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**GEOLOGICAL SURVEY OF CANADA
MEMOIR 430**

**SUBSURFACE GEOLOGY OF PRE-MESOZOIC
STRATA, GREAT BEAR RIVER MAP AREA,
DISTRICT OF MACKENZIE**

D.C. Pugh

1993



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PREFACE

Over the last forty years much has been published on the sedimentary geology of Great Bear River area. The discoveries of oil in the Devonian reef at Norman Wells and in Cambrian sands at Tedji Lake have attested to the area's hydrocarbon potential. Surface mapping and local studies have revealed rock sequences and crustal structures of great potential value to our understanding of global geology. The aim of this report is to assist evaluation of the economic potential and to improve the interpretation of the geological history. The format follows that of the earlier report (Memoir 401) on the adjacent Peel River area. Based on subsurface data, the stratigraphy and structure of the area are analyzed in detail and are illustrated on a series of maps and cross-sections, and nomenclature is reviewed and integrated regionally with that of adjacent areas.

Elkanah A. Babcock
Assistant Deputy Minister
Geological Survey of Canada

PRÉFACE

Au cours des quarante dernières années, la géologie sédimentaire de la zone de Great Bear River a fait l'objet de nombreuses publications. Les découvertes de pétrole faites dans le récif dévonien à Norman Wells et dans les sables cambriens à Tedji Lake ont confirmé le potentiel en hydrocarbures de cette zone. Des séquences rocheuses et des structures crustales d'une grande valeur pour la compréhension de la géologie globale ont été révélées par des travaux de cartographie des formations en surface et des études géologiques locales. Le présent rapport a pour objectif de faciliter l'évaluation du potentiel économique de cette zone et d'en améliorer l'interprétation de l'histoire géologique. La présentation suit celle d'un rapport antérieur (mémoire 401) portant sur la zone adjacente de Peel River. À partir de données souterraines, la stratigraphie et la structure de la zone sont analysées en détail, et illustrées sur une série de cartes et de coupes, et la nomenclature est présentée et intégrée à celle des zones adjacentes de la région.

Elkanah A. Babcock
Sous-ministre adjoint
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CONTENTS

1	Abstract/Résumé
2	Summary/Sommaire
4	Introduction
4	Study area
4	Previous work
4	Present study
4	Acknowledgments
4	Borehole reference system
4	Metric conversion
5	Stratigraphy
5	General
5	Nomenclature
5	Precambrian stratigraphy
5	Proterozoic
5	Unit 1 (Cap Mountain)
5	Shale unit
10	Dolomite unit
11	Lower Paleozoic stratigraphy
11	Mount Clark Formation
12	Mount Cap Formation
13	Member a
13	Member b
13	Member c
13	Member d
14	Member e
14	Member f
14	Member g
14	Member h
14	Type area
14	Shale facies
15	Mahony Arch
15	Contacts
16	Saline River Formation
16	Lower clastic member
16	Salt member
17	Upper clastic member
17	Ronning Group
17	Franklin Mountain Formation
18	Cyclic member
19	Rhythmic member
19	Cherty member
20	Upper dolomite member
20	Type lithology
21	Mount Kindle Formation
21	Basal member
21	Lower dark member
21	Upper pale member
22	Undivided
22	Peel Formation
23	Middle Paleozoic stratigraphy
23	Delorme Group
24	Tsetso Formation
25	Tatsieta Formation
25	Arnica platform
26	Fort Norman Formation
26	Arnica and Landry formations
28	Hume Formation
28	Headless Member
29	Middle member
29	Upper member
29	Undivided Hume Formation
29	Horn River Group
29	Hare Indian Formation
30	Bluefish Member
30	Grey shale member
31	Black shale member
31	Ramparts Formation
32	Canol Formation
32	Revision

33	Imperial Formation
33	Canyon Creek sandstone lentil
34	Jungle Ridge limestone member
34	Structural geology
34	Fort Norman structure
34	Mackenzie Arch
34	Bulmer Lake Arch
34	Mahony Arch
34	Keele Trough
34	Good Hope Basin
34	Mackenzie Platform
34	Keele Arch
35	Great Bear Basin
35	Anderson Basin
35	Historical Geology
35	Earliest record
35	Cambrian-hypersaline basin
36	Late Cambrian to Late Ordovician
36	Late Ordovician to Late Silurian
36	Late Silurian to Early Devonian
36	Early to Middle Devonian
36	Givetian interlude
36	Late Devonian
37	Economic geology
37	Hydrocarbon potential
37	Cambrian clastics
37	Cambrian to Devonian carbonates
37	Mineral deposits
37	References
41	Appendix 1 - Paleontology
49	Appendix 2 - Logs of wells A-12 to P-78
121	Appendix 3 - List of wells with geological data
137	Appendix 4 - Revision of Peel River area geological data

Illustrations

Figures (in pockets [1, 3-7], [8-13], [14-18], [19, 20], [21, 22], [23, 24], [25], [26], [27], [28], [29])

8	1. Location and index map
	2. Diagrammatic, generalized time-lithostratigraphic cross-sections in the Great Bear River area
	3. Scenario of the Proterozoic subcrop and overlying Mount Clark Formation
	4. Isopach and lithofacies map of Mount Cap Formation
	5. Isopach, lithofacies and structure contour map of Saline River Formation
	6. Isopach and structure contour map of Ronning Group
	7. Isopach and lithofacies map of Franklin Mountain Formation
	8. Isopach and lithofacies map of Mount Kindle and Peel formations
	9. Isopach and structure contour map of the Devonian succession Delorme Group to Horn River Group
	10. Isopach and lithofacies map of the Delorme Group, the Tsetso and Tatsieta formations, and possible equivalents
	11. Isopach and lithofacies map of Fort Norman Formation
	12. Isopach and lithofacies map of Arnica and Landry formations
	13. Isopach and lithofacies map of the Hume Formation
	14. Isopach and lithofacies map of the Horn River Group and Ramparts Formation
	15. Isopach and lithofacies map of the Bluefish Member
	16. Isopach and lithofacies map of the Canol Formation
	17. Isopach and structure contour map of the Imperial Formation
	18. Subcrop-outcrop map of pre-Mesozoic rocks
	19. Pre-Ronning Group stratigraphic cross-section D-02 to G-22
	20. Pre-Ronning Group stratigraphic cross-section H-34 to E-11
	21. Ronning Group stratigraphic cross-section G-02 to G-60
	22. Ronning Group stratigraphic cross-section N-39 to G-60
	23. Ronning Group stratigraphic cross-section I-01 to F-62
	24. Devonian stratigraphic cross-section G-02 to G-52
	25. Devonian stratigraphic cross-section K-29 to F-62
	26. Devonian stratigraphic cross-section F-57m to K-71
	27. Devonian stratigraphic cross-section J-65 to G-70
	28. Devonian stratigraphic cross-section I-70d to G-52
	29. Upper Devonian stratigraphic cross-section G-12 to A-12

Table

6	1. Table of formations
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SUBSURFACE GEOLOGY OF PRE-MESOZOIC STRATA, GREAT BEAR RIVER MAP AREA, DISTRICT OF MACKENZIE

Abstract

The geological sequence in the subsurface of Great Bear River map area begins with the Proterozoic Hornby Bay Group on the east, separated by the Fort Norman structure from the Mackenzie Mountains Supergroup on the west. Overlying these unconformably are the Cambrian rocks of Good Hope Basin and Keele Trough, which straddle Mahony Arch and include three formations: the Mount Clark; the Mount Cap (Members a to h); and the Saline River (Lower clastic, Salt, and Upper clastic members). The Upper clastic strata grade into the lower Paleozoic carbonates of the Ronning Group, comprising three formations: the Franklin Mountain (Cyclic, Rhythmic, Cherty and Upper dolomite members); the Mount Kindle (Basal, Lower dark and Upper pale members); and the Peel (undivided). Pre-Devonian erosion exposed Cambrian rocks over Keele Arch. Above this regional unconformity lie, in the south, the Delorme Group comprising the Tsetso and Camsell formations, overlain by the Fort Norman Formation, which was deposited penecontemporaneously with the Tatsieta Formation to the northwest. Overlying these are the laterally equivalent Arnica (dolomite) and Landry (limestone) formations, superseded in turn by the Middle Devonian Hume Formation (Headless Member, Middle and Upper members) and the Givetian Horn River Group consisting of the Hare Indian Formation (Bluefish Member, Grey shale and Black shale members), the Ramparts Formation (Siltstone lentil, Platform and Reef members), and the Canol Formation (Allochthonous limestone). The Upper Devonian Imperial Formation, including the youngest rock unit below the sub-Mesozoic unconformity, contains the localized Canyon Creek sandstone and Jungle Creek limestone member.

The economic prospects of the Great Bear River map area include widespread hydrocarbon potential and the possibility of zinc, lead, and uranium oxide deposits.

Résumé

La séquence géologique souterraine de la région cartographique de Great Bear River commence avec le groupe protérozoïque de Hornby Bay à l'est, séparé par la structure de Fort Norman du supergroupe de Mackenzie Mountains à l'ouest. Au-dessus reposent en discordance les roches cambriennes du bassin de Good Hope et la dépression de Keele qui chevauche l'arche de Mahony et qui comprend trois formations : Mount Clark; Mount Cap (membres de a à h); et Saline River (membres inférieur clastique, salifère et supérieur clastique). Les couches du membre supérieur clastique se transforment en roches carbonatées du Paléozoïque inférieur du groupe de Ronning, comprenant trois formations : Franklin Mountain (membres cyclique, rythmique, chertoux et supérieur à dolomie); Mount Kindle (membre basal, inférieur foncé et supérieur pâle); et Peel (non divisé). L'érosion pré-dévonienne a mis à jour les roches cambriennes au-dessus de l'arche Keele. Au-dessus de cette discordance régionale repose au sud le groupe de Delorme comprenant les formations de Tsetso et Camsell sous-jacentes à la formation de Fort Norman qui a été mise en place en même temps que la formation de Tatsieta au nord-ouest. Reposent sur ces formations, les formations latéralement équivalentes d'Arnica (dolomie) et de Landry (calcaire), remplacées à leur tour par la formation de Hume du Dévonien moyen (membre de Headless, membres intermédiaire et supérieur) et le groupe givétien de Horn River composé de la formation de Hare Indian (membre de Bluefish, membres à schiste argileux gris et à schiste argileux noir), la formation de Ramparts (membres à lentille de pélite, de plate-forme et de récif) et la formation de Canol (calcaire allochtone). La formation d'Imperial du Dévonien supérieur, comprenant l'unité rocheuses la plus récente au-dessous de la discordance submésozoïque, contient le grès localisé de Canyon Creek et le membre calcaire de Jungle Creek.

La région cartographique de Great Bear River présente d'immenses possibilités de gisements d'hydrocarbures et de gisements probables de zinc, de plomb et d'oxyde d'uranium.

Summary

The oldest rocks drilled so far in the Great Bear River map area occur on the eastern side, are of Proterozoic age, and correlate with the Hornby Bay Group, which outcrops in the Coppermine area to the northeast. Juxtaposed with these rocks in the subsurface to the west, across the Precambrian Fort Norman structure are younger Proterozoic carbonate and clastic rocks belonging to the Mackenzie Mountains Supergroup.

Basal Cambrian quartzose sands of the Mount Clark Formation were deposited in Good Hope Sub-basin in paleodepressions in the Precambrian erosion surface. Mackenzie Arch provided a barrier to open marine circulation. Northeast of this arch Keele Trough was separated from Good Hope Sub-basin by a partial barrier, the Mahony Arch. The Mount Cap Formation was deposited as a series of alternating glauconitic shales and carbonates in the Good Hope Sub-basin (Members a to h) and as a thick shale facies in the Keele Trough. Increasingly hypersaline conditions followed, which gave rise to the Upper Cambrian Salt member of the Saline River Formation sandwiched between the Lower and Upper clastic members.

Lower Paleozoic carbonates developed over the entire Mackenzie Platform area. They constitute the Ronning Group, which is composed of three formations: the Upper Cambrian to Lower Ordovician Franklin Mountain Formation, comprising Cyclic, Rhythmic, Cherty and Upper dolomite members; the Upper Ordovician to Silurian Mount Kindle Formation, undivided except east of Keele Arch where, in Great Bear Basin, it is subdivided into Basal dark and Upper pale members; and the Upper Silurian to Lower Devonian Peel Formation in the northwest.

Pre-Devonian erosion is demonstrated by a regional unconformity at the top of Ronning Group rocks. Erosion over Keele Arch exposed Upper Cambrian sandy dolomites and possibly also Middle Cambrian shales. Deposition of the Delorme Group took place during the subsequent marine transgression in the south, and consisted of silty carbonates and clastics (Tsetso Formation) and thick sequences of silty evaporites (Camsell Formation). To the northwest, Lower Devonian shallow marine limestone and shale (Tatsieta Formation) were deposited on the Peel Formation, penecontemporaneously with the precipitation of anhydrite (Fort Norman Formation) in the south. Subsequently, the whole of the Mackenzie Platform supported the development of brown sucrosic dolomite (Arnica Formation) and its laterally equivalent brown pelletal limestone (Landry Formation). These were superseded by a regionally uniform series of argillaceous bioclastic limestones and shales of the Middle Devonian Hume Formation, consisting of the Headless Member and Middle and Upper members. Keele Arch remained a positive, possibly submarine feature supplying some fine clastic material to the surrounding sediments.

The Givetian interlude on the northwestern shelf area of continental North America is represented by the Horn River Group, consisting of: the Hare Indian (Bluefish Member, Grey shale and Black shale members); Ramparts (Siltstone lentil, Platform and Reef members); and Canol (with basal Allochthonous limestone locally on reef flanks) formations.

Late Devonian time on the shelf area featured Imperial Formation clastics, very fine grained at first, and becoming increasingly more silty and sandy. Canyon Creek sandstone lentil is one localized sand deposit, and Jungle Ridge limestone member is a thin but more extensive unit, which possibly outcrops southward as bioclastic and reefy limestone in Dahadinni River area. The Imperial Formation is the youngest rock unit below the sub-Mesozoic unconformity.

The economic prospects of the Great Bear River area include widespread hydrocarbon potential and the possibility of zinc, lead, and uranium oxide deposits.

Sommaire

Les roches les plus anciennes forées à ce jour dans le région cartographique de Great Bear River se trouvent du côté est, sont d'âge protérozoïque et correspondent au groupe de Hornby Bay qui affleure dans la zone de Coppermine au nord-est. Juxtaposées à ces roches, sous la surface vers l'ouest, à travers la structure précambrienne de Fort Norman, se trouvent des roches carbonatées et clastiques protérozoïques plus récentes faisant partie du supergroupe de Mackenzie Mountains.

Des sables quartzeux d'âge cambrien provenant de la base de la formation de Mount Clark se sont déposés dans le sous-bassin de Good Hope dans des paléodépressions de la surface d'érosion précambrienne. L'arche de Mackenzie a obstrué la libre circulation des eaux marine. Au nord-est de cette arche, la dépression de Keele était séparée du sous-bassin de Good Hope par une barrière partielle, l'arche de Mahony. La formation de Mount Cap a été mise en place en une série de couches alternates de schistes argileux et de roches carbonatées glauconitiques dans le sous-bassin de Good Hope (membres a à h) et en un épais faciès de schistes argileux dans la dépression de Keele. Des conditions de plus en plus sursalées ont suivi, donnant naissance au membre salifère du Cambrien supérieur de la formation de Saline River coincé entre les membres clastiques inférieur et supérieur.

Des roches carbonatées du Paléozoïque inférieur se sont formées sur toute la zone de la plate-forme du Mackenzie. Elles constituent le groupe de Ronning qui se compose de trois formations : la formation de Franklin Mountain du Cambrien supérieur à l'Ordovicien inférieur, comprenant des membres cyclique, rythmique, chertueux et supérieur à dolomie; la formation de Mount Kindle de l'Ordovicien supérieur au Silurien, non divisée sauf à l'est de l'arche de Keele où, dans le bassin de Great Bear, elle se subdivise en deux membres, basal foncé et supérieur pale; et la formation de Peel du Silurien supérieur au Dévonien inférieur dans le nord-ouest.

L'érosion prédévonienne est mise en évidence par une discordance régionale au sommet des roches du groupe de Ronning. L'érosion au-dessus de l'arche de Keele a mis au jour des dolomies sableuses du Cambrien supérieur et peut-être également des schistes argileux du Cambrien moyen. La sédimentation du groupe de Delorme a eu lieu pendant la transgression marine subséquente dans le sud; il se compose de roches carbonatées et de roches clastiques silteuses (formation de Tsetso) et d'épaisses séquence d'évaporites silteuses (formation de Camsell). Au nord-ouest, les calcaires et les schistes argileux marins peu profonds mis en place en milieu Dévonien inférieur (formation de Tatsieta) se sont déposés sur la formation de Peel, en même temps que la précipitation d'anhydrites (formation de Fort Norman) dans le sud. Par la suite, une dolomie saccharoïde brune (formation d'Arnica) et son calcaire graveleux brun latéralement équivalent (formation de Landry) se sont formés sur toute la plate-forme du Mackenzie. Ces derniers ont été remplacés par une série régionalement uniforme de calcaires et de schistes argileux bioclastiques de la formation de Hume du Dévonien moyen, composée du membre de Headless et des membres intermédiaire et supérieur. L'arche de Keele est demeurée un élément de soulèvement d'origine probablement sous-marine fournissant une certaine quantité de matériaux clastiques fins aux sédiments environnants.

L'interlude givétien sur la plate-forme nord-ouest de l'Amérique de Nord continentale est représenté par le groupe de Horn River composé des formations suivantes : Hare Indian (membre de Bluefish, membres à schiste argileux gris et à schiste argileux noir); Ramparts (membres à lentille de pélite, de plate-forme et de récif); et Canol (comportant du calcaire allochtone basal par endorits sur les flancs de récifs).

Au cours de Dévonien supérieur, les roches clastiques de la formation d'Imperial ont été mise en place sur la plate-forme, leur granulométrie très fine du début devenant graduellement plus silteuses et sableuse. La lentille de grès de Canyon Creek est un dépôt de sable localisé et le membre calcaire de Jungle Ridge est une unité mince mais étendue qui affleure probablement vers le sud en calcaire bioclastique et récifal dans la zone de la rivière Dahadinni. La formation d'Imperial est l'unité rocheuses la plus récente située au-dessous de la discordance sub-mésozoïque.

La zone de Great Bear River présente d'immenses possibilités de gisements d'hydrocarbures et de gisements probables de zinc, de plomb et d'oxyde d'uranium.

INTRODUCTION

Study area

Great Bear River map area is bounded by the 64th and 68th parallels north latitude and by the 112th and 128th meridians west longitude. The area includes much of the northern interior plains as well as, in the south, the Franklin Mountains, part of the Mackenzie Mountains, and, between them, the intermontane Mackenzie Plain. The eastern boundary of the study area is the mapped contact between Paleozoic rocks and the underlying rocks of the Precambrian Shield east of approximately the 119th meridian. The study, however, has been taken beyond the remaining three boundaries of Great Bear River map area to the 63rd parallel, in order to provide optimum integration by overlap with concurrent stratigraphic studies to the south; to the 130th meridian, for smooth continuity with recently published subsurface maps of the Peel River map area to the west (Pugh, 1983); and, for the sake of completeness, north to the coastline of the Arctic Ocean. Subsurface geology of the study area is illustrated on seventeen isopach, lithofacies, subcrop and superimposed structure contour maps, eleven stratigraphic cross-sections, and one time-lithostratigraphic cross-section.

Previous work

The list of previous geological studies presented in the Peel River report (Pugh, 1983) essentially applies to the Great Bear River map area. McConnell (1889) was the pioneer in this area, and it was not until after the discovery of oil in Norman Wells in 1920 that the results of more detailed geological investigations were published: Kindle and Bosworth (1921); Williams (1922, 1923) and Hume (1923). Some twenty years later the war-motivated boost to oil exploration in the Norman Wells area resulted in the unpublished reports of the Canol Project, and the published work of Hume and Link (1945). Hume's timely, 1954, report, which summarized thirty years of geological work in the lower Mackenzie River area, was the forerunner of many studies by industry geologists. Those pertinent to the present stratigraphic study were subsequently reviewed and summarized by Tassonyi (1969), whose report on the subsurface geology of the region included detailed discussions on the problems of stratigraphic nomenclature that had arisen throughout the years.

Most of the more recently published geological maps and stratigraphic studies referred to in this work are the result of helicopter-supported fieldwork by the Geological Survey of Canada, namely, Operation Mackenzie (1957) and Operation Norman (1968-69). During half a century of exploratory drilling, geological mapping and stratigraphic work, there was growing need for a broad, integrative, regional study of geological history and economic potential. The work of Pugh (1983) aimed to satisfy that need for a study of pre-Mesozoic geology in the Peel River map area, from the Alaska international border to Mackenzie River. Twenty-six formal (including five new) and fifteen informal names were applied regionally to the pre-Mesozoic stratigraphy.

Present study

The present work is a logical continuation of the Peel River map area study (Pugh, 1983), and the established set of pre-Mesozoic nomenclature is carried east to the

Precambrian Shield, north to the Arctic Ocean, and south to correlate with stratigraphic names from south of Great Bear Plain. The present report, therefore, is a companion volume to the previous report, and the same format of presentation is used throughout. Knowledge of the earlier report is recommended for full appreciation of the present material.

Data used for this study were recorded from wells drilled for oil and gas. All boreholes that were drilled within the study area (excluding Norman Wells field) and released from confidential status, as reported in the Schedule of Wells by Canada Department of Northern Affairs and National Resources, were considered. Between 1980 and 1982 a regional correlation network was established, based on radioactivity well logs (or electric logs in the case of older wells) and examination of all available drill cuttings. All 79 wells are listed in Appendix 3 along with basic geological data.

Acknowledgments

For valuable sharing of information and ideas the writer is most grateful to colleagues J.D. Aitken (Proterozoic stratigraphy and structures), D.G. Cook (outcrop information and structural geology), J. Dixon (Cambrian stratigraphy), N.C. Meijer Drees (Devonian stratigraphy), D. Morrow (Silurian-Devonian nomenclature) and G.K. Williams (Devonian stratigraphic problems).

T.T. Uyeno examined samples from E-30¹, N-62, and O-13 for Ordovician conodonts. These results, together with previously unpublished paleontological results of W.H. Fritz, D.C. McGregor, A.E.H. Pedder, G.O. Raasch, A.R. Sweet, and T.T. Uyeno, are contained in Appendix 1. Valuable technical assistance by Elspeth G. Snow with the initial drafting is especially acknowledged.

For their constructive comments and suggestions the writer is indebted to critical readers, J.D. Aitken, D.G. Cook, N.J. McMillan, D. Morrow, and B.S. Norford.

Borehole reference system

Boreholes have been assigned brief reference numbers using their "unit-section" locations (Canada Department of Indian Affairs and National Resources, 1985), a simple and highly practical system for repeated reference to borehole sections (see Pugh, 1983, p. 2).

Figure 1 includes well locations with the unit/section references. In Appendix 3 all wells are listed in alphabetical and numerical order of well reference (A-12, A-16, A-23, . . .), and information includes well name and location by latitude-longitude and by Yukon Territory and Northwest Territories Land Survey System.

Metric conversion

All relevant subsea elevations and thicknesses are presented in both metric and Imperial units of measurement. This dual "m(ft)" designation successfully bridges the conversion gap between metric units, in the text and on the maps (Figs. 3-18), and borehole footages in Appendices 1 and 2 and on the logs shown on stratigraphic cross-sections (Figs. 19-29).

¹Borehole reference number – see under following heading.

STRATIGRAPHY

General

In the present study area two major regional unconformities within the pre-Mesozoic succession are used to divide the stratigraphy into three intervals for separate consideration: Precambrian; Cambrian-Silurian; and Silurian-Devonian. Precambrian strata underlie the entire study area and the distribution of these units can only be accounted for by the buried Fort Norman structure of Aitken and Pugh (1984). Cambrian to Silurian strata cover most of the area and are related to at least two paleostructures, Keele Arch (Cook, 1975) and Mahony Arch (new name). Silurian and Devonian rocks, although relatively sparsely represented in the northern half of the study area, form a dozen major rock units in the south. Silurian and Devonian lithofacies include a wide variety of carbonates, evaporites and fine and coarse grained clastic rocks, with thicknesses ranging from zero on the Keele Arch to an aggregate of more than 5000 m below the Mackenzie Plain.

Nomenclature

Tassonyi's (1969) investigation of subsurface geology in the lower Mackenzie River and Anderson River area, and his comprehensive discussions of stratigraphic nomenclature provided the firm basis upon which the regional stratigraphy west of the Mackenzie River was developed (Pugh, 1983). Of the twenty-six formal and fifteen informal names that make up that nomenclatural system, eighteen of the formally named and eleven informally named units extend into the present study area. In addition, four formal rock units from the south are recognized in this report and twenty informal names either originate within, or may be carried north into, this study area. Of the thirty-one informal members nine are new members (this report). A total, therefore, of twenty-two formal and thirty-one informal names constitute the pre-Mesozoic stratigraphic nomenclature for Great Bear River map area. These fifty-three names are listed in the legend of Appendix 3 and are described briefly in the Table of Formations (Table 1). The stratigraphic relationships within the present nomenclatural system are illustrated diagrammatically in Figure 2.

Precambrian stratigraphy

Fifteen boreholes within the study area penetrate Precambrian strata. Of these, eleven reached total depth in beds readily assignable to either the Shale unit or the Dolomite unit of Pugh (1983). Southeast of what has been named the Fort Norman structure (Aitken and Pugh, 1984) the remaining four boreholes were completed in Precambrian rocks very different from those encountered anywhere northwest of the structure. At all four locations these rocks are assigned to Unit 1 of the Cap Mountain section (Aitken et al., 1973).

Proterozoic (see Figures 3, 19, 20)

Unit 1 (Cap Mountain)

Exposed in outcrop at Cap Mountain in the southern Franklin Mountains, four Precambrian units were recognized by Douglas and Norris (1963, 1974) and were described by Aitken et al. (1973). The oldest of these, consisting of purple mudstones with minor amounts of dolomite and sandstone, was called Unit 1.

At borehole E-11¹, only 30 km from Cap Mountain, the 13.4 m of Precambrian rocks at the bottom of the borehole consist of red, purple, brown and green shale, grading to sandstone and argillaceous dolomite. These beds are overlain by the Lower Cambrian Mount Clark Formation. In another borehole in the same general area, G-52, 40 km from E-11, there are 107 m of strata below the Mount Clark Formation; these beds are purple and green and consist of a lower sequence of dolomite, shale, siltstone and sandstone and an upper dolomite. The sections at E-11 and G-52 have both been equated with Unit 1 at Cap Mountain (Aitken and Pugh, 1984).

Borehole G-22, more than 200 km north of G-52, penetrated 22.3 m of red, purple and green shale, dolomite and chert below the base of the Mount Clark Formation. These beds, too, are assigned to Unit 1 at Cap Mountain on the basis of their close lithological resemblance to those at E-11 and G-52, and their total dissimilarity to strata in much closer sections northwest of the Fort Norman structure (see Figure 3). An interesting section at D-61, located even closer to the Fort Norman structure as it is drawn on Figure 3, reveals Upper Cambrian beds (Saline River Formation) lying directly on 170.1 m (drilled section) of highly siliceous, pale grey-green "shale". Drill cuttings are "sparkly", giving the appearance of being from metamorphosed rock. The presence of altered Precambrian sediments at this location may confirm the close proximity of the Fort Norman structure.

If the rocks at D-61 are, in fact, altered, from which strata were they derived? Cambrian aged strata seem highly unlikely, especially as Lower and Middle Cambrian beds (Mount Clark and Mount Cap formations) are indisputably missing only 35 km away at I-74 (see cross-section, Figure 20). If then, the altered rocks are of Precambrian origin, they certainly bear no resemblance to the Dolomite unit that is present at I-74, or indeed little similarity to any of the Precambrian rocks northwest of the Fort Norman structure. The D-61 "shale", therefore, appears to be related to the Precambrian southeast of the structure. There, the three Precambrian subsurface sections (at G-52, E-11, and G-22), although predominantly red in colour, do include some green shale (as noted above). For this reason, and for lack of compelling evidence to suggest correlation with any of the other three units at Cap Mountain, as they are described by Aitken et al. (1973), the D-61 "shale" is possibly related to the strata at G-52 etc., and, therefore, also is tentatively assigned to Unit 1.

Unit 1 at Cap Mountain has been correlated (Aitken and Pugh, 1984) with parts of Unit 9 of the Helikian Hornby Bay Group (Kerans et al., 1981) outcropping east and north of Great Bear Lake.

Shale unit

The informal term, "Shale unit", was introduced by Pugh (1983, p. 3) to refer to "siliceous fine clastic rocks underlying a dolomite-siltstone-shale sequence... represented by one incomplete borehole section (D-40) in the northeastern corner of the map-area". This 198 m thick section consists of two siliceous shale and siltstone units separated by a thin siliceous limestone.

Seven subsurface sections in the northwestern part of the present study area contain rocks that are related to the Shale unit, according to evidence presented below. First, the borehole at M-63, 158 km from D-40, which was drilled to

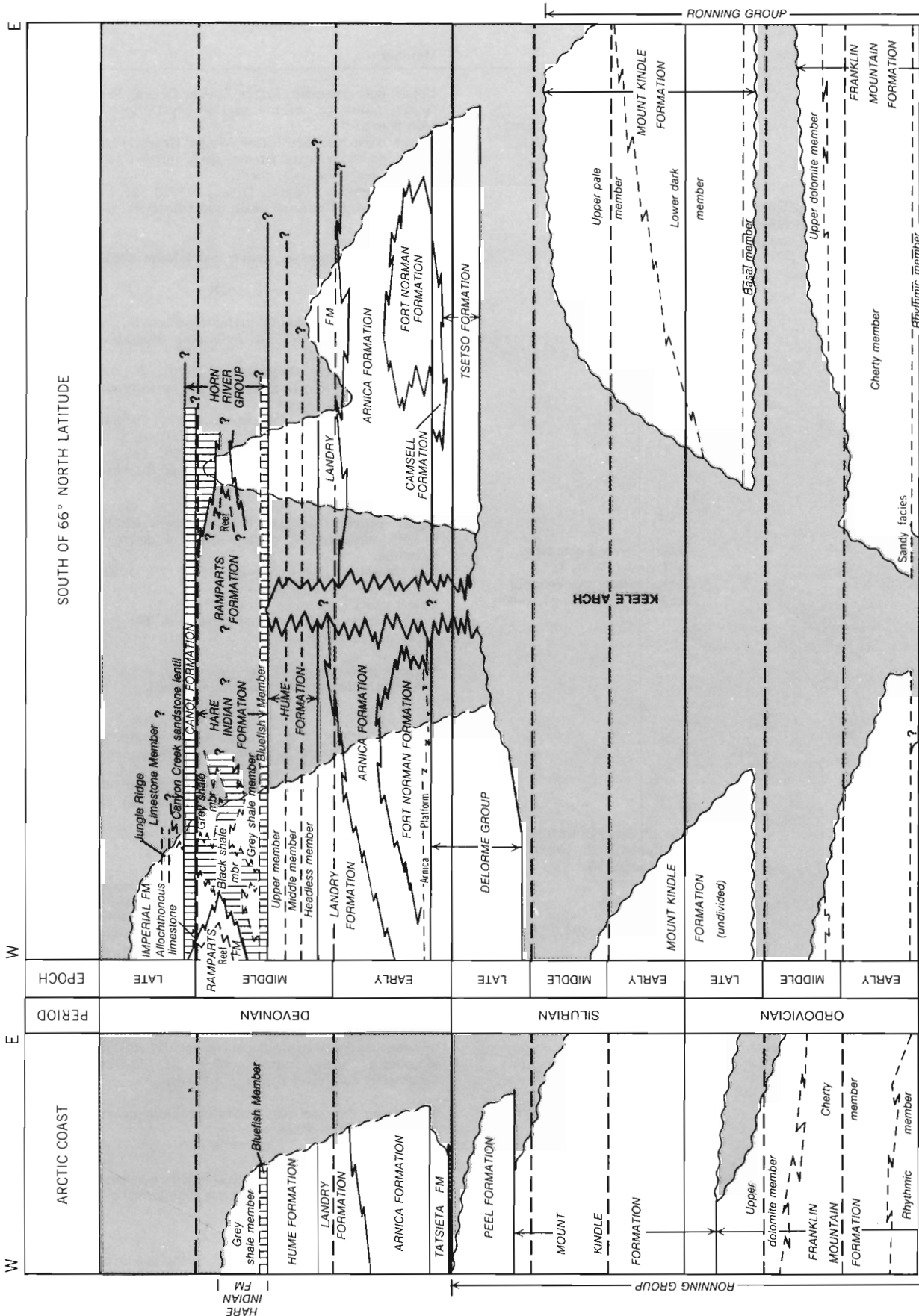
¹Borehole section reference number (see Appendix 3) = E-11-63-50-123-00; Y.T. and N.W.T. Land Survey System.

