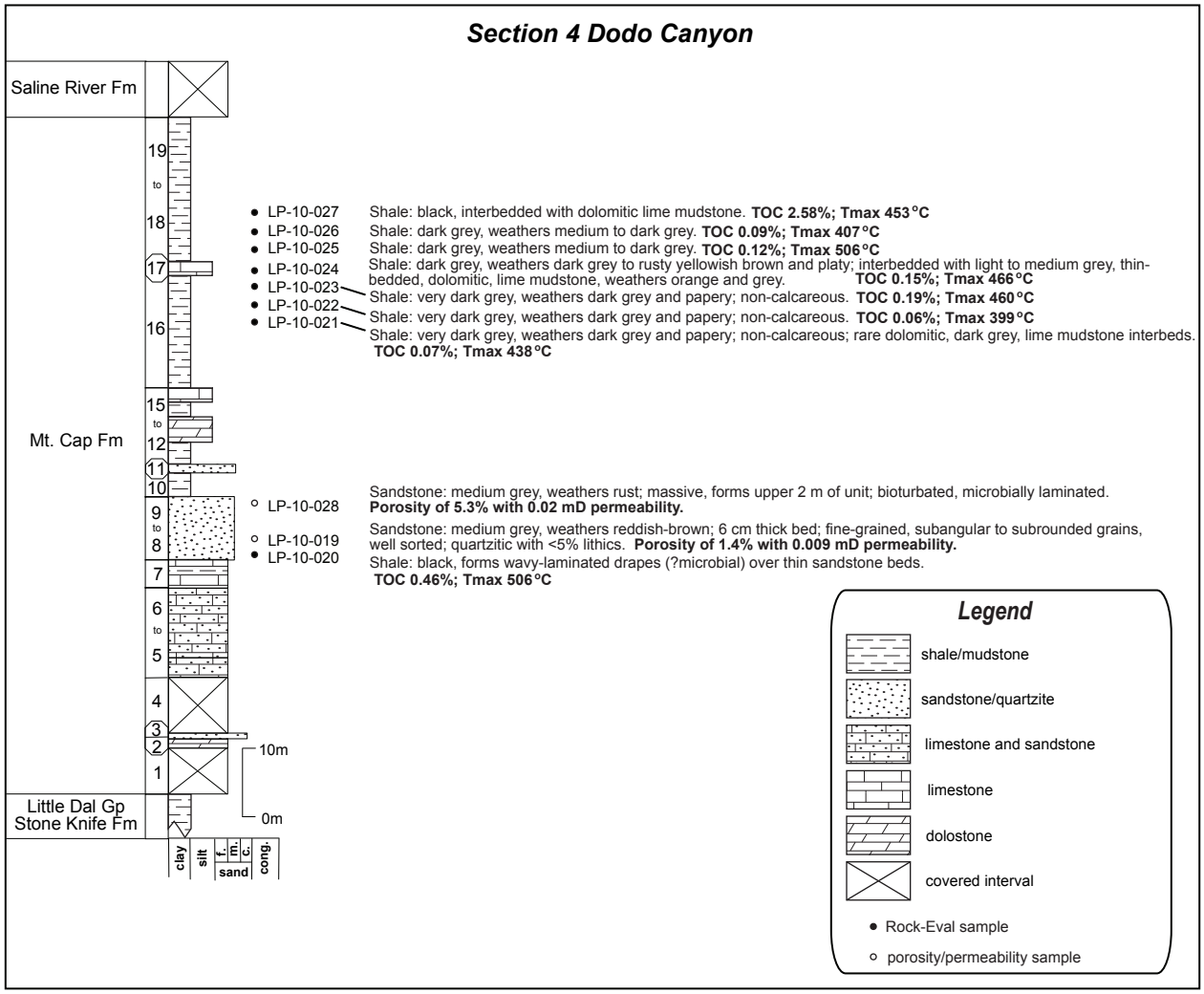


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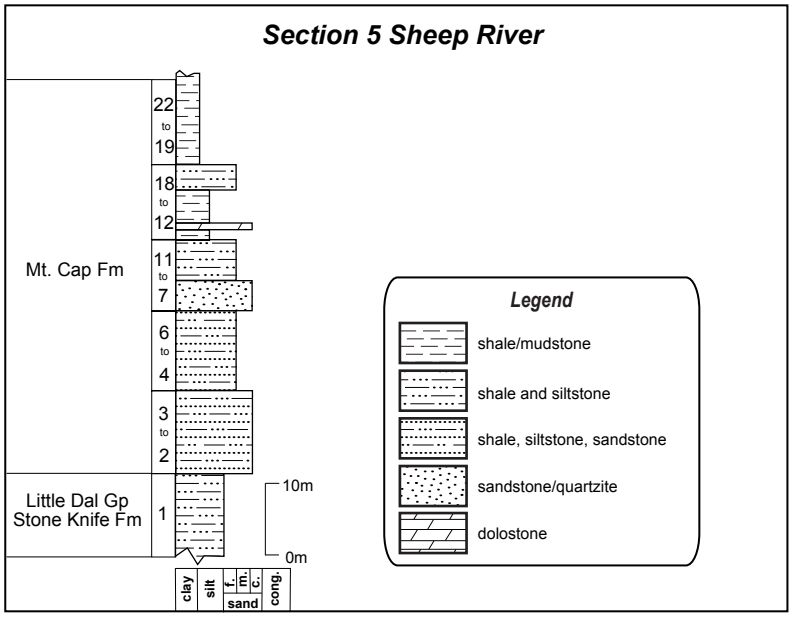


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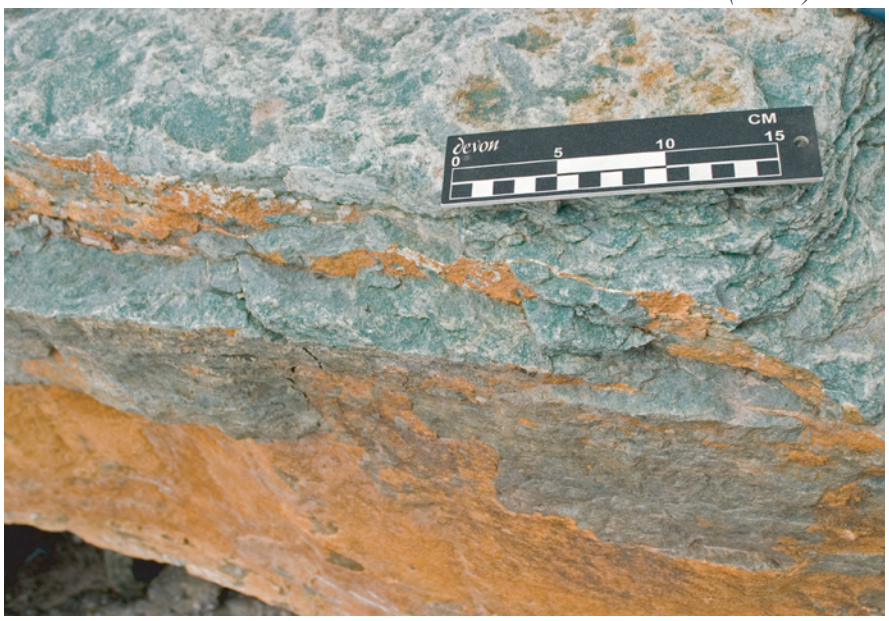


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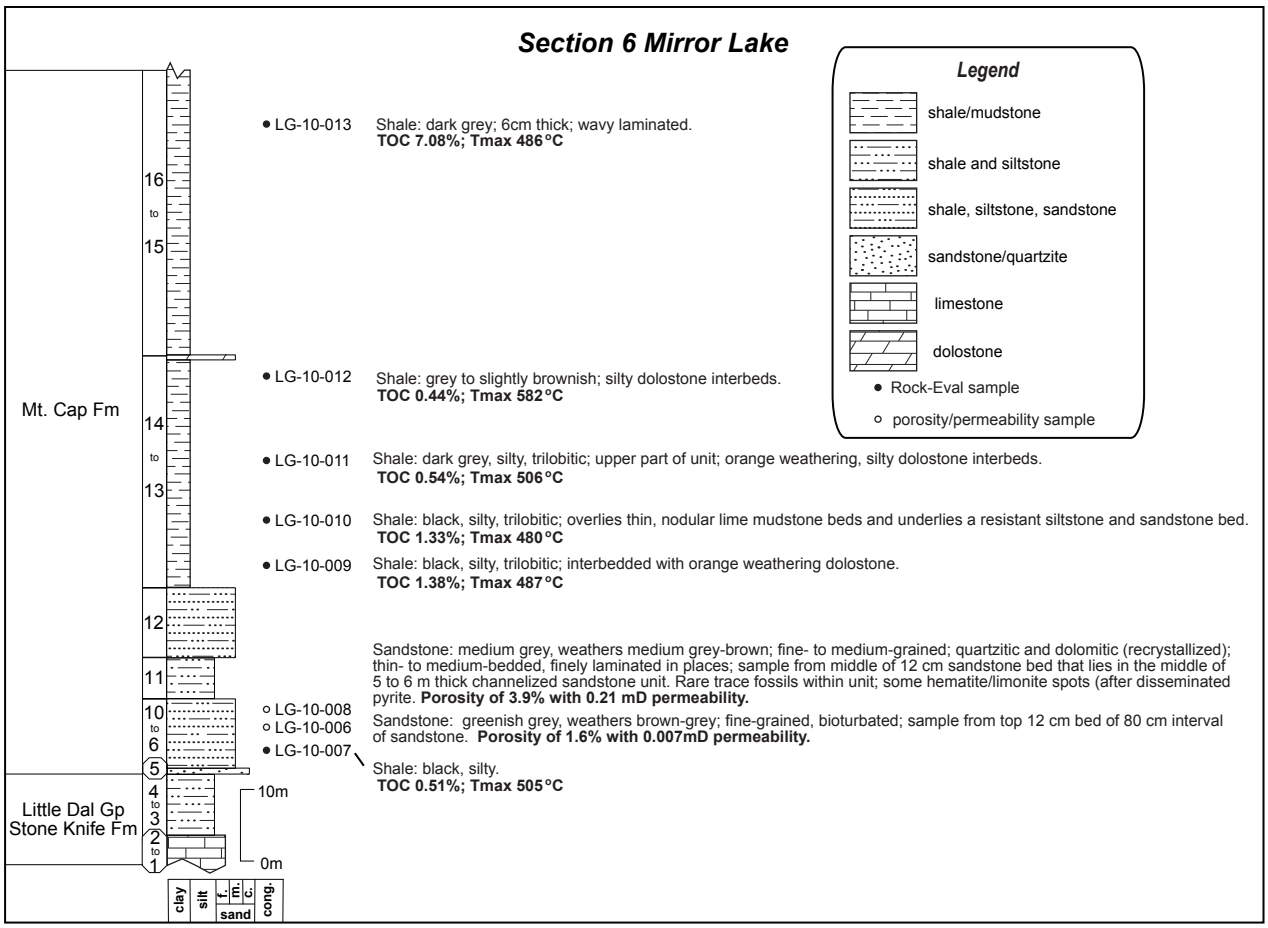


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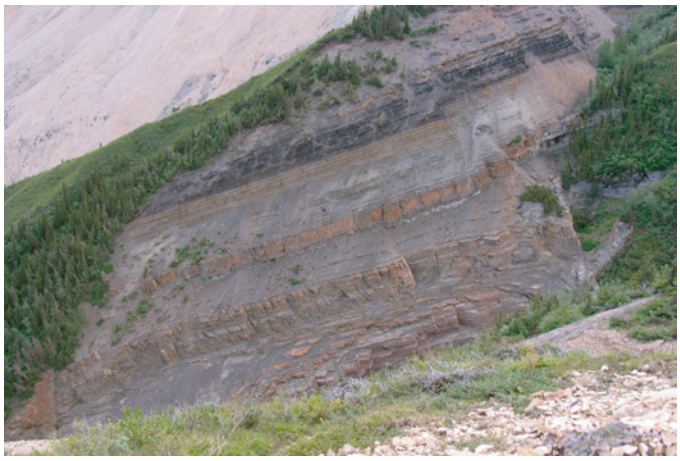


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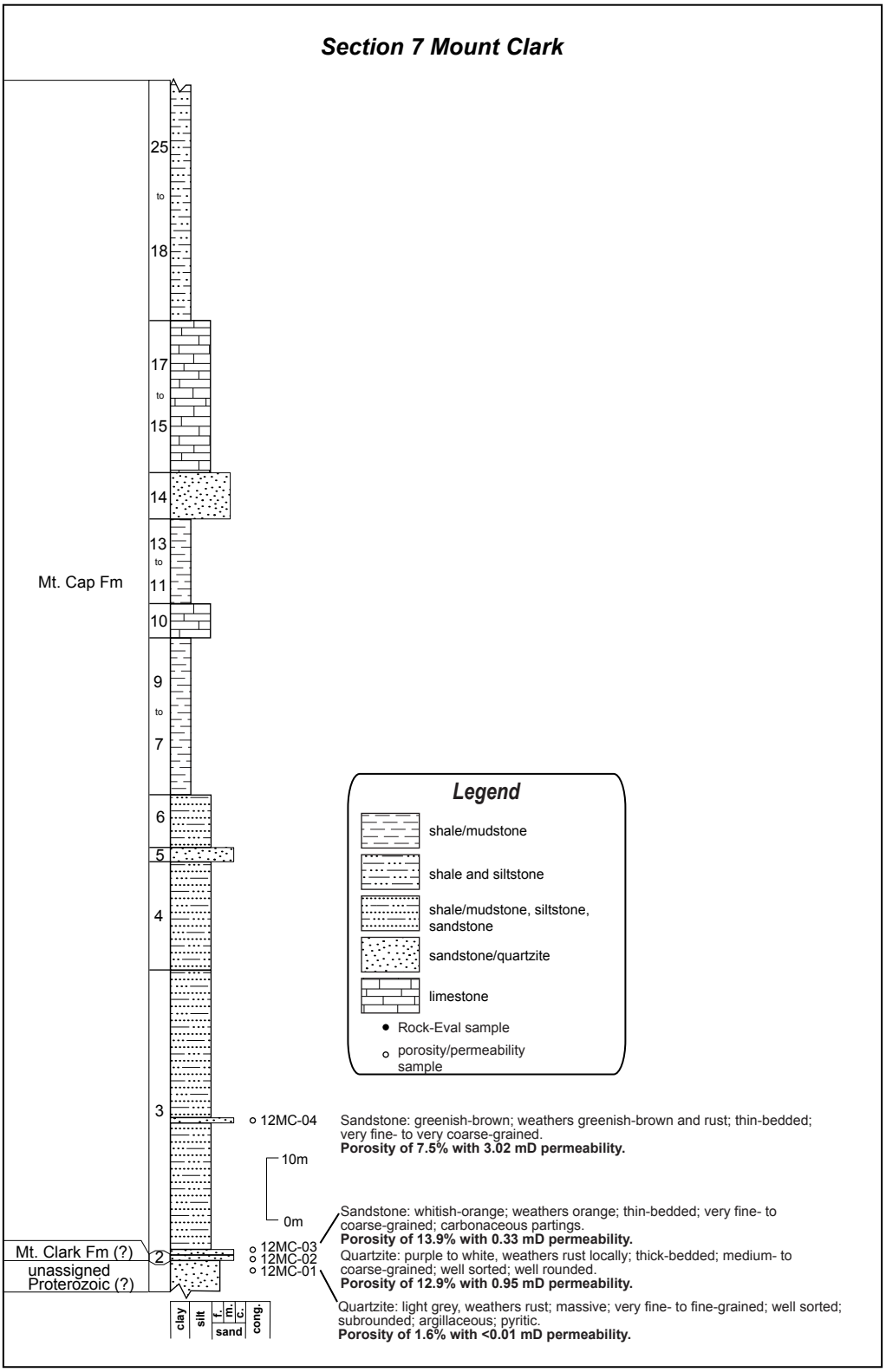