TABLE 1
Table of Formations

System or stage	Rock unit name, author and thickest borehole section (in metres)		Lithology
	Group	Formation	Member
Upper Devonian		Imperial Formation, Hume and Link (1945) and Bassett (1961), 1072.0 at A-28 ¹	Shale and siltstone: dark grey; some very fine grained sandstone. Jungle Ridge limestone member (Hume and Link, 1945) 39.3 at I-07L: limestone, argillaceous and silty. Canyon Creek sandstone lentil (Stewart, 1945) 33.5 at G-78: sandstone, very fine grained.
-- ? --		Canol Formation, Bassett (1961), 92.0 at J-48	Shale: black, bituminous, pyritic; locally argillaceous dolomite, limestone or siltstone at the top. Allochthonous limestone (MacKenzie, 1970) 21.9 at J-48: basal reef and echinoderm debris.
	Horn River Group Whittaker (1922) 387.7 at A-16	Ramparts Formation, Kindle and Bosworth (1921), 170.7 at H-15	Reef member (Tassonyi, 1969) 129.8 at H-40: reef and bioclastic limestones. Platform member (Tassonyi, 1969) 41.1 at H-15: limestone, bioclastic, some fragmental, locally silty. Siltstone lentil (Pugh, 1983) 29.0 at H-77: siltstone, calcareous.
Middle Devonian		Hare Indian Formation, Kindle and Bosworth (1921), 325.8 at A-12	Grey shale member (Pugh, 1983) 318.2 at A-12: shale, grey, dark grey, variably calcareous, micromicaceous. Black shale member (new name) 229.8 at G-51p: shale, black, variably calcareous, locally micromicaceous. Bluefish Member (Pugh, 1983) 63.4 at G-51p: shale, black, bituminous, noncalcareous, with black argillaceous limestone and/or crystalline calcite at base.
		Hume Formation, Bassett (1961), 285.3 at G-51p	Upper member (Tassonyi, 1969) 88.4 at G-51p: limestone, bioclastic, fossiliferous, locally argillaceous. Middle member (Tassonyi, 1969) 123.4 at I-54w: limestone and, in the upper half, interbedded calcareous shale. Headless Member (Headless Formation, Douglas and Norris, 1961) 80.5 at M-43: limestone and interbedded grey and black calcareous shale.
Middle Devonian	Arnica (including Arnica Platform) and Landry, 1581.9 at I-70d	Landry Formation, Douglas and Norris (1961)	Limestone: buff, brown, aphanitic and pelletal.
		Arnica Formation, Douglas and Norris (1961)	Dolomite: brown, buff, grey, micro- to fine-crystalline, in part sucrosic; locally at top includes Manetoe dolomite (Douglas and Norris, 1961), grey, fine to coarse crystalline.
		Fort Norman Formation, Meijer Drees (in press), 1443.2 (structurally thickened?) at M-43	Anhydrite; some dolomite.
Lower Devonian		Arnica Platform, Williams (1975), 219.5 at I-70d	Dolomite: generally microcrystalline, dark grey to black, brown or bluff.
Lower Devonian		Tatsieta Formation, Pugh (1983), 17.7 at G-02 (only section)	Limestone: aphanitic; pale buff; shale: micropyrritic, pale green; dolomite: microcrystalline, white.
	Delorme Group Douglas and Norris (1961), Morrow (in press) >2066.5 at I-70d	Camsell Formation Douglas and Norris (1961)	Anhydrite; silty carbonate.
		Tsetso Formation, Meijer Drees (in >359.7 at O-13	Dolomite: microcrystalline to aphanitic; pale grey, pale buff, varicoloured; anhydrite; shale: varicoloured; sandstone: very fine to coarse grained; siltstone.
Upper Silurian		Peel Formation, Pugh (1983), 355.7 at G-02	Dolomite: in part microsucrosic, some medium crystalline; pale grey and pale buff; some shale.
Lower Silurian or later			Dolomite: micro- to medium-crystalline; brown, buff; locally some chert. OR

¹ Borehole section reference number (see Appendix 3) = A-28-64-10-125-00, Y.T. and N.W.T. Land Survey System.

System or stage	Rock unit name, author and thickest borehole section (in metres)		Lithology
	Group	Formation	
Upper Ordovician	Ronning Group, Stewart (1944), >1373.7 at G-02	Mount Kindle Formation, Williams (1922), >361.2 at G-7J	Upper pale member (after Meijer Drees, 1975) 89.9 at G-52: dolomite, micro- to fine-crystalline; buff; trace pale chert. Lower dark member (after Meijer Drees, 1975) 142.6 at G-52: dolomite, dark brown-grey; micro- to very fine-crystalline; some dark chert. Basal member (Meijer Drees, 1975) 25.9 at G-60: dolomite, argillaceous; shale and siltstone: dark grey to black.
Lower Ordovician or later			Dolomite; limestone; chert; sandstone; shale; red and green colouring. OR
Upper Cambrian		Franklin Mountain Formation, Williams (1922), 1053.7 at E-15	Upper dolomite member (after MacKenzie, 1974b) 315.5 at G-02: dolomite, fine to coarse crystalline, creamy white to pale buff. Cherty member (Macqueen, 1970) 753.5 at E-15: dolomite, fine to coarse crystalline, with chert, silicified oolites and clear quartz. Rhythmic member (Macqueen, 1970) 373.1 at D-45: dolomite, very fine to medium crystalline, brown, grey. Cyclic member (Macqueen, 1970) 130.5 at L-66: dolomite, argillaceous, brown, grey; interbedded shale increasing downward.
Upper Cambrian		Saline River Formation, Williams (1923), 885.4 (structurally thickened?) at N-28, or 448.4 at A-40	Upper clastic member (Meijer Drees, 1975) 119.8 at E-15: varicoloured shale; some dolomite, anhydrite, siltstone. Salt member (Meijer Drees, 1975) 795.5 at N-28, or 313.6 at A-40: halite. Lower clastic member (Meijer Drees, 1975) 43.6 at K-44: shale; some dolomite, anhydrite; in the south, some siltstone, sandstone. Shale: grey to green and brown; in upper part, some dolomite, microcrystalline (shale facies). OR
Middle Cambrian		Mount Cap Formation, Williams (1922, 1923), 298.4 at A-40 OR Shale facies >595.0 at L-04	Member h (new name) 36.3 at M-48: shale, green, dark green, grey-brown; some dolomite, buff, brown, micro-crystalline. Member g (new name) 26.3 at A-40: dolomite, micro- to medium-crystalline, buff to brown, oolitic; chert; some shale, dark green, black. Member f (new name) 36.6 at M-48: shale, green, dark green, black; some dolomite, glauconitic. Member e (new name) 18.9 at D-02: dolomite, brown, glauconitic; limestone; siltstone; shale; locally chert. Member d (new name) 39.6 at D-02: shale, green, dark green, dark grey, black; locally some dolomite; rare siltstone. Member c (new name) 17.4 at D-45: dolomite, brown, micro- to medium-crystalline; some shale, green. Member b (new name) 82.3 at A-40: shale; siltstone: micaceous; dolomite; glauconite; locally sandstone. Member a (new name) 47.9 at D-02: siltstone; sandstone; dolomite; shale: glauconitic.
Lower Cambrian		Mount Clark Formation, Williams (1923), 64.3 at G-22	Sandstone: fine to very coarse grained, quartzose; rare siltstone and red shale.
Proterozoic	Mackenzie Mountains Supergroup, Aitken (1981)	Dolomite unit, Pugh (1983) =Map-unit H1, Aitken et al. (date) 112.2 at M-63 (only complete section)	Dolomite: buff, pink with thin blood-red streaks; locally oolitic chert; in lower part some shale, varicoloured.
		Shale unit, Pugh (1983), >298.1 at E-15	Siltstone; shale; sandstone; orthoquartzite; locally conglomerate in lower part; upper part shale.
	Hornby Bay Group	Unit 1 (Cap Mountain), Aitken et al. (1973)	Shale; dolomite; sandstone; siltstone: all varicoloured.



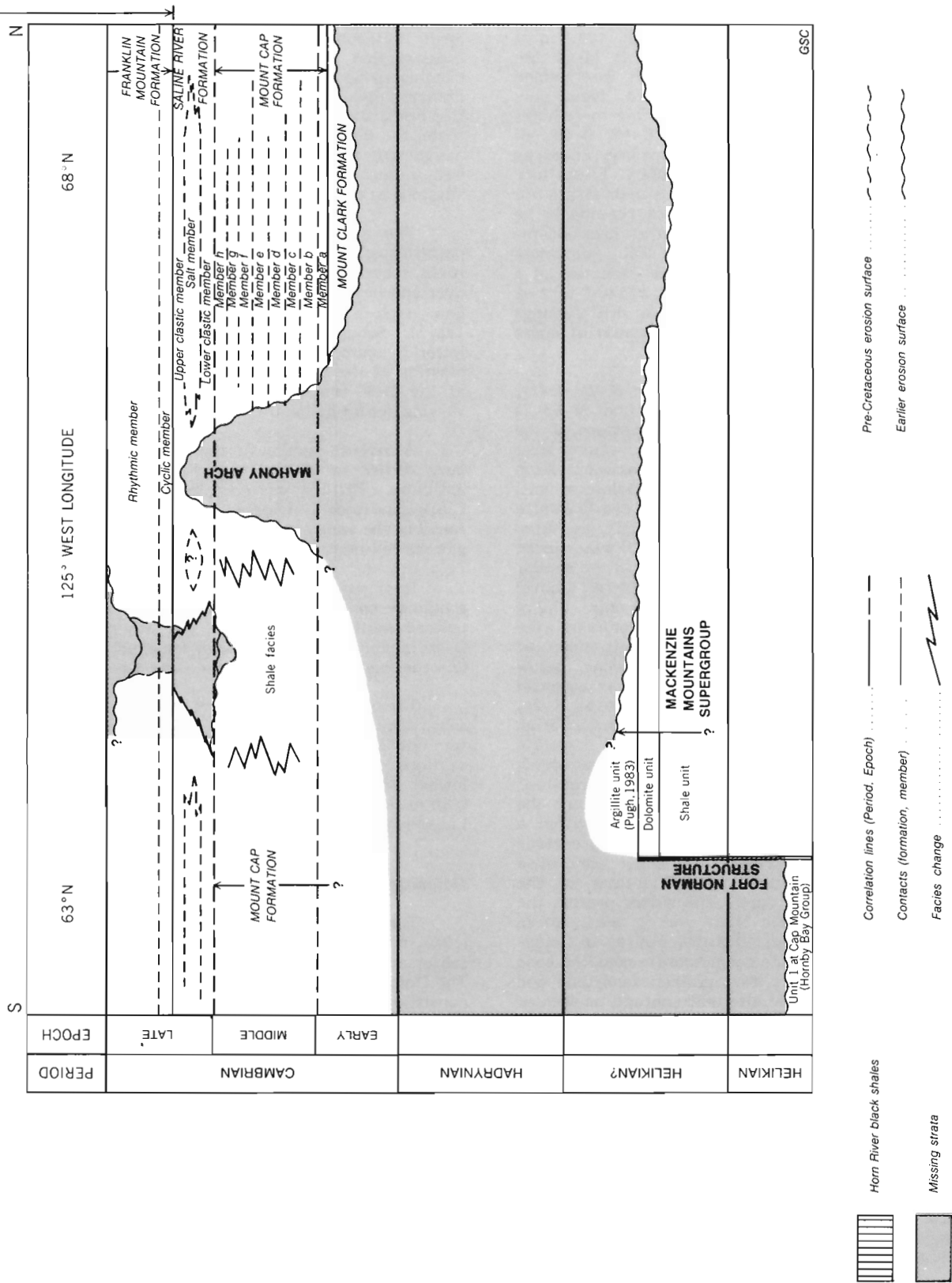


Figure 2. Diagrammatic, generalized time-lithostratigraphic cross-sections in the Great Bear River Group.

more than 200 m below the base of Lower Cambrian sandstone, exposed a section resembling the reference section for the Shale unit at D-40 (Pugh, 1983): 108.5 m of very dark brown-grey to black, hard shale at M-63 are overlain by a brick-red dolomite unit with interbedded varicoloured shale decreasing in amount upward. Next, only 22 km north of M-63 is the nearest (E-15) of four more holes bored into Precambrian beds (K-24, L-21, E-15, D-45, all shown on the cross-section in Figure 19), exposing sequences of alternating siltstone, sandstone and shale. These four sections are close enough to one another and their strata are so similar that their intercorrelation cannot reasonably be doubted, even though there seems to be no obvious bed-to-bed correlation between them (see Figure 19). Maximum grain size is fine or very fine sand, with the exception of a 7 m thick conglomerate near the base of the thickest section (at K-24). The conglomerate is represented in drill cuttings by sandstone chips and fragments of larger clasts of chert and quartz.

The relationship between the sections at K-24, L-21, E-15 and D-45 and the sections at D-40 and M-63 is considered in the framework of the regional pattern of the Proterozoic subcrop. Progressively older formations have been shown (Pugh, 1983) to subcrop northeastward from Mackenzie Arch, the oldest subcrop being the Dolomite unit. The actual oldest beds encountered underlying the Dolomite unit at D-40 were referred to as the Shale unit, as noted above. The top of this Shale unit at D-40 was placed (op. cit.) 244 m below the Proterozoic subcrop. In the similar dolomite-above-shale section at M-63 (considered above) which is east-southeast of D-40, the shale top is only 112.2 m below the Precambrian surface. This confirms the expectation that northeastward the Dolomite unit thins and the Shale unit is eventually found subcropping below Cambrian strata. What, in fact, is found, is that borehole sections of Precambrian siltstone-sandstone-shale at K-24, L-21, E-15, and D-45 immediately underlie Lower Cambrian beds. How do these expected Shale unit subcrops correlate with the predominantly shale sections at D-40 and M-63, which can readily be accepted as stratigraphically related? To explain in terms of a facies change would require the change to take place between M-63 and E-15, within a distance of only 20 km. Alternatively, the shales preserved at D-40 and M-63 could represent the upper part of a sequence for which the coarser clastic sections to the northeast represent the lower part. The writer prefers the latter explanation, in which the Shale unit is seen, not in terms of laterally rapid facies changes, but as a fining-upward clastic sequence from the conglomerate near the base of K-24 section, through very fine grained sandstone and siltstone to shale below the Dolomite unit contact, as seen at D-40 and M-63.¹

Farther northeastward, 75 km from D-45, dolomite reappears at the Proterozoic subcrop below Lower Cambrian sandstone. The presence of shale, interbedded with pink, grey and brown dolomite, may indicate the lower part of the Dolomite unit (see under the following heading) and the Shale unit not far below subcrop. From the presence of the Dolomite unit both to the northeast and to the southwest of the Shale unit subcrops (at K-24, L-21, E-15, and D-45) an anticlinal structure is inferred. Assuming that the top of the Shale unit is, in fact, not far below the subcrop at K-44, the northeastern Shale unit/Dolomite unit boundary is believed to

be near that location (see Figure 3). As it is drawn, that boundary also includes a Precambrian section at D-02 as a Shale unit subcrop. The D-02 section, also shown on the cross-section in Figure 19, is the sixth of the seven candidates with strata for placement in the Shale unit, and immediately underlies Lower and Middle Cambrian Mount Cap beds, and consists of maroon, brown and green very silty shale; the shale section is incomplete at 51.2 m thickness. Its assignment to the Shale unit is on the basis of correlation with maroon, purple-brown and green shales interbedded with siltstone in the upper part of the Shale unit section at K-24.

The present study, therefore, extends the regional pattern northeastward from progressively older Proterozoic rocks subcropping northeastward from the Mackenzie Arch over and beyond an anticlinal structure (referred to as Great Bear Arch in Aitken and Pugh [1984, Figure 1, after Young, 1981]). Subcropping along the core of the anticline are the lower(?) coarser beds of the Shale unit; the upper(?) finer clastics of the Shale unit are found preserved on the flanks, at the D-02 subcropping and at D-40, M-63 and K-44, at varying depths below the Dolomite unit.

A seventh section of the Shale unit is thought to have been drilled at M-48, located as it is at the core of the anticline. Drilling was completed 49.4 m below the Mount Clark sandstone. However, no obvious "new lithology" was found in the very poor samples (cavings) corresponding to the gamma ray-neutron trace indicative of Precambrian beds.

It is suggested that the Shale unit reference section should be compounded from the 298 m coarsening- to fining-upward section at E-15, and the original shale section at D-40 in which the contact with the overlying shaly lower part (? - see Pugh, 1983, p. 7) of the Dolomite unit is shown.

The Shale unit, the oldest known Proterozoic unit in the subsurface north of the Fort Norman structure (Fig. 3), has so far not been equated more closely with known outcrop sections other than to establish that it is "sub-H1", the lowest formation of the Mackenzie Mountain Supergroup (Aitken et al., 1982). The age of the "sub-H1" is Middle or Late Proterozoic (Young et al., 1979, 1982).

Dolomite unit

The informal name, Dolomite unit, was used by Pugh (1983, p. 3) to refer to varicoloured dolomite found in five subsurface sections below the sub-Cambrian unconformity. The Dolomite unit was stated (*ibid.*) to be easily recognized, consisting of "microcrystalline to aphanitic dolomite, coloured pink, yellow, buff, pale green, grey or white, and in part with characteristic blood-red streaks. Chert was found in three of the sections, in one of which . . . the chert replaces oolite". . . No reference section was selected. At a sixth borehole location, D-40, a section "of silicified dolomite and siltstone and some red and dark grey shale and one 6 m-bed of black argillite", it was argued (*ibid.* p. 7), may represent a lower member of the Dolomite unit.

Five borehole sections of Precambrian dolomite in the northwestern part of the present study area are readily equatable to the sections above, which are assigned to the Dolomite unit. Those at H-34 and I-74 (see Figure 3, and

¹It may seem inappropriate to expand the vertical range of the strata to which the term "Shale unit" applies, to include older beds which are predominantly siltstone and sandstone. However, a very simple designation is the only practical requirement for the subsurface Proterozoic units at this stage of investigation. "Shale unit" suffices for these "sub-H1" - equated beds until the time is ripe for formal stratigraphic assignment.

cross-section, Fig. 20) display pink or red colouring and thin, blood-red streaks. A third section, at A-40, consists of pink to buff dolomite and oolitic chert.

The other two sections (K-44, M-63) were discussed under the previous heading with reference to the underlying Shale unit. At K-44, buff, grey, pink and green microcrystalline and aphanitic dolomite, in part with oolitic structure, includes some green shale. At M-63, dolomite is mostly pink to red in colour, with some varicoloured shale in the lower 80 m; it overlies what is considered to be the Shale unit, on the basis both of stratigraphic similarity with the section at D-40, 158 km away, and of the regional pattern of the Proterozoic subcrop (see above under Shale unit). The latter section (M-63), with a lower, shaly part, provides supportive evidence for the argument that the dolomite-siltstone-shale sequence at D-40 represents a lower member of the Dolomite unit rather than a localized facies change (Pugh, 1983, p. 7).

Two reference sections are suggested for the Dolomite unit: M-63, which, at 112.2 m is the thickest and includes the lower contact with the Shale unit; or I-74, which includes the chert and characteristic blood-red streaks. The Dolomite unit is equated to map unit H1 of the Mackenzie Mountains Supergroup, Middle or Late Proterozoic in age (Young et al., 1979, 1982).

Lower Paleozoic stratigraphy

Considered under this heading are six previously described formations, illustrated on six maps (Figs. 3-8) and three cross-sections (Figs. 21-23).

The lower three formations, Mount Clark, Mount Cap and Saline River, which together form a natural assemblage of clastics and evaporites, were grouped by Tassonyi (1969, p. 13, 14) under the name, Macdougall (name originating with T.A. Link in 1921, cited in Hume and Link, 1945). Tassonyi (1969), although admitting "only limited application" at that time, expressed future need of a group name in the statement (*ibid.*), "The Macdougall Group is assumed to be present in the subsurface within the whole study-area west of the Precambrian edge". Before Tassonyi's foresight could be proved correct, however, Macdougall Group was declared obsolete by Aitken et al. (1973, p. 28) on the grounds that the type Macdougall Formation as described by Link (in Hume and Link, 1945) included Proterozoic rocks. Later, Pugh (1983) demonstrated a need for a group "handle" in the subsurface, but, failing to revive Macdougall, used instead, "Cambrian clastics-evaporites assemblage". The latter descriptive phrase defeats its utilitarian purpose and is here abandoned. A need is still felt to be able to refer simply and concisely to the Cambrian assemblage, but such need does not justify introduction of an entirely new name to the literature.

The upper three, predominantly carbonate formations, Franklin Mountain, Mount Kindle and Peel, are referred to together by the name, Ronning Group, a convenient and potentially useful term, which was revived by Pugh (1983).

Lower Paleozoic stratigraphy embraces an aggregate of some 3000 m of section, of which the Ronning Group approaches 2000 m.

Mount Clark Formation

Basal Paleozoic sandstone is known along the margin of the Canadian Shield: from the subsurface throughout Alberta and northeastern British Columbia (Basal sandstone unit, Pugh, 1975); from Great Slave Lake (Old Fort Island Formation, Norris, 1965); and from Cap Mountain at approximately 63°25'N (Mount Clark Formation, Williams, 1923). The basal sandstone has been mapped north of 63°, as Mount Clark Formation by Cook and Aitken (1969) and Douglas and Norris (1974), and as Old Fort Island Formation by Balkwill and Yorath (1970a, b), Cook and Aitken (1971), and Balkwill (1971). The latter authors preferred to use Old Fort Island because of mappable continuity with the type area of that formation at Great Slave Lake.

Features of the basal Paleozoic sandstone, common to the descriptions given by all the above-noted authors, are: it is quartzose; fine grained to predominantly medium and coarse grained; it contains occasional conglomerate and rarer siltstone and shale; it is time-transgressive; and it discontinuously occupies paleodepressions on the Precambrian erosion surface. In fact, the only remaining feature, it seems, which might characterize the basal Paleozoic sandstone in any particular area, is the nature of the overlying rock unit. Specifically, those basal sandstones, which are overlain by La Martre Falls Formation, were defined (by Norris, 1965) as Old Fort Island Formation; those overlain by Mount Cap Formation were defined (by Williams, 1923) as Mount Clark Formation.

The name "Old Fort Island" was used in mapping north of 63° because, as stated by Cook and Aitken (1971, p. 6), "a much more positive correlation is established with that formation to the south than with the Mount Clark Formation to the west". They did, however, (Cook and Aitken, 1971, p. 6) recognize that their Old Fort Island Formation was overlain by Mount Cap Formation, the extension of which from the Franklin Mountains was justified by the "degree of lithologic correspondence as well as the stratigraphic position and sequence". The basal Paleozoic sandstone north of 63°N is referred to here as Mount Clark Formation for the following reasons: its consistent facies and its continuity below the Mount Cap Formation throughout the subsurface, as described below; its lithological and stratigraphic identity with the type section of Mount Clark Formation; and the precedence of the name Mount Clark over Old Fort Island.¹

The type section of the Mount Clark Formation (Williams, 1923, p. 76B) was described by J.D. Aitken and R.W. Macqueen in 1972 (Section AC-541 in Aitken et al., 1973, p. 148) and was summarized (*ibid.*, p. 34) as consisting of "orthoquartzitic sandstone and subordinate quartzite, white to yellow at the base, with purplish and reddish grey intervals increasing upward . . .", and having a thickness in excess of 215 m.

Fifteen boreholes within the present study area have penetrated Precambrian strata. Of these, twelve were drilled through sandstone of the Mount Clark Formation. The distribution of the Mount Clark Formation is shown on Figure 3, and nine sections are included on two cross-sections (Figs. 19, 20). The Mount Clark Formation, seen in the subsurface, consists entirely of quartzose sandstone and local

¹However, this does not render the name, Old Fort Island, obsolete. Mount Clark, as stated above, is defined as being overlain by Mount CLARK (as distinct from Old Fort Island overlain by La Martre Falls). Although Balkwill (1971, p. 14) reported "mappable continuity" of Mount Cap and Saline River formations "with the lower part of La Martre Falls Formation", the actual identification of Mount Cap, even if present at Great Slave Lake, may not be possible due to the incompleteness of the lower part of the type La Martre Falls.

conglomerate, with the exception of minor amounts of shale and siltstone in a restricted area close to the northwestern zero edge. The sandstone commonly appears in drill cuttings as unconsolidated, rounded or sub-rounded sand, also as partly silica-cemented sand, and more rarely as orthoquartzitic fragments. Within the main area of known distribution in the subsurface, west and northwest of Great Bear Lake, there is a general south to north decrease of maximum grain size, from conglomerate to medium grained sand. At H-34 and G-22, the latter displaying the maximum recorded subsurface thickness of 64.3 m, the entire section seems to consist of quartz conglomerate and sandstone; northward, conglomerate appears only as a basal deposit at E-15 and D-45. North of a west-northwest-trending line, roughly through Aubrey Lake, nothing coarser than coarse grained sandstone was recorded. Already mentioned is the presence of finer clastic material near the zero edge in the northwest: at D-45 the upper cored part of the Mount Clark section was described in the Well History Report as including some interbedded green shale; the 13.4 m thick section at L-21 consists of orthoquartzite, maroon silty shale, green waxy shale and medium and coarse grained sand; nearest to zero edge, at K-24, a 5.5 m thick section includes a 1.2 m interval of coarse grained siltstone. Significantly, the drill cuttings from K-24 indicate two grain size modes: medium and coarse grained quartz sand, and silty, fine and very fine grained quartzose sandstone.

In the southeastern part, near the type area, the 21.3 m thick section at E-11 comprises mainly fine to medium grained quartzose sandstone with some poorly sorted, generally subrounded, very fine to coarse grained sandstone. The nearby G-52 section, 41.5 m thick, is made up entirely of fine grained quartzitic sandstone.

The distribution of Mount Clark sandstone west and northwest of Great Bear Lake displays a sufficiently orderly variation of thickness to allow the drawing of a 50 m isopach and a zero edge. This orderly variation does not support the commonly recognized theory of disconnected deposition, but, from other areas, there is evidence of less predictable thickness variation: the 215+ m thickness of type Mount Clark Formation given by Aitken et al. (1973) is ten times that at E-11 only 30 km away (at both locations the conformably overlying beds are Mount Cap Formation); the formation is missing below Mount Cap beds in the far north at D-02; and at I-74 and D-61 both Mount Clark and Mount Cap beds are absent below depositionally thin Saline River Formation.

From the foregoing we may construct a depositional model for the Mount Clark Formation of a shallow, slightly elongate basin, the axis of which was roughly coincident with the axis of the underlying Precambrian anticline, trending west-northwest from present-day Great Bear Lake. It is proposed that the basin be named the Good Hope Basin. The quartzose clastic sediments are much coarser grained to the south, especially near the southerly depositional edge, where quartzose conglomerate settled close to a depositional or structural high, aligned roughly west-northwest through Mahony Lake. This high is discussed fully under the heading: Mount Cap Formation-Mahony Arch.

Mount Clark sediments appear to have been derived from both reworked Proterozoic sediments and Precambrian igneous rocks. The two grain-size modes at K-24 (noted above) indicate the possibility that at least the finer-grained sandstone, siltstone and shale were derived from the wearing down of Proterozoic Shale unit strata exposed beyond the Mount Clark depositional edge along the core of the paleoanticline. The coarser sand and conglomerate to the south of the anticline were deposited near to the line of a Proterozoic dolomite ridge, similar to the situation recorded

by Balkwill (1971, p. 12, 13), 300 km to the southeast, "Adjacent to basement ridges at Beaverlodge Lake . . . the basal beds contain abundant pebbles and cobbles of massive quartz (probably derived from nearby ridge-forming Precambrian quartz veins . . .". Because there were no Proterozoic strata from which the material required for quartzose conglomerate could have been derived, we are safe in assuming a granite/quartz vein source. Conglomerate (as noted above) constitutes the initial deposit at E-15 and D-45; at E-15 it must have been transported over a distance of at least 160 km (say, from close to the Fort Norman Structure as a minimum) to 250 km (nearest present-day basement outcrops). The depositional story of the Mount Clark Formation in the type area is obscured by the scarcity of data, but the same reasoning as above may apply equally well to the southeastern part of the study area.

Strata overlying the Mount Clark Formation at E-15 and G-22 have been dated as late Early Cambrian by W.H. Fritz (see cross-section, Figure 19). The age of the Mount Clark Formation, therefore, is within the Early Cambrian, but may vary from place to place. It is, at least in part, equivalent to the Old Fort Island Formation of Great Slave Lake.

Mount Cap Formation

The Mount Cap Formation is widely distributed in the study area and occurs in two discrete depositional areas separated by Mahony Arch. Northeast of this barrier, the formation is divisible into eight distinct members, whereas southwest of the arch more than 600 m of Mount Cap shale facies are undivided.

The name, Mount Cap, originated with Williams (1922) who subsequently (1923) redefined it. It referred to some 30 m of sandstones and shales overlying the Mount Clark Formation at the type locality on Cap Mountain. In 1968, a section of Mount Cap Formation more than 100 m thick at the "Macdougall Group" (now obsolete) type section in Dodo Canyon, was measured by R.W. Macqueen, who described it (in Aitken et al., 1973, p. 125-128, 175) as dark grey shale and varicoloured quartzose sandstone, micritic limestone and dolomite. The name, Mount Cap, was used in the northeastern part of the present study area, the Coppermine Arch region, by Cook and Aitken (1969), and in the adjoining Colville Lake area, by Cook and Aitken (1971). Extension of the name from the Franklin Mountains was considered (Cook and Aitken, 1971, p. 6) to be justified by "the degree of lithologic correspondence as well as the stratigraphic position and sequence". Cook and Aitken (1971) and Balkwill (1971, p. 14) described the Mount Cap Formation in the Coppermine and Hottah Lake areas as consisting of varicoloured shales, siltstones, glauconitic fine grained sandstones ("very abundant, tabular glauconitic grains as large as 0.3 mm", Balkwill, 1971) and brown dolomite.

The only borehole to have penetrated the Mount Cap Formation when Tassonyi (1969, p. 15, 16) described the unit was N-28, in which "the basal 392 feet" were assigned to that formation. Approximately 36.6 m of Tassonyi's Mount Cap at N-28 (i.e. the upper 120 ft, in which Tassonyi described (op. cit., p. 16) "traces of anhydrite and associated white gypsiferous shales") are now reassigned to the Lower clastic member (Meijer Drees, 1975) of the overlying Saline River Formation.

Meijer Drees (1975) used the name Mount Cap Formation in the subsurface throughout the Fort Simpson area (south of Great Bear River map area) almost as far as

Great Slave Lake, where he considered it to be equivalent to a middle part of the La Martre Falls Formation.

Pugh (1983) traced characteristic Mount Cap lithofacies of varicoloured shales, dolomite, chert, oolite and glauconite as far west as approximately 130°W longitude, beyond which shale, sandstone and siltstone extend as far as 133° or 134°W. An attempt was made (op. cit., Fig. 24) to correlate sub-units between two borehole sections (D-40, I-11) in the northeastern part of the Peel River map area, a correlation which can be expanded in the light of the present study (see footnote, p. 16).

Stratigraphic interpretations presented in this report are based on data derived from 20 boreholes in the Great Bear River study area. There are 12 complete and 2 incomplete sections of Mount Cap Formation from which it has been possible to identify an eightfold lithological subdivision. This has been correlated from D-02 in the north to H-34 close to Mahony Lake (shown on eight sections included on cross-sections, Figures 19, 20).

The overall lithology of the subdivided Mount Cap Formation comprises shales (especially dark green and black), brown dolomite, oolite, chert, glauconite, sandstone and siltstone. This is characteristic Mount Cap lithofacies, readily distinguishable from the Mount Clark sandstone below and the Lower clastic unit of the Saline River Formation above, even though drill cutting samples below the Saline River are commonly very poor. The radioactivity logs of these sections show clearly the sequence of alternating litho-units, basically a carbonate-shale sequence. Because these repeated facies result in relatively thin sub-units (mostly between 10 and 50 m), mechanical logs are especially necessary in this case to identify the members and to pinpoint the tops. Eight members are recognized, labelled a to h. As there are only two sections (A-40, M-48) showing all eight members, and because the A-40 section is covered only in part by a very poor log trace, M-48 is designated the reference section for the subdivided Mount Cap Formation (see litholog, Appendix 2; and cross-section, Figure 19).

Member a

At M-48 reference section, Member a consists of sandstone, siltstone and dolomite with abundant glauconite throughout. The quartzose sandstone is mainly fine grained, less commonly medium and coarse grained. Southeastward from M-48, quartzose sandstone and siltstone predominate, as at G-22: in addition to sandstone at M-48, there is some poorly sorted sandstone with more than 50 per cent glauconite. The sandstone facies of Member a is quite distinct from the non-glauconitic, coarser grained sandstone of the underlying Mount Clark Formation.

Northwestward from M-48, sandstone disappears: at E-15, coarse crystalline, glauconitic dolomite with some siltstone and shale occur; at K-24, similar dolomite and dark grey-green shale are found. The distribution of clastic material in Member a suggests derivation of sand and silt sized material from a roughly southeasterly source. This does not exclude the possibility of other sources; for example, for the basal, very fine grained sandstone, in the north at D-02.

Member a averages 25 to 30 m in thickness, increasing northwesterly (maximum of 47.9 m at D-02) where dolomite is dominant, and decreasing southeasterly (11.6 m at G-22, 3.7 m at H-34) where sandstone-siltstone predominate.

Member a was dated by W.H. Fritz as late Early Cambrian at E-15 (Barnes et al., 1974), and G-22 (see Appendix 1).

Member b

Member b is the first (lowest) shale unit of the Mount Cap Formation. It is represented in this report by 11 complete borehole sections. Shale, the predominant rock, is most commonly green, locally also black, brown and, rarely, purple and maroon. Thicker sections include some siltstone and dolomite. In all but two sections in the northwest (D-02, K-24), both shale and siltstone are generally very micaceous, a feature that distinguishes Member b from any of the other shale members. Siltstone and dolomite may be very highly glauconitic. At M-48, poor samples indicate shale with some siltstone and dolomite, all very micaceous and very glauconitic.

Silty, very fine grained sandstone at H-34, close to zero edge on the flank of Mahony Arch, is the only recorded occurrence of sandstone in Member b. It occurs in a mainly siltstone, non-shale section, which can reasonably be interpreted as the shoreward facies of Member b. It is inferred then that the zero edge south of H-34, and the absence of Mount Cap beds at I-74 (see also below), are depositional, rather than erosional, events.

Distribution of Member b is similar to that for the Mount Cap as a whole (see Figure 4). Maximum thickness is 82.3 m at A-40.

Member b at E-15 was dated by W.H. Fritz (Barnes et al., 1974) as early Middle Cambrian.

Member c

This is the thinnest member and lithologically the most consistent. In 10 borehole sections it consists of dolomite that is generally brown or dark brown, fine and medium crystalline, locally micro-, very fine- or coarse-crystalline; minor amounts of green, dark green, and black shale are common. Exceptionally, at H-34 on the flank of Mahony Arch, the dolomite is buff grey to dark grey, mostly siliceous. Member c gives a distinctive "kick" on radioactivity logs (see cross-section, Figure 19).