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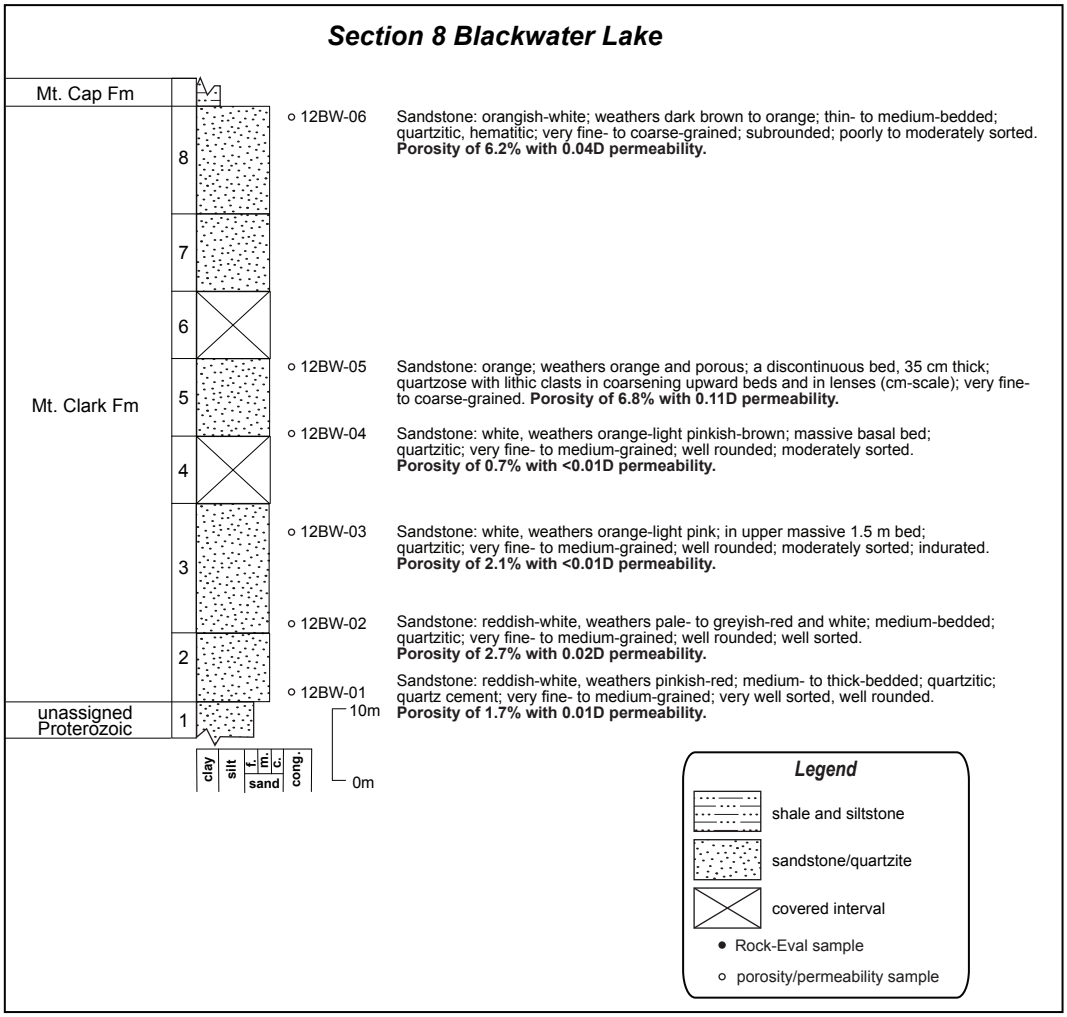


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Figure 11e. *Planar view of uppermost Mount Clark sandstone beds.*

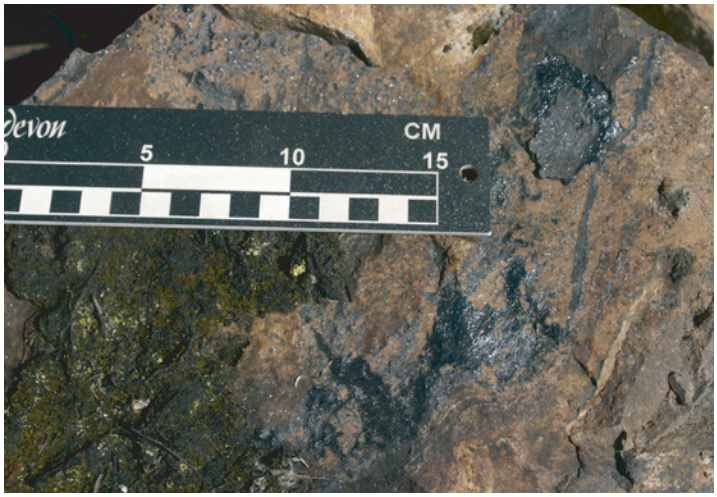


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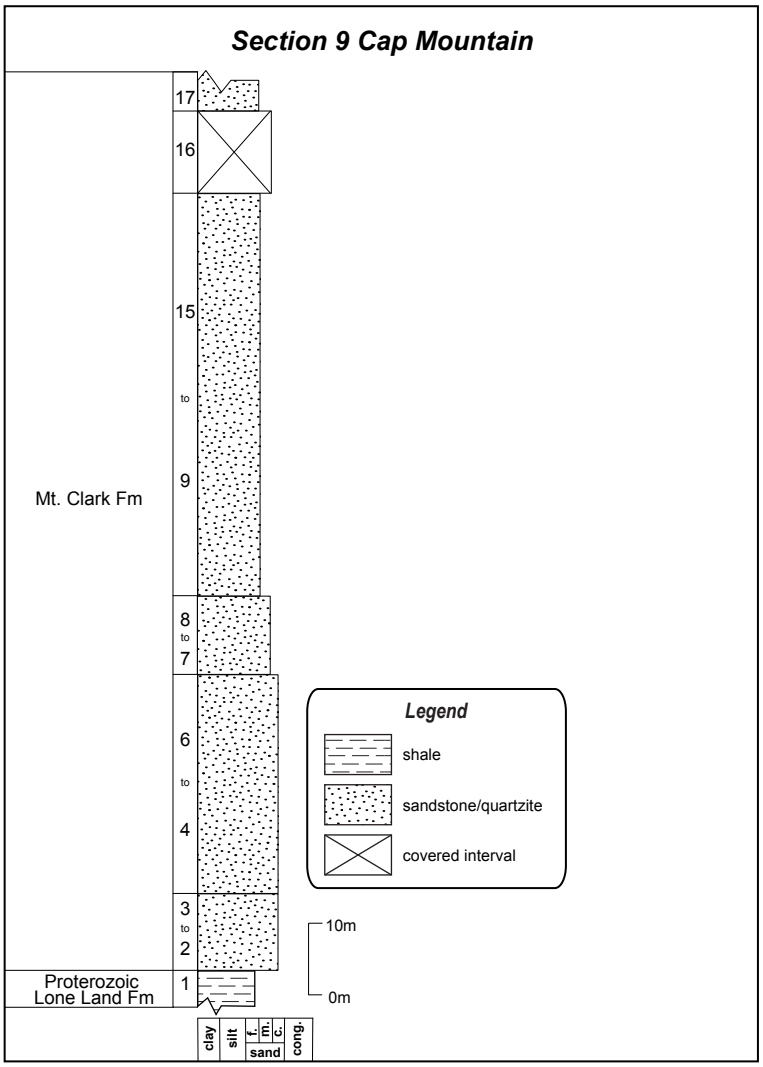


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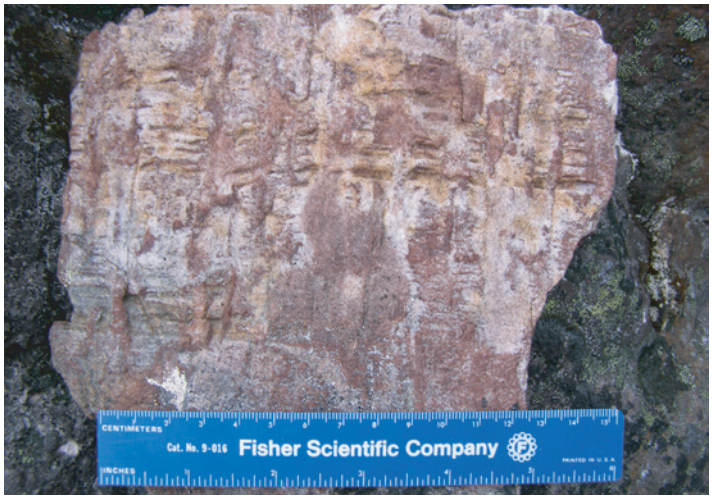


Figure 12e. *Fresh surface showing dark pink colour of sandstone and* Skolithos *burrows in lower Mount Clark Formation.*



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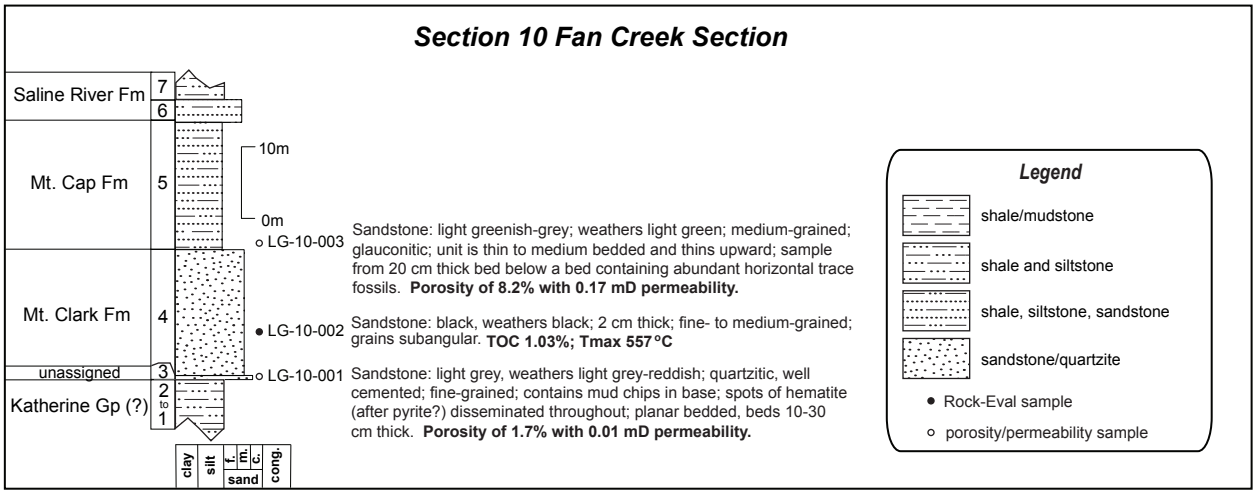


Figure 13. *Measured strata at Section 10 Fan Creek; sample descriptions from Pyle and Gal (2011).*

Photos 13a to 13f. *Section 10 Fan Creek.*



Figure 13a. *Overview of Cambrian section, west side of Fan Creek.*



Figure 13b. *Upper Katherine Group(?) red beds (Unit 2, 5.5 m thick).*



Figure 13c. *View east toward Fan Creek, overview of Mount Cap Formation (39.0 m thick).*

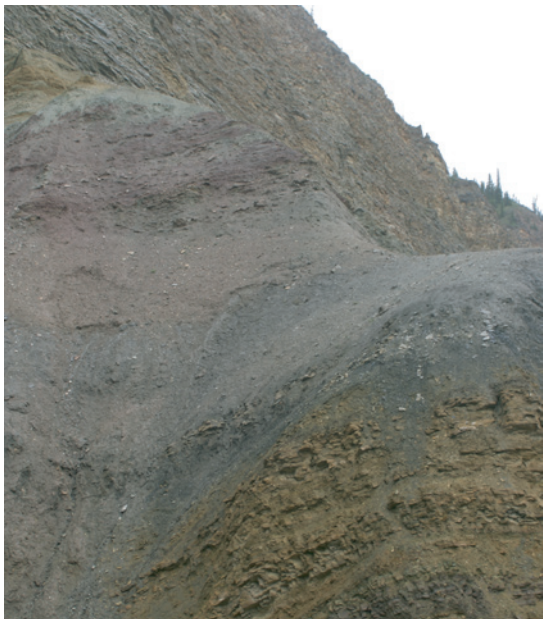


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Figure 13e. *Mount Cap Formation, medium-grained sandstone (Unit 4, hammer on outcrop for scale).*



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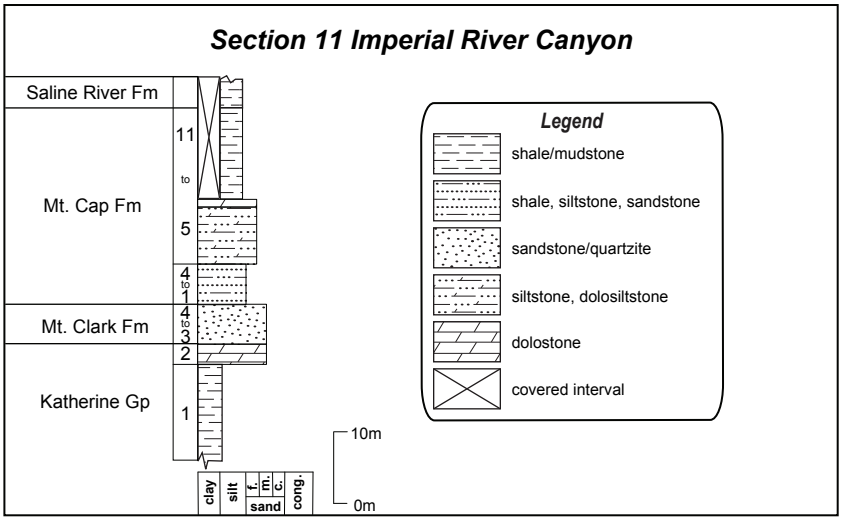