Member c averages about 10 m in thickness, with a maximum of 17.4 m at D-45. The member may be thicker at A-40, but, due to very poor data, Members c, d and e cannot there be separated.

Member c at E-15 was dated (Barnes, et al., 1974) as early Middle Cambrian.

Member d

Shale of Member d is identified in seven complete borehole sections. In a further six sections Members d and e remain undivided. Member d consists mainly of green or dark green shale with subordinate black; northwestward there are increasing amounts of dolomite, generally brown, very fine to medium crystalline. Siltstone was recorded in only one section (L-21).

Units d and e are undivided at four locations (F-62, G-22, G-34, K-76) beyond the southeastern limit of overlying Member f (see Figure 4). The shale is green, maroon and brown; siltstone, a minor constituent at F-62 and G-22, predominates at K-76 and H-34 on Mahony Arch flank. Some dolomite is present in all but the H-34 section.

Three of the seven complete sections of Member d are around 20 m thick. Maximum recorded thickness is 39.6 m at

D-02, but it is possible this figure may be exceeded at A-40 within the indivisible c-d-e section. Undivided Members d and e, beyond the limit of Member f to the southeast, are a little less than 30 m thick at F-62 and G-22, and only 12 m and 8 m, respectively, at K-76 and H-34.

In summary, Member d is a shale unit that thickens northwestward to include increasing amounts of dolomite, and thins to the southeast into siltstone facies approaching a possible depositional edge.

Member e

This carbonate unit overlies Member d at the seven locations where Members d and e can be differentiated. Characteristic lithology is brown dolomite, very fine, fine or medium crystalline, often glauconitic, and locally with green shale and less commonly chert. Exceptions are the localized occurrences of limestone and siltstone: at D-45, Member e consists almost entirely of limestone, micrograined, fine and very fine grained, and siltstone, dolomitic and calcareous. Forty-six kilometres away at the Mount Cap reference section at M-48, an otherwise characteristic facies of buff and brown micro- and very fine-crystalline dolomite, in part highly glauconitic, includes some micrograined dolomitic limestone and some very micaceous dolomitic siltstone.

The thickness of Member e ranges from a maximum of 18.9 m at D-02 to 7.0 m at L-21. It is the highest (youngest) member to be distributed over the entire area of deposition of subdivisible Mount Cap.

Member f

Eight complete borehole sections of this member are recognized. In the Mount Cap reference section (M-48) Member f consists of 36.6 m of green shale alone, except for one thin (3 m) bed of 'familiar' brown crystalline dolomite. Similar lithology and thickness were recorded at D-45 and A-40. Elsewhere Member f thins: to the north, 10.4 m of green and black shale at K-44¹ include two thin dolomite markers and some siltstone; to the northwest, beyond the limit of overlying Member g, four sections of green and black shale range in thickness from 14.0 m to 3.4 m (K-24).

Member g

Carbonate Member g is considered to be present in four subsurface sections. Underlying Member h at A-40 (26.8 m thick) and at M-48 (21.3 m thick), it consists of buff to brown, microcrystalline to fine and medium crystalline dolomite, with some interbedded green, brown and black shale; some brown and white chert was recorded in the lower part at A-40. At D-45, Member g comprises 10.7 m of buff to brown oolitic dolomite grading to chert, and some interbedded green and dark grey shale. At K-44, 4 m of dolomite at the top of the Mount Cap Formation are assigned to Member g.

Member h

A shale unit at the top of the Mount Cap Formation at A-40 and M-48 is designated Member h. It consists of green, grey-green and grey-brown shale with some thinly

interbedded, buff to brown, microcrystalline dolomite. Member h is overlain by the Lower clastic member of the Saline River Formation with which at first sight it might be confused. However, the smoother-textured, rather splintery shale and clean, brown, crystalline dolomite, which characterize the Saline River strata in the Mount Cap Formation, are in practice easily distinguished from the rougher-textured shale, argillaceous dolomite and anhydrite of the Lower clastic member.

Type area

Thirty kilometres from the mountain type section of the Mount Cap Formation, the subsurface section at E-11 comprises 6.7 m of: green and brown shale; fine to very fine grained quartzose sandstone; black, partly siliceous, oolitic, dolomite, grading to chert; and glauconite concentrations. These rocks of the type area are strikingly similar to those described above, more than 200 km to the north-northwest. Their stratigraphic position in both areas between the underlying Mount Clark Formation and the overlying Lower clastic member of the Saline River Formation should leave no reasonable doubt that the Mount Cap Formation, subdivided as described above, is, in fact, the Mount Cap in its type sense.

Shale facies

Three incomplete borehole sections of Middle Cambrian rocks southwest of Mahony Arch remain to be considered. The thickest recorded (>595 m) at L-04, consists mostly of grey-green to grey and brown shale, with rare, brown, microcrystalline, argillaceous dolomite and brown and grey-green, argillaceous siltstone; in only the top 60 m grey and pale green shale is interbedded with brown to buff and white, microcrystalline, siliceous dolomite. Five kilometres away at N-62, 155 m of dark grey to black, grey-green to dark green shale and argillaceous dolomite can be correlated almost bed for bed with the upper part at L-04 (see cross-section, Figure 20).

At N-28, 82 m of strata underlying a characteristic three-member section of the Saline River Formation consist of grey-green and purple shale with traces of dolomite and limestone in the drill cuttings, and glauconite recorded at one horizon. L-04 and N-28 are related by way of the lower Middle Cambrian *Glossopleura* Zone (W.H. Fritz: at L-04, in Norford et al., 1970; at N-28, in Norford et al., 1971). The relatively thick shale sequence southwest of Mahony Arch, therefore, is at least partly time-equivalent to Members b and c of the Mount Cap Formation northeast of the Arch (see above).

N-28, closest of the three shale sections to Mahony Arch (as drawn on Figure 4), with evidence of carbonates and glauconite content, bears a significant lithological resemblance to the Mount Cap. On the other hand, the Middle Cambrian shales at L-04 and N-62 reflect a depositional environment clearly distinct from that northwest of Mahony Arch where, as discussed above, typical Mount Cap lithology extends into the eightfold membership. The thicker shales accumulated in what must have been a relatively narrow basin between Mackenzie Arch and Mahony Arch, herein referred to as Keele Trough, possibly extending southward between Mackenzie and Bulmer Lake arches (see Figure 4). Interestingly, the Mount Cap type section and the

¹ An overlying 4 m thick dolomite unit is assigned to Member g, rather than considering it to be another dolomite marker in Member f.

nearby E-11 section are apparently on the western flank of the Bulmer Lake Arch, indicating the possibility that they represent shoreward or shallow water facies of homotaxial basinal equivalents at L-04 and N-62. Because of the foregoing important relationships, the writer proposes to refer to the Middle Cambrian shales at L-04 etc. as Mount Cap Shale facies, thereby preserving a mental regional image engendered by the name, Mount Cap.

Mahony Arch

The absence of Mount Cap Formation at D-61 and I-74, together with the absence of underlying Mount Clark Formation (Fig. 3) and the anomalous thinning of overlying Saline River Formation (Fig. 5), point to the existence of a Cambrian "high" in the Mahony Lake area. A similar situation in the Peel River map area was recorded and discussed by Pugh (1983, p. 10). The absence at L-26 of Lower and Middle Cambrian strata between the Proterozoic Dolomite unit and the Upper Cambrian Saline River Salt member, was considered (Pugh, 1983) to be due to nondeposition over a suggested topographic high of resistant dolomite, rather than to truncation during structural deformation and subsequent removal.

It is tempting to draw between L-26 and Mahony Lake a band of projected nondeposition and thereby postulate an arch parallel to, and perhaps in some way related to, Mackenzie Arch. Such an "arch" might conceivably have been simply a topographic ridge of Precambrian rock, or, alternatively, may have been tectonically generated. The suggested (op. cit.) model of a topographic ridge consisting of the resistant Proterozoic Dolomite unit presents a problem as it crosses the Fort Norman structure (see Figure 3) eastward into shale of Proterozoic Unit 1 (at D-61). It also fails to explain as well as a relative uplift model does, the downwarping on either side necessary to accommodate the substantial accumulation of Lower to Upper Cambrian sediments to the northeast and a Middle Cambrian shale basin to the southwest. The latter model of tectonic generation is supported by extending the projected arch southeastward, still roughly parallel to Mackenzie Arch, and finding that it would be colinear with, or would merge with, Bulmer Lake Arch (Meijer Drees, 1975). At the same time, the absence of Mount Cap beds at the G-52 location would be explained.

Pugh's (1983, p. 10) model of nondeposition at L-26 is thereby modified and expanded to constitute a belt of nondeposition along a tectonically generated arch parallel to Mackenzie Arch and possibly related to, or colinear with, Bulmer Lake Arch. This arch is named after Mahony Lake, below which it is buried, and close to which the main evidence for its existence was derived. There is no evidence to suggest that Mahony Arch was more than a positive alignment between, and relative to, downwarping on either side, and in that sense was merely a barrier, or partial barrier, between two depositional basins, contributing little, if any, material to the Cambrian sediments. Furthermore, the fact that type Mount Cap strata, as found on what appears to be the southwest flank of Bulmer Lake Arch (E-11), extend to the north of Mahony Lake, indicates that Mahony Arch was not a continuous barrier.

Contacts

The contact of the Mount Cap Formation with the underlying Mount Clark Formation is abrupt and non-gradational. Criteria for distinguishing the sandstone facies of Member a from Mount Clark sandstone are stated above.

The nature of the upper contact of the Mount Cap Formation with the Saline River Formation, west of this study area, was discussed by Pugh (1983). It was demonstrated that (op. cit.), at least in the northeastern part of the Peel River map area "there was no substantial sub-Saline River erosional break".¹ It was concluded from assembled evidence from both the subsurface and the Mackenzie Mountain front that, "likely no more than relatively minor truncation at the depositionally-thinned edge of the Mount Cap took place before burial beneath the first Saline River sediments...".

North of Mahony Arch, subdivision of Mount Cap Formation reveals that the overlying Lower clastic member of the Saline River Formation is in contact with different members at different locations. The cross-section (Fig. 19) shows clearly each of Members e, f, g and h at the upper contact. If we take this to mean truncation of these members below an erosional unconformity, we must necessarily accept that in the Good Hope Basin, the centre of crustal downwarping corresponding to the depositional centre of the Mount Clark and subdivided Mount Cap Formation (see Figures 3, 4) became an area of uplift and erosion of the upper members of the Mount Cap, and then again became the centre of downwarping during Saline River deposition (see Figure 5). Apart from being intuitively unsatisfactory, this model also demands acceptable answers to the following questions: why is mostly nonresistant shale preserved at the upper surface of the Mount Cap (see cross-section, Fig. 19) if this was an eroded surface?; why do we find only Members f, g and h truncated in this model, in contrast to the surprisingly well preserved depositional thinning into shoreward facies of Members a, b, c, d and e (clearly demonstrated approaching Mahony Arch between G-22 and H-34, refer to cross-section, Figs. 19, 20)?

An alternative model is preferred that accommodates a more stable tectonic setting, one in which Mount Cap Formation sedimentation reflects gentle cyclic fluctuations of downwarping. Carbonates alternated with clastics, and beginning with deposition of sands and silty muds, the clastics progressively became finer, until only clay-sized material entered the filling basin. In the later stages, sedimentation was gradually more localized as the Good Hope Basin filled, possibly during a tectonic pause preceding the new and more extensive downwarping at the beginning of Saline River deposition. This generalized model could be modified to accommodate the possibility that Members a to h may not be time-lithostratigraphic units, but this would not change the overall concept that the upper contact represents nothing more than a depositional hiatus between the deposition of the Mount Cap and Saline River formations.

Southwest of Mahony Arch, the lower contact of the Mount Cap shale facies has not been exposed. The upper contact with the Saline River Formation is found only at

¹This was on the basis of correlation of beds between J-42, D40, and I-11 (see Pugh, 1983, Figure 24). Correction of the Mount Cap-Saline River contact in those sections in the light of the present study (i.e., to reassign the lower part of the Lower clastic unit to Mount Cap, see Appendix 4, this report) in fact strengthens Pugh's (1983) interpretation.

N-28; Lower clastic member shales with drill-cutting traces of anhydrite rest on shales with drill-cutting traces of dolomite, limestone and glauconite. At L-04, some 600 m of Mount Cap shale facies are overlain directly by Mesozoic strata. As already stated, the upper part of this section correlates precisely with the N-62 section, which, interestingly, is overlain by the Cyclic member of the Franklin Mountain Formation. The absence of the Saline River Formation at N-62 is discussed fully under that heading. It is not likely that the upper, more dolomitic part of the Mount Cap shale facies found in both L-04 and N-62 is equivalent to the Saline River Formation

Lower to Middle Cambrian sediments are distributed over the entire study area west of the margin of the Canadian Shield, except along Mahony Arch, which constituted a partial barrier between two somewhat different depositional environments. Late Early Cambrian age beds (Member a) are known to be initial Mount Cap deposits northeast of Mahony Arch. Beds of early Middle Cambrian age are known from both sides of the Arch (Members b and c, and Shale facies). Lack of sufficient well control prevents a precise correlation throughout the whole study area, but, on the basis of most similar lithology, the Mount Cap Formation of the type area, the eastern outcrop areas, and the Peel River area (Pugh, 1983, Fig. 4) seem to equate more to the lower dolomite-sandstone-siltstone-shale members of the subdivided Mount Cap in Good Hope Basin.

Saline River Formation

The Saline River Formation, like the underlying Mount Cap Formation, is widely distributed throughout the study area. Its units similarly thin or wedge out against Mahony Arch. Changes in the shape of the depositional area southwest of the Arch are reflected in the localized absence of Saline River rocks above thick Mount Cap shale facies.

The name, Saline River, was introduced by Williams (1923, p. 77B) for beds, about 30 m thick, of red and green shale containing salt casts and gypsum, poorly exposed on the Saline River near its confluence with the Mackenzie River. The Saline River Formation was given defined boundaries by Tassonyi (1969, p. 17) to "include all evaporites and evaporitic associations which are underlain by the Mount Cap Formation and overlain by the massive dolomites of the Ronning Formation, or by any continuous carbonate sequence". With reference to the Vermilion No. 1 well (N-28), Tassonyi (1969) described "two distinct lithologies: a lower thick salt and evaporite unit referred to as the salt member and an upper shale member that is partly evaporitic". Later work on the subsurface modified the lower boundary. In borehole section, E-11, Meijer Drees (1975, p. 12) recognized a threefold division of the Saline River Formation: "a lower clastic member consisting of shale and anhydritic siltstone"; "a middle evaporitic member comprising salt and anhydrite"; and "an upper clastic member consisting of shale and anhydritic salt and anhydrite". Meijer Drees' Lower clastic member is found to be present at N-28; refinement of Tassonyi's Mount Cap-Saline River contact was discussed above (under "Mount Cap Formation"). Pugh (1983, Fig. 24) carried the use of Lower clastic member into the Peel River area; refinement of Pugh's Mount Cap-Saline River contact has also been noted (footnote, p. 16).

Within the present study area, eighteen boreholes provide complete three-member sections of the Saline River Formation. Data from these were used to compile an isopach-lithofacies-structure contour map (Fig. 5). Twelve of the sections are shown on cross-sections (Figs. 19, 20).

Lower clastic member

Throughout the study area, the Lower clastic member consists of grey-green to brown-grey (rarely maroon or purple) shale, with some grey to grey-brown, argillaceous dolomite; anhydrite is commonly associated with both shale and dolomite. Exceptionally, maroon and purple shale is dominant in sections over Mahony Arch, and also on the flank of Bulmer Lake Arch, where siltstone also occurs; drill cuttings from G-52 include traces of quartzose, fine grained sandstone.

The Lower clastic member varies in thickness mostly within the 20 to 40 m range, with a maximum of 43.6 m recorded at K-44. The member is anomalously thinner (less than 20 m) in the proximity of the above arches, with a minimum thickness of 8.5 m below Mahony Lake (I-74). The lower contact with the Mount Cap Formation is considered to represent a depositional hiatus (see under previous heading for discussion, and for criteria for distinguishing between facies below and above the contact). The upper contact with the Salt member is conformable and nongradational.

Salt member

The present study records Saline River halite in fourteen borehole sections, and equivalent evaporitic beds at five other locations. At D-02 in the north, the Salt member consists of brown to grey, microcrystalline dolomite, and grey dolomitic shale with some anhydrite and some white and smoky brown chert. Over Mahony Arch, 11.0 m of anhydrite and hard grey shale at I-74, and 17.7 m of dolomite and anhydrite at K-76, equate to 10.1 m of halite at nearby H-34, but have no distinct correlate at D-61. On the western flank of Bulmer Lake Arch, 42.7 m of halite at E-11 correlate with 20.1 m of red, green and grey shale with some anhydrite at G-52. Southwest of Mahony Arch, a thick Salt member (at G-78, N-28) includes at the top a transitional facies unit of pink and buff anhydrite, maroon, olive-green and pale green shale, and salt. Approximate halite-anhydrite lithofacies boundaries are drawn on Figure 5.

The Salt member is absent below the lower Keele River area. At N-62, the Mount Cap Shale facies is overlain directly by the Franklin Mountain Cyclic member. The alternative possibility that the upper, more dolomitic part of the section there assigned to the Shale facies could be an equivalent of the Saline River Formation is rejected on the grounds that not a trace of evaporite was noted and that the rocks present are unlike the shale and dolomite encountered in any known Saline River section. The fact that the Saline River-Franklin Mountain contact is everywhere conformable and gradational (see below) implies that the absence of Saline River sediments below the Franklin Mountain Cyclic member at N-62 must be the result of nondeposition.

Tassonyi (1969, p. 18) conceived that the Salt member was deposited in a trough-like depression trending northwest between Norman Wells and Fort Good Hope, rather than as a circular-shaped, basin-centre evaporite. Matthews (1977, p. C-42, 43) indicated that the Salt member was deposited in graben troughs. Pugh (1983, p. 11 and Figure 5) presented data from ten borehole locations west of the Great Bear River area, indicating the "elongated, rather than circular, shape to the body of halite". Isopachs and lithofacies of the Salt member in the Great Bear River study area (included in Figure 5) indicate a somewhat different basinal configuration from that envisaged by previous writers. Pugh's (1983) elongate salt body appears to extend (200 and 300 m isopachs) east to Great Bear Lake, outlining Good Hope Basin, with a maximum thickness of 313.6 m at A-40, and to have a

north-trending extension (shown by 100 m isopachs). Mahony and Bulmer Lake arches continue to be reflected (as noted above for the Lower clastic member) in anomalous thinning and lithofacies below the Mahony Lake and Blackwater Lake areas, but no longer in evidence to the west (see Pugh, 1983, at L-26, where the Salt member lies directly on Proterozoic strata). Southwest of Mahony Arch, drilling of G-78 penetrated 115.8 m of halite, and at N-28 the Salt member measures 795.5 m¹. One hundred kilometres away to the southeast, none of the Saline River members are present (at N-62, L-04). Evidently, the basin-arch configuration changed significantly between the times of Mount Cap and Saline River deposition. The concept of the inter-arch Keele Trough, southwest of Mahony Arch, postulated for Mount Cap Shale facies, continues to be valid for the Saline River Formation, but was altered significantly in shape. The very area (below Keele River) from which the main evidence of a Mount Cap shale basin was derived, became an area of nondeposition of Saline River sediments (and, moreover, we cannot ignore the possibility of erosion of Mount Cap Shale facies). With the burial of Mahony Arch west of Mahony Lake (at L-26, by the time of salt precipitation), and because of a lack of Saline River borehole data between Norman Wells and Fort Good Hope to suggest alternative possibilities, the thick halite sections at G-78 and N-28 are most easily seen as representing the southern part of an essentially triple-lobe basin (Norman Wells-Smith Arm-Fort Good Hope). A northern extension passes into dolomite-anhydrite facies at D-02. Southward, the Salt member passes through anhydrite facies over Mahony Arch, and possibly out of distinct recognition (as seen at D-61), with no data so far to actually demonstrate physical continuity with its reappearance across the anhydrite-halite facies boundary (below Blackwater Lake area).

Upper clastic member

With only minor variations, the Upper clastic member consists primarily of maroon, green, olive-green, grey-green, purple, brown, dolomitic and locally silty shale; in most sections there is interbedded buff, grey, pink, microcrystalline to aphanitic, rarely silty dolomite, and, invariably, some pink, white, pale buff, pale green anhydrite, usually thinly interbedded with, or as streaks in, the shales. Siltstone is uncommon, and was recorded at only three locations: at E-11, as pale grey and pale brown, dolomitic siltstone, interbedded with varicoloured shale and some anhydrite; at E-15, the thickest section, as a minor constituent, thinly interbedded with shale and some anhydrite; and at L-66, an incomplete section of grey, buff or pink, dolomitic siltstone and pale green or maroon dolomitic shale.

The thickness of the Upper clastic member varies markedly, from a minimum of 13.1 m at I-74 to a maximum recorded 119.8 m at E-15. There appears to be no meaningful average figure, but, significantly, the thickness in the proximity of Mahony and Bulmer Lake arches (none more than 36.3 m in all five sections) is less than elsewhere (all greater than 39.0 m), confirming continued activity of these structures.

Because its upper contact is gradational (see below), the seemingly unpredictable thickness variations in the Upper clastic member may be attributable partly to a facies boundary relationship with the underlying Salt member. The gradational upper contact with the overlying Franklin Mountain Cyclic member was pinpointed following the rule

set by Pugh (1983, p. 12), "with the aid of gamma-ray logs where predominantly shale beds change to predominantly argillaceous dolomite". A rider was provided (op. cit.) to accommodate carbonates at the top of the Saline River Formation, if "they include interbedded grey-green, olive-green and maroon shales". It was further noted (op. cit.), "This should not exclude the possibility of having minor greenish colouring in the otherwise normally grey shales interbedded with dolomite at the base of the Franklin Mountain Formation". All of these criteria were satisfied in placing the contact at F-62 and G-22 where the gradation is very pronounced. At F-62, a 19 m thick unit (between borehole footages 3514 and 3577) of dolomite and shale, pale green-grey to pale green with trace of maroon, is assigned to the Upper clastic member; at the base of the Cyclic member, argillaceous dolomite is interbedded with some buff-grey and grey-green shale.

The foregoing evidence seems to indicate that the basic tectonic configuration of parallel arches and basin during Mount Cap deposition did not endure into the time of Saline River sedimentation. Mahony Arch was submergent and active, but, after the beginning of salt precipitation, influenced deposition only at the eastern end; a new positive feature restricted sedimentation in an area (N-62) which later was to be uplifted as Keele Arch; this, in conjunction with Mahony and Bulmer Lake arches, may have created a generally high, but at least partly submergent area between a northern tri-lobate salt basin (Fig. 5) and an elongate salt basin south from E-11 (see Meijer Drees, 1975, Figure 8).

Ronning Group

The reader is referred to Pugh (1983, p. 13, 14) for the historical background of this name. During the course of more than sixty years as a stratigraphic name, it has been raised to group status, reduced to reconnaissance use only in surface mapping, and most recently revived by Pugh (op. cit) for use in the subsurface of Peel River map area as a group name for the Franklin Mountain, Mount Kindle and Peel formations. All three formations are recognized in the study area.

Franklin Mountain Formation

The name, Franklin Mountain, originated with Williams (1922, 1923), who applied it to 100 m of calcareous shale and limestone lying between the Saline River Formation below and the Mount Kindle Formation above, and outcropping on the eastern slope of Mount Kindle in the Franklin Mountains. Forty years later, Douglas and Norris (1963, p. 11) reported nearly 400 m of Franklin Mountain Formation on the northeast face of Mount Kindle, and described the measured section (in ascending order) as follows: limestone and calcareous shale; dolomite; brown, green and red shales with subordinate sandstone and dolomite; and the upper two thirds mainly pale grey dolomite with minor chert lenses.

Several workers applied the name in their regional surface and subsurface studies, among them: Macqueen (1970, p. 225) who, in the plains east of the Lower Mackenzie River, recognized three units below the Mount Kindle Formation and referred to them informally as Cyclic, Rhythmic and Cherty units; Macqueen and Mackenzie (1973, p. 183), who recognized these three units in the cored borehole section at E-15; Mackenzie (1974c), who studied the

¹The possibility that this could be structurally exaggerated makes little difference to the interpretations that follow.

cored borehole section at A-73 (near Tenlen Lake), noting a "zone of floating sand grains" within the Cherty unit, and adding a "porous dolomite unit" above the Cherty unit; and Pugh (1983, p. 15) who, in the Peel River map area, traced the above divisions westward, but found it practical for that area to omit the informal names other than Cherty unit.

The present study of the Franklin Mountain Formation in the Great Bear River area defines the extent of the type facies as described by Douglas and Norris (1963), beyond which it passes into the thick sequence of regionally characteristic grey dolomites. A total of 35 boreholes within the study area have provided data pertaining to all or part of Franklin Mountain Formation. Of these, 23 were drilled into the underlying strata. The four members of the Franklin Mountain Formation are described, followed by discussion of type lithology. D-02 is chosen as the representative section of the characteristic four-member dolomite facies (see Appendix 2 and cross-section, Figure 21).

Cyclic member. The Cyclic member was first described in the subsurface at E-15 by Macqueen and Mackenzie (1973) and at A-73 by Mackenzie (1974c) who equated it to the basal argillaceous beds at the type section. This simple designation has sufficed throughout the study area. There are 22 complete subsurface sections.

In the representative section at D-02, the Cyclic member comprises brown to grey-buff, grey to pale buff, in part argillaceous dolomite, with some upward-decreasing, interbedded, green-grey, dolomitic shale. The Cyclic member dolomite, commonly with some darker coloured areas, is characteristically microcrystalline to aphanitic and variably argillaceous. Uniquely, at E-11 in the south, the beds are in part silty and there are sandy zones. This and other lithological variations are dealt with below.

Cyclic member distribution follows a distinct pattern. With two important exceptions (discussed below), all sections greater than 60 m thick occur north of 67°N latitude, with a maximum of 128.9 m at E-15. Between 67° and 66°N latitude, the Cyclic member is 58.8 m thick at M-48, and 58.3 m at A-40. Of the 14 sections south of 66°, 11 range in thickness from a trace to 43.6 m, and these can be grouped as follows:

1. Mahony Lake area

19.2 m at H-34; 15.5 m at K-76; 43.6 m at D-61 (argillaceous dolomite, but no shale); trace at I-74 (some argillaceous dolomite at the base). This area of relatively very thin Cyclic member overlies anomalously thin Cambrian beds (see under previous headings); the anomaly is attributed to the presence of Mahony Arch. This same area displays closure of isopachs in the Franklin Mountain Formation, related to thinning (Fig. 7) where strata of that formation were protected by overlying Mount Kindle strata from post-Ordovician erosion. We may infer, therefore, that at least this part of Mahony Arch continued to be a positive feature during Cyclic member deposition, and that its activity continued or was renewed sometime prior to Mount Kindle deposition. Pre-Mount Kindle uplift, in fact, is indicated by the truncation of Franklin Mountain members, below Mount Kindle beds, between H-34 and F-62 (cross-section, Fig. 23)

2. Northeast of Mahony Lake area

38.1 m at F-62; 37.2 m at G-22. The Cyclic member here is some 20 m thinner than in the nearest sections to the northwest (A-40, noted above). Although this is compatible with the general southeasterly thinning trend, it is distinctly thicker than in three of the Mahony Lake sections. Isopachs of the Franklin Mountain Formation (Fig. 7) show that this area (F-62, G-22), preserved from post-Ordovician erosion, was at the southeast end of an area in which very thick carbonate accumulation is indicated

3. West-southwest of Mahony Lake area

43.6 m at G-78; 39.6 m at K-03; trace at N-28 (argillaceous dolomite)¹. Thickness in the order of 40 m is compatible with the general southerly or southeasterly thinning. Similarly, the overall thickness of the Franklin Mountain Formation (below Mount Kindle beds) is found to decrease steadily southeastward from the Peel River area (Fig. 7). In contrast, at N-28, the Franklin Mountain Formation and its Cyclic member are both anomalously thin; moreover, this thinning is bounded by much thicker sections to the east and southeast. Because there is no evidence from underlying Cambrian beds of previous positive crustal activity at N-28, any uplift reflected in Franklin Mountain sediments must be new in that area. The position of N-28 relative to paleo-structural trends suggests early activity of Keele Arch

4. Blackwater Lake area

45.1 m at E-11 (beds are in part silty and include some sandy zones); 43.0 m at G-22; 33.5 m at I-54b (no samples). A thickness of 40 m is a reasonable figure approaching the Bulmer Lake Arch zero edge (Meijer Drees, 1975, Fig. 9). The granite core of this arch is the obvious source for the coarser clastic quartz material at E-11

The remaining three sections south of latitude 66°N constitute a fifth distinct group:

5. Lower Keele River area

50.3 m at N-62 (argillaceous and calcareous dolomite; silty calcareous shale; some pale green dolomitic shale; trace of anhydrite); >108.5 m at J-65 (beds noticeably silty); 130.5 m (maximum recorded thickness) at L-66. Thicknesses of Franklin Mountain sections in this area exceed 500 m, even though exposed to pre-Devonian and pre-Mesozoic erosion. Pre-Mount Kindle thicknesses must have been much more, so that both the reconstructed figures for the Franklin Mountain Formation and those of the Cyclic member are very close to their counterparts north of 67°

The recorded traces of anhydrite at N-62 suggest the possibility that part of the Cyclic member there may be an equivalent of Saline River beds (otherwise entirely absent at N-62), or alternatively that localized hypersalinity developed initially within this localized area of thicker carbonate buildup.

¹In the absence of radioactivity logs, picking of tops at N-28 was accomplished using drill cutting evidence and deduction: the Franklin Mountain Formation, below Mount Kindle beds, is thin; the upper two thirds appear to be Cherty member; the lower part has some argillaceous dolomite throughout, but is more argillaceous at base; the writer prefers the interpretation of a trace of the Cyclic member and a thin Rhythmic member to the alternative of a thick Cyclic member and no Rhythmic member.

The gradational nature of the lower contact was discussed under "Saline River Formation". The upper contact with the Rhythmic member is conformable and non-gradational.

In summary, the Cyclic member distribution represents the beginning of thick carbonate buildup over a wide area north of latitude 66°N and in a smaller area in the south, bounded by submarine highs and Bulmer Lake Arch. Silt-sized material on the southwest side of the latter area (at J-65) may have heralded the coarser clastic material that was subsequently to enter the depositional area (see below under "Type lithology").

Rhythmic member. The Rhythmic member was so named (Norford and Macqueen, 1975) because of its distinctive sedimentary rhythms characteristic of surface exposures in the Franklin and Mackenzie mountains. These rhythms were reported (Macqueen and Mackenzie, 1973, p. 184) to be "not apparent" in the cored borehole section at E-15. Pugh (1983, p. 15) made only passing reference to this unit because the distinctive rhythms of the Rhythmic member and also the basal argillaceous Cyclic member both disappear westward in Peel River map area. With reference to the overall Franklin Mountain, it was noted (Pugh, 1983) "very generally, the higher in the section, the paler the colours and the coarser the crystallinity".

In the present study area, recognition of the Cyclic member below and delineation of the Cherty member above are the means by which the stratigraphic boundaries of the Rhythmic member are defined. Although the upper boundary cannot be picked on mechanical logs with any consistent precision, and because the downward disappearance of chert in drill cuttings is not always a practical single criterion for pinpointing the Rhythmic-Cherty contact, a significant change from darker to paler colour and from fine to more coarse crystalline dolomite is commonly associated with this boundary. By these means, the Rhythmic member top has been traced southward from its regionally characteristic lithology into more complex carbonate facies, including sand and shale.

A total of 31 boreholes have penetrated the Rhythmic member within the Great Bear River study area. From these, there are 24 complete sections, of which 15, underlying the Cherty member, are not eroded. In the representative section at D-02, the Rhythmic member comprises dolomite, which in the upper part is pale buff, pale grey and white, micro-, very fine-, fine- and medium-crystalline, and which grades downward to buff-grey to pale buff, microcrystalline and aphanitic, and in part slightly argillaceous. In the most northerly section (G-02) where drilling terminated within the Franklin Mountain Formation, 198.1 m of strata above total depth have been assigned to the Rhythmic member even though there are traces of chert in the drill cuttings.

Varicoloured beds occur in the Franklin Mountain Formation, and their limits are shown on Figure 7. The most northerly record of varicoloured dolomite in the subsurface is at D-45. There, the Rhythmic member, overlain only by regolith conglomerate of chert and oolitic dolomite, includes some pink and pale yellow colouring with traces of pale green and maroon shale. The more strongly varicoloured sections, located in the lower Keele River area, include sand and limestone: at N-62 and I-01, white, pink, brown, and red dolomite and white to buff limestone are in part argillaceous, silty and sandy, grading to fine and medium grained quartzose sandstones and red or brown silty shales; at E-30 an incomplete section of the Rhythmic member is predominantly limestone – brown, buff, pink, red-streaked and orange. The

only other record of sand in the Rhythmic member is in the Blackwater Lake area (E-11, G-60) in the form of silty and sandy zones and floating sand grains in mostly pale buff to dark grey-brown dolomite.

Although the thickness distribution of the Rhythmic member may be influenced by a time-variable upper contact with the Cherty member and certainly by erosion below younger formations, a general depositional pattern can nevertheless be gleaned from available data. The thickest sections are in the north, at D-45 (373.1 m) and D-01 (368.8 m, overlain by the Cherty member), and other sections in the same general area range from 263.7 m to as little as 112.8 m in thickness (K-24). The apparent tendency for thinner Rhythmic member to be overlain by thicker Cherty member, which is referred to again below under "Cherty member", suggests that an average thickness of Rhythmic member north of 66°N latitude might be more meaningful. We find that a mean figure of 250 m compares well to thicknesses to the south in the lower Keele River area: 247.5 m below the Cherty at J-65; 209.7 m and 208.5 m below the sub-Mesozoic unconformity at L-66 and N-62, respectively. For the Mahony Lake area, thicknesses of at least 200 m are indicated (see cross-section, Figure 23), with a thin 90.8 m at D-61 being attributed to pre-Mount Kindle truncation. Eastward, the Rhythmic member thins to around 150 m (F-62, G-22). Similarly, 200-150 m thicknesses extend southward to south of Blackwater Lake area. In the subsurface it is only in a localized area northwest of Keele River that there is evidence of a significant anomaly: as little as 83.8 m of beds at N-28 occupy the interval from the top of the Saline River Formation to what has been picked as the bottom of the Cherty member, and within this only a trace of the Cyclic member is assumed to be present (see footnote, p. 17); 111.3 m at G-78; 189.0 m at K-03. Although sparsity of chert in the overlying Cherty member in this area, and lack of radioactivity log control for N-28 and G-78 make difficult the precise placing of the Rhythmic-Cherty contact, the fact that at N-28 Franklin Mountain as a whole is also anomalously thin (isopachs, Fig. 7) is compatible with a thin Rhythmic member.