Figure 14. *Measured strata at Section 11 Imperial River Canyon.*

Photos 14a to 14f. *Section 11 Imperial River Canyon.*

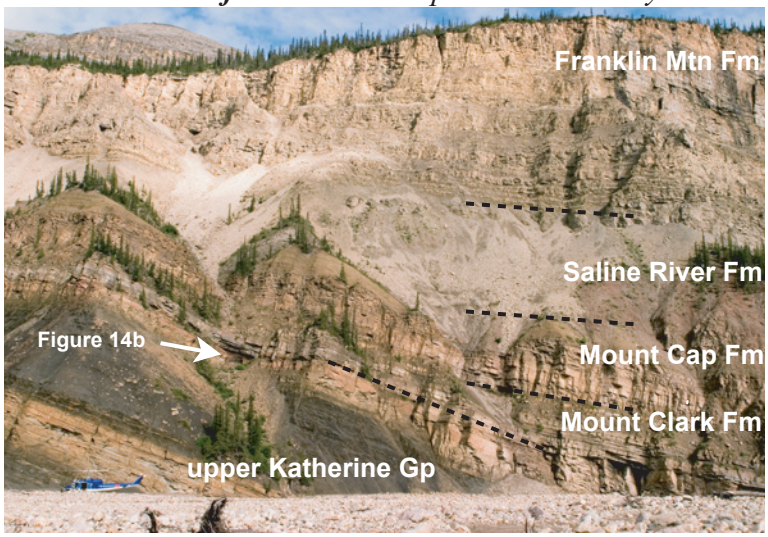


Figure 14a. *View north of Cambrian section overlying Proterozoic upper Katherine Group, Imperial River Canyon.*



Figure 14b. *Mount Clark Formation conglomeratic lag in red beds (medium- to thick-bedded) above the sub-Cambrian unconformity; exposed in gully at arrow in Figure 14a.*

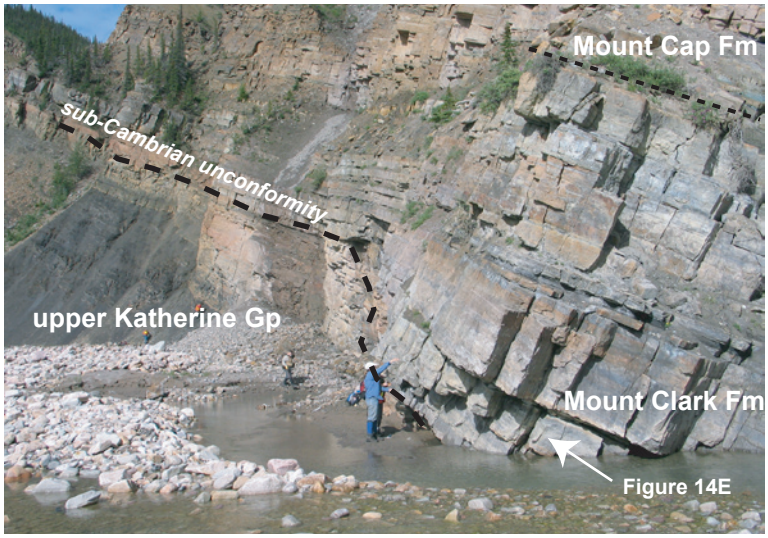


Figure 14c. *Mount Clark Formation down-cutting into upper Katherine Group.*

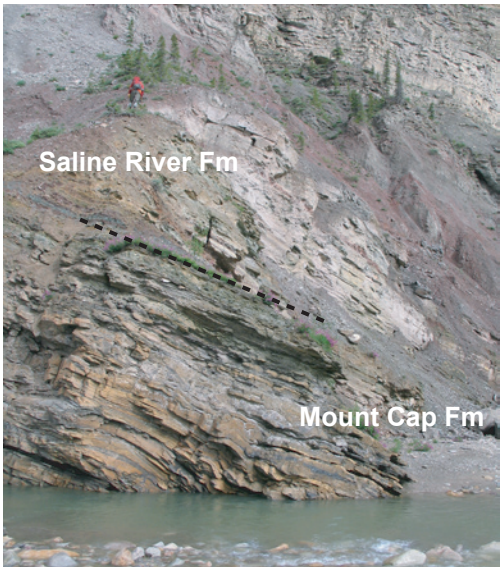


Figure 14d. *Upper Mount Cap Formation sandstone, dolostone and black shale overlain by Saline River Formation clastics and evaporites.*



Figure 14e. Skolithos *burrows within basal Mount Clark Formation (Unit 3; arrow in Figure 14c).*



Figure 14f. *Basal, red- and green-weathering Saline River Formation clastics.*

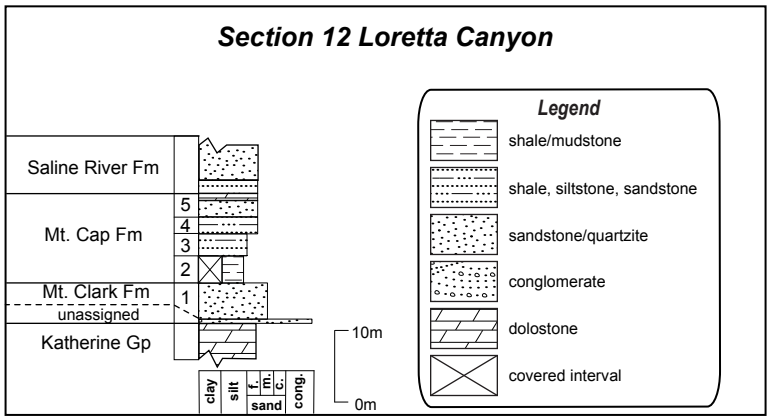


Figure 15. *Measured strata at Section 12 Loretta Canyon (after description by Aitken et al., 1973).*

Photos 15a to 15f. *Section 12 Loretta Canyon.*



Figure 15a. *Aerial view of upper Katherine Group overlain by bright red- to buff-weathering Mount Clark and Mount Cap formations, Loretta Canyon Section.*



Figure 15b. *An unassigned unit of red beds down-cut into upper Katherine Group, upstream of waterfall in Figure 15a.*



Figure 15c. *Lower Mount Clark Formation sandstone and red beds.*

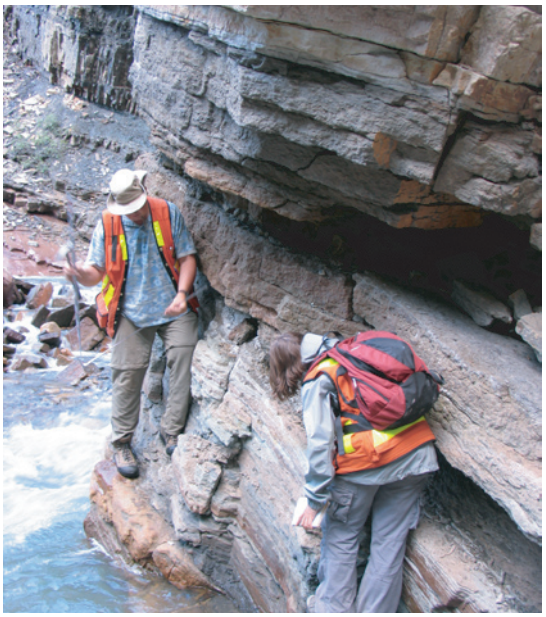


Figure 15d. *Extensively bioturbated, glauconitic sandstone, lower Mount Cap Formation, in downstream section (Unit 5).*