The foregoing evidence indicates a generally uniform distribution and dolomitization of Rhythmic unit sediments throughout the area except for the appearance of clay to medium sand-sized clastics in the south, and the possibility of nearby localized crustal warping.

Drill cutting samples from the top of the Rhythmic member at N-62 were examined by T.T. Uyeno (see Appendix 1), but were found to be barren of conodonts. The Rhythmic member was given a Late Cambrian age by Macqueen and Mackenzie (1973, p. 183).

Cherty member. The upper part of the Franklin Mountain Formation, in which dolomite contains chert, quartz and silicified oolites, was named the Cherty unit by Macqueen (1969) during mapping east of the lower Mackenzie River. The name, Cherty member, has been used south of 64° by Meijer Drees (1975) and west into the Peel River area by Pugh (1983). In the present study area, the Cherty member is found in 24 boreholes, of which 20 drilled through into the Rhythmic member. Five of these twenty complete sections are overlain by the Upper dolomite member.

The subsurface representative section of the Franklin Mountain Formation (at D-02) includes a 304.8 m thick section of the Cherty member with regionally characteristic lithology: pale buff-grey to very pale buff and white, mostly coarse crystalline dolomite, with some fine and medium crystalline dolomite in the lower part; milky white to very

pale buff chert, abundant near the top, and with traces of clear quartz. Chert and silicified oolite are relatively more abundant in the north, but also locally in the south, for example at C-21, where 330.4 m of fine to very coarse crystalline dolomite includes abundant oolitic chert throughout.

South of latitude 67°N, some pink, red or pale green colouring of the Cherty member dolomite and the presence of green shale or intercrystalline green clay are another characteristic feature, one which is confined almost entirely to the Great Bear River area. The western limit of this feature was determined by Pugh (1983, Fig. 7) a little west of longitude 128°W; at this location, no such colouring was recorded in the underlying Rhythmic member. Similarly, in the present area, the varicoloured Cherty member is areally more extensive than the varicoloured Rhythmic member (see, for example, G-22, F-62, I-54b, G-60). However, in the lower Keele River area, where Rhythmic beds are most intensely varicoloured, the Cherty member (where present in the northern part at B-45, K-14, E-30, C-21) has barely a trace of pink or green colouring. This Rhythmic-to-Cherty disappearance of colouring is accompanied in the same area by an increase in incidence and grain size of sand content: at E-30, the basal 49 m consist of dolomite, chert, quartz, and coarse and very coarse, subrounded quartzose sand; at B-45 a trace of medium grained, rounded quartz sand is found 20 m above the base; at J-65, K-14, and N-28, floating medium and coarse grained rounded quartz sand grains occur near the top; at J-65, the top 10 m of dolomite grade to quartzose sandstone. South and north of Blackwater Lake area, sandy zones are present throughout the Cherty member at G-60 and I-54b.

Thickness distribution of the Cherty member is controlled mainly by pre-Devonian, pre-Mesozoic and present-day erosion. It may be meaningful only where overlain by the Upper dolomite member. Five sections are in this category: in the north, 359.7 m at G-02, 304.8 m at D-02; in the east, 123.7 m at F-62, 126.8 m at G-22; in the southwest, 177.4 m at K-03. We might reasonably expect that other eroded sections would be thinner, but, in fact, three are much thicker: 421.5 m at A-40; 429.5 m at K-24; and 753.5 m at E-15. Much or most of this thickness at E-15 was argued (Macqueen and Mackenzie, 1973, p. 184) to be depositional in origin (as opposed to being a result of repetition by faulting). Both contacts, therefore, are suspected of being time-transgressive, and there are two observations that are pertinent to this: the apparent tendency of the thinner Rhythmic member to be overlain by the thicker Cherty member; for example, 171.3 m and 753.5 m at E-15 compared with 368.4 m and 304.8 m, respectively, at D-02; the Cherty and Upper dolomite members are lithologically indistinguishable except on the basis of chert and quartz content. The lower and upper contacts of the Cherty member are, therefore, considered to be time-transgressive facies-boundary relationships. For an exception to this pattern at the lower contact in the Keele River area, see below under "Type lithology".

Core samples from E-30 were examined by T.T. Uyeno (see Appendix 1) but were found to be barren of conodonts. Conodonts from core samples of the Cherty member at C-21 have been dated as Early Ordovician (T.T. Uyeno in Brideaux et al., 1975). Drill cutting samples from B-45 yielded conodonts dated by T.T. Uyeno as Early Ordovician, early Arenigian (see Appendix 1).

Upper dolomite member. This fourth unit was added at the top of the three member Franklin Mountain Formation by

Mackenzie (1974c) who referred to it as the "porous dolomite unit", in the cored borehole section at A-73 (Tenlen Lake). Pugh (1983), in delineating the Cherty member, recognized the upper non-cherty dolomite unit consistently occurring over most of the Peel River area east of Richardson Mountains.

In the present study area, the Upper dolomite member is identified in six borehole sections in the north, east and southwest. Assumed limits of the unit are drawn on Figure 7. At D-02, the representative section for the Franklin Mountain Formation, the Upper dolomite member is made up entirely of pale to very pale buff and pale grey, medium to coarse crystalline dolomite; it is 81.1 m thick and is overlain by Mount Kindle brown, micro- to fine-crystalline dolomite. Two sections in the east (45.7 m at F-62 and 35.1 m at G-22) and a section to the southwest (13.7 m at K-03) are all of similar lithology but with some green intercrystalline clay, and all three underlie Mount Kindle beds. The absence of the Upper dolomite member below Mount Kindle west of F-62 and G-22 suggests pre-Mount Kindle truncation over Mahony Arch, to which is also attributed the thin, Cherty section at D-61 (see above). At another section in the southwest (H-15), 37.5 m of creamy white to buff and grey (some pink), fine, medium and coarse crystalline dolomite underlies Lower Devonian Fort Norman Formation.

The remaining section is at the most northerly borehole location, G-02. At this locality, 315.5 m are composed of 256 m of regionally characteristic pale, coarse crystalline dolomite with some intercrystalline quartz and traces of green shale, and an upper 60 m of pale buff to grey and brown, coarse crystalline and fine crystalline dolomite; it is overlain by buff to brown, micro- to fine-crystalline dolomite of the Mount Kindle Formation. The appearance of darker colouring and some fine crystalline dolomite in this uniquely thick section suggests a possible transitional or gradational change from the generally very pale, coarse crystalline Upper dolomite to brown, more finely crystalline Mount Kindle dolomite. The implication of a reduced degree of unconformity between the Franklin Mountain and Mount Kindle formations in this northern location close to the Anderson Basin may well be related to the stated (Pugh, 1983) disappearance of this unconformity westward approaching the Richardson Trough. A further implication that Upper dolomite beds of post-Early Ordovician age may be present at G-02 relates favourably to the dating of an Upper dolomite coral as probably Late Ordovician or Silurian by B.S. Norford (quoted in Pugh, 1983, p. 17)¹. The location was at N-02, about 200 km southwest of G-02.

The Upper dolomite member, therefore, though poorly represented in Great Bear River area, contributes in two ways to our understanding of the lower Paleozoic geology:

1. It delineates, by its somewhat peripheral distribution, a central (Keele Arch) area of deeper truncation of Franklin Mountain beds and also an area over Mahony Arch of greater pre-Mount Kindle erosion
2. It provides evidence of possible post-Lower Ordovician Franklin Mountain strata.

Type lithology. Norford and Macqueen's (1975) description of the Franklin Mountain type section places 266 m of clearly rhythmic dolomite into the Rhythmic member, which includes clastic quartz with rare beds of medium to very coarse grained quartzose sandstone; it assigns only 14 m of sandy dolomite to the Cherty member. These type section thicknesses of Norford and Macqueen agree closely with those of nearby subsurface sections (see Figure 7).

¹"As a colonial coral it is Middle Ordovician or younger" (pers. comm., B.S. Norford, August, 1985).

Sand was recorded in both the Rhythmic and Cherty members in the subsurface. Three borehole sections near to and east of the type locality include some sand: sandy zones in the Rhythmic member at E-11 and G-60; and sandy zones in the Cherty member at G-60 and I-54b. Summarizing the clastic input for Keele River area 150 to 200 km northwest of the type locality: some silt and sand during Cyclic deposition; fine and medium grained sand, silt and varicoloured clay during the later part of Rhythmic deposition (I-01, N-62, L-66); coarse and very coarse grained sand at the beginning of Cherty member accumulation (E-30). The coarse grained sand at the base of the Cherty member at E-30, and the sharp Rhythmic-Cherty contact at E-30 and C-21 (see Figure 23) may well be related to an "apparent minor unconformity" below the Cherty member, suggested by Norford and Macqueen (1975, p. 9) for the Franklin and Mackenzie mountains. Sand occurrences at the top of the Cherty member, (e.g., at J-65, N-28) are not considered to represent one discrete depositional event. Instead, the topmost sand, especially where associated with green shale and red and green colouring, are considered to be features of weathering below pre-Mount Kindle or later erosion surfaces (see also Pugh, 1983, p. 16).

Possible sources for the Franklin Mountain detrital quartz, in particular the very coarse sand (cited above at the base of the Cherty member at E-30) have not been determined. The only possible source rocks appear to be Precambrian igneous rocks and/or Lower Cambrian sandstones. However, there are no known paleo-exposures of these rocks to the south or west of Keele River, and the absence of recorded detrital quartz in Franklin Mountain beds to the east and north of the type locality does not support derivation from those directions either.

Mount Kindle Formation

The name, Mount Kindle Formation, originated with Williams (1922, p. 60; 1923, p. 79b), who used it when describing "grey magnesian limestone" exposed at, and south of, Mount Kindle in the Franklin Mountains. Two overlapping sections (on Mount Kindle and Smith Ridge) were reported by Douglas and Norris (1963, p. 11, 12) as consisting of fine to medium crystalline dolomite, grey and finely vuggy in the lower part, and pale brown-grey to pale grey in the upper part. Colonial corals from the basal beds were dated (Douglas and Norris, 1963) as Late Ordovician (Richmondian) and fossils from beds near the top as early Silurian. The same authors (*ibid.*, p. 32-34) also described the Mount Kindle Formation in Redstone No. 1 well as brown, fine crystalline limestone and dolomite.

The same (Mount Kindle-Smith Ridge) section was described in detail by Norford and Macqueen (1975), who defined a threefold subdivision: a basal member, 20.7 m thick, of argillaceous dolomite and dark shale; a middle resistant member, 64.6 m thick, of dark grey dolomite with many corals and some chert; and an upper member, 176.4 m exposed, of grey and pale grey dolomite. The age of the type Mount Kindle was stated (*op. cit.*) to range from Late Ordovician (basal and middle members) to Early Silurian (Llandovery) and possibly later (upper member).

Meijer Drees (1975, p. 14-18) described the Mount Kindle Formation in the subsurface of the Fort Simpson area as follows: "basal member of dark grey argillaceous dolomite and silty shale, in places underlain by or interbedded with sandstone; a lower dark grey fossiliferous dolomite member (or facies); and an upper light grey dolomite member (or facies)". The dark grey dolomite member was stated (*ibid.*) to

consist of "dark greyish brown and greyish brown dolomite", the upper light grey member to be "light greyish brown and greyish brown".

The threefold division of the Mount Kindle Formation is recognized in eight complete borehole sections in the southeastern part of the present study area. It is proposed to adopt a more concise informal appellation. Because the entire formation is made up of dolomite, and "grey" does not describe the colour, the three units are herein referred to as: the Basal member, the Lower dark member, and the Upper pale member. The subdivision is traceable northward from the type locality almost to Smith Arm. North of latitude 66°N and west of the Franklin Mountains, the Mount Kindle Formation is undivided. Isopachs and lithofacies of the Mount Kindle Formation are shown on Figure 8, and eleven sections are included on cross-sections (Figs. 21-23).

Basal member. In four subsurface sections within 140 km of the Mount Kindle type locality, the Basal member is made up of dark brownish grey to black, argillaceous and silty, microcrystalline dolomite, with some black silty shale; at E-11 the shale is in part very sandy and contains crinoid ossicles; the cored section at G-52 includes siltstone, crinoid ossicles and solitary corals; in the thickest section (25.9 m at G-60) there is some black chert, in part pyritic. Northward, Basal member lithology varies: at D-61, 3.0 m of brown-grey flaky shale; at H-34, 5.2 m similar to strata at the type locality, abundant pyrite at base; at F-62, 0.9 m of buff-grey pyritic shale, north of which the unit cannot be discerned.

The Basal member at G-52 was cored, and was described by Meijer Drees (1975) as lying unconformably on the Franklin Mountain Formation. To the north, between H-34 and F-62 (Fig. 23), the Basal member overlies the Franklin Mountain with angular unconformity. The upper contact with the Lower dark member is apparently conformable. A gradational upper contact was reported by Meijer Drees (1975, p. 16) in a cored section south of 63°.

Lower dark member. In the subsurface section (G-60) nearest to the type locality, 25 km southeast of Mount Kindle, the Lower dark member is made up entirely of grey-brown to dark brown-grey, micro- to very fine-crystalline dolomite. Northeast of Mount Kindle, borehole sections include dark chert, sometimes abundant, as it is at E-11 (chert, very dark brown-grey to black, some grey-buff). Northward, colours gradually pale: at I-54b, the dolomite is predominantly buff to grey-brown, but the chert is grey-brown to black, and there is some black dolomitic shale. In the most northerly recorded section (F-62), dolomite is mostly buff in colour, and chert is grey-buff.

The thickness of the Lower dark member ranges from 50.6 m (K-76) in the north to more than 100 m near the type locality, with a maximum of 142.6 m at G-52. The overall southward trend to thicker sections and darker colours for both the Basal member (see above) and the Lower dark member is taken to indicate a southward-deepening basin.

Upper pale member. The lithology of the Upper pale member varies very little from the characteristic dolomite - buff to pale buff, very fine crystalline, some medium crystalline, with intercrystalline porosity and traces of pale chert. The most southerly section in the study area, G-60, southeast of the type section, includes a middle part of grey-buff to white, aphanitic to microcrystalline dolomite with traces of dark grey shale. The contact with the Lower dark member is picked on the basis of colour change, with a corresponding subtle change on the gamma-ray trace (see cross-section, Fig. 21).

The thickness of the Upper pale member in the subsurface ranges from 65.5 m to 89.9 m. This variation is considered not to be controlled significantly by erosion of the upper surface (see below). East-to-west thickening appears to be at the expense of the Lower dark member: in the north, from 64.3 m Lower and 67.7 m Upper at F-62 to 50.6 m and 86.9 m at K-76; in the south from 142.6 m and 89.9 m at G-52 to 64.6 m and 176.4 m at the type section. Assuming minimal erosion of the upper surface prior to Tsetso deposition (see below), this relationship is indicative of an eastward-migrating facies boundary.

Wherever the Upper pale member is recognized in the subsurface (in nine borehole sections north of latitude 63°N), it is overlain unconformably by the Tsetso Formation. Throughout much of the study area, the Mount Kindle Formation has been removed by erosion, particularly over Keele Arch (Cook, 1975). The northeast flank of this arch is reflected in the truncation of subdivided Mount Kindle below Tsetso Formation between I-74 and H-34 (see Figures 23 and 8). However, Mount Kindle isopachs also reflect that elsewhere below Tsetso Formation (and below only Tsetso), subdivided Mount Kindle Formation is fairly uniformly distributed. For this reason, and because the Upper pale member is found thickening westward (i.e. toward Keele Arch), sub-Tsetso erosion of Mount Kindle is considered to be insignificant (the above-noted truncation against Keele Arch excepted). Thickness distribution, therefore, of the Upper pale member is assumed to be largely, if not entirely, depositional.

Undivided. In the northern Franklin and eastern Mackenzie mountains, the Mount Kindle Formation was described by Macqueen (1970, p. 229) as "a monotonous succession of uniform, medium to dark brownish grey, fine to medium crystalline dolomites" with abundant chert and silicified fossils. Pugh (1983, p. 18) reported uniform Mount Kindle lithology in 45 borehole sections east of about longitude 134°W in the Peel River area. There was stated (*ibid.*) to be, "very little variation from brown, buff, grey, pale buff and dark brown, very finely to finely and medium crystalline dolomite, with some sucrosic texture and some intercrystalline and vuggy porosity".

Over much of the Great Bear River study area, Mount Kindle Formation is absent below Devonian or younger beds and this is especially so outside the southern part. North of 66° and east of the Franklin Mountains, undivided Mount Kindle was recorded at only nine widely distributed borehole locations, from G-02 in the north to G-70 in the south. The uniform rock type consists of buff to brown, micro- to fine-crystalline dolomite with traces of pale chert. The thickest recorded section of Mount Kindle, an incomplete 361.2 m at G-70, is made up of grey-buff to grey-brown, micro-, very fine- and fine-crystalline dolomite with traces of chert in the upper 120 m, and is situated 55 km southwest of the type section of subdivided Mount Kindle. To the north, 20 km from F-62 (the most northerly section of subdivided Mount Kindle), the undivided equivalent at G-22 is mostly buff, microcrystalline dolomite with some very pale green shale in the upper part, and a zone of pink colouring and some white and pink chert in the lower part.

Undivided Mount Kindle Formation thicknesses range from 9.1 m (N-28) to greater than 361.2 m (G-70). Its distribution is controlled by erosion: sub-Delorme Group at G-70 (in the south); sub-Peel Formation at D-02 and possibly also at G-02 (in the north); sub-Fort Norman Formation at

A-52, K-03 and N-28 (to the southwest); sub-Arnica Formation at K-24; sub-Mesozoic at G-22; and at present-day surface at L-21.

The absence of Mount Kindle Formation in the northern Franklin Mountains has been attributed to erosion over the pre-Devonian Keele Arch (Cook, 1975). Twelve borehole sections confirm the absence of Mount Kindle beds from the lower Keele River area northward (see Figure 8). In three of these sections (C-21, H-61, I-74) on the northeast flank of the Arch, the Franklin Mountain Formation is overlain by the Tsetso Formation. The pre-Devonian phase of Keele Arch, therefore, is pre-Tsetso.

The coincidence of the north-northwest trending axis of the Arch and the approximate line of facies change between subdivided and undivided Mount Kindle strata suggest that early activity of the Arch may have influenced the depositional pattern of Mount Kindle carbonate. Alternatively, that which was to become Keele Arch was simply the 'western' side in juxtaposition with relative downwarping that took place at the beginning of deposition of the Basal and Lower dark members. The close similarity between the dolomites of the Upper pale member and undivided Mount Kindle indicates that whatever mechanism resulted in the east-to-west facies change ceased to play any part after deposition of Lower dark dolomite. There is no evidence to indicate nondeposition of the Mount Kindle carbonate over Keele Arch. Its absence over the Arch, therefore, is attributed entirely to truncation. On the northeast side of Keele Arch, this erosion was terminated prior to Tsetso deposition.

Peel Formation

The name, Peel Formation, was introduced by Pugh (1983, p. 20) for a sequence of dolomite rocks making up the lower part of a previously unnamed "Upper Silurian-Lower Devonian" interval. The formation, the upper of the three sub-units of the Ronning Group¹ in the Peel River area, was defined (*op. cit.*) as "the pale-coloured, generally micro- to finely crystalline dolomite sequence overlying the Mount Kindle Formation and overlain by the Tatsieta Formation". The designated type section at Pacific Peel Y.T. F-37 is 350 m thick. "Pale grey and pale buff colouring and microsucrosic textures were stated (*op. cit.*) to be "characteristic features of the Peel Formation by which it is easily distinguished from underlying brown, less finely sucrosic dolomites of the Mount Kindle Formation... and from overlying aphanitic limestone and pale green micropyrritic shale of the Tatsieta Formation, or, where the latter is absent to the east, from overlying brown sucrosic dolomite of the Arnica Formation".

The Peel Formation is clearly present in its type sense at two borehole locations in the northwest of the present study area. At G-02, the interval between characteristic Mount Kindle below and Tatsieta above is occupied by 355.7 m of predominantly pale buff to pale grey, micro-sucrosic dolomite with some medium crystalline dolomite in the lower part. Some dark grey to black, silty shale was recorded in the upper part of this section, also a basal 40 m of buff to dark brown dolomite with some grey to dark brown-grey argillaceous dolomite grading to shale. Darker coloured dolomite and dark shale were stated by Pugh (1983) to be "not characteristic of the Peel Formation"; in the type section the presence of dark shales in the basal beds was considered to represent interfingering of Road River basal shale. G-02 is, in fact, located close to Anderson Basin.

¹See Pugh (1983) for historical background.

At D-02 the Mount Kindle Formation is overlain by 98.5 m of pale buff to pale grey, mostly microcrystalline dolomite, medium crystalline in the lower 30 m, and, in turn, these strata are overlain by buff to brown, porous, sucrosic dolomite of the Arnica Formation.

The approximate eastern zero edge of the Peel Formation (isopachs shown on Figure 8) is extended from the Peel River area. The pronounced eastward thinning and absence of Tatsieta Formation at D-02 testify to pre-Arnica truncation of the Peel Formation. The appearance of darker sediments at G-02 suggests proximity to Anderson Basin, and possible transition to Road River-related sediments (as in the type area, discussed above).

The Mount Kindle-Peel contact was described by Pugh (1983, p. 21) as "apparently conformable. . . may be in part disconformable", and the upper boundary of the Peel Formation, "is a paleo-erosional surface at the sub-Devonian unconformity"¹. Contact relationships between G-02 and D-02 are shown on the cross-section in Figure 21: possible disconformity at the lower contact disappearing basinward; and unconformable at the top below the Tatsieta and Arnica formations. The Peel Formation was considered by Pugh (1983) to range from Late Silurian to possibly Early Devonian, on the basis of direct paleontological data at three locations (indicative of a Late Silurian age) and from equivalent transitional beds (Early Devonian age).

Middle Paleozoic stratigraphy

The natural boundary between lower and middle Paleozoic stratigraphy north of latitude 63°N is the sub-Devonian unconformity, which, in Great Bear River map area, was influenced by the first major phase of Keele Arch activity (Cook, 1975).

The Upper Silurian to Upper Devonian succession to be considered under this heading comprises twelve rock units that have previously been assigned formational or group status. They are illustrated on nine maps (Figs. 9-17) and six cross-sections (Figs. 24-29). Upper Silurian to Lower Devonian strata constitute the lowermost three units. They are in part laterally equivalent and are characterized by a carbonate-evaporite-detrital facies: Delorme Group, Tsetso and Tatsieta formations. The next four units, also in part laterally equivalent, comprise Lower to Middle Devonian carbonate-evaporite rocks: Arnica platform, Fort Norman, Arnica, and Landry formations. Middle Devonian beds are divided into three units, of which the lowest is the carbonate-shale Hume Formation. The upper two Middle Devonian units, along with the lowest Upper Devonian unit, make up the Horn River Group: the laterally equivalent Hare Indian (grey and black shale facies) and Ramparts (reef facies) formations overlain by the Canol Formation (black shale facies). Upper Devonian shales of the Imperial Formation are found to be the highest rock unit below Mesozoic strata.

Delorme Group

The name, Delorme Formation, was introduced by Douglas and Norris (1961) for a sequence of silty carbonate rocks in the Root River area of the southern Mackenzie

Mountains. As a result of subsequent misuse of this term to include widely differing lithofacies, Delorme as a formation has been declared obsolete (Morrow and Cook, 1987; Morrow, in press). On the basis of an in-depth study of the Silurian-Devonian rock sequence in the northern Mackenzie Mountains, Morrow (in press) has effectively solved the nomenclatural problem by raising Delorme to group status. The new group comprises the Tsetso Formation (sandy to argillaceous carbonates) and Camsell Formation (silty carbonates and evaporites). It was stated (Morrow, in press), "the Camsell Formation is correlative either in large part or completely with the upper part of the Tsetso outside the area of Camsell development".

It should be noted that Meijer Drees (in press) defines the Tsetso Formation as including evaporite as a minor component; the type Tsetso (at I-15, see below) includes subordinate amounts of anhydrite.

The Delorme Group in the subsurface west of Keele Arch is represented by five sections of mainly dolomite and anhydrite. Only one of these, at G-70, is complete; 1330.5 m consist of: a lower 335 m of buff and buff-grey to dark brown aphanitic and microcrystalline dolomite, in part anhydritic, with some black dolomitic shale and, near the top, a 6 m zone with some fine to medium grained quartzose sandstone; an upper 995 m of dolomite, mostly buff to grey-brown, microcrystalline and aphanitic, with variable amounts of interbedded anhydrite, and including one 20 m thick zone with some silty, very fine to fine grained quartzose sandstone.

East of G-70, 15 km away at I-54W, the top 60 m of an incomplete 402.3 m thick Delorme section of anhydrite and dolomite is in part silty and sandy to very sandy (very fine to coarse grained, rounded quartz grains).

West of G-70, 53 km away at I-70d, more than 2000 m of anhydrite, with some dolomite, at the bottom of the borehole, are assigned to the Delorme Group.

At K-29, drilling was completed 1258.8 m below the base of the Arnica platform. This section is considered to be Delorme Group, of which the lower 219.5 m are equated with the Tsetso Formation (Morrow, in press). The K-29 Delorme section appears to correlate with the incomplete 289.3 m section of dolomite with some anhydrite at B-30, 24 km northeast of K-29 (see cross-section, Figure 25).

Isopachs of the Delorme Group and equivalents are shown on Figure 10². It is evident that, even from only one complete and four incomplete thicknesses, there is a rapid easterly and northeasterly thinning of the Delorme Group on the western side of Keele Arch. In the Wrigley area, the Delorme is found thinning eastward into the type area of the Tsetso Formation (Fig. 28), overlain all the way by Fort Norman anhydrite. A little to the north, the disappearance of the Delorme Group within the 15 km between B-30 and I-01 (see Figure 25) and the 12 km between B-30 and J-65 (see Figure 27) is more easily explained simply as depositional thinning against Keele Arch and/or partial equivalence to the Arnica platform deposits, than by placing a substantial erosional break between two evaporite sequences with the additional implications of such a model. Support for the continuing emergence of the Keele Arch is given by the presence of quartzose sandstone within the Delorme Group (G-70, I-54W), probably derived from reworked sandstone from within the Franklin Mountain Formation.

¹"sub-Devonian" is used here in an approximate sense only: post-Peel Formation (which may extend into the Lower Devonian); pre-Delorme Group (Upper Silurian to lowest Devonian).

²The inclusion of Arnica platform on this map is explained below under that heading.

The contact with the underlying Mount Kindle Formation is exposed in the subsurface only at G-70. There, it is abrupt and may be unconformable. The Delorme Group is overlain at G-70, I-54w and B-30 by Fort Norman anhydrite, and in the more westerly sections at I-70d and K-29 by Arnica platform dolomite. The suggested depositional thinning indicates that the upper contact is conformable. The regional unconformity, therefore, which is referred to herein as "sub-Devonian", may extend below, but not above the Delorme Group.

The Delorme Group east of Keele Arch is considered under the following heading.

Tsetso Formation

The term, Tsetso Formation, derived from the name, Tsetso Lake, has been proposed by Meijer Drees (in press) for a succession of sandy carbonates, shale and anhydrite overlying the Mount Kindle Formation and overlain by the Fort Norman Formation. The type section was selected (op. cit.) in the Shell Ochre River I-15 well between borehole depths 4633 and 3946 ft.; a thickness of 209.4 m. Type Tsetso consists of sandy and silty dolomite, quartzose sandstone and some anhydrite. Meijer Drees (in press, Fig. 8) has proposed an informal seven-fold subdivision of the type section, which includes marker units that can very usefully be traced south and north from I-15. Camsell Formation anhydrite, equivalent to the Tsetso Formation, has been delineated east of Keele Arch by Meijer Drees (in press, Figs. 7, 9).

The use of the name, Tsetso Formation, has been extended to the northern Mackenzie Mountains where, together with its facies equivalent, the Camsell Formation silty evaporite sequence, the two formations constitute the Delorme Group (Morrow, in press; and see above under Delorme Group heading).

The present study supports the foregoing assignments entirely. The following discussion of the Tsetso Formation recognizes the presence also of a Camsell evaporite sequence, and hence of the biformal Delorme Group east of Keele Arch, but for simplicity all are being considered as Tsetso Formation.

Within the area east of Keele Arch there are thirteen borehole sections of Delorme Group, one of which (G-60) includes the Tsetso type section. These thirteen sections are predominantly of Tsetso lithology. Isopachs and lithofacies are illustrated in Figure 10. Dolomite-evaporite-clastics facies extend some 300 km north from the type section wherever Devonian rocks are preserved on the east side of Keele Arch. Throughout most of that area north of latitude 64°N, Tsetso strata are varicoloured, more intensely so in the north: at H-34 the section is predominantly dolomite with sandstone and shale and some anhydrite, and these rocks are coloured pale buff to white, brick-red, maroon, pale purple, pink, purple-brown, and pale green. Very poorly sorted quartzose sandstone and/or sandy and silty dolomite, which were recorded in seven of the sections, occur along the

western side of the area of Tsetso distribution; exceptionally, the most westerly section, at C-21, comprises only varicoloured dolomite and shale. The one borehole south of the type locality (at G-60) consists entirely of dolomite with some anhydrite.

The Tsetso Formation is overlain in eleven sections by Fort Norman anhydrite, with which, locally, it might be confused. The contact is drawn (as at I-54b; and see cross-section, Figure 24) at the top of the highest red shale or other varicoloured beds.

Surface exposures of Tsetso Formation near Fort Norman are listed in Meijer Drees (in press). Two of these exposures, south of Mount St. Charles, were described by Morrow and Meijer Drees (1981, p. 112, 113) as "silty and sandy dolomite with some chert pebble lenses".

Isopachs of Tsetso Formation (Fig. 10) show a bilobate pattern of distribution¹. The thickest recorded Tsetso section is at O-13; this apparently almost complete section (see cross-section, Figure 24) is 359.7 m thick, with other thicknesses in the south ranging between 200 and 300 m. The northern lobe thins to zero, to the east, west and north, from a central thickness of 212.1 m at D-61. Thinning below the overlying Fort Norman-Arnica formations is considered to be depositional – 81.7 m, for example, at C-21 on the eastern flank of Keele Arch. Thinning to 45.7 m at F-62 is erosional at the sub-Mesozoic surface.

Tsetso thickness distribution is strikingly similar to that of the underlying subdivided Mount Kindle Formation (Fig. 8), indicating related basinal configurations. It has been noted above that the facies change between subdivided and undivided Mount Kindle strata was the result of the proto-Keele Arch being a positive submarine feature during the early part of Mount Kindle deposition. The depositional thinning of the northerly lobe of the Tsetso and the presence of quartzose sand in several of the more westerly sections suggest that Keele Arch during Tsetso deposition was, in part at least, a land feature exposing the sand-bearing Franklin Mountain Formation and possibly older strata. In the south, westward thinning of Tsetso below the Fort Norman Formation is much less pronounced as the Tsetso passes into the westward-thickening Delorme Group. This boundary, like the earlier Mount Kindle facies boundary, is roughly coincident with the axis of Keele Arch. In the absence of direct evidence to the contrary, deposition in this area is assumed to have been continuous over the Arch axis.² The presence in the south of quartzose, medium to coarse grained sand in Tsetso and Delorme beds on either side of the Arch axis (I-15, E-11, G-70, I-54W) suggests derivation from, and proximity to, exposed lower Paleozoic strata over Keele Arch to the north.³

Referring to Figure 10, the reconstructed isopachs of the Tsetso-Delorme Group have been drawn to include the Arnica platform. The latter was included in this map because of the possibility of partial time correlation (see p. 25). If, however, the Arnica platform were excluded from the isopachs, the reconstructed zero edge of Tsetso-Delorme strata could be drawn very much farther south than is shown on Figure 10, meaning that sand-bearing lower Paleozoic

¹ Anhydrite is dominant in the upper part of the sections at O-13 and D-61, indicating that the two lobes represent subbasinal developments of Camsell evaporite facies toward the end of Tsetso deposition. This agrees with Morrow (in press), as noted above, that Camsell is correlative with upper Tsetso. For the purpose of this study, Camsell anhydrite is not discussed separately, and therefore these relatively minor developments east of Keele Arch are included under Tsetso Formation.

² Willow Lake Passage of Williams (1975, p. 32), Keele Arch being McConnell Ridge.

³ Morrow (in press, Fig. 13D) has noted, for the northern Mackenzie Mountains, close petrographic similarity between the sandstone of the Franklin Mountain Formation and that of the Tsetso Formation.

strata could have been exposed over Keele Arch during deposition of the Tsetso-Delorme Group. This implies that the Arnica platform postdated the above-postulated southward transportation of lower Paleozoic sand from Keele Arch, and furthermore that, because the sand occurrences in the Delorme and Tsetso beds occur more in the upper part of these units, the Arnica platform is entirely younger than those units.

The Tsetso Formation lies unconformably on the Mount Kindle Formation, which is found truncated below the Tsetso on the northeast flank of Keele Arch. The upper contact with Fort Norman anhydrite is apparently conformable, and may be gradational in the southern part (I-54b, etc.).

Westward, the Tsetso Formation is the silty carbonate and sandstone facies of Delorme Group in the Mackenzie Mountains. The Tsetso may be in part equivalent to the Tatsieta Formation in the Peel River area.

Tatsieta Formation

The name, Tatsieta Formation, was introduced by Pugh (1983, p. 25) to refer to a "thin sequence of limestone and green shale at the base of the subsurface Devonian system" in the Peel River map area. At its type section, the R.O.C. Grandview Hills No. 1 (A-37) borehole at latitude 67°N, the Tatsieta Formation consists (op. cit.) of "61 m of pale buff aphanitic limestone, some white 'chalky' limestone and some pale green micropyrritic shale and it includes in the top 10 m pale grey very silty dolomite". It lies between the Peel Formation below and Arnica Formation above. Type lithology was stated (op. cit.) to extend northeastward from Peel River. An eastern depositional edge was drawn west of longitude 129°W.

One borehole section of Tatsieta Formation is identified in the extreme north of the present study area (see Figure 10). At G-02, the Peel to Arnica interval, 17.7 m thick, comprises white to pale buff aphanitic limestone, pale green to pale green-grey micropyrritic shale, and some creamy white, microcrystalline, calcareous dolomite.

The Tatsieta Formation, which was recognized by Pugh (op. cit.) to be a key marker unit throughout most of the Peel River area, is now found to persist unchanged north to the Arctic Ocean. The present study has no data to contribute to the understanding of relationships between the Tatsieta and possible equivalents within the southern part of Great Bear River area. Tatsieta isopachs and lithofacies have been included on the Delorme map (Fig. 10) to give recognition to the possibility of correlation.

Arnica platform

Williams (1975) coined the term "Arnica platform dolomite" for a marker unit at the base of the Arnica Formation. The recognition of this marker contributed toward relating the Delorme Group and Arnica formations of the mountains to their equivalents below the Mackenzie Plains. Williams (1975) listed eight borehole and three surface sections of Arnica platform dolomite with footage statistics, criteria for recognition, and the nature of underlying and overlying strata. Of the eleven sections, eight were recognized (op. cit., p. 33) by "dark colour, contrasting

noticeably with rocks above (except Funeral) and below" and "crinoids", and by other criteria.

The name given by Williams (1975) is ideally descriptive of the unit's stratigraphic position and correlative value, except that "Arnica", by definition, renders "dolomite" superfluous. The more concise "Arnica platform", therefore, is used herein.

To the seven of Williams' borehole sections that are north of latitude 63°N, the present report adds another three close to the northeast zero edge of the Arnica platform on the flank of Keele Arch. Of these ten sections, six comprise dark grey and brown dolomite with the darkest at the more southwesterly locations: very dark grey to black, at I-70d; and very dark brown-grey at G-70. Buff and brown dolomite make up the Arnica platform closer to Keele Arch, at J-65, I-01 and J-42. The platform dolomite is generally microcrystalline, locally very fine to fine crystalline. At B-30, the lower, somewhat dolomitic part (117 m) of the Fort Norman Formation (see Figures 25, 27) is recognized as Arnica platform equivalent, following Williams' (1975, p. 33) assignment on the basis of fossil evidence. In the subsurface, the Arnica platform thickens southwesterly from 94.5 m at I-01 to a maximum recorded 219.5 m at I-70d.

It will be seen below that the value of the Arnica platform as a correlative marker is appreciated when viewed within the framework of Lower and Middle Devonian rocks. The interval from the top of the Delorme Group to the base of the Hume Formation is occupied in the subsurface by basically three lateral-facies-related units, commonly encountered, in ascending order: Fort Norman, Arnica and Landry formations. The Arnica platform, described by Williams (1975) as marking the base of the Arnica Formation, was stated (1975, p. 34) to "be expected to become evaporitic eastward". Therefore, because the Fort Norman-Arnica boundary is an eastward-migrating, time-transgressive facies relationship¹, the Arnica platform may be expected to pass eastward into (not necessarily either at the base or at the top) the Fort Norman Formation. This understanding is at the basis of the correlations presented in this report: in the south, as a facies equivalent at the top and in the middle of the Fort Norman Formation through G-70 and I-54W (see cross-section, Figure 28); and farther north, as a facies equivalent at the base of the Fort Norman Formation through K-29, B-30 and I-01 (see cross-section, Figure 27). The implication from these relationships – that the Arnica platform may be, itself, a time-transgressive rock unit – does not invalidate Williams' (1975, p. 34) interpretation of this unit "as a blanket carbonate deposited during a major transgressive pulse". It does mean, however, that there is a possibility of the Arnica platform being in part time-correlative with the topmost beds of the Delorme Group. It is for this reason that the Arnica platform has been included in Figure 10 directly southwest of Keele Arch (B-30, etc.) where it has been recognized as a basal equivalent within the Fort Norman Formation and where the Delorme Group has thinned to zero.

It was reasoned above that, rather than being time equivalent, the Arnica platform may be younger than the Delorme Group or the Tsetso Formation, depending on the derivation of the sand found within the upper parts of the latter units. The inclusion of the Arnica platform in Figure 10 may also, therefore, serve to inspire further study.

¹Williams (1975, Fig. 7.3), and demonstrated by Pugh (1983).

Fort Norman Formation

The term, Fort Norman Formation, has been introduced by Meijer Drees (in press) for the surface anhydrite-dolomite succession that is the lateral facies equivalent of the surface breccias constituting most, but not all, of the Bear Rock Formation (originally defined by Hume and Link, 1945, and extended to the subsurface by Tassonyi, 1969). The name was derived from the settlement of Fort Norman, in which area the formation was previously mapped by Tassonyi (1969) as the Evaporite member of the Bear Rock Formation. Because it was seen that the stratigraphic relationships between the Fort Norman Formation and its facies equivalents can be more easily studied to the south near Fort Simpson, the type section was chosen to be in the Fina Willow Lake L-59 well. This location is south of the present study area. It was stated (Tassonyi, 1969) that at its type locality, the Fort Norman Formation lies between the Tsetso Formation below and the Arnica Formation above.

In the subsurface of the study area, the Fort Norman Formation has been drilled in 39 boreholes, and, of these, 25 are complete sections. Drill cuttings indicate a characteristic lithology of pale anhydrite with minor amounts of dolomite. Exceptionally, dolomite appears to predominate in the upper part at two locations in the southeast, at E-11 and I-15, and also in the southwest at K-29. Solution breccia equivalents of the Fort Norman Formation¹ occur at J-65 and I-01 (see map, Fig. 11) close to the truncated edge on Keele Arch.

Isopachs of the Fort Norman Formation on Figure 11 show the depositional thickness distribution below the overlying and lateral-facies-related Arnica Formation. Fort Norman evaporites accumulated in three roughly lenticular bodies. In the south, one of these bodies is more than one thousand metres thick at its centre, and passes southwestward into the dolomite facies equivalent Arnica Formation, thinning rapidly northward to zero edge against Keele Arch, and is apparently continuous with the other two bodies through 200 to 300 m thick corridors to the northeast and northwest. To the northeast, somewhat elongate, and parallel to Keele Arch, the second body is possibly 400 m thick, and exhibits pronounced peripheral thinning to a zero edge. To the northwest, also reaching close to 400 m, a small lenticular area extends farther northwestward to a more even distribution and reaches a depositional edge in the Peel River area.

The Keele Arch area appears not to have been favourable for the precipitation of Fort Norman evaporite. At C-21, it is definitely absent; the Arnica rests directly on the Tsetso Formation. The question then arises as to whether or not Keele Arch was exposed at the time of Fort Norman evaporite deposition, and, if it was not, whether Arnica dolomite deposition was occurring over part or all of the area contemporaneously with deposition of Fort Norman evaporite. It will be seen under the next heading that the Arnica-Landry interval preserved below overlying Hume Formation at C-21 is significantly thicker than the sub-Hume section at I-74, 30 km to the northeast (see Figure 25). The whole facies-related Fort Norman-Arnica-Landry package, however, thins westward toward Keele Arch. It is probable, therefore, that the lower part of the Arnica at C-21 is, in fact, equivalent to the Fort Norman, and that Arnica carbonate began to build up at C-21 at the same time as the precipitation of anhydrite northeastward. However, the possibility that Keele Arch contributed to the nondeposition

of Lower and Middle Devonian carbonates over at least part of Keele Arch is indicated by the following:

1. The fact that the Arch is clearly outlined by an absence of evaporite and by an overall marked thinning of evaporite on both flanks
2. The reported presence of quartzarenite sandstones in the Bear Rock (Fort Norman) Formation near Keele Arch (Morrow and Meijer Drees, 1981, p. 112, 113)
3. The occurrence of some fine clastic material in post-anhydrite Landry strata southwest and northeast of the Arch, and of traces of pink colouring in Landry limestone at C-21 (see Figure 12).

This possibility of nondeposition is expressed on Figure 12 as a speculative zero edge in the present Fort Norman area.

Arnica and Landry formations

The names, Arnica and Landry formations, which originated with Douglas and Norris (1961) in their study of the Camsell Bend-Root River-Virginia Falls map areas, have been used progressively northward in surface mapping (Gabrielse et al., 1973; Aitken and Cook, 1974). Pugh (1983) used the two names in describing the subsurface of Peel River map area and designated R.O.C. Grandview Hills No. 1 (A-37) well as the representative borehole section. Reasons were given (Pugh, 1983, p. 25) for declaring obsolete the name, Gossage, superseded by Tatsieta, Arnica and Landry formations. Arnica dolomite was described (Pugh, 1983, p. 27) as "generally brown and buff, finely crystalline and characteristically in part sucrosic with common inter-crystalline and vuggy porosity" and Landry limestone as "generally pale buff in the lower part to chocolate brown at the top and is aphanitic, variably argillaceous and pelletal". The contact between the two units was placed "at the base of the stratigraphically lowest limestone", the nature of the contact reflecting "a pulsating, but overall easterly, migration of the dolomite-limestone depositional boundary".

The above descriptions of lithology have been found to apply consistently over the wide range of their distribution within the present study area, enabling straightforward identification of 53 Arnica-Landry borehole intervals. Of these, 41 were complete Arnica and Landry sections. Variations do occur, and it is on the characteristic lithological background that they gain significance. They will be discussed under two headings:

1. Southwest of Keele Arch

In the thicker sections southwest of Keele Arch there is clearly a southwesterly trend to darker, increasingly argillaceous carbonates. At I-70d, the 1288.7 m of Arnica dolomite is mostly grey or buff-grey, micro- to very fine-crystalline and micro-sucrosic, and includes about mid-section 100 m of brown-grey to black argillaceous limestone. At this locality, the Arnica is overlain by characteristic chocolate- and buff-brown aphanitic Landry limestone. This is one instance in the Great Bear River area where the "stratigraphically lowest limestone" criterion (Pugh, 1983) for placement of Arnica-Landry contact requires a modifier to recognize interfingering of basinal limestone (Funeral - see below) within the Arnica dolomite.

¹Bear Rock Formation in surface sections (Morrow and Meijer Drees, 1981).

The transition to basinal facies is more pronounced in the Keele-Redstone rivers area, particularly in the Landry Formation. At G-51p, an incomplete (at 698 m) Arnica section, exhibiting both a trend to evaporite facies and, at the top, dark grey dolomite with relict pelletal structure, is overlain by aphanitic, pelletal Landry limestone ranging in colour from grey-buff to black, and grading to black calcareous shale. Toward Keele Arch from G-51p, aphanitic and micrograined limestone with traces of pelletal structure is in part argillaceous and silty, and grades to dark grey-brown, silty, calcareous shale. This observed distribution of fine clastic material indicates derivation from Keele Arch, with the silt settling locally on the southwest flank, and the clay passing basinward. Although darker rocks in the more southwesterly sections bear witness to basinward sedimentation throughout the entire Arnica-Landry interval, clastic input from Keele Arch appears to have been confined to the time of later Landry deposition.

Douglas and Norris (1961) have shown that, south of latitude 63°N in the Camsell Bend and Root River areas, the upper part of the Arnica Formation and all of the Landry Formation together pass into a shaly limestone unit known as the Funeral Formation. Douglas (1974) used the name Funeral to the north in surface mapping to Dahadinni Range, the area of the 1973 borehole I-70d. Meijer Drees (1980), describing Lower and Middle Devonian units in M-43 borehole, assigned the entire interval between the Bear Rock (now Fort Norman) and Headless (lower part of Hume) formations to the Funeral Formation. The present writer disagrees with the use of the name Funeral in any of the borehole sections encountered within the study area. At I-70d, where Funeral was used for surface exposures (Douglas, 1974), the Arnica-Landry, as stated above, varies from regionally characteristic facies only to the extent of exhibiting grey Arnica dolomite and a relatively thin interval of basinal limestone. To designate this darker interval a tongue of the Funeral Formation might well be meaningful in the context of a regional understanding of the depositional environment. Similarly, the Landry section of G-51p would be usefully recognized as a transitional facies (to the Funeral Formation). If, farther southwestward (basinward), there are sections that show that most or all of the Delorme-Hume interval comprises predominantly basinal deposits, then the Funeral Formation, in the sense of its use by Douglas and Norris (1961), would appear to be an ideal appellation. On the other hand, to extend the Funeral into the known Arnica-Landry territory of this report would merely obscure shelf relationships. Minor amounts of shale occurring in the Landry do not make it non-Landry technically or usefully.

One other recorded occurrence of dark shale deserves mention. In the extreme north, at G-02, a 196.6 m thick section of otherwise characteristic Landry limestones includes throughout some interbedded shale, mostly dark brown-grey to black. Several similar sections in the Peel River area have been assigned (Pugh, 1983, p. 28) to a band of transitional facies (the Road River Formation) along the east side of Richardson Trough. Likewise, the section at G-02 may represent Landry in transition to Anderson Basin equivalents.

2. Northeast of Keele Arch

Arnica dolomite northeast of the Arch varies essentially only in its finer crystal size from the regionally familiar buff to brown, sucrosic lithology. It is generally microcrystalline, and in drill cuttings may locally appear almost "earthy" or "chalky" textured, and may look quite unfamiliar where bituminous residue superimposes a pattern of microspecks and streaks. Porosity is more commonly pinpoint or vuggy, rather than the usual intercrystalline.

Of the 14 Arnica-Landry borehole intervals northeast of the Arch, 12 subcrop below Mesozoic strata. Two complete and six truncated sections of Landry are available, and, of these, two display α -characteristic features: at C-21, traces of pink colour, otherwise buff to brown limestone; at N-70, much of the aphanitic limestone is argillaceous, some grading to very calcareous shale, some very pyritic, and some with thin veins and inclusions of pink calcite.

Two sections northeast of Keele Arch pose contact problems, for which the "stratigraphically lowest limestone" criterion (Pugh, 1983) is unsatisfactory: at C-21, the interval is almost equally divided into a fourfold dolomite-limestone-dolomite-limestone sequence; at F-49, the lower 30 m consists of interbedded limestone and dolomite, 3 m of pale green shale in the middle, and the upper part comprises 18 m of Arnica dolomite and 7 m of Landry limestone. As it is not the precise placing of the Arnica-Landry boundary that is important in the context of a regionally recognized lateral facies relationship, it is of little concern whether we have tongues of Arnica in Landry or tongues of Landry in Arnica. The writer feels free, therefore, to break the rule for the 'special' area northeast of Keele Arch. For the sake of providing a boundary, the top of the highest dolomite has been chosen for these two sections (C-21, F-49), but they may equally well be labelled, Arnica-Landry undivided.

The only depositionally controlled thickness variation northeast of Keele Arch lies between C-21 and I-74 (30 km apart), where Landry is overlain by Hume Formation. Thicknesses of Arnica and Landry formations increase from 15.2 m and 22.6 m, respectively, at I-74, to 99.4 m and 35.4 m at C-21, a substantial thickening toward the Arch. However, as discussed under the previous heading, it is probable that part of the Arnica at C-21 is isochronous with Fort Norman anhydrite at I-74.

In summary, the Arnica and Landry formations are remarkably consistent rock stratigraphic units from the southern to the northern limits of the study area. They are bounded along possibly the entire western side by a transition into basinal units: the Funeral, Red River, Sombre and Road River formations in the southern part; the Road River Formation in Peel River area; and assumed basinal facies west or northwest of G-02 in Anderson Basin in the north. Their eastern limit is erosion-controlled below Mesozoic strata. It is possible that these units were not deposited along the crest of Keele Arch, and that, in the later part of this interval, submarine scouring of exposed lower Paleozoic shales and varicoloured carbonates contributed fine clastic material and traces of pink colouring to nearby Landry sediments.

In the southeast corner (Fig. 12), the 50 m isopach of Arnica-Landry (preserved below the Hume Formation) suggests depositional thinning over Liard Ridge (after Williams, 1975). It would be reasonable to postulate that the coaxial Keele Arch-Liard Ridge provided the modification in the nearshore marine environment that is reflected in the chalky-textured carbonates and locally occurring green shale and pyrite.

Hume Formation

The historical development of the term, Hume Formation, was given previously (Pugh, 1983, p. 29) for the Peel River area. Bassett (1961, p. 486, 487) designated a type section on the Hume River (see Figure 13, this report) and gave a description outlining a fivefold division. Subsequently, similar subdivisions were recognized by Tassonyi (1969, p. 62) in the Norman Wells area and by Pugh (1983) in the southeastern part of Peel River map area. Pugh found that the fivefold division thicknesses in the subsurface closely resembled those of the type area, but differed from those reported by Tassonyi (1969). Inability to carry the type area subdivisions far, either to the west, north or east, was attributed (Pugh, 1983, p. 29) to "evidently rapid facies changes", and for that reason the sub-units were not formally recognized. Borehole section F-57 m, from the Peel River area, is reproduced on the cross-section in Figure 26 (this report), and the fivefold division of the type area is correlated from this locality southward into a widely recognizable threefold Hume subdivision (see below).

The overall Hume lithology, which is consistent throughout both the Peel River and Great Bear River map areas, comprises bioclastic, fossiliferous and argillaceous limestone and interbedded grey or green-grey calcareous shale. It is the vertical distribution of shale strata and their degree of areal persistence on which the Hume subdivision is founded. Cross-section F-57 to K-71 (Fig. 26) shows the correlation of Hume sub-units southeastward from the fivefold division of the type area. The upper part of the Hume at F-57 is a limestone-shale-limestone sequence that can be traced some 50 km through H-40 to J-48, beyond which the thin middle shale unit pinches out. The Hume at K-03, therefore, comprises the type locality Lower and Middle members and an Upper member that is an undivided composite of the upper three sub-units of the type area. The threefold membership at K-03 continues southeastward to K-71, and with continuing uniformity southward (Fig. 27) from J-65 to G-70. The Lower member, thus correlated from type area to G-70 is found to be precisely the Headless Formation as defined by Law (1971, Fig. 26)¹, thereby agreeing with Law (1971, p. 451) that the Headless and lower Hume of Bassett (1961) are correlative.

South of the present study area, the Headless Formation shale is overlain by Nahanni Formation limestone. Referring to Douglas and Norris's (1960) finding that on the Headless Range of the southern Mackenzie Mountains, Nahanni limestones grade laterally into shales that were included in the Headless Formation, Law (1971, p. 452) suggested that this upper Nahanni-facies-equivalent part of the Headless "should perhaps be called by a different name". Whether the upper Hume alone, or the upper and middle

members together are to be equated to Nahanni Formation, is a question which should be resolved from a surface-to-subsurface study, which is outside the scope and area of this report. Pending such work, and as the Middle member in the subsurface is clearly not Headless shale, the three sub-units of the Hume Formation are referred to herein as the Headless Member and the Middle and Upper members. Isopachs and lithofacies of the Hume Formation and the Headless Member are shown on Figure 13. Hume sections are included in all five Devonian stratigraphic cross-sections, Figures 24-28.

Headless Member

At the most southerly location, G-70, nearest to the Headless Formation type locality, the Headless Member consists of grey, pale grey, grey-buff, micrograined, argillaceous and silty limestone, which is in part bioclastic, and in part pelletal; and much grey to very dark grey and black shale. Black shale in the Hume Formation is confined to the Headless Member and observed in a dozen borehole sections southwest of Keele Arch. The more basinward section at G-51p is predominantly dark grey to black, calcareous shale, with interbedded grey to grey-buff, micrograined, partly argillaceous limestone. Closer to the Arch, at B-30, where the Headless limestone is aphanitic to micrograined with traces of pelletal structure, it resembles the Landry Formation, but includes some silty and calcareous, dark brown-grey to black shale. Even closer to Keele Arch, sections at I-01 and J-65 are made up of the more familiar argillaceous and bioclastic limestone with grey, calcareous shale, and this same lithology characterizes the Headless Member in all other sections, northwest to the Peel River area, and in erosional outliers of the Hume Formation northeast and southeast of Keele Arch.

The remarkably persistent uniformity of individual beds throughout the area of Headless distribution, as revealed on the sonic-gamma ray trace, and its conformable lower and upper contacts, give diagnostic value to the isopachs (Fig. 13). Drawn at 10 m intervals, they show very clearly the nature of the depositional thinning and the reflection in this of Keele Arch. In contrast to the gradual thinning that can be seen eastward through the Blackwater Lake area and northward through the Norman Wells area, the Headless is seen to thin rapidly on the southwestern flank of Keele Arch. Reasonable projection of the 10 m isopach from A-37b eastward to take into account the 31.7 m of Headless at C-21, and southward to Stewart Lake area, outlines a probable area of little or no deposition. Because the isopachs of total Hume follow the same pattern as the Headless isopachs, reconstructed Hume isopachs have been drawn (Fig. 13) around an assumed nondepositional area over the crestal area of the Arch. Southward there appears to be much less pronounced influence along the axis of the Arch on Headless (and Hume) deposition.

The lower boundary of the Headless is placed where buff, brown, aphanitic and pelletal Landry limestone changes to grey, argillaceous, bioclastic limestone and interbedded shale. Ability to pinpoint consistently this lower contact requires careful sonic-gamma ray log correlation in addition to sample examination, suggesting that there is some degree of gradational change. This is supported by the occasional

¹This disagrees with Meijer Drees' (1980, p. 20 and Fig. 4) statement that "the Lower and Middle members are approximately equivalent to the Headless Formation as defined in the subsurface by Law (1971)". Comparison of the Hume section at G-70 and I-46 in Meijer Drees' Figure 24 and in Law's Figure 26, shows clearly that Law's Headless equates only with about the lower two thirds of Meijer Drees' Lower member, which renders Meijer Drees' statement (op. cit.) invalid.

appearance of Landry-like limestone in Headless samples (as, for example, at B-30, mentioned above). The upper contact is more easily drawn at the top of a prominent shale interval below an equally prominent limestone unit that is conspicuous both on sonic (see Figure 27) and electric log (see Figure 26) traces.

Middle member

The Middle member turns out to lie both lithologically and stratigraphically between the shale-rich Headless Member below and the essentially non-shale Upper member. The Middle member comprises bioclastic, fossiliferous limestone with varying amounts of argillaceous limestone and interbedded calcareous shale. The argillaceous content increases northward. It is very sparse in the south at G-70 and A-12 (Fig. 27) but yet serves to distinguish Middle from Upper on sonic-log trace. From K-71 to the Peel River area, the limestone-shale ratio approaches Headless Member proportions. The Middle member there is reliably distinguished from the Headless by the prominent basal limestone below which the contact has been drawn.

At B-30, the Middle member includes some argillaceous, calcareous siltstone, which at that location suggests derivation from Keele Arch, supporting the postulation that the Arch was not entirely covered by Hume sediments.

The age of the Middle member at M-43 has been determined as Middle Devonian, Eifelian, by A.E.H. Pedder (Appendix 1).

Upper member

The Upper member of the Hume Formation is characterized by grey to grey-buff, grey-brown and white, micrograined, bioclastic, fossiliferous, nonargillaceous limestone. Northward, however, there is some argillaceous content: northwest at K-03, a mid-section shale unit appears that extends into the Peel River area to become one of the five subunits of the type Hume Formation (discussed earlier); at C-21 (see Figure 25) the thickening of the Middle member at the expense of the Upper member suggests that the lower part of the Upper member is argillaceous. Uniquely, at J-65, on the western flank of Keele Arch, the Upper member is entirely buff to white, fine to coarse crystalline dolomite, probably related to reefoid facies of which there are occurrences at several locations to the north (Fig. 13).

The Middle-Upper contact was drawn as an extension from the type area. Southeastward from the base of a major limestone unit at F-57 m, it falls at the base of essentially nonargillaceous limestone constituting the upper one third of the Hume Formation. This rule applies south all the way to G-70 and from there east into the Blackwater Lake area (Fig. 28). This lower contact of the Upper member appears to be an approximate timeline, with the exception of the above-mentioned, suspected facies boundary at C-21.

The upper contact of the Hume Formation with the Hare Indian Formation is abrupt but with no evidence of erosion. This agrees with previous observations (Bassett, 1961, p. 487; Tassonyi, 1969, p. 66, who allowed for the possibility of localized erosional surfaces on bioherm tops; and Pugh, 1983, p. 30).

Undivided Hume Formation

In the northern part of the study area the Hume Formation is present in borehole sections G-02 and D-02, and

probably also at M-43 (see Figure 24). Characteristic Hume lithology is found as far north as G-02: grey-buff to grey-brown and white, argillaceous, fossiliferous limestone, and grey, calcareous shale. A possible subdivision into a more shaly lower part and a predominantly limestone upper part indicate a close relationship with the southern Hume.

At M-63, the Franklin Mountain, Cherty member, is overlain by 349 m of limestone at the top of the borehole. The lower 129 m of this is characteristic Landry limestone, buff coloured with some brown, and aphanitic with traces of pellets. This is overlain by 220 m of greyish, argillaceous, fossiliferous limestone, and buff, calcareous, very micaceous shale, and includes a 10 m interval of limestone with breccia-like structure and black, noncalcareous pellets (see Appendix 2 for more detail). This is assigned to a localized variant of the Hume Formation, the only possible, but less likely alternatives being anomalous equivalents of the upper Landry or Hare Indian formations.

Horn River Group

The name, Horn River, made its stratigraphic debut as a label for a few metres of shale northwest of Great Slave Lake (Whittaker, 1922). Its subsequent redefinition and various applications and correlations were discussed and summarized by Pugh (1983, p. 31, 32), who proposed that Horn River should be raised to group rank to include, in the north, the Middle Devonian Hare Indian and Ramparts formations and the Upper Devonian Canol Formation. This was shown (Pugh, 1983), not only to integrate into one stratigraphic package the variety of seemingly different meanings of the name, Horn River, but also to give a nomenclatural identity to a "unique sedimentary interval of regional transition" from lower Paleozoic carbonates to upper Paleozoic clastics.

The Horn River Group in the present study area was studied in 42 borehole sections, the data from which were used to compile three isopach and lithofacies maps (Figure 14, of the Horn River Group and Ramparts Formation; Figure 15, of the Bluefish Member; Figure 16, of the Canol Formation). Sections are included in all five Devonian cross-sections (Figs. 24-28).

Hare Indian Formation

The name, Hare Indian Formation, developed from the original term, Hare Indian River Shale, of Kindle and Bosworth (1921). Hare Indian has consistently been applied to the shale facies equivalent of the Ramparts Formation. Pugh (1983, p. 32, 33) discussed the need to redefine the criterion for the Hare Indian-Ramparts contact. It was demonstrated (op. cit.) that the contact could be picked unvaryingly throughout the complex reef-to-shale facies relationships on the basis of assigning all quartz siltstone and sandstone to members of the Ramparts Formation. The provision was included that "Hare Indian shales locally may be very silty, grading to argillaceous fine-grained siltstone in the upper part". A basal, black shale unit was given (op. cit.) formal recognition as the Bluefish Member, and the previously Unnamed part (Tassonyi, 1969, p. 71) was referred to (Pugh, 1983) informally as the Grey shale member.

Where, therefore, the Ramparts Formation is absent, the Horn River Group becomes a black-grey-black all-shale unit in which the Hare Indian Grey shale separates the Bluefish Member from the Canol Formation. In the Peel River area the Grey shale member becomes black as Horn River units are traced westward. Pugh (1983) developed

gamma-ray criteria for the westward-continuing recognition of the Bluefish Member at the base of the resultant all-black Horn River (Formation), in which the Grey shale member could no longer be discerned. For practical purposes of surface mapping in the Peel River area, the assignment of black shale to Canol, because all Canol is black, is understandable and acceptable even though technically incorrect (Pugh, 1983, p. 38). However, the application of that practice in the Great Bear River area will now be seen to be unacceptable.

Beginning from F-57m (see Figure 26) where the Horn River Group includes the two-member Hare Indian, three-member Ramparts and the Canol Formation, these sub-units are carried eastward to H-40. The line of cross-section then leaves the reef (see also Figure 14), so that only the black-grey-black, all-shale, Hare Indian-Canol version of Horn River Group is present at J-48. The next step on the cross-section leads to K-03, southeast of the reef, where there is an all-black shale Horn River section. Continuing the correlation southward, via Figure 27, to G-70, the section passes through some interesting grey-black relationships, which amply prove that there is more to Horn River black shale than just Canol, and more to Hare Indian black shale than just Bluefish. In view of the foregoing correlation, it is proposed to distinguish Hare Indian black shale facies by increasing the membership of the Hare Indian Formation to include the Bluefish, Grey shale and Black shale members.

Bluefish Member. The term, Bluefish member, was first used by R.J. Kirker in a presidential address in 1962 to the Alberta Society of Petroleum Geologists. Tassonyi (1969), for lack of a suitable type section, postponed formal recognition in favour of "Spore-bearing member". Mackenzie (1972) gave potential economic importance to this thin bituminous member and reported beds of fibrous calcite with cone-in-cone structure persisting within the member throughout the Lower Mackenzie and Anderson River area. Pugh (1983, p. 33) reinstated the earlier name to give this unit formal definition, and selected Powell Creek as the type section, one which had been described by Mackenzie (1972). A subsurface reference section was designated 60 km north of the type locality, a section selected "in order to emphasize the inclusion of the basal limy beds within the Bluefish Member, rather than at the top of the underlying Hume Formation" (Pugh, 1983). A second reference section was suggested (op. cit.) at Mac No. 1 borehole (J-76), it having been reported by Mackenzie (1972) to be the only subsurface occurrence of Bluefish fibrous calcite in a cored section.

The 32 borehole sections of the Bluefish Member recognized in the present study area demonstrate the widespread uniform lithology of this relatively thin unit. At G-02, near the Arctic Ocean coast, black, bituminous, flaky noncalcareous shale makes up all of the 27.7 m thick section, except for a basal 5 m of grey-brown to very dark brown-grey, calcareous shale with white and brown calcite grading to grey-brown, very argillaceous limestone. At G-70, 760 km to the south, a 34.7 m thick section of Bluefish comprises black, bituminous, siliceous, slightly calcareous, pyritic shale, and the basal 13 m are very calcareous with biocalcitic mosaics, grading near the base to black and white, bioclastic, argillaceous and bituminous limestone.

An apparent variation occurs where the entire unit is calcareous. The two sections of calcareous shale and limestone at D-65 and A-12 (Fig. 27) are also very thin, suggesting that elsewhere, equivalents of the upper, noncalcareous part of the Bluefish may locally be at the base of the overlying Grey shale member. A depositional pinch-out of the Bluefish Member is indicated in the south by the rate of eastward thinning (Fig. 15) and the absence of the

member farther east at I-15 (below the Grey shale member) and at G-60 (below Ramparts). The Bluefish Member at B-30 and J-65 on the southwest flank of Keele Arch also varies from the characteristic pattern in that some limestone occurs throughout entirely noncalcareous shale sections. This may indicate, when considered with the somewhat more pronounced thinning in that area, an approaching depositional edge. Reconstructed isopachs have been drawn to enclose an area of less than 10 m thickness over the Arch. They could equally well be drawn to outline an area of nondeposition.

In contrast to the uniform basinward thickening evident south of Keele Arch, isopachs of the Bluefish Member (Fig. 15) to the north indicate an irregular distribution: thickening northeastward from Fort Norman; localized thinning, thickening and variation in basal limestone content between Fort Norman and the Peel River area. These variations may reflect irregularities in sea-floor topography, a distinct possibility in that area, where evidence of biohermal development has been recorded in the underlying Hume Formation (see under previous heading).

The lower contact with the Hume Formation is sharp, and apparently conformable, but there could be localized erosional surfaces on top of Hume bioherms. The upper contact has been picked using the criterion proposed by Pugh (1983, p. 34), "at the top of the zone of ultra high sonic-gamma ray log trace and where the upward change from bituminous to non-bituminous is gradual, the contact is at the base of the gradation". This not only coincides perfectly with a colour change from black or brown-black to brown-grey where the Bluefish is overlain by the Grey shale member, but is an equally valid criterion for establishing the contact between the Bluefish and Black shale members (as, for example, at K-71 and A-37s, Figure 26). This confirms Pugh's (op. cit.) finding that in the subsurface, the Bluefish Member can be easily distinguished at the base of an all-black Hare Indian shale, a valuable stratigraphic tool as well as a certain indicator that, within the family of Horn River black shales, the Bluefish shale is different.

Grey shale member. The characteristic feature of the Grey shale member in the Peel River area was described by Pugh (1983) as "gradation from dark brown-grey, rarely black, at the base immediately above the Bluefish Member, upward through brown-grey, progressively paler to grey, green-grey or buff-grey and, in the thicker sections, to pale grey at the top." The grey shales were further described (op. cit.) as, "micromicaceous, often very micaceous in the upper part" and generally grade upward "from non-silty and slightly or non-calcareous at the base to calcareous and silty at the top of the thicker sections".

This characteristic lithology is recognized both in the extreme south and far north of Great Bear River area. At G-70 in the south, a 158.8 m thick section consists at the bottom of grey to dark brown-grey, noncalcareous shale that grades upward through brown-grey and grey, slightly calcareous and micromicaceous to grey, flaky, calcareous and micromicaceous. At G-02 in the north, in a 124.7 m thick section, the Grey shale member is pale grey to brown-grey, flaky, slightly calcareous and micromicaceous. Similarly in the Norman Wells area, the 140.2 m thick section at J-48 is made up of basal, dark brown-grey, noncalcareous shale that grades upward through brown-grey and grey, slightly silty, slightly calcareous and micromicaceous shale, to an upper, pale grey, silty, very micaceous shale.