Figure 15e. *Downstream section of bioturbated, thin- to medium-bedded, cross-bedded sandstone of Mount Cap Formation.*



Figure 15f. *Top of brecciated, dolosiltstone bed, upper Mount Cap Formation.*

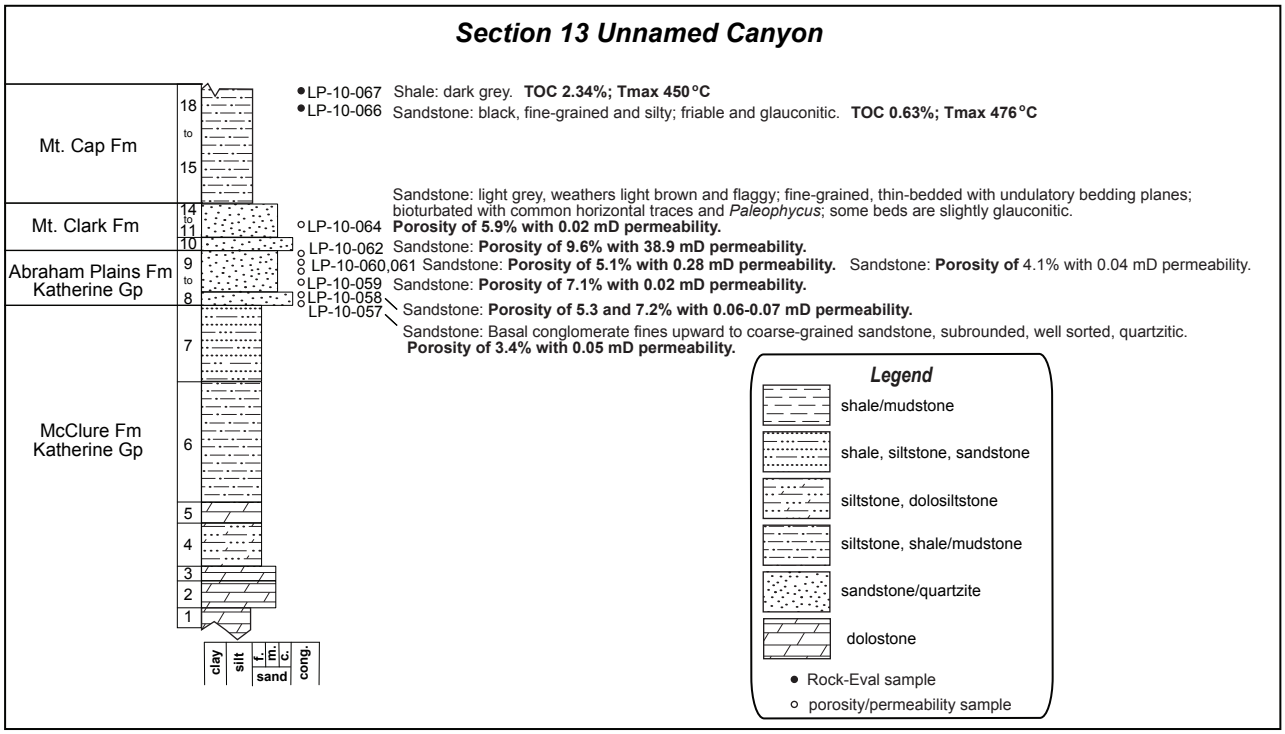


Figure 16. *Measured strata at Section 13 Unnamed Canyon; sample descriptions from Pyle and Gal (2011).*

Photos 16a to 16f. *Section 13 Unnamed Canyon.*

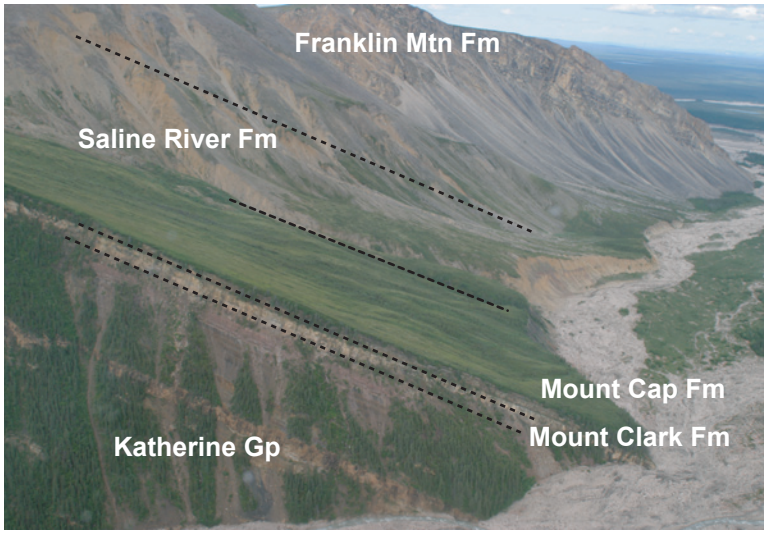


Figure 16a. *View down-river (east) of Unnamed Canyon Section.*



Figure 16b. *Conglomeratic zone with Abraham Plains Formation (Unit 8), with well-sorted basal lag deposits and medium- to coarse-grained sandstone.*

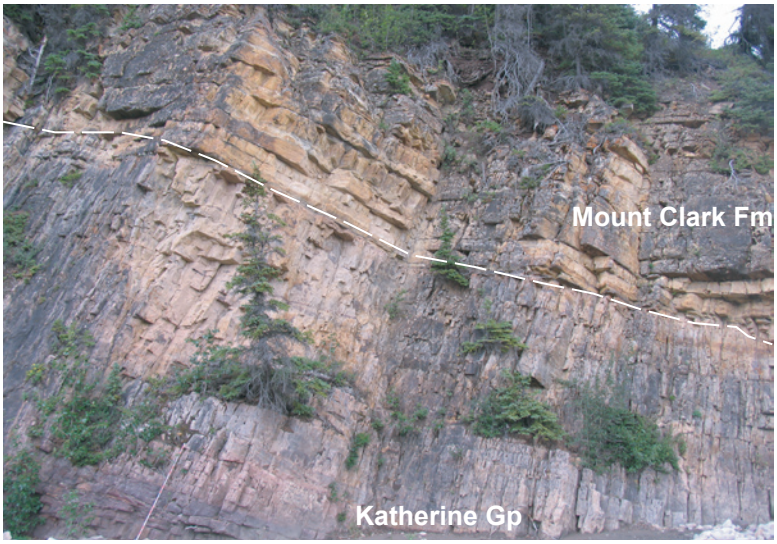


Figure 16c. *Bioturbated Mount Clark Formation sandstone disconformably overlies Abraham Plains Formation sandstone and conglomerate (Figure 16b viewed in lower left, measuring staff for scale).*



Figure 16d. *High-angle and planar cross-beds in medium-bedded Mount Clark Formation sandstone.*