Even though some variation might be expected wherever the Grey shale member passes laterally into its facies equivalent, the Black shale member, the same characteristic pattern can be discerned. For example, at

I-4b, where Black shale intervenes between a two-part Grey shale member, the lower part is grey, brown-grey to very dark grey and black, in part micromicaceous, and the upper part is grey, brown-grey, dark grey, in part silty and very micaceous. Finally, the C-21 section, northeast of Fort Norman, is uniquely different in its colour gradation from green-grey at the base to grey, very dark grey, black, buff-grey and grey-brown at the top below the Ramparts Formation. This could reasonably be attributed to a transition in the upper part to the Black shale member.

Black shale member. The informal term, Black shale member, is introduced to identify the black shale facies equivalent to the Grey shale member. The presence of black shale in the upper part of the Hare Indian Formation was recognized by Tassonyi (1969, p. 90), "the term Horn River Formation should be extended into those areas where the Ramparts Formation is absent and where the dark shales of the Canol Formation are inseparable from similar shales of the Hare Indian Formation, and used to include both formations". Tassonyi (1969, Figs. 9, 10), however, did subdivide Horn River black shales, but includes them all in a triple-member Canol Formation.

Comparison of Tassonyi's cross-section (1969, Fig. 10) with the assignments made in the present study (Appendix 2) shows that the Black shale member equates with Tassonyi's Lower member of the Canol Formation. For example, Tassonyi's Canol, Lower member, at Loon Creek No. 2 (1969, Sec. 37, Fig. 10) between borehole footages 1645 and 1330 (501.4 and 405.4 m), equals the upper, Black shale part of Hare Indian Formation at G-78 (Fig. 26, this report) between 1644 and 1353 feet (501.1 and 412.4 m). Correlations in Figures 26 and 27 show the Black shale member, the Grey shale member and the Ramparts Formation as lateral facies-interrelated units. Tassonyi's (1969) Canol Lower member is depicted likewise as a facies equivalent of the Ramparts Formation, for example, at Loon Creek No. 1, Section 34 (A-52 this report). Clearly, Tassonyi's Canol Lower member, as shown on Figure 10 (Tassonyi, 1969), consists in fact, of those dark shales of the Hare Indian Formation that were stated (op. cit.) to be inseparable from Canol, and which turn out to be the Black shale member of this report.

The Black shale member is fairly easily recognized southeast of the Norman Wells area, but recognition becomes more difficult in places between the Norman Wells and Peel River areas (F-57m). Comparison of Tassonyi's (1969) Figure 9 and with assignments in the present report shows that the Canol Lower member equates variously: to the Allochthonous limestone unit at H-40 and A-16; to Canol at G-44 and F-39; and to Ramparts at L-28. This lack of consistency is the result of several factors: the presence of Allochthonous limestone (see under Canol Formation); the uncertainty of recognition of allochthonous beds in drill cuttings; the dating of Allochthonous limestone as Frasnian (Late Devonian); and the vertical range of the Ramparts Reef member into Frasnian in at least one section (J-76). Assignments, therefore, within this local area are necessarily tentative, and for simplicity, pending more detailed study, the term Black shale member has not been used for any of the black shale interval overlying the Ramparts Formation between Norman Wells and F-57m.

The Black shale member consists of black, bituminous shale, variably micaceous, variably siliceous, variably pyritic, and locally calcareous. At A-28, it is very micromicaceous;

at A-37s it is slightly calcareous and includes traces of grey-buff siliceous limestone; at K-03, 121.6 m of brown-black, siliceous, variably calcareous, very bituminous, micromicaceous shale include some pyrite, some black shell fragments, some brown to black chert, traces of brown, pale brown, and brown-black limestone, a trace of glauconite concentrations, and, in one part, traces of green-grey, very micaceous shale.

The lower boundary of the Black shale member may be its contact with the Bluefish Member, the latter distinguished by its ultra high sonic-gamma ray trace, or it may be a facies-related contact with the Grey shale member (as at G-78, I-46, etc.) or with the transitional grey/black shale facies (as at A-28). The upper boundary may also be a facies-related contact with the Grey shale member (as at A-28, I-46), or it may be a contact with the Canol Formation (as, for example, at A-37s, D-65, etc.). Probably the most useful and reliable way of picking the Black shale-Canol contact is by incorporating it into the regional correlation network, as demonstrated on the cross-sections in Figures 26 to 28. It is only the broader vision of the regional picture that can give a firm basis for placing the Black shale-Canol contact. A subtle change in lithology and/or the log trace across this contact will probably be there, and indeed these changes are easily discernible in some sections, but it is suggested that they cannot provide the useful criteria that would enable the contact to be picked with confidence in any one isolated borehole section¹. Without knowledge of the broader regional picture, it would be most reasonable, but incorrect, for example, to assign all the Horn River black shale at G-70 and at D-65 to the Canol Formation, and to place the Canol at the sub-Mesozoic erosion surface at J-65 and B-30.

The Black shale member tends to occupy the upper part of the Hare Indian-Ramparts interval more than it does the lower part. It may, therefore, be significantly (= diagnostically) related to Ramparts reef development. If so, detailed study of Black shale distribution and content might help locate any so-far-undiscovered reefs. The limits of Black shale distribution in relation to Ramparts are shown on Figure 4.

Ramparts Formation

The name, Ramparts Formation, developed from the original term, Ramparts limestone (Kindle and Bosworth, 1921, p. 443-463), through many years of controversy over Devonian nomenclature. Tassonyi (1969) advocated the use of the name, Ramparts, in its original type sense, and recognized two informal members: a bedded platform, overlain by a more massive reef member. Pugh (1983, p. 35) increased Ramparts membership to four: the Siltstone lentil, the Platform member, the Reef member and the Sandy member. The Ramparts Formation is identified in 21 of the 42 Horn River sections in the present study. Because little new knowledge is added to what has already been described and illustrated for the Peel River area (Pugh, 1983), the members of this formation are not treated separately in this report.

Of main interest is the evidence of Ramparts development outside the Norman Wells area. The Platform member and/or the Siltstone lentil occur thinly (less than 20 m thick) in the south: overlying the Grey shale member at A-12, I-54w and I-15, and occupying the whole Hume-to-

¹This does not eliminate the need first to determine lithology, for which core or drill cuttings must be examined in conjunction with mechanical logs.

Canol interval at G-60. In the erosional outlier at C-21, near the top of a 284.7 m thick Horn River section, the Ramparts Formation is represented by 48.5 m of coarse grained, bioclastic and fossiliferous (reef, crinoid and shell organisms) limestone with some calcareous pyritic siltstone, and includes a 10 m interval of black micaceous shale and buff-grey micaceous siltstone. This is overlain by brown-grey, micromicaceous pyritic shale below the sub-Mesozoic unconformity. The foregoing suggests, at C-21, proximity to thicker reef development, though the reef may have been removed by pre-Mesozoic erosion over Keele Arch. Some Ramparts limestone at A-37b may indicate the western edge of this same postulated development.

There is no indication that Hare Indian-Ramparts sedimentation was influenced by Keele Arch activity. Minor thinning over that area showing in Horn River isopachs (Fig. 14) are accounted for by thinning only of the Bluefish Member (see Figure 15). Hare Indian Grey shale and/or Ramparts carbonates, therefore, may have been the first Devonian sediments to cover Keele Arch completely and to bury pre-Devonian beds.

The age of the Ramparts Formation is Givetian (late Middle Devonian) (Pedder, 1975), and the upper part of the Reef member is referred by A.E.H. Pedder (in Norford et al., 1971, p. 17, 18, 21) to the "Late Devonian *mackenziense* Zone".

Canol Formation

The name, Canol Formation, derived from Camp Canol on Mackenzie River opposite Norman Wells, was proposed by Bassett (1961, p. 494) and defined as the black shale unit directly overlying the Kee Scarp Formation or, where the latter is absent, directly overlying the Hare Indian Formation. It is completely exposed at its type locality on the northwest side of Powell Creek at the Mackenzie Mountain front (65°16'30"N, 128°46'30"W).

At the Canol type section, Bassett (1961) included at the top of the underlying "lower Kee Scarp Formation", a limestone and shale unit, which subsequent study has shown to be a distinctive unit. Braun (1966, p. 254) referred to this limestone and shale unit as "Unnamed beds" because they belonged neither lithologically nor faunally to the "Kee Scarp" (Ramparts Formation), and lithologically they were "not typical of the Fort Creek shales" (Fort Creek shales = Canol Formation, see Tassonyi, 1969, p. 90). The "Unnamed beds" at Powell Creek were assigned a Frasnian (Late Devonian) age by Braun (1966). The Canol type section, therefore, no longer agreed with the Canol definition of directly overlying Kee Scarp (Ramparts). This situation called for either redefinition of the name, or revision of a type section boundary, depending upon the exact nature of the "Unnamed beds".

MacKenzie (1970) made a detailed study of the "Unnamed beds" at Powell Creek and referred to them as "allochthonous reef debris and limestone turbidites". Subsequently, MacKenzie (1973) identified Upper Devonian beds of echinoderm debris between the Ramparts and Canol formations in a cored borehole section some 40 km north of the Powell Creek section, and concluded that they were genetically similar to the reef debris beds outcropping at Powell Creek.

Pugh (1983, p. 37) provided additional evidence from the subsurface, stating, "debris beds appear also to be present

in six borehole sections on the west (seaward) flank of the reef, according to evidence from drill cuttings and sonic logs". It was suggested (Pugh, 1983) that more detailed work was required to justify recognition of the Allochthonous limestone as a formal map unit, but importance was given to the fact that "debris beds do occur and that in two localities, at least, they are of early Frasnian age". Pugh (1983, p. 38), although recognizing that the debris beds were deposited roughly contemporaneously with Canol shales, chose simply to redefine the Canol Formation rather than revise a type section: it "directly overlies the Ramparts Formation or its reef-derived Allochthonous limestone unit, or, where these are absent, directly overlies the Hare Indian Formation."

In the present study area, possible Allochthonous limestone overlying the Ramparts Formation occurs only west of Norman Wells. Because the debris beds are verified, therefore, to be of very limited distribution, and because they are stratigraphically identified, not with Ramparts from which they were derived, but with Canol sediments into which they came to rest, it is proposed to include them within the Canol Formation.

*Revision*¹. The lower boundary of the type Canol Formation is redefined in order to include within the formation localized deposits of debris material which, subsequent to the original definition of the Canol Formation, have been found to be an integral part of the Canol Formation. The proposed change of boundary will further restore the original intent of Bassett (1961, p. 494) that the Canol Formation directly overlies the Ramparts Formation.

At the type locality on Powell Creek, the lower boundary of the Canol Formation is moved downsection 16 m to incorporate beds which Bassett (1961) originally included in the Kee Scarp (Ramparts) Formation. MacKenzie (1970) referred to these beds as "allochthonous reef debris and limestone turbidites", and described them as "Lower thin-bedded argillaceous and silty limestone with black shale interbeds, black chert and blocks of coral and stromatoporoid-bearing limestone (18 ft) and overlying dark grey calcareous shales with graded echinoderm beds (35 ft)".

There are only three other verified occurrences of Allochthonous limestone at the base of the Canol Formation: one outcrop (Carcajou Ridge, Braun, 1966); and two borehole sections (G-56, MacKenzie, 1973; D-53, Pugh, 1983). In addition, 13 borehole sections of Canol are assumed (Pugh, 1983 and present study) to include Allochthonous limestone, on the basis of evidence from drill cuttings and the mechanical log trace. All of the foregoing, verified and assumed, are within 80 km of the Powell Creek Canol type section. The thickness of the Allochthonous limestone is generally less than 10 m.

The lower contact of the Canol Formation is redrawn in the original sense, namely, at the top of the Ramparts Formation, or, where this is absent, at the top of the underlying Hare Indian Formation. In the subsurface, the Allochthonous limestone is more easily distinguished from underlying Ramparts by its corresponding sharp "kick", than it is from the overlying black shale. There is only one recorded section in which suspected Allochthonous limestone rests directly on Hare Indian: at J-48 (see cross-section, Figure 26), where it is recorded as a relatively very thick (21.7 m) interval of largely black shale with shell fragments, calcite and reef debris. Twenty-one kilometres away at H-40, 3.4 m of assumed limestone debris in black shale, at the base of the Canol, rest directly on the Ramparts Reef member.

¹Following the recommendations of the North American Commission on Stratigraphic Nomenclature, 1983, Article 19, p. 855.

Canol Formation shales are characteristically black, bituminous, siliceous, pyritic and noncalcareous, making them easily distinguishable except where they overlie the Black shale member of the Hare Indian Formation (discussed above under that heading). In the general area of Norman Wells over a distance of a hundred kilometres, there is a thin carbonate development at the top of the Canol Formation: at H-40, 6 m of brown, fine crystalline, siliceous dolomite; at A-16, 7 m of brown, siliceous, partly pyritic dolomite; at J-76, 12 m of brown, siliceous limestone and brown, noncalcareous shale; at G-78, 11 m of brown-black, bituminous shale with some brown-black, hard, bituminous siltstone and a trace of pale buff, aphanitic limestone; and at G-51c, the top 22 m include some brown-grey, coarse grained, argillaceous siltstone and brown, micro- and very fine-crystalline dolomite. The foregoing are examples of the upper part of the Canol Formation, which corresponds to Tassonyi's (1969) Upper member, although Tassonyi seems not to have mentioned the presence of carbonates and siltstone.

Thickness distribution of the Canol Formation is irregular. In the Norman Wells area, the variations seem to be inversely related to the thickness of the Ramparts Formation (Fig. 16), agreeing with Tassonyi (1969, p. 93). A similar relationship was noted also for the Peel River area by Pugh (1983, p. 38). However, in the south of the study area, pronounced thickness variation does not seem to be related to underlying Ramparts (which is only thinly developed there). Instead, the variation may be the result of differential movement of the basin floor prior to deposition of Imperial marine clastic sediments.

The contact of the Canol Formation with the underlying Ramparts has been discussed above. Where Ramparts is absent, contact with the Grey shale member of the Hare Indian Formation is colour controlled and appears to be abrupt but conformable; contact with the Black shale member has been described under that heading. The upper boundary of the Canol Formation with the Imperial Formation is apparently conformable.

Imperial Formation

Documentation of marine shales and silty sandstones at the top of the Paleozoic succession in the Norman Wells area began with Kindle and Bosworth (1921). These rocks were known at various times by the names, Bosworth, Camp Creek, and Carcajou Mountain, before Hume and Link (1945, p. 34-39) introduced the name, Imperial Formation, and designated a type section on the Imperial River (see map, Figure 17, this report). The Imperial Formation was later revised by Bassett (1961, p. 496) to include, at the type section, 10 m of "upper non-bituminous shales of the Fort Creek Formation"; the lower bituminous member became the Canol Formation. Bassett's (1961) redefinition was stated, briefly, "as the sequence of Devonian clastics and minor interbedded limestones, which overlies the Canol Formation and is unconformably overlain throughout the region by Cretaceous strata". Pugh (1983, p. 41) recounted several documented descriptions of Imperial lithology to illustrate facies variability in the Mackenzie River area. Among these: Tassonyi (1969) described a lower marine shale and an upper member of interbedded marine siltstones, sandstones, shales and subordinate limestone beds; Aitken et al. (1982) recognized that shale dominated and siltstone was prominent, and that subordinate sandstone units "are clearly more prominent in the upper part of the formation".

The present study is mainly concerned with the Imperial Formation in the subsurface southeast of Norman Wells. Thirty-four borehole sections are considered, and the

interpretation is illustrated in a map (Fig. 17) and cross-section (Fig. 29). A subcrop-outcrop map (Fig. 18) shows the areal extent of pre-Mesozoic erosion alone, and also the area where the Imperial has been further truncated by post-Cretaceous exposure. The thickness distribution, therefore, as shown by the isopachs in Figure 17, is valued only in conjunction with the structure contours in constructing superimposed contour maps at lower surfaces (Figs. 5, 6, 9). Eight sections of Imperial Formation are shown on cross-section, Figure 29, covering a distance of more than 250 km from G-12 at Norman Wells to A-12 near Wrigley. A-12 and K-03 support the earlier descriptions of a lower shale and an upper shale-siltstone-sandstone subdivision near Norman Wells. At K-03, 282 m of dark grey to black, micromicaceous shale with some thinly interbedded siltstone, are overlain by 264 m of very fine grained micaceous sandstone, coarse grained and fine grained micaceous siltstone and silty shale, and 129 m of dark grey, micromicaceous shale with interbedded, grey, coarse grained and fine grained, micaceous siltstone. The lower shale part is the same thickness at both A-12 and K-03, which are 20 km apart.

A different pattern is observed as we move south. The limestone member between A-37b and A-28 (described separately below) moves upsection southward. Marker bed correlation lines can be drawn between A-28 and A-12 (see Figure 29), that indicate northward condensation of section; in other words, an increasing rate of sediment accumulation southward. The southern sections display a coarsening-upward feature, but it appears that most or all of the Imperial beds preserved in the south may be equivalent to only the lower part of the Imperial sections in the Norman Wells area. In this model of southward increasing rate of sedimentation, we might expect to find a corresponding change in sediment colour, mainly from darker to paler southward. This does, in fact, seem to be the case. Whereas at K-03, described above, the shales are dark grey to black, at D-65, for example, Imperial shale varies upward from slightly green-grey with some dark grey at the base, to grey and brown-grey upsection.

The lower contact with black, bituminous shale of the Canol Formation is probably conformable, but, according to subsurface data, apparently not gradational. The upper boundary of the Imperial Formation is controlled by either pre-Cretaceous or post-Cretaceous erosion.

Canyon Creek sandstone lentil

Tassonyi (1969, p. 99) described a thin, locally-occurring sandstone unit within the lower part of the Imperial Formation which had originally been reported by Canol geologists as Canyon Creek sandstone. Stewart (1945, p. 20) had referred to this unit in Canyon Creek No. 1 borehole (G-51c) as the Canyon sandstone member. Tassonyi (1969), because of "the local nature of this sandstone", deemed it more appropriate to refer to it as the Canyon Creek sandstone lentil.

In the reference section at G-51c, the Canyon Creek sandstone lentil is considered to occur between borehole depths of 1316 and 1225 feet (401.1 and 373.4 m), giving a thickness of 27.7 m. It comprises pale grey, very fine grained, silty, quartz-rich, micaceous siltstone. It is separated from the Canol Formation by 16 m of dark grey shale. Two thicker sections occur: at G-78, 33.5 m of buff, very fine grained, dolomitic, siliceous, quartz-rich, silty sandstone, resting directly on the Canol Formation; at J-20, 37.2 m of pale buff, very fine grained, silty sandstone grading to coarse grained siltstone, separated from the Canol by 10 m of dark grey shale.

Known distribution of the Canyon Creek sandstone is confined in the subsurface to the above three boreholes. It is known from outcrop in Norman Range where it has been reported as thick as 90 m (Stewart, 1945, p. 20).

Both lower and upper contacts were reported by Tassonyi (1969) as "gradational into shales through interbedded shales and siltstones.

Jungle Ridge limestone member

The term, Jungle Ridge limestone member, was used by Hume and Link (1945, p. 29, 30) to refer to a silty and shaly limestone within the lower part of Imperial Formation. They reported it to be about 60 m thick on Jungle Ridge. In Bluefish No. 1A (A-37b), Hume and Link (1945) reported the member to be between borehole depths of 1780 and 1618 feet (542.5 and 493.2 m), immediately below the sub-Mesozoic erosion surface. As a result of calculations based on field data, Tassonyi (1969, p. 100), suggested that the limestone member in the reference well may be restricted by excluding the lower, more shaly part, which is transitional into the underlying shale. This suggestion is compatible with the electric log trace, which places the limestone between borehole depths of 1640 and 1618 feet (500.0 and 493.2 m).

Since Tassonyi's study, two boreholes, I-701 and A-28, have revealed a limestone unit within the Imperial Formation, but much higher in the section than at A-37b. About 30 km south of the reference section, at I-701, 39.3 m of grey-buff to very pale buff, micrograined argillaceous limestone occur 166 m above the bottom of the borehole, and an estimated 310 m above the Canol. About 100 km south of the reference section, at A-28, 34.7 m of pale buff, silty, bioclastic, fossiliferous limestone and brown and buff aphanitic limestone are nearly 600 m above the Canol. These three sections of Imperial are included in Figure 29. Marker horizons have been drawn within the Imperial Formation that indicate that the limestone intervals at A-28 and I-701 are directly related and, furthermore, that it is reasonable to extend the correlation northward to the Jungle Ridge limestone member at A-37b. Projection of the unit southward from A-28 indicates a possible truncated edge close to D-65. It may, therefore, be found to outcrop on Crescent Ridge Anticline (Dahadinni River, Map 1374A, Douglas, 1974), and is possibly the fossiliferous limestone in map unit uDsp or even the reefy limestone, map unit uDls.

The Jungle Ridge limestone member, therefore, appears to have a much greater areal distribution than was known when Tassonyi (1969, p. 99) proposed to give it the rank of lentil "owing to its local occurrence."

STRUCTURAL GEOLOGY

The record of tectonic activity based on evidence from the subsurface of the present study area covers mainly that area to the southwest of Great Bear Lake. Four arches, jointly spanning Cambrian to Middle Devonian time, have roughly similar northwest trends. Underlying the Paleozoic rocks is a northeast trending structure of Proterozoic age.

The tectonic elements of Great Bear River area, pertinent to this report, are as follows (see also Figure 1), listed chronologically.

Fort Norman structure

The Fort Norman structure was named by Aitken and Pugh (1984) and described as a "northeast-trending,

northwest-side-down, Precambrian structure passing near Fort Norman, District of Mackenzie". This structure demarcates the southeast limit of the Middle or Upper Proterozoic "Mackenzie Mountains supergroup east of Mackenzie River".

Mackenzie Arch

The term, Mackenzie Arch, was used by Gabrielse (1970, p. 375-400) and Aitken et al. (1973, p. 37, 38) to describe a northwest-trending Proterozoic to Cambrian structure passing through the Mackenzie Mountains. Its reactivation during Cambrian time probably provided the restrictive barrier that allowed development of hypersaline marine conditions in which evaporites of the Saline River Formation precipitated.

Bulmer Lake Arch

Bulmer Lake Arch was recognized by Meijer Drees (1974) as a north-northwest-trending, paleotopographic and tectonic feature in the Bulmer Lake area. It was stated (op. cit.) to consist of a high, partly of Precambrian granite, and to have been a positive element during Cambrian sedimentation.

Mahony Arch

The term, Mahony Arch, is proposed in this report for a Cambrian feature trending roughly northwest, and passing below Mahony Lake. This positive feature provided a barrier or partial barrier between two depositional basins, Good Hope Basin, and Keele Trough, which paralleled Mackenzie Arch. Mahony Arch may have extended into the Peel River area and also may have merged with Bulmer Lake Arch.

Keele Trough

The term, Keele Trough, is introduced in this report for an Early(?) and Middle Cambrian structural depression located between Mackenzie and Mahony arches, and named after the Keele River area, where nearly six hundred metres of Middle Cambrian shales were drilled in borehole L-04.

Good Hope Basin

The term, Good Hope Basin, is applied in this report to a broad, shallow Cambrian depression northeast of Mahony Arch. It was named after the Fort Good Hope area, the centre of maximum accumulation of Lower, Middle and Upper Cambrian sediments.

Mackenzie Platform

The name, Mackenzie Platform, was used by Lenz (1972, p. 328, 329) to refer to the Cambrian to Middle Devonian shelf platform east of Richardson Trough (Peel River area, see Pugh, 1983). Extending during Late Cambrian time over most of the Great Bear River area, it subsequently merged with Keele Arch and became bounded by Anderson and Great Bear basins.

Keele Arch

The name, Keele Arch, was proposed by Cook (1975) for a "regional paleo-arch about 200 miles long and 75 miles wide . . . from Keele River northward at least to Lac des Bois". It

was stated (op. cit.) to have developed in pre-Early Devonian time and to have been reactivated in pre-Late Cretaceous time. The Arch broadens northward into Mackenzie Platform.

There is evidence (p. 17, this report) of a proto-Keele Arch as early as Late Cambrian.

Great Bear Basin

Great Bear Basin was described by Yorath and Cook (1981, p. 37) as an Early Cretaceous (Albian) tectonic element, possibly bounded on its western side by Keele Arch, and with a northern limit arbitrarily chosen north of Great Bear Lake. Yorath and Cook stated (1981, p. 11) that the Basin existed "as a structural and at times depositional basin at various times during the Paleozoic and Mesozoic, essentially corresponding to periods of uplift along the adjacent Keele Arch".

In the present report, Great Bear Basin is described as a discrete sedimentary basin possibly generated during Late Ordovician to Early Silurian time, and active from Late Silurian to Middle Devonian time (see under Mount Kindle and Middle Paleozoic Stratigraphy headings).

Anderson Basin

The name, Anderson Basin, was used by Yorath and Norris, 1975, for a trough-like depression adjacent to and on the southeast side of the Aklavik Arch Complex. It cuts across the northwest corner of the study area bounding the Mackenzie Platform in that direction. The existence of Anderson Basin in Late Silurian and in Middle Devonian times is inferred from the presence of basinal transition facies in platform carbonate sequences of those ages in the subsurface at the Arctic coast. The possibility that Anderson Basin is a northern extension of Richardson Trough is not demonstrable at this time.

HISTORICAL GEOLOGY

An account of the geological history of the present study area will naturally complement that of the adjoining Peel River area (Pugh, 1983, p. 52-54). In order, therefore, to present the Great Bear River story as completely as possible at this time, while maintaining an uninterrupted account, parts of the previously published Peel River story (Pugh, 1983) are quoted without further acknowledgment.

Earliest record

Paleozoic rocks of the Hornby Bay Group, which outcrop in Coppermine area (Kerans et al., 1981) in the northeastern part of the study area, are the earliest known sedimentary rocks in Great Bear River area. Rocks correlative with Hornby Bay Group are known also in the southeastern half of the area, both in outcrop and subsurface. Later Proterozoic (Helikian and Hadrynian) strata in the subsurface are formations of the Mackenzie Mountains Supergroup. These younger rocks subsequently were structurally truncated to the southeast by the Fort Norman structure (Aitken and Pugh, 1984).

Cambrian-hypersaline basin

By Early Cambrian time, the land surface northeast of Mackenzie Arch had been sculptured by differential

weathering into a ridge-depression landform. A broad Precambrian anticlinal structure exposed fine and coarse grained clastic rocks of the Proterozoic Shale unit northwest of the Fort Norman structure. Erosion of these exposed beds contributed mud, silt and sand to the initial Phanerozoic sediments, while much greater amounts of very coarse grained quartzose material were transported into the area from Precambrian outcrops on the craton. The accumulation of the Mount Clark sands is centred roughly over the axis of the above-mentioned Precambrian anticline, suggesting that this may have been the site of a paleotopographic depression in the outcropping Shale unit. This alone, however, would not explain the same depositional basin continuing through Middle and Late Cambrian time. By the same reasoning, the ridge of more resistant Proterozoic dolomite along the southwest side, which was not covered by Mount Clark sands and which subsequently was only thinly covered by Upper Cambrian sediments, cannot reasonably be interpreted only as a Precambrian paleotopographic feature. It is, therefore, assumed that Good Hope Basin and Mahony Arch may already have been structural elements at the beginning of Cambrian time. Although nothing is known of earliest Cambrian history between Mackenzie and Mahony arches, basal Cambrian sands were also deposited as discontinuous and diachronous beds in paleotopographic depressions around the periphery of the Good Hope Basin area and to the south.

More extensive marine flooding followed in late Early Cambrian time. At the beginning of Mount Cap deposition, glauconitic quartzose sands and silts were carried into the southeastern part of Good Hope Basin, their distribution northwestward grading into an increasingly thicker accumulation of carbonate and clay. These later consolidated as brown, coarse crystalline dolomite and dark green and black shale.

Late Early Cambrian deposition northeast of Mahony Arch began with predominantly micaceous silty clay settling in Good Hope Basin, and alongside the Arch, minor glauconitic carbonate development and some shoreward sand. Mount Cap sedimentation continued through Middle Cambrian time in a cyclic carbonate-clay sequence. Four carbonate-clay cycles completed the Mount Cap Formation, with the areal distribution in Good Hope Basin possibly decreasing progressively as the Basin filled. Meanwhile, during Middle Cambrian time southwest of Mahony Arch, a much greater amount of clay sediment settled in Keele Trough. This subsequently compacted into 600 m or more of grey, green and brown shales with interbedded dolomite only near the top.

A general, somewhat deeper, though restricted, marine inundation in early Late Cambrian time marked the beginning of Saline River deposition. Mount Cap rocks were almost everywhere covered by the clay and lime muds and anhydrite of the Lower clastic member. Proterozoic rocks over Mahony Arch and part of Bulmer Lake Arch were only thinly covered. Part of what was later the site of Keele Arch became a positive feature, so that locally Mount Cap beds were not buried by Lower clastic, or indeed by any Saline River, sediments. Increasingly hypersaline conditions brought about the precipitation of salt in a trilobate basin in the north and an elongate basin in the south, the two areas separated by a structurally high, but at least partly submergent area over Mahony, Bulmer Lake and Keele arches. This positive complex continued to influence the subsequent regional blanket distribution of Upper clastic varicoloured clay muds. The slow subsidence of the entire shelf area that followed, gave rise in later Cambrian time to open marine circulation and a depositional transition to argillaceous dolomite and decreasing amounts of grey shale.

Late Cambrian to Late Ordovician

Thick carbonate buildup over the entire Mackenzie Platform area during Late Cambrian time began with the Cyclic member argillaceous dolomites of the Franklin Mountain Formation, in the distribution of which is reflected a continuing influence of Mahony Arch and an early positive movement of Keele Arch. The Rhythmic member accumulated during latest Cambrian time, the end of which was marked in the south by crustal warping, exposing Proterozoic and/or Lower Cambrian coarse clastics that were reworked locally into the upper part of the Rhythmic dolomite and the base of the succeeding Cherty dolomite. The Franklin Mountain carbonates at that time were varicoloured throughout the southern half of the study area.

As carbonate development continued through Early Ordovician time, formation of chert was common over the southern part of the area. Conditions favouring chert formation appear to have migrated northward (as well as westward, see Pugh, 1983). To the south, the rising of the cratonic shelf area relative to sea level exposed much of the Mackenzie Platform to erosion. Erosion over Mahony Arch removed all Upper dolomite rocks and cut deeply into the Cherty dolomite unit.

Late Ordovician to Late Silurian

In Late Ordovician time came renewed marine transgression. In the extreme north, where the erosional break is less marked, the new phase followed a transitional change of deposition from the pure, very pale dolomite of the Franklin Mountain Formation to the generally brown, very fine to medium crystalline dolomite of the Mount Kindle Formation. In the southeastern part of the area, marine flooding accompanied the first downwarping of Great Bear Sub-basin. In this elongate basin, bounded on its western side by the site of Keele Arch, deposition of black basal muds was followed by dark-coloured cherty carbonate development (Lower dark), and this in turn was superseded by paler-coloured carbonate (Upper pale).

Late Silurian to Early Devonian

By latest Silurian or earliest Devonian, a depositional change had taken place in the northern part of the Mackenzie Platform, from the brown, medium crystalline Mount Kindle dolomite to the very pale, microcrystalline Peel Formation dolomite. Peel carbonates included darker material closer to Anderson Basin.

Eustatic changes gave rise to the "sub-Devonian" unconformity. Probably during the course of Peel deposition to the north and west, Mount Kindle rocks were already sub-aerially exposed over the southern part of the area, and were being truncated on the flanks of Keele Arch. Renewed marine transgression in the south brought about the deposition of the Delorme Group, made up of carbonates, clastics and anhydrite of the Tsetso Formation and thick sequences of silty evaporites and carbonates of the Camsell Formation. Continuing, or renewed, activity of Keele Arch exposed the Franklin Mountain Formation and possibly also older rocks, from which sand, silt and shale were reworked into the later Tsetso sediments. Meanwhile, in the north, rocks of the Mount Kindle and Peel formations were exposed at the "sub-Devonian" erosion surface.

Early to Middle Devonian

Slow regional resubmergence during Early Devonian time, in the north of and to the west of the study area,

resulted in the deposition of shallow marine aphanitic limestone and green shale of the Tatsieta Formation. Possibly at the same time, in the southern part of the area, Fort Norman anhydrite had begun to precipitate in three, roughly lenticular evaporitic basins. Keele Arch was a submarine feature and along its flanks conditions locally were conducive to carbonate development. From the southwest flank this carbonate extended southwestward to become the Arnica Platform.

A deepening marine environment resulted in the regional development of carbonates over the Mackenzie Platform. The depositional boundaries between the Fort Norman anhydrite and the brown, dolomitized Arnica carbonate, and between Arnica and the brown, pelletal Landry limestone, migrated generally eastward, so that in time, anhydrite was superseded by dolomite, and dolomite (almost everywhere) by limestone. Toward the end of this process, a minor positive movement of Keele Arch may have re-exposed Cambro-Ordovician rocks, from which may have been derived the fine clastic material and traces of pink colouring in Landry carbonates near the Arch. The Early and Middle Devonian platform carbonates passed basinward into deepening dark shale facies: southwest of Keele Arch into the Funeral Formation; in the extreme northwest into unnamed rocks in Anderson Basin.

A deeper basinal environment southwest of Keele Arch persisted into Middle Devonian Eifelian time. Interbedded black and grey shales and argillaceous limestone deposited in the southwestern part of the area and extending close to the Arch constitute the Headless Member at the base of the Hume Formation. Regionally over the entire Mackenzie Platform, the Hume was deposited as a laterally uniform series of argillaceous bioclastic limestones and grey shales. Keele Arch remained a positive feature, possibly submarine, but supplying some fine clastic material to surrounding carbonate sediments. Some bioherms developed northwest of Keele Arch.

Givetian interlude

On the northwestern shelf area of continental North America, Cambrian to Middle Devonian time was dominated by carbonate development and overall tectonic stability. Late Devonian to Permian time featured the deposition of orogenic clastic sediments derived from a northern source (Pugh, 1983). Between these two depositional stages was the Givetian interlude, lithologically represented by the Horn River Group, during which time sedimentary processes over a wide area slowed and finally came almost to a standstill straddling the boundary of Middle to Late Devonian time.