Figure 16e. *Cross-bedded, bioturbated lower Mount Cap Formation siltstone.*



Figure 16f. *Dolomitic siltstone and black shale, upper Mount Cap Formation.*

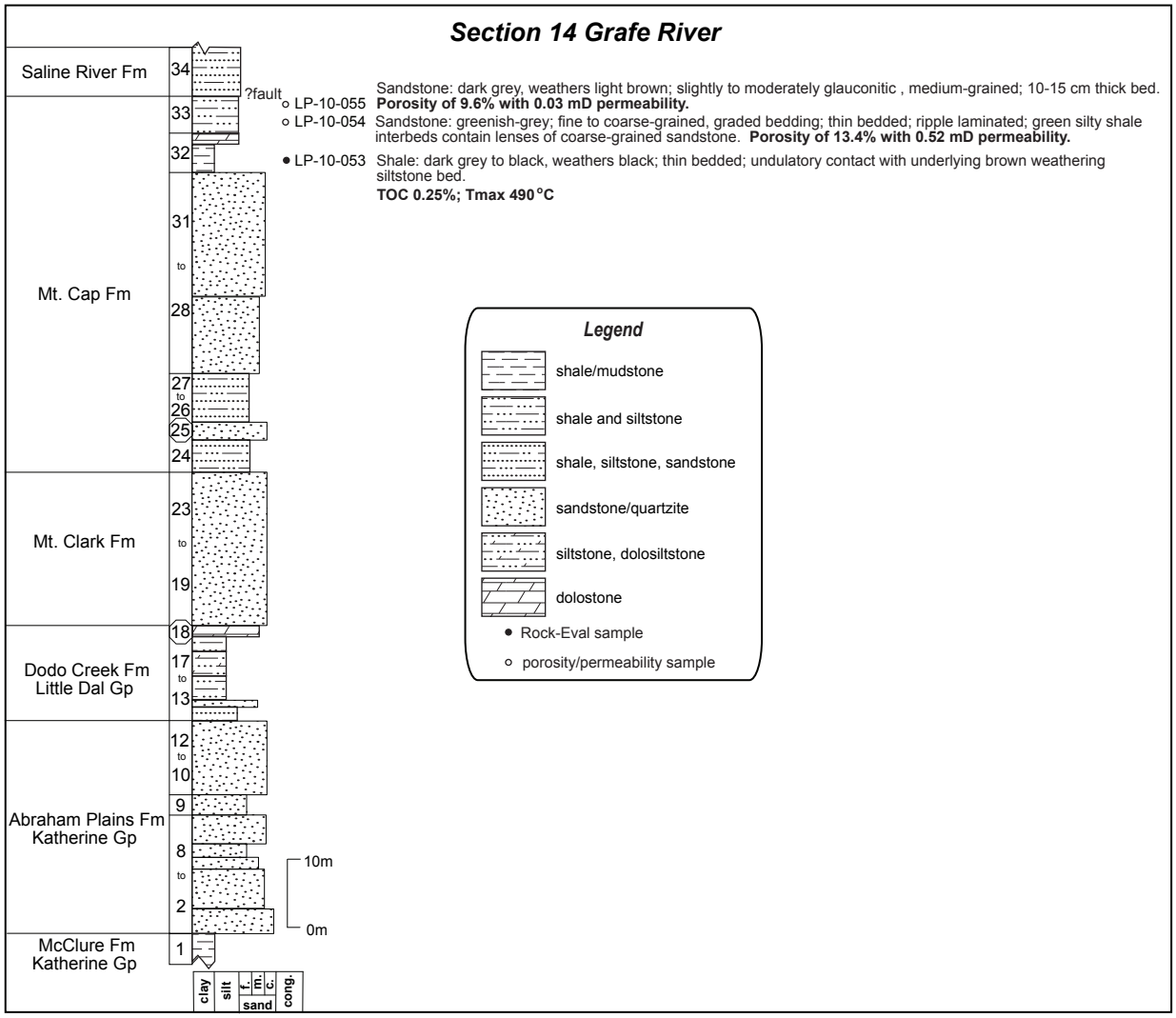


Figure 17. *Measured strata at Section 14 Grafe River; sample descriptions from Pyle and Gal (2011).*

Photos 17a to 17f. *Section 14 Grafe River.*



Figure 17a. *Proterozoic Katherine Group near base of measured section, Grafe River.*



Figure 17b. *Coarse-grained to conglomeratic, trough cross-bedded sandstone of Katherine Group (Abraham Plains Formation).*



Figure 17c. *Overview of Mount Cap Formation, middle part of Grafe River canyon.*



Figure 17d. *Cross-beds, Abraham Plains Formation, have north-dipping troughs which show east-dipping mega-ripples on upper surface.*



Figure 17E. *Interbedded, bioturbated siltstone and cross-bedded sandstone, middle Mount Cap Formation.*



Figure 17F. *Pinch and swell and boudinage within thin-bedded siltstone, dolostone, and black shale (Unit 32), upper Mount Cap Formation.*

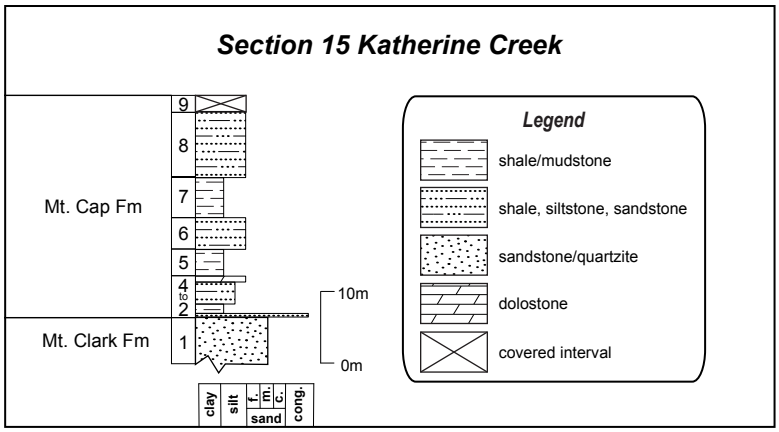


Figure 18. *Measured strata at Section 15 Katherine Creek.*

Photos 18a to 18f. *Section 15 Katherine Creek.*

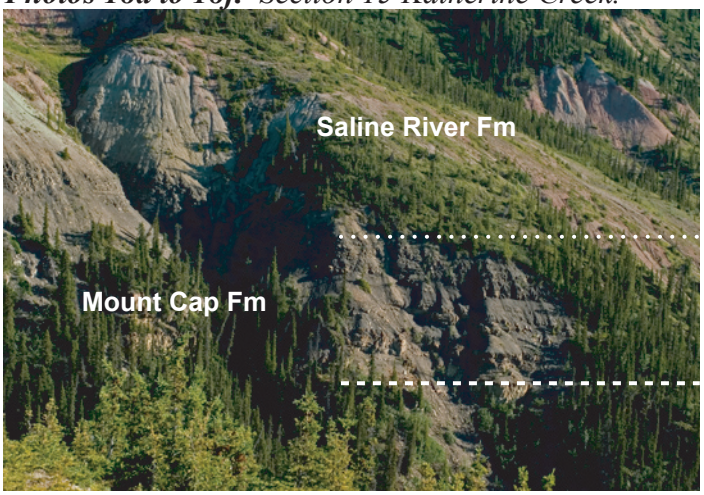


Figure 18a. *Distant view of measured section (lower right) of Mount Cap Formation, Katherine Creek Section.*