Bituminous muds with fibrous calcite (Bluefish Member) were the first black sediments to settle over the Mackenzie Platform. Submarine topographic highs formed by Hume bioherms were thinly covered as was also much or all of Keele Arch. Grey and black micaceous muds (Hare Indian Formation) followed, at the same time as reef (Ramparts Formation) built up locally offshore. The interlude ended with a "black sea". Reef-top debris tumbled down into bituminous pyritic muds which settled as a regional black veneer (Canol Formation) at the opening of the Late Devonian Frasnian Stage.

Late Devonian

Slowly at first, a new depositional pattern evolved. Mud sediments of the Imperial Formation became progressively less bituminous. Localized silty sand deposits appeared (Canyon Creek sandstone lenticle). Southward, the

rate of sediment accretion increased rapidly. Some thin bioclastic and reefy limestones developed in the Dahadinni River area, and one of these may be continuous with an argillaceous limestone unit (Jungle Ridge limestone member) in the southern part of the present Norman Range area. Clays, silts and sands continued to be carried on to the shelf area at least throughout the Frasnian Stage. There is no clear evidence from this study indicating the source of these Imperial sediments.

Imperial rocks may have been continuously exposed to erosion from Carboniferous through Jurassic time. Renewed uplift of Keele Arch re-exposed earlier Paleozoic rocks down to Middle Cambrian beds along its crest prior to the Cretaceous marine transgression.

ECONOMIC GEOLOGY

Hydrocarbon potential

Cambrian clastics

Porous quartzose sandstones (Lower Cambrian Mount Clark Formation, see Figure 3), up to more than 60 m in thickness, extend through the subsurface for some 200 km west and northwest of Great Bear Lake. Near their western extremity, at K-24, near Tedji Lake, this sandstone unit has tested gas to surface at 4.4 Mmcf/d ($123 \times 10^3 \text{ m}^3/\text{d}$). Chances are good for the presence of structural-stratigraphic traps (for example, related to the northern part of Keele Arch) within the main sandstone body, and also in discontinuous deposits elsewhere. Mount Clark sandstones are capped by generally nonporous Middle and Upper Cambrian shales, dolomites and evaporites.

Cambrian to Devonian carbonates

Intercrystalline porosity is a common feature of Franklin Mountain coarse crystalline dolomite (Fig. 7) and Arnica sucrosic dolomite (Fig. 12). Porosity is generally vuggy in the locally-oil-producing Ramparts Reef limestone (Fig. 14). There are abundant Paleozoic source rocks in the basinal shaly equivalents of the platform carbonates. Updip closures are uncommon, but there is a good possibility that there are structural traps west of the Mackenzie Mountains.

Major source rocks in the area are the Horn River black shales (Bluefish and Black shale members of the Hare Indian Formation and the Canol Formation), widely distributed and in part laterally equivalent to the Ramparts Formation (see cross-sections, Figures 26, 27). A more in-depth study of the relationships between Ramparts and the off-reef Hare Indian Black shale may aid in locating other reef developments outside the Norman Wells area.

Widespread bituminous residue in porous Arnica dolomite below Great Bear Plain suggests loss to the overlying porous Mesozoic sands, but leaves the possibility of entrapment where the Arnica is overlain locally by bituminous shale, instead of the more common sandstone, at the base of the Mesozoic strata.

Mineral deposits

The Bluefish Member (Fig. 15) of the Hare Indian Formation is important as a potential indicator of metalliferous deposits. The equivalent Bituminous member at the base of the Horn River unit at Pine Point (Great Slave

Lake) has been found (Macqueen et al., 1975) to contain high values of zinc, lead and uranium oxide. The base of the Horn River Group was also reported (Pugh, 1983) to be mineralized in the western half of Peel River area.

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APPENDIX 1

Paleontology

Report on one Lower Cambrian fossil collection from British Petroleum et al. Losh Lake G-22 Well (lat. 65°51'29"N, long. 133°19'45"W), N.W.T. B.S. Norford submitted the collection for identification to W.H. Fritz in May 1977. The collection was returned to Calgary on May 20, 1977. (NTS 106 F)

Field number	Conodonts and age	GSC loc. no.
Interval 3722-3732' (1134.5- 1137.5 m), Mount Cap Formation, basal 10' (3 m) above contact with Old Fort Island Formation.	<i>Olenellus gilberti</i> ? Meek <i>Paterina</i> sp.	C-68087

Remarks

Upper Lower Cambrian (upper part of *Bonnina-Olenellus* Zone).

Palynology of samples from the western District of Mackenzie (NTS 96 and 106), submitted by W.S. MacKenzie. Identifications and comments by D.C. McGregor.

Slides of palynological residues from 27 localities were submitted for study. Descriptions of the localities, provided by W.S. MacKenzie, appear at the end of the report.

Loc. C-24313, slides 1-4: Large and small specimens of *Leiosphaeridia* and rare, unidentifiable trilete spores. Sculpture, if originally present, is completely obscured by severe corrosion. The spores evidently are Silurian or younger but a more specific conclusion is not possible.

Loc. C-24403, slides 5-8: Similar to previous, but specimens slightly less corroded. The only identifiable fossil is a specimen of *Lophozonotriletes* sp. Spores of this type range throughout the Middle and Upper Devonian.

Loc. C-24415, slides 9-12: Highly corroded specimens of *Leiosphaeridia* up to 300 µ in diameter, of no stratigraphic value.

Loc. C-24444, slides 13-16: Rare scolecodonts and small, subtriangular, trilete spores, highly corroded, unidentifiable, and of no stratigraphic value beyond indicating a Silurian or younger age. In addition there are dark brown, subtriangular, unsculptured spore-like structures about 15-45 µ in diameter, resembling fungal spores. They have no known stratigraphic significance.

Loc. C-28099, slide 17: Carbonized organic debris and a few specimens of *?Tasmanites*. This genus is long-ranging in the Devonian, and not useful for age determination at present.

Loc. C-28100, slides 18 and 19: *Tasmanites*, *Leiosphaeridia*, and organic debris, of no stratigraphic significance.

Loc. C-28101, slides 20 and 21: Same as previous.

Loc. C-28102, slide 22: Dark brown to black, fragmented organic debris, and *Leiosphaeridia*. Nothing identifiable or diagnostic of age.

Loc. C-28103, slides 23 and 24: Unidentified thin-walled leiospherids, and one poorly preserved, thick, trilete spore. Although badly preserved, the spore resembles *Tholisporites*, *Geminosporea*, or *Archaeozonotriletes*. Spores of these genera are most abundant in Givetian rocks, but occur also in the Upper Devonian.

Loc. C-28104, slides 25 and 26: Large, thin-walled specimens of *Leiosphaeridia*, poorly preserved and of no stratigraphic value.

Loc. C-28105, slides 27 and 28: Same as previous.

Loc. C-28106, slides 29 and 30: Corroded and pitted *Leiosphaeridia* and *?Tasmanites*, of no stratigraphic value.

Loc. C-28107, slides 31 and 32: Same as previous.

Loc. C-28108, slides 33 and 34: Well preserved dinoflagellates of post-Paleozoic, possibly Jurassic-Cretaceous age. As the preparations are from cuttings, the dinoflagellates could be either *in situ* or from cavings or drilling mud. It is difficult to tell which is the case without having examined samples from higher in the hole.

Loc. C-28109, slide 35: Numerous Devonian spores. The following were identified:

Cirratiradites avius Allen
Contagisporites optivus (Chibrikova) Owens var. *optivus*
 cf. *Cristatisporites triangulatus* (Allen) McGregor and
 Camfield
Cymbosporites magnificus (McGregor) McGregor and
 Camfield
Grandispora protea (Naumova) Moreau-Benoit
Hymenozonotriletes celeber Chibrikova
Hystricosporites sp.
Kraeuselisporites ollii? (Chibrikova) McGregor and
 Camfield
 cf. *Triangulatisporites rootsii* Chaloner (fragment)

The age indicated by this assemblage is early late Givetian. *Cirratiradites avius* and *Hymenozonotriletes celeber* are both abundant, and are characteristic of mid to late Givetian strata in Vestspitsbergen and the south Urals respectively. Cf. *Cristatisporites triangulatus* may be a precursor of typical late Givetian *C. triangulatus*. Cf. *Triangulatisporites rootsii* is part of a morphon that includes the late Givetian species *Aulicosporites vitabilis* Allen.

Loc. C-28110, slide 36: Dark brown to black fragmented organic debris and leiospheres, of no stratigraphic value.

Loc. C-28111, slides 37 and 38: Extremely poorly preserved, dark brown to black, subcircular and irregular organic structures, and rare light yellow *Leiosphaeridia*. Material of at least two ages appears to be represented here, but neither is of use for age determination.

Loc. C-28112, slides 39 and 40: *Leiosphaeridia* and *?Tasmanites*, mostly 100-350 µ in diameter, dark brown. No age determination possible.

Loc. C-28113, slides 41 and 42: Same as previous.

Loc. C-28114, slides 43 and 44: There are palynomorph assemblages of at least three ages in this sample. The oldest, poorly preserved, probably is Givetian or early Frasnian, based on one identifiable specimen of the spore *Hymenozonotriletes celeber* Chibrikova. The most abundant and well preserved component is Early Carboniferous, probably Viséan, and consists mostly of *Dictyotriletes*, *Convolutispora*, and densosporites. The youngest is Mesozoic, possibly Early Cretaceous, based on the presence of spores assignable to *Cicatricosisporites*, and dinoflagellates. I cannot say which of these assemblages is *in situ*, if any, as I do not have enough information from other levels in the hole to put this sample in perspective. As the slides are from cuttings, the younger assemblages could represent caving.

Loc. C-28115, slide 45: This sample contains assemblages of at least three ages. The youngest is Mesozoic, possibly Cretaceous. One of the other assemblages, the best preserved, contains *Contagisporites optivus* (Chibrikova) Owens, and is therefore late Givetian or Frasnian in age. The third assemblage is badly preserved, and its age is unknown.

Loc. C-28118A, slides 46 and 47: Indeterminate, dark brown to black, amorphous organic debris and *Leiosphaeridia*, of no stratigraphic value.

Loc. C-28119A, slides 48 and 49: Same as previous.

Loc. C-28120A, slides 50 and 51: Dark brown to black, pitted and broken *Leiosphaeridia*, and rare trilete spores. Of the spores, only *Hystricosporites* sp. and cf. *?Triangulatisporites rootsii* Chaloner (fragment) could be identified. The age is Givetian or Frasnian.

Loc. C-28121A, slides 52 and 53: Pitted, broken, dark brown to black, unidentifiable leiospheres of no stratigraphic value.

Loc. C-28122A, slides 54 and 55: Poorly preserved leiospheres and spores, unidentifiable and of no stratigraphic value.

Loc. C-28123A, slides 56 and 57: Same as previous.

Slide no.	GSC loc.	Well name	Depth in feet (m)	Latitude/longitude
1-4	C-24313	Imp. Mac No. 1	3110 (947.9)	65°15'30"N;126°53'00"W 10° above base of Hare Indian
5-8	C-24403	Imp. Mac No. 1	1024 (312.1)	
9-12	C-24415	Imp. Mac No. 1	522 (159.1)	
13-16	C-24444	Imp. Mac No. 1	15' (4.6)	above base of Hare Indian Fm.
17	C-28099	Thunder River D-69	640-700 (195.1-213.4)	67°38'10"N;120°12'40"W
18, 19	C-28100	Beavertail G-26	700-730 (216.1-222.5)	65°55'25"N;128°34'25"W
20, 21	C-28101	Shoals C-31	2210-2260 (673.6-688.9)	65°30'07"N;128°51'45"W
22	C-28102	Iroquois D-40	460-540 (140.2-164.6)	67°29'08"N;129°52'20"W
23, 24	C-28103	Maida Creek F-57	2130-2210 (649.2-673.6)	65°36'17"N;128°10'36"W
25, 26	C-28104	Maida Creek F-57	2160-2210 (658.4-673.6)	
27, 28	C-28105	Maida Creek F-57	2300-2360 (701.0-719.3)	
29, 30	C-28106	Maida Creek F-57	2370-2430 (722.4-740.7)	
31, 32	C-28107	Maida Creek F-57	2220-2290 (676.7-698.0)	
33, 34	C-28108	Hume River L-09	5050-5150 (1539.2-1569.9)	65°28'31"N;129°31'32"W
35	C-28109	Oscar Creek H-71	640-730 (195.1-222.5)	65°30'20"N;127°13'26"W
36	C-28110	Carcajou L-24	4500-4540 (1371.6-1383.8)	65°33'34"N;128°50'20"W
37, 38	C-28111	Mountain River H-47	1610-1620 (490.8-493.8)	65°46'23"N;129°07'50"W
39, 40	C-28112	Hume River A-53	1860-1910 (566.9-582.1)	66°02'12"N;129°09'46"W
41, 42	C-28113	Grandview L-26	1310-1340 (399.3-408.4)	66°35'32"N;130°20'21"W
43, 44	C-28114	Stewart B-30	5920-5970 (1804.4-1819.6)	64°19'12"N;125°19'20"W
45	C-28115	Dodo Canyon K-03	5750-5810 (1752.6-1770.9)	65°02'33"N;126°46'14"W
46, 47	C-28118A	Mountain R. A-23	3000-3020 (914.4-920.5)	65°42'14"N;129°19'12"W
48, 49	C-28119A	Iroquois I-11	3060-3090 (932.7-941.4)	67°40'40"N;129°32'05"W
50, 51	C-28120A	Grandview No. 1	1550-1560 (472.4-475.5)	67°06'12"N;130°52'30"W
52, 53	C-28121A	Little Chicago N-32	500-520 (152.4-158.5)	67°11'46"N;130°06'55"W
54, 55	C-28122A	Manuel Lk. J-42	860-920 (262.1-280.4)	67°11'40"N;129°23'15"W
56, 57	C-28123A	Ontaratue K-4	1610-1650 (490.7-502.9)	66°33'37.5"N;130°46'10"W

Report by A.E.H. Pedder on 17 subsurface Devonian fossil lots from S.W. District of Mackenzie, submitted by N.C. Meijer Drees (NTS 95 G, H, I & N).

Stratigraphic level	Well, fauna and age	GSC loc. no.	Stratigraphic level	Well, fauna and age	GSC loc. no.
			4009.5' (1222.1 m), Hume Fm., 463.5' (141.3 m), below top; 50.5' (15.4 m) above top of Headless Fm.	As above <i>Temnophyllum</i> sp. indet. gastropods, indet. Age: Middle or Late Devonian (not Famennian)	C-65088
3805' (1159.8 m), Hume Fm., 259' (79.9 m), below top; 255' (77.7 m) above top of Headless Fm.	Candex et al. Dahadinni M-43A 63° 52' 59" N; 124° 39' 15" W; 95 N <i>Radiastrea</i> sp. cf. <i>R. trichomisca</i> (Crickmay) Age: Middle Devonian, late Eifelian	C-65089	4020' (1225.3 m), Hume Fm., 474' (144.5 m), below top; 40' (12.2 m) above top of Headless Fm.	As above <i>Alveolites</i> sp. nov. Age: Middle Devonian, Eifelian	C-65092
3864' (1177.8 m), Hume Fm., 318' (96.9 m), below top; 196' (59.7 m) above top of Headless Fm.	As above <i>Alveolites</i> sp. nov. Age: Middle Devonian, Eifelian	C-64521	4048' (1233.8 m), Hume Fm., 502' (153.0 m), below top; 12' (3.7 m), above top of Headless Fm.	As above <i>Alveolites?</i> sp. Age: Devonian?	C-65091
3866' (1178.3 m), Hume Fm., 320' (97.5 m), below top; 194' (59.1 m) above top of Headless Fm.	As above <i>Digonophyllum</i> sp. cf. <i>D. powellense</i> McLean Age: Middle Devonian, probably late Eifelian	C-64523	4314' (1314.9 m), Landry Fm., 52' (15.9 m), below top; 584.5' (178.2 m), above top of Bear Rock Fm.	As above gastropods Age: not determinable	C-65096
3878' (1182.0 m), Hume Fm., 332' (101.2 m), below top; 182' (55.5 m) above top of Headless Fm.	As above <i>Radiastrea trichomisca</i> (Crickmay) Age: Middle Devonian, late Eifelian	C-64525	4413' (1345.1 m), Landry Fm., 151' (46.0 m), below top; 485' (148.0 m), above top of Bear Rock Fm.	As above tabulate coral, gen. nov. (Multithecoporidae) Age: Probably Middle Devonian	C-65095
3881' (1182.9 m), Hume Fm., 335' (108.2 m), below top; 179' (54.3 m) above top of Headless Fm.	As above <i>Lekanophyllum?</i> sp. indet. Age: Early or Middle Devonian	C-64524	4986' (1519.7 m), Bear Rock Fm., 88.5' (27.0 m), below top (faulted and repeated below).	As above <i>Chovanella burgessi</i> Peck & Eyer Age: Middle Devonian	C-65093
3988' (1215.5 m), Hume Fm., 442' (134.7 m), below top; 72' (21.9 m) above top of Headless Fm.	As above <i>Tikhinella</i> sp. indet. <i>Stachyodes</i> sp. indet. <i>Thamnopora</i> sp. indet. rugose coral, indet. fragment gastropods ostracodes Age: Middle or Late Devonian	C-65094	Remarks		
4002' (1219.8 m), Hume Fm., 456' (139.0 m), below top; 58' (17.7 m) above top of Headless Fm.	As above <i>Pachyfavosites</i> sp. indet. Age: Early or Middle Devonian	C-65090	1. <u>Candex et al. Dahadinni M-43A</u> Although the specimen of <i>Radiastrea</i> in C-65089 (3805', 1159.8 m) cannot be firmly identified, both it and <i>R. trichomisca</i> (Crickmay) in C-64525 (3878', 1182.0 m) should be considered diagnostic of the Hume Formation (<i>adoceta</i> and lower <i>dysmorphostrota</i> Zones of Pedder, 1975). Species that a decade or so ago would have been accommodated in <i>Alveolites</i> or <i>Caliapora</i> have recently been assigned to a number of new genera (Mironova, 1974). In the light of Mironova's and other work, the forms identified as <i>Alveolites</i> in C-64521 (3864', 1177.7 m) and C-65092 (4020', 1225.2 m) may belong to another genus. Regardless of this possibility the species, which has not been named, is typical of the		

- Hume Formation. Firm identification of the large cystimorph corals in C-64523 (3866'/1178.3 m) and C-64524 (3881'/1182.9 m) is impossible, because only incomplete specimens were recovered from the small diameter core. The occurrence of the foraminifer genus *Tikhinella* in C-65094 (3881'/1182.9 m) is important (see above). The new tabulate coral in C-65095 is probably related to both *Syringoporella* and *Spiroclados*, and, therefore, should be of Middle Devonian age. Rice (1971, p. 10) gave the range of the charophyte species *Chovanella burgessi* as late Eifelian to late Givetian. However, the occurrence in the Bear Rock Formation at a depth of 4986 feet (1519.7 m) (C-65093) is possibly early or middle, rather than late Eifelian.
2. Pan American A-1 Mattson #1
Dendrostella trigemme occurs with *Stringocephalus* in the McDame Group of British Columbia and some other parts of the world (Old World Faunal Realm). These occurrences are considered to be Givetian, but by far the greatest number of occurrences in Western Canada are in the upper Eifelian Hume, Nahanni, Headless and Dunedin formations and their equivalents. The occurrence of the foraminifer genus *Tikhinella* is important; previously it was regarded as being highly characteristic, if not entirely diagnostic, of the Upper Devonian Frasnian Stage (Toomey et al., 1970).
 3. Gulf et al. Trout River D-14
 Collections from depths of 1500 to 1628.5 feet (457.2-496.4 m) in this well were reported on by the present author in Paleontological Report No. HRB-25-AEHP-71. In outcrop, *Psydracophyllum lonsdaleiaforme* is known from the Nahanni and Headless formations of southwest District of Mackenzie (Pedder, 1971), while *Sociophyllum redactum* occurs in the type exposure of the Horn Plateau reef (McLaren and Norris, 1964). The Nahanni and Headless formations are believed to be late Eifelian and therefore slightly older than the early Givetian Horn Plateau Formation.
 4. Imp. Triad Harris River F-71
 The discovery of a species of *Trypanopora* in the Lonely Bay Formation of this well (2291', 698.3 m; C-76466) is the first record of the genus in North America. The oldest and youngest well dated occurrence of the genus currently known are in the Zlichovian Bindi and Cavan limestones of southwestern Australia, and Upper Givetian limestone at Mont d'Haus, France (Pel and Lejeune, 1971).
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- Report by A.R. Sweet on *Leiosphaeridia* sp. in five samples of the Hare Indian Formation for W.S. MacKenzie (Project 710010).
- Localities: District of Mackenzie
1. McDermott Canada GCO. Maida Ck., F-57 (65°36'17"N, 128°10'36"W, NTS 106 H); interval 2120-2130 feet (646.2-649.2 m); sample C-23941.
 2. IMP Canol Mac #1 (65°15'30"N, 126°59'00"W, NTS 96 E); 3110 feet (947.9 m) depth, 10 feet (3.1 m) above base of Hare Indian Formation; sample C-24313.
 3. IMP Canol Hoosier Ridge #1 (65°24'16"N, 127°32'14"W, NTS 96 E); 1024 feet (312.1 m) depth, 36 feet (11.0 m) above base of Hare Indian Formation; sample C-24403.
 4. Delcaila et al., Rond Lake #5 (67°06'00"N, 128°24'55"W, NTS 106 P); 522 feet (159.1 m) depth, 31 feet (9.5 m) above base of Hare Indian Formation; sample C-24415.
 5. Powell Creek locality (65°16'00"N, 128°46'00"W, NTS 106 H); from 15 feet (4.6 m) above base of Hare Indian Formation; sample C-24444.

The maximum diameters of one hundred algal spore cases from each of the five samples referable to the genus *Leiosphaeridia* were measured to determine the range of variability of this spore type over an extended geographic area. The per cent frequency size distribution was then calculated for each population using a class size of 25 microns.

On the basis of size distribution one could consider two species to be present (one greater than 150 μ in diameter and one less than 150 μ in diameter); however, there is no other morphological basis for making such a distinction. Groupings of spores of various sizes were observed. This may mean that the total assemblage belongs to one biological species and that the variation in spore size within a single sporangial (?) mass is a reflection of either:

1. A mixture of mature and immature specimens, or
2. Differential sporal development within a single sporangia either by the partial abortion of some of the spores or a tendency toward heterospory.

Most probably the variation in size distribution (Fig. 1) within the different samples is a factor of size sorting during deposition. Hence, the value of these palynomorphs might be in their use as indicators of energy conditions within the basin of deposition.

Leiosphaeridia has no specific age significance. Scolecodonts and small anomalous trilete spores were seen in sample C-24444. Trilete spores were also seen in C-24403.

Report by T.T. Uyeno on five lots of conodont samples from four wells in the Fort Norman area, west-central District of Mackenzie (NTS 96 B, C), submitted by D.C. Pugh.

Field no. and stratigraphy	Locality, conodonts and age	GSC loc. no.
Franklin Mtn. Fm, Cherty mbr., 4000 to 5000' (1219-1524 m) below top (Con. no. 732-1; wt. = 400/g)	Candel East Mackay B-45 64°44'09"N, 125°38'18"W (NTS 96 C) <i>Oneotodus variabilis</i> Lindström <i>"Scolopodus" gracilis</i> Ethington and Clark (graciliform element)	C-50558/ 4000-5000 (1219-1524)
Age: Early Ordovician, early Arenigian (<i>"Scolopodus" quadruplicatus</i> aff. <i>Scolopodus rex</i> Interval of Ethington and Clark, 1982)		

Remarks: CAI 2 *"Scolopodus" gracilis* has its first occurrence within the *"S." quadruplicatus* aff. *S. rex* Interval, but ranges considerably higher. *Oneotodus variabilis* has been previously reported from the Road River Formation at the Broken Skull River section. There it occurs about 37 m below a sample that yielded a conodont fauna diagnostic of this interval (Tipnis et al., 1979).

Collector's note: probable age, Early Ordovician; Cherty member top at 3990' (1216.2 m), overlain by Cretaceous.

Unnamed fm., 2840 to 3030' (865.6-923.5 m) below top (Con. no. 732-2; wt. = 131 g)	Decalta Keele N-62 64°21'48"N, 124°57'12"W (NTS 96 C)	C-50559/ 2840-3030 (865.6-923.5)
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Remarks: No conodonts

Collector's note: top at 2841' (866.0 m), overlain by Cretaceous; probable age, Ordovician, perhaps Silurian-Devonian.

Unnamed fm., 2900 to 3090' (883.9-941.8 m) below top (Con. no. 732-3; wt. = 131 g)	Cdn. Res Keller Lake 0-13, 64°12'53"N, 122°17'25"W (NTS 96 B)	C-50560/ 2900-3090 (883.9-941.8)
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Remarks: No conodonts

Collector's note: suspect no pre-Devonian at bottom of well; interval overlain by Devonian Bear Rock Group.

Unnamed fm., 1331.5 to 1332.5' (405.8-406.1 m) below top. (Con. no. 732-4; wt. = 460 g)	Old Fort Point E-30 64°49'26"N, 124°50'16"W (NTS 96 C)	C-52551/ 1331.5-1332.5 (405.8-406.1)
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Remarks: No conodonts

Collector's note: probable age, Ordovician.

Unnamed fm., 2578.5 to 2579' (785.9-786.1 m) below top. (Con. no. 732-5; wt. = 499 g)	Old Fort Point E-30 64°49'26"N, 124°50'16"W (NTS 96 C)	C-52551/ 2578.5-2579 (785.9-786.1)
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Remarks: No conodonts

Collector's note: probable age, Ordovician.

References

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1982: Lower and Middle Ordovician conodonts from the Ibex area, western Millard County, Utah; Brigham Young University Geology Studies, v. 28, pt. 2, p. 155.
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1979: Ordovician conodont biostratigraphy of the southern District of Mackenzie; Geological Association of Canada, Special Paper 18, p. 39-91, (imprint 1978).

Report by T.T. Uyeno on four lots of conodont samples from the Vera Formation in southwestern District of Mackenzie (NTS 95 F), and from Aquitaine Old Fort Point E-30 well in Fort Norman area, District of Mackenzie (NTS 96 C), submitted by D.G. Cook.

76-CW-80B; 61°55'15"N, 124°55'10"W C-59499
Vera Fm. (Con. (NTS 95 F) southwestern
no. 650-1; District of Mackenzie
wt. = 1549 g)
Ozarkodina confluens
(Branson and Mehl),
alpha morphotype
of Klapper and Murphy
(1975)

in 95 F/15 near *O. remscheidensis*
base of Vera Fm. *remscheidensis*
in Tundra Thrust- (Ziegler)
plate

Age: latest Silurian,
late Pridolian (upper-
most *eosteinhorrensis*
Zone)

Remarks: CAI 5

Collector's note: Silurian-Devonian

Unnamed fm., Aquitaine Old Fort Point C-52551/
910 to 925' E-30 well, 64°49'26"N, 910-925
(277.4-281.9 m) 124°50'16"W (NTS 96 C) (277.4-281.9)
below top. (Con. **Remarks:** No conodonts
no. 511-2;
wt. = 387 g)

Unnamed fm., Same locality as C-52551/
1325 to 1336' C-52551 1325-1336
(403.9-407.2 m) (403.9-407.2)
below top. (Con. **Remarks:** No conodonts
no. 511-3;
wt. = 1980 g)

Unnamed fm., Same locality as C-52551/
2568 to 2583' C-52551 2568-2583
(782.7-787.3 m) (782.7-787.3)
below top. **Remarks:** No conodonts
(Con. nos.
511-1 and 4;
wt. = 2.9 g)

Reference

Klapper, G. and Murphy, M.A.
1975: Silurian-Lower Devonian conodont sequence in
the Roberts Mountains Formation of central
Nevada; University of California, Publications in
Geological Sciences 111, p. 62 (imprint 1974).

Report by T.T. Uyeno on 78 lots of Middle and Upper
Devonian conodont samples from 14 wells located in
southwestern District of Mackenzie and southeastern Yukon
Territory (NTS 85 E, F, L; 95 A, B, F, G, H, J, N), submitted
by N.C. Meijer Drees.

Note: in the following report, the ages of the
conodonts are quoted in terms of conodont zones (see
attached figure from Klapper and Johnson, 1980,
Text-fig. 1, for the correlation of these zones with the
standard stages). This is because the selection of the
Lower-Middle and Middle-Upper Devonian boundaries
are yet to be made by the Subcommittee on Devonian
Stratigraphy. The prevailing opinion is that the base of
the Lower *dengleri* Subzone will be ultimately selected
for the Middle-Upper Devonian boundary, and the base
of the *partitus* Zone (upper half of the *patulus* Zone on
the attached figure) for the Lower-Middle Devonian
boundary.

Stratigraphic level (wt. of sample)	Conodonts and age
1. <u>Candex et al. Dahadinni M-43A</u> Lat. 63°52'59.3"N, long. 124°39'15.1"W; NTS 95 N GSC loc. C-64552 (Con. no. 652) See also Report no. 10-TTU-77. 3710.5' (1131.0 m); <i>Panderodus</i> sp. (2 specimens) Nahanni Fm. (217 g) Age: Middle Ordovician to Middle Devonian, and possibly early Late Devonian (depending on the placement of the Middle-Upper Devonian boundary)	
2. <u>Decalta et al. Johnson A-12</u> Lat. 61°31'02"N, long. 124°02'75"W; NTS 95 F GSC loc. no. C-45952 (Con. no. 54) 2161.5' (658.8 m); <i>Icriodus difficilis</i> Ziegler and Hare Indian Fm. Klapper (658 g) <i>Polygnathus varcus</i> Stauffer Group of Klapper et al. (1970) <i>Schmidtognathus wittekindti</i> Ziegler Age: Lower <i>hermanni-cristatus</i> Zone to lower part of the Lower <i>asymmetricus</i> Zone (but probably Upper <i>dengleri</i> Zone to lower part of the Lower <i>asymmetricus</i> Zone, with control at the 2192-foot level) 2192' (668.1 m); Hare <i>Elsonella rhenana</i> Lindström Indian Fm. (593 g) and Ziegler <i>Icriodus difficilis</i> Ziegler and Klapper <i>I. subterminus</i> Youngquist <i>Palmatolepis disparilis</i> Ziegler and Klapper <i>Polygnathus varcus</i> Stauffer Group of Klapper et al. (1970) Age: Upper <i>dengleri</i> Subzone	

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1966: Eine Verfeinerung der Conodontengliederung an der Grenze Mittel-/Oberdevon; Fortschritte in der Geologie von Rheinland und Westfalen, v. 9, p. 647-676 (imprint 1965).
- Report by T.T. Uyeno on nine lots of conodont samples from the Candex et al. Dahadinni M-43A well located at latitude 63°52'59.3"N, longitude 124°39'15.1"W, western District of Mackenzie, submitted by N.C. Meijer Drees (NTS 95 N).

Well interval and stratigraphy	Conodonts and age	GSC loc. no.
4622.5-4625' (1409-1410 m); core 67, box 2; Funeral Fm. (332 g)	<i>Icriodus</i> aff. <i>I. angustus</i> Stewart and Sweet of Bultynck (1972) (two I elements; small form)	C-46949/ 4622.5-4625 (1409-1410)
Age: early to mid-Couvinian/ Eifelian; <i>Pelekysgnathus pedderi</i> - <i>Polygnathus parawebbi</i> (early form) faunal unit of Uyeno (in press)		

Remarks: The *pedderi-parawebbi* faunal unit also occurs in the lower part of the Hume Formation at Powell Creek, western District of Mackenzie (Uyeno, in press). There the unit occurs within the brachiopod "*Schuchertella*" *adoceta* Zone.

Conodont Color Alteration Index (CAI) = 4%.