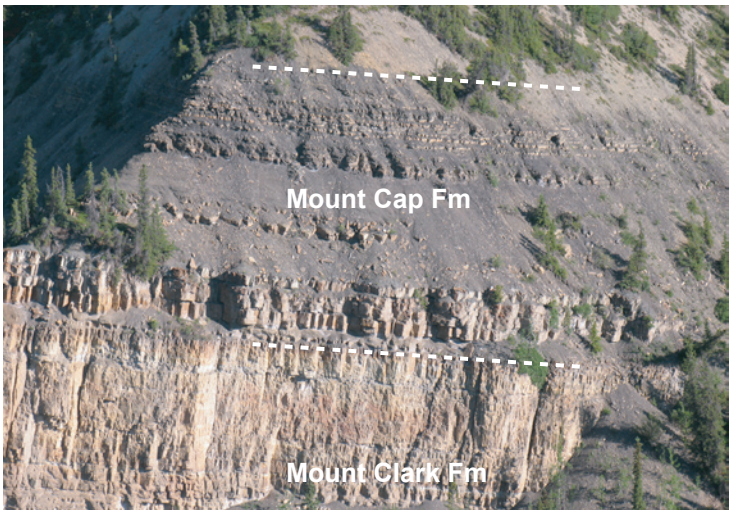


Figure 18b. *Cross-canyon view of Mount Cap Formation, west of measured section at Katherine Creek.*



Figure 18c. *Down-cutting, fine-grained sandstone of Mount Cap Formation, overlain by stromatolitic dolostone (Unit 4).*



Figure 18d. *View down-section to basal conglomeratic lag (Unit 2) in Mount Cap Formation.*



Figure 18e. *Fine-grained sandstone containing shell hash and underlain by thin-bedded ironstone (Unit 6).*



Figure 18f. *Upper ripple-laminated sandstone interbedded with dolomitic siltstone and black, fissile shale (Unit 8).*

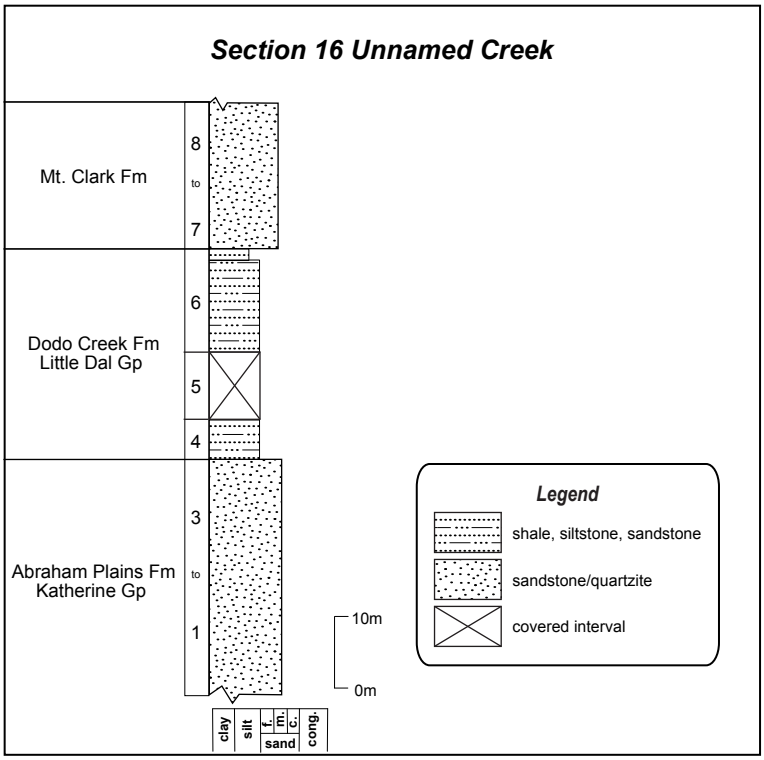


Figure 19. *Measured strata at Section 16 Unnamed Creek.*

Photos 19a to 19f. *Section 16 Unnamed Creek.*



Figure 19a. *Downstream view of underlying Proterozoic quartzite of Katherine Group, Unnamed Creek Section.*



Figure 19b. *Cross-bedded conglomeratic sandstone (Unit 3) of Abraham Plains Formation of Katherine Group.*



Figure 19c. *Abundant horizontal burrows in cliff-side talus, within glauconitic, fine-grained sandstone in upper Mount Clark Formation.*



Figure 19d. *Thick-bedded sandstone in upper Mount Clark Formation.*



Figure 19e. *Trough cross-bedded sandstone with multiple layers of* Skolithos *burrows, upper Mount Clark Formation.*



Figure 19f. *Talus block (event bed) with graded bedding, pebble lag fining upward (to the right), Mount Clark Formation.*

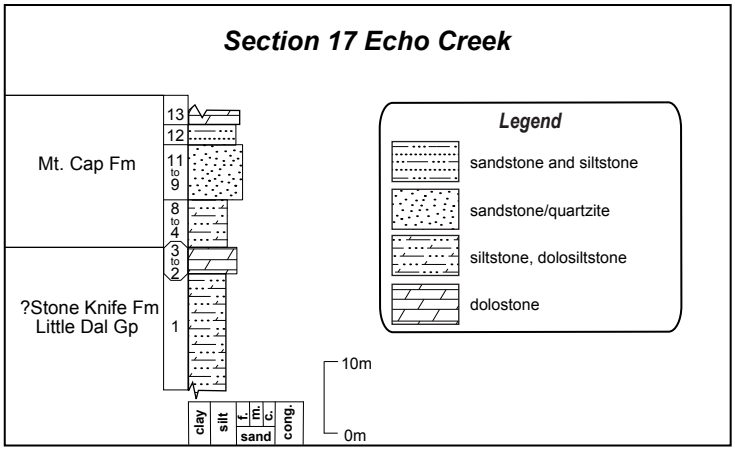


Figure 20. *Measured strata at Section 17 Echo Creek.*

Photos 20a to 20f. *Section 17 Echo Creek.*

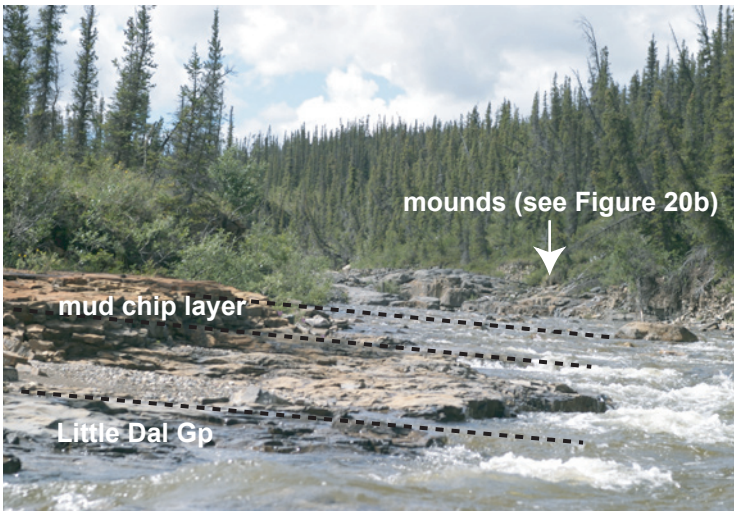


Figure 20a. *Microcrystalline dolostone with thin mud chip layer, overlain by stromatolitic mounds, Little Dal Group, Echo Creek Section.*



Figure 20b. *Stromatolitic mound, 1 m diameter and up to 4 m locally; overlying dolostone thins laterally.*



Figure 20c. *Upper falls contain interbedded dolostone, siltstone and fine-grained sandstone of Mount Cap Formation (Unit 13).*



Figure 20d. *Uppermost dolostone, bioturbated siltstone, and glauconitic sandstone (Unit 13).*



Figure 20e. *Medium-grained, cemented, quartz sandstone, ooidal ironstone, and bedded dolomitic siltstone, Mount Cap Formation (Unit 9).*



Figure 20f. *Top of bed showing horizontal burrows in fine-grained sandstone, Mount Cap Formation (Unit 10).*