4625-4627.5' (1410-1410.5 m); core 67, box 2, Funeral Fm. (464 g)	indeterminate conodont fragments only (2)	C-46949/ 4625-4627.5 (1410-1410.5)
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Remarks: Conodont CAI = 6; conodonts from this interval suggest a high degree of metamorphism (Epstein et al., 1977)

The following intervals did not yield any conodonts:

Intervals	Weight of samples processed (g)
4598.5-4600.5' (1401.6-1402.2 m); core 66, box 1	340
4627.5-4630' (1410.5-1411.2 m); core 67, box 2	342
4710-4711' (1435.7-1436.0 m); core 72, box 2	287
4726-4727' (1440.5-1440.8 m); core 73, box	138
14856-4857' (1480.0-1480.4 m); core 79, box 3	260
4866-4867' (1483.0-1483.5 m); core 80, box 2	317
4875-4876' (1485.9-1486.2 m); core 81, box 1	335

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APPENDIX 2
Logs of Wells A-12 to P-78

1.	A-12
Log of Decalta Johnson A-12 Location: 63°31'02"N, 124°02'15"W Elevation of Kelly Bushing: 563.0 m (1847 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
Borehole Depth feet (m)	Lithology
UPPER DEVONIAN	
Imperial Formation	
Top at bedrock, 563.0 m (1847 ft.) above sea level Thickness: 609.9 m (2001 ft.)	
0-50 (0-15.2)	Samples missing
50-~500 (15.2-~152.4)	Siltstone: slightly green-grey, micaceous, in part argillaceous; grading to Shale: grey, silty, micromicaceous; shale increases downward Trace of sandstone: pale green-grey, pale buff-grey, very fine grained, silty, in part siliceous
~500-2001 (~152.4-609.9)	Shale: grey to dark grey, micromicaceous; grading to Shale: green-grey, very silty; grades downward to Shale: grey to very dark grey, micro- micaceous, flaky to splintery
DEVONIAN	
Thickness: >617.2 m (>2025 ft.)	
Horn River Group	
Thickness: 371.6 m (1219 ft.)	
Canol Formation	
Top at 46.9 m (154 ft.) below sea level Thickness: 37.5 m (123 ft.)	
2001-2124 (609.9-647.4)	Shale: black, bituminous, siliceous, micro- micaceous; some pyrite; at 2100- 2110 feet (640.0-643.1 m), some chert: very pale blue
Ramparts Formation	
Top at 84.4 m (277 ft.) below sea level Thickness: 8.2 m (27 ft.)	
Platform member/Siltstone lentil	
2124-2151 (647.4-655.6)	Limestone: grey-buff, micrograined, very silty; grading to Siltstone: buff, calcareous, argillaceous Some calcite veins
Hare Indian Formation	
Top at 92.7 m (304 ft.) Thickness: 325.8 m (1069 ft.)	
Grey shale member	
(Thickness: 318.2 m/1044 ft.)	
2151-~2930 (655.6-~893.1)	Shale: pale grey, flaky, slightly calcareous, very micromicaceous. At 2161.5 feet (658.8 m) and 2192 feet (668.1 m) - conodonts, Middle-Upper Devonian boundary, T.T. Uyeno (see Appendix 1)
~2930-3195 (~893.1-973.8)	Shale: grey to dark grey, flaky, micro- micaceous; grading downward to dark grey to black

Borehole Depth feet (m)	Lithology
Bluefish Member	
(Thickness: 7.6 m/25 ft.)	
3195-3220 (973.8-981.5)	Shale: black, bituminous, calcareous, with calcite streaks and patterns; grading to Limestone: very argillaceous
Hume Formation	
Top at 418.5 m (1373 ft.) below sea level Thickness: 162.2 m (532 ft.)	
Upper member	
(Thickness: 48.8 m/160 ft.)	
3220-3380 (981.5-1030.2)	Limestone: grey-buff to dark grey-brown, some chalky buff; micrograined, some aphanitic; some shell fragments; some calcite, white
Middle member	
(Thickness: 64.3 m/211 ft.)	
3380-3591 (1030.2-1094.5)	Limestone: as above; any shale present is hidden among Hare Indian shale cavings
Headless Member	
(Thickness: 49.1 m/161 ft.)	
3591-3752 (1094.5-1143.6)	Limestone: buff-grey to dark brown-grey, micro- to very fine-grained, in part silty and argillaceous, bioclastic; some shale: grey and black
Landry Formation	
Top at 580.6 m (1905 ft.) below sea level Thickness: 46.6 m (153 ft.)	
3752-3905(R) (1143.6-1190.2)	Limestone: buff-grey and buff to dark brown, aphanitic to micrograined; some limestone: buff, brown and white, pelletal; much calcite, white
Arnica Formation	
Top at 627.3 m (2058 ft.) below sea level Thickness: >36.9 m (>121 ft.)	
3905(R)-4026 (1190.2-1227.1)	Very poor samples - no dolomite observed
Total depth: 1227.1 m	
2.	A-16
Log of Imperial Hossler Ridge No. 2 Location: 65°25'00"N, 127°32'11"W Elevation of Kelly Bushing: 84.1 m (276 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log. Sample quality poor.	
UPPER DEVONIAN	
Imperial Formation	
Top at bedrock, 68.9 m (226 ft.) above sea level Thickness: 245.1 m (804 ft.)	
50(S)-~470 (15.2-~143.3)	Siltstone: grey, micromicaceous Shale: dark grey, micromicaceous, in part silty
~470-854 (~143.3-260.3)	Shale: dark grey, micromicaceous, in part silty

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
DEVONIAN		Limestone: brown, aphanitic	
Thickness estimated at 790 m (2592 ft.)		Arnica Formation	
Horn River Group		Top at 677.9 m (2224 ft.) below sea level Thickness: 18.3 m (60 ft.)	
Thickness: 387.7 m (1272 ft.)		Dolomite: buff, brown, fine crystalline, sucrosic; some intercrystalline porosity	
Canol Formation		Fort Norman Formation	
Top at 176.2 m (578 ft.) below sea level Thickness: 20.1 m (66 ft.)		Top at 696.2 m (2284 ft.) below sea level Thickness: >48.2 m (>158 ft.)	
854-878 (260.3-267.6)	Dolomite: brown, siliceous, probably in part pyritic	2560(S)-2700 (780.3-823.0)	Anhydrite: pale buff, pale grey, white
878-902 (267.6-274.9)	Shale: black, pyritic	Samples missing	
	Allochthonous limestone (Thickness: 5.5 m/18 ft.)	Total depth: 828.5 m	
902-920 (274.9-280.4)	Electric log and a few cuttings indicate limestone debris		
Ramparts Formation			
Top at 196.3 m (644 ft.) below sea level Thickness: 158.5 m (520 ft.)			
Reef member (Thickness: 122.8 m/403 ft.)			
920-1323 (280.4-403.3)	Limestone: pale buff to white; reef		
Platform member (Thickness 20.4 m/67 ft.)			
1323-1390 (403.3-423.7)	Limestone: buff to brown, very fine grained; some limestone: brown, very silty		
Siltstone lentil (Thickness: 15.2 m/50 ft.)			
1390-1440 (423.7-438.9)	Siltstone: grey, in part coarse grained, micaceous		
Hare Indian Formation			
Top at 354.8 m (1164 ft.) below sea level Thickness: 209.1 m (686 ft.)			
Grey shale member (Thickness: 175.2 m/575 ft.)			
1440-2015 (438.9-614.2)	Shale: grey, micaceous, silty, slightly calcareous		
Bluefish Member (Thickness: 33.8 m/111 ft.)			
2015-2126 (614.2-648.0)	Shale: black, bituminous		
Hume Formation			
Top at 563.9 m (1850 ft.) below sea level Thickness: 104.9 m (344 ft.)			
2126-2163 (648.0-659.3)	Limestone: argillaceous, and Shale: grey, calcareous		
2163-2240 (659.3-682.8)	Limestone: pale buff to buff-grey, micro-grained, in part fine grained, in part argillaceous		
~2240-2470? (~682.8-752.9?)	Limestone: grey-buff, very fine grained, in part silty Shale: grey, calcareous		
Landry Formation			
Top at 668.7 m (2194 ft.) below sea level Thickness: 9.1 m (30 ft.)			

3. A-23

Log of Arco Smoking Hills A-23
Location: 69°22'06"N, 126°20'30"W
Elevation of Kelly Bushing: 292.0 m (958 ft.)
Well log prepared by the writer based on drill cuttings;
no mechanical logs available.

MESOZOIC

Thickness: 338.3 m (1110 ft.)
Basal beds (Lower Cretaceous?)

1260(S)-1450(S)
(384.1-442.0) **Sand: medium to very coarse grained, sub-rounded quartz; some larger grains; probably some reworked Paleozoic rock in the lower part**

DEVONIAN

Thickness: >149.4 m (>490 ft.)

Landry Formation

Top at 150.0 m (492 ft.) below sea level
Thickness: 76.2 m (250 ft.)

1450(S)-1660(S)
(442.0-506.0) **Limestone: pale buff to buff and white, aphanitic to micrograined, grading downward to more characteristic buff-brown with traces of pellets**

1660(S)-1700(S)
(506.0-518.2) **Limestone: pale buff to white, aphanitic to micrograined; in part dolomitic**

Arnica Formation

Top at 226.2 m (742 ft.) below sea level
Thickness: >73.2 m (>240 ft.)

1700(S)-1720(S)
(518.2-524.3) **Dolomite: pale buff, very fine, fine and medium crystalline**

1720(S)-1940(S)
(524.3-591.3) **Dolomite: buff, brown and pale buff, micro-crystalline, very fine and fine crystalline**

Total depth: 596.2 m

4.	A-28
Log of Decalta Keele S. A-28 Location: 64°07'03"N, 125°04'10"W Elevation of Kelly Bushing: 390.1 m (1280 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	

Borehole Depth feet (m)	Lithology
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MESOZOIC AND (?)TERTIARY

Thickness: 1161.0 m (3809 ft.)
Basal beds (Lower Cretaceous?)

3842-3869 (1171.0-1179.3)	Shale: dark brown-grey to black, very micromicaceous; trace pyrite; some shale: white, waxy, in part micaceous.
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UPPER DEVONIAN

Imperial Formation

Top at 789.1 m (2589 ft.) below sea level
Thickness: 1072.0 m (3517 ft.)

3869-~3980 (1179.3-~1213.1)	Siltstone: pale green, argillaceous, micromicaceous; some shale: grey-green
~3980-5395 (~1213.1-1644.4)	Shale: grey-green to grey, micromicaceous; some siltstone: pale green, micaceous; grades downward to Shale: grey to green-grey, micromicaceous; and Siltstone: grey, pale grey, pale green, in part micaceous

Jungle Ridge limestone member (Thickness: 34.7 m/114 ft.)

5395-5509 (1644.4-1679.1)	Limestone: pale buff, bioclastic, fossiliferous, in part very silty; some limestone: brown, buff, aphanitic
5509-~6630 (1679.1-2020.8)	Siltstone: pale green to pale grey-green, micaceous, in part argillaceous, in part slightly calcareous; some shale: green-grey, micromicaceous
~6630-7386 (~2020.8-2251.3)	Shale: grey, micromicaceous, in part silty; grading to Siltstone: green-grey, micaceous, argillaceous; grades downward to Shale: brown-grey, micromicaceous, silty; grading to Siltstone: grey to grey-brown, micaceous

DEVONIAN

Thickness: >949.2 m (>3116 ft.)

Horn River Group

Thickness: 327.8 m (1074 ft.)

Canol Formation

Top at 1861.1 m (6106 ft.) below sea level
Thickness: 50.0 m (164 ft.)

7386-7550 (2251.3-2301.2)	Shale: black, bituminous; with some pyrite
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Hare Indian Formation

Top at 1911.1 m (6270 ft.) below sea level
Thickness: 277.4 m (910 ft.)

Borehole Depth feet (m)	Lithology
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Grey shale member
(Thickness: 51.8 m/170 ft.)

7550-7720 (2301.2-2353.1)	Shale: grey, some dark grey and green-grey, flaky to splintery, noncalcareous
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Black shale member
(Thickness: 191.4 m/628 ft.)

7720-8153 (2353.1-2485.0)	Shale: black, bituminous, siliceous, very micromicaceous; trace pyrite
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8153-8348 (2485.0-2544.5)	Shale: grey to dark grey and black, in part micromicaceous, noncalcareous
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Bluefish Member
(Thickness: 34.1 m/112 ft.)

8348-8430 (2544.5-2569.5)	Shale: black, bituminous, in part slightly calcareous; trace pyrite
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8430-8460 (2569.5-2578.6)	Shale: as above, thinly interbedded with Limestone: black and white; grading from black speckled and streaked with white to white with black streaks; bituminous, argillaceous, fossiliferous
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Hume Formation

Top at 2188.4 m (7180 ft.) below sea level
Thickness: 233.2 m (765 ft.)

Upper member
(Thickness: 71.9 m/236 ft.)

8460-8696 (2578.6-2650.5)	Limestone: chalky buff with white specks and streaks, to brown with white streaks and veins; micrograined
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Middle member
(Thickness: 92.0 m/302 ft.)

8696-8907 (2650.5-2714.9)	Limestone: brown, dark brown, buff, white, micro- to very fine-grained, some aphanitic, in part bioclastic; some shale: grey, calcareous, silty, grading to siltstone
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8907-8998 (2714.9-2742.6)	Limestone: brown, dark brown, buff, pale buff, micro- to very fine-grained, bioclastic
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Headless Member
(Thickness: 69.2 m/227 ft.)

8998-9225 (2742.6-2811.8)	Limestone: brown, dark brown, argillaceous, silty Shale: black, calcareous, splintery
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Landry Formation

Top at 2421.6 m (7945 ft.) below sea level
Thickness: 127.7 m (419 ft.)

9225-9510 (2811.8-2898.7)	Limestone: brown, buff, mainly aphanitic, trace pelletal, in part micrograined; some limestone: very dark brown, aphanitic, argillaceous
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9510-9644 (2898.7-2939.5)	Limestone: brown, dark brown, some buff, aphanitic, some pelletal and fine grained; bioclastic; some interbedded dolomite: buff, microsucrosic
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Fort Norman Formation

Top at 2549.3 m (8364 ft.) below sea level
Thickness: >260.9 m (>856 ft.)

9644-10 500 (2939.5-3200.4)	Anhydrite and dolomite (grey, buff, brown, in part anhydritic)
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Total depth: 3200.4 m

5.	A-37b	Borehole Depth feet (m)	Lithology
	Log of Imperial Bluefish No.1-A Location: 64°56'01"N, 125°50'54"W Elevation of Kelly Bushing: 67.1 m (220 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log. Sample quality poor.		Hume Formation Top at 702.0 m (2303 ft.) below sea level Thickness: 114.0 m (374 ft.) <u>Upper member</u> (Thickness: 52.1 m/171 ft.) 2523-2694 (769.0-821.1) Limestone: buff, white, brown, micro- to fine-grained, bioclastic; at 2556 feet (779 m) Favosites , at 2658 feet (810.2 m) brachiopods and ostracodes, at 2562 feet (780.9 m) brachiopods (Raasch and Associates, Ltd., 1971) <u>Middle member</u> (Thickness: 51.5 m/169 ft.) 2694-2830 (821.1-862.6) Limestone: grey, grey-buff, brown, micro- to very fine-grained, in part argillaceous Shale: grey, brown-grey, calcareous 2830-2863 (862.6-872.6) Limestone: grey-buff, white, brown, micro- to very fine-grained <u>Headless Member</u> (Thickness: 10.4 m/34 ft.) 2863-2897 (872.6-883.0) Limestone: as above; and Shale: grey, brown-grey, calcareous Landry Formation Top at 816.0 m (2677 ft.) below sea level Thickness: 7.0 m (23 ft.) 2897-2920 (883.0-890.0) Limestone: brown, buff, white, pelletal and aphanitic Arnica Formation Top at 823.0 m (2700 ft.) below sea level Thickness: 6.1 m (20 ft.) 2920-2940 (890.0-896.1) Dolomite: brown, very fine crystalline, sucrosic Fort Norman Formation Top at 829.1 m (2720 ft.) below sea level Thickness: >182.6 m (>599 ft.) 2940-3539 (896.1-1078.7) Anhydrite and dolomite. Dolomite decreases downward Total depth: 1078.7 m
6.	A-37s		
	Log of Mobil Slater River A-37 Location: 64°56'05"N, 126°05'42"W Elevation of Kelly Bushing: 132.6 m (435 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.		MESOZOIC Thickness: 157.0 m (515 ft.) Basal beds (Lower Cretaceous?) -515 (-157.0) Shale: very dark grey, flaky to splintery, micromicaceous
			MESOZOIC Thickness: 383.4 m (1258 ft.) Basal beds (Lower Cretaceous?) -1618 (-493.2) Shale: dark grey, micromicaceous UPPER DEVONIAN Imperial Formation Top at 426.1 m (1398 ft.) below sea level Thickness: 87.4 m (287 ft.) <u>Jungle Ridge limestone member</u> (Thickness 6.7 m (22 ft.) 1618-1640 (493.2-499.9) Limestone: buff, crumbly Shale: buff-grey, soft, very micaceous, bentonitic 1640-1780 (499.9-542.5) Shale: grey, silty, calcareous, micromicaceous 1780-1905 (542.5-580.6) Shale: dark grey DEVONIAN Thickness estimated at 565 m (1854 ft.) Horn River Group Thickness: 188.4 m (618 ft.) Canol Formation Top at 513.6 m (1685 ft.) below sea level Thickness: 28.0 m (92 ft.) 1905-1997 (580.6-608.7) Shale: black (very poor samples) Ramparts Formation Top at 541.6 m (1777 ft.) below sea level Thickness: 18.6 m (61 ft.) <u>Platform member</u> 1997-2058 (608.7-627.3) Limestone: grey-buff, argillaceous; possibly, in the upper part, some shale: brown-black, bituminous, calcareous Hare Indian Formation Top at 560.2 m (1838 ft.) below sea level Thickness: 141.7 m (465 ft.) <u>Grey shale member</u> (Thickness: 115.2 m/378 ft.) 2058-2436 (627.3-742.5) Shale: grey, calcareous, micromicaceous <u>Bluefish Member</u> (Thickness: 26.5 m/87 ft.) 2436-2505 (742.5-763.5) Shale: black, bituminous, noncalcareous; in part calcareous toward base 2505-2523 (763.5-769.0) Shale: black, bituminous, calcareous; some limestone: black, brown and white, bituminous, argillaceous

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
UPPER DEVONIAN			
Imperial Formation			
Top at 24.4 m (80 ft.) below sea level Thickness: 506.3 m (1661 ft.)			
515-1078 (157.0-328.6)	Siltstone: pale green-grey, coarse grained, micaceous Siltstone: grey, micromicaceous Shale: grey, green-grey, silty, micromicaceous Sandstone: pale green-grey, very fine grained, silty, micaceous; some rusty weathering at the top	3125-3168 (952.5-965.6)	Limestone: grey-buff to white, micro-grained to aphanitic
1078-2176 (328.6-663.2)	Shale: dark grey, micromicaceous, in part silty; grading to Siltstone: argillaceous	3168-3270 (965.6-996.7)	Limestone: grey-buff, grey, white, micro- to very fine-grained, in part aphanitic and argillaceous; some shale: grey, calcareous
		Landry Formation	
		Top at 864.1 m (2835 ft.) below sea level Thickness: 32.0 m (105 ft.)	
		3270-3375 (996.7-1028.7)	Limestone: buff, brown and white, aphanitic and pelletal
DEVONIAN		Arnica Formation	
Thickness estimated at 739.4 m (2426 ft.)		Top at 896.1 m (2940 ft.) below sea level Thickness: 18.9 m (62 ft.)	
Horn River Group			
Thickness: 199.0 m (653 ft.)		3375-3437 (1028.7-1047.6)	Dolomite: buff to brown, micro- to very fine-crystalline, sucrosic
Canol Formation		Fort Norman Formation	
Top at 530.7 m (1741 ft.) below sea level Thickness: 71.3 m (234 ft.)		Top at 915.0 m (3002 ft.) below sea level Thickness: >19.2 m (>63 ft.)	
2176-2290 (663.2-698.0)	Shale: black, siliceous, bituminous, in part very siliceous; grading to Chert: argillaceous Trace dolomite: brown; trace pyrite	3437-3500 (1047.6-1066.8)	Anhydrite and dolomite: brown, very fine crystalline, anhydritic
2290-2410 (698.0-734.6)	Shale: very dark grey to black, fissile, bituminous; trace pyrite	Total depth: 1066.8 m	
Hare Indian Formation			
Top at 602.0 m (1975 ft.) below sea level Thickness: 127.7 m (419 ft.)		7. A-40	
Black shale member (Thickness: 110.3 m/362 ft.)		Log of Union Good Hope A-40 Location: 66°29'10"N, 124°35'52"W Elevation of Kelly Bushing: 443.8 m (1456 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to gamma ray-neutron log - very poor log and no log below 4240 feet (1292 m).	
2410-2661 (734.6-811.1)	Shale: brown-black, siliceous, in part slightly calcareous, bituminous, pyritic; traces of limestone: grey-buff, siliceous	CAMBRIAN-SILURIAN	
2661-2772 (811.1-845.0)	Shale: black, bituminous, micromicaceous	Ronning Group	
Bluefish Member (Thickness: 17.4 m/57 ft.)		Thickness: 740.7 m (2430 ft.)	
2772-2829 (845.0-862.3)	Shale: black, bituminous, variably calcareous, in part streaked white and very calcareous, pyritic; in lower part some limestone: black and white, bituminous, argillaceous	Franklin Mountain Formation	
		Top at 443.8 m (1456 ft.) above sea level Thickness: 740.7 m (2430 ft.)	
Hume Formation		Cherty member (Thickness: 421.5 m/1383 ft.)	
Top at 729.7 m (2394 ft.) below sea level Thickness: 134.4 m (441 ft.)		0-20 (0-6.1)	Samples missing
Upper member (Thickness: 55.8 m/183 ft.)		20-200 (6.1-61.0)	Dolomite: very pale grey to very pale buff and milky white, trace pink, very fine to fine and microcrystalline; some chert; trace clay: pale green
2829-3012 (862.3-918.1)	Limestone: pale buff to brown and white, aphanitic to very fine grained, bioclastic	200-350 (61.0-106.7)	Dolomite: pink to very pale buff and milky white, very fine to fine crystalline; much chert: white and very pale buff, and clear quartz; appear to be crystal-lined vugs
Middle member (Thickness: 47.5 m/156 ft.)		350-410 (106.7-125.0)	Chert: very pale buff and milky white; some dolomite, as above
3012-3125 (918.1-952.5)	Limestone: grey, grey-buff, aphanitic to micrograined, in part argillaceous; some shale: grey, buff-grey, calcareous	410-560 (125.0-170.7)	Dolomite: pink and some pale buff, very fine, fine and medium crystalline; some chert: milky white

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
560-620 (170.7-189.0)	Dolomite: buff to grey, micro- to coarse-crystalline; trace clay: pale green, intercrystalline		Shale: green, dolomitic, and some brown and black, brittle Some chert: brown and white, in the lower part
620-1080 (189.0-329.2)	Dolomite: pale buff, pale grey and pink, mostly fine to medium and coarse crystalline; trace chert: very pale buff		<u>Member f</u> (Thickness: 24.7 m/81 ft.)
1080-1350 (329.2-411.5)	Dolomite: pink, fine to coarse crystalline; some chert: milky white and pink; some clear dolomite rhombs	4103-4184 (1250.6-1275.3)	Shale: green to grey-green, some dark green-grey to black, mostly micromicaceous, in part dolomitic; some dolomite: buff to dark brown, in part very silty; some glauconite concentrations; in basal 5 m, some limestone: pale buff, micrograined
1350-1383(R) (411.5-421.5)	Samples missing		<u>Members e, d and c (undivided)</u> (Thickness: 102.4 m/336 ft.)
	<u>Rhythmic member</u> (Thickness: 260.9 m/856 ft.)		
1383(R)-1540 (421.5-469.4)	Samples missing	4184-4520(S) (1275.3-1377.7)	Dolomite: buff to brown and grey, mostly microcrystalline, in part silty Shale: green to brown-grey, dolomitic, mostly very micaceous Siltstone: pale grey to white and grey-buff, dolomitic, micaceous; glauconite pellets scattered throughout At base, trace of dolomite: brown, medium crystalline
1540-1550 (469.4-472.4)	Dolomite: as above; no chert observed - possibly all cavings		<u>Member b</u> (Thickness: 82.3 m/270 ft.)
1550-2239 (472.4-682.4)	Samples missing		
	<u>Cyclic member</u> (Thickness: 58.2 m/191 ft.)		
2239-2430 (682.4-740.7)	Samples missing	4520(S)-4790(S) (1377.7-1460.0)	Shale: grey-brown, very micaceous, slightly dolomitic; shale: green, micro-micaceous, slightly dolomitic Siltstone: pale grey, pale buff and white, very micaceous, dolomitic, in part siliceous, in part highly glauconitic (to 90% pellets) Some dolomite: buff to gray, siliceous, glauconitic
	CAMBRIAN		<u>Member a</u> (Thickness: 27.4 m/90 ft.)
	Saline River Formation		
	Top at 296.9 m (974 ft.) below sea level Thickness: 448.4 m (1471 ft.)		
	<u>Upper clastic member</u> (Thickness: 95.4 m/313 ft.)		
2430-2743 (740.7-836.1)	Samples missing	4790(S)-4880(S) (1460.0-1487.4)	Siltstone: pale grey to pale green and pale buff-grey, mostly very glauconitic and siliceous, in part dolomitic, in part coarse grained and sandy Shale: green to grey-green, flaky to splintery, some grey-brown, very micaceous Sandstone: white, trace pink, very fine grained, siliceous, glauconitic
	<u>Salt member</u> (Thickness: 313.6 m/1029 ft.)		Mount Clark Formation
2743-3320 (836.1-1011.9)	Samples missing		Top at 1043.6 m (3424 ft.) below sea level Thickness: 54.9 m (180 ft.)
3320-3772 (1011.9-1149.7)	Halite	4880(S)-5060(S) (1487.4-1542.3)	Very poor samples - sand and sandstone: pink in the lower part, fine to very coarse grained, quartzose; in the lower part some sandstone: very fine to medium grained, silty
	<u>Lower clastic member</u> (Thickness: 39.3 m/129 ft.)		
3772-3901 (1149.7-1189.0)	Dolomite: brown-grey to grey-buff, mostly aphanitic to microcrystalline, in part argillaceous, in part anhydritic Shale: brown-grey to grey-green, in part dolomitic Some anhydrite		
	Mount Cap Formation		
	Top at 745.2 m (2445 ft.) below sea level Thickness: 298.4 m (979 ft.)		PROTEROZOIC
	<u>Member h</u> (Thickness: 34.7 m/114 ft.)		Top at 1098.5 m (3604 ft.) below sea level
3901-4015 (1189.0-1223.8)	Shale: green to olive-green to dark grey-green, some grey-brown, splintery to flaky, dolomitic; some dolomite: pale grey and pale buff to brown, microcrystalline, in part silty		<u>Dolomite unit</u> (Thickness: >50.3 m/>165 ft.)
	<u>Member g</u> (Thickness: 26.8 m/88 ft.)	5060(S)-5225 (1542.3-1592.6)	Dolomite and chert: pink to buff, micro-crystalline dolomite, and oolite, especially oolitic chert; at base, some orthoquartzite with trace glauconite
4015-4103 (1223.8-1250.6)	Dolomite: buff to brown, microcrystalline, some very fine crystalline and a trace of fine crystalline, in part pyritic		Total depth: 1592.6 m

8.	A-52
	Log of Imperial Loon Creek No. 1 Location: 65°11'06"N, 126°54'23"W Elevation of Kelly Bushing: 116.4 m (382 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log.

Borehole Depth feet (m)	Lithology
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MESOZOIC

Thickness: 146.3 m (480 ft.)
Basal beds (Lower Cretaceous?)

455-480 (138.7-146.3)	Sandstone: fine to medium grained, slightly glauconitic, possibly sub-angular to subrounded with quartz outgrowths; some sand: coarse, very coarse and probably granule size and larger; quartz
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UPPER DEVONIAN

Imperial Formation

Top at 29.9 m (98 ft.) below sea level
Thickness: 528.8 m (1735 ft.)

480-520 (146.3-158.5)	Sandstone: slightly green-grey, very fine grained, silty, micaceous; some siltstone: grey, micaceous, argillaceous
520-550 (158.5-167.6)	Siltstone: pale green-grey, coarse grained, very micaceous; some interbedded shale
550-1360 (167.6-414.5)	Siltstone: grey, argillaceous, micromicaceous; some siltstone: pale grey, coarse grained, micaceous Shale: dark grey, micromicaceous
1360-2215 (414.5-675.1)	Shale: dark grey, micromicaceous; rare siltstone: grey, argillaceous

DEVONIAN

Thickness: 702.6 m (2305 ft.)

Horn River Group

Thickness: 289.6 m (950 ft.)

Canol Formation

Top at 558.7 m (1833 ft.) below sea level
Thickness: 79.2 m (260 ft.)

2215-2333 (675.1-711.1)	Dolomite: brown-grey, siliceous, argillaceous Shale: brown-black, bituminous, in part siliceous; trace pyrite
2333-2427 (711.1-739.8)	Shale: dark brown-grey, micromicaceous, bituminous
2427-2475 (739.8-754.4)	Shale: brown-black, siliceous, bituminous; some pyrite

Hare Indian Formation (incl. Ramparts tongue)

Top at 637.9 m (2093 ft.) below sea level
Thickness: 210.3 m (690 ft.)

Black shale member
(Thickness: 125.9 m/413 ft.)

2475-2810 (754.4-856.5)	Shale: brown-black, bituminous, in part calcareous, siliceous; shale: dark brown-grey, bituminous, very siliceous; trace ironstone: brown
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Borehole Depth feet (m)	Lithology
2810-2835 (856.5-864.1)	Shale: brown-black, calcareous, bituminous, with many limy streaks and specks Limestone: brown, fine grained, bituminous
2835-2888 (864.1-880.3)	Limestone: brown, brown-black and white, argillaceous, bituminous Shale: brown-black, calcareous, bituminous

Ramparts tongue, Platform member (Thickness: 8.5 m/28 ft.)

2888-2916 (880.3-888.8)	Limestone: buff, brown, white, fine and medium grained, bioclastic, in part bituminous
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Grey shale member (Thickness: 63.1 m/207 ft.)

2916-3123 (888.8-951.9)	Shale: grey to pale buff-grey, in part slightly calcareous, micromicaceous, in part very micaceous; trace ironstone: pale brown
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Bluefish Member (Thickness: 12.8 m/42 ft.)

3123-3165 (951.9-964.7)	Shale: black, bituminous, slightly calcareous; trace pyrite At the base, shale: brown-black and brown, very calcareous; grading to limestone: very argillaceous, bituminous
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Hume Formation

Top at 848.3 m (2783 ft.) below sea level
Thickness: 102.1 m (335 ft.)

3165-3360 (964.7-1024.1)	Limestone: buff, pale buff, white, mainly micrograined to aphanitic, some fine grained
3360-3411 (1024.1-1039.7)	Shale: grey, slightly calcareous
3411-3500 (1039.7-1066.8)	Limestone: grey-buff, brown, white, micro- and very fine-grained

Landry Formation

Top at 950.4 m (3118 ft.) below sea level
Thickness: 21.3 m (70 ft.)

3500-3535 (1066.8-1077.5)	Limestone: buff, brown, aphanitic and micrograined
3535-3570 (1077.5-1088.1)	Limestone: as above, some pelletal

Arnica Formation

Top at 971.7 m (3188 ft.) below sea level
Thickness: 14.6 m (48 ft.)

3570-3618 (1088.1-1102.8)	Dolomite: brown, buff, very fine and fine crystalline, sucrosic
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Fort Norman Formation

Top at 986.3 m (3236 ft.) below sea level
Thickness: 274.9 m (902 ft.)

3618-4100 (1102.8-1249.7)	Anhydrite and dolomite (in part anhydritic)
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~4100-4400 (~1249.7-1341.1)	Anhydrite
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~4400-4520 (~1341.1-1377.7)	Anhydrite and dolomite (anhydritic)
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Borehole Depth feet (m)	Lithology
CAMBRIAN-SILURIAN	
<u>Runnig Group</u>	
Thickness: >272.8 m (>895 ft.)	
Mount Kindle Formation	
Top at 1261.3 m (4138 ft.) below sea level	
Thickness: 7.0 m (23 ft.)	
4520-4543 (1377.7-1384.7)	Dolomite: buff, fine crystalline; trace chert: white
Franklin Mountain Formation	
Top at 1268.3 m (4161 ft.) below sea level	
Thickness: >265.8 m (>872 ft.)	
<u>Cherty member</u> (Thickness: 151.5 m/497 ft.)	
4543-4570 (1384.7-1392.9)	Dolomite: pale buff to creamy white, some very pale grey, very fine to fine crystalline, some microcrystalline; some chert: white
4570-5040 (1392.9-1536.2)	Dolomite: pale buff to creamy white, some pink and green colouring, very fine to fine and medium crystalline, some micro- and coarse-crystalline; trace chert: white, buff mottled and clear quartz; some shale: pale green, in part filling porosity; some scattered pyrite crystals; much pink colouring at 4880-4890 feet (1487.4-1490.5 m)
<u>Rhythmic member</u> (Thickness: >114.3 m/>375 ft.)	
5040-5350 (1536.2-1630.7)	Dolomite: buff-grey, brown, pale buff, fine and very fine crystalline; grading downward to brown, buff, grey, micro- and fine-crystalline
5350-5415 (1630.7-1650.5)	Dolomite: buff, pale buff, grey, pale grey, brown, micro-, very fine-, fine- and medium-crystalline
FAULT	
Franklin Mountain Formation	
Top at 1534.1 m (5033 ft.) below sea level	
Thickness: >10.7 m (>35 ft.)	
<u>Cherty member</u>	
5415-5450 (1650.5-1661.2)	Dolomite: pale buff to creamy white and pale grey with trace pink, very fine, fine and medium crystalline with some micro- and coarse-crystalline; some clear quartz (no chert found); trace shale: pale green, in part filling porosity; trace pyrite
Total depth: 1661.2 m	
9.	B-30
Log of Candel Stewart B-30 Location: 64°19'12"N, 125°19'20"W Elevation of Kelly Bushing: 514.8 m (1689 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
MESOZOIC AND (?)TERTIARY	
Thickness: 1509.1 m (4951 ft.) Basal beds (Lower Cretaceous?)	

Borehole Depth feet (m)	Lithology
5436-5441 (1656.9-1658.4)	Sandstone: fine grained, poorly sorted, siliceous, angular, quartz/chert; some glauconite
DEVONIAN	
Thickness: >1289.3 m (>4230 ft.)	
<u>Horn River Group</u>	
Thickness: 163.1 m (535 ft.)	
Hare Indian Formation	
Top at 1143.6 m (3752 ft.) below sea level	
Thickness: 163.1 m (535 ft.)	
<u>Black shale member</u> (Thickness: 100.3 m/329 ft.)	
5441-5770 (1658.4-1758.7)	Shale: black, noncalcareous, bituminous, slightly siliceous; some pyrite
<u>Grey shale member</u> (Thickness: 33.2 m/109 ft.)	
5770-5879 (1758.7-1791.9)	Shale: brown-grey, dark grey, very micromicaceous, in part silty
<u>Bluefish Member</u> (Thickness: 29.6 m/97 ft.)	
5879-5976 (1791.9-1821.5)	Shale: black, bituminous, noncalcareous; some limestone: dark grey, black and white, argillaceous. At 5920-5970 feet (1612.4-1819.7 m) - spore study, D.C. McGregor (see Appendix 1)
Hume Formation	
Top at 1306.7 m (4287 ft.) below sea level	
Thickness: 211.5 m (694 ft.)	
<u>Upper member</u> (Thickness: 74.4 m/244 ft.)	
5976-6220 (1821.5-1895.9)	Limestone: buff, grey-buff, some brown, mostly micrograined to "earthy"-textured, some very fine and fine grained
<u>Middle member</u> (Thickness: 75.6 m/248 ft.)	
6220-6405 (1895.9-1952.2)	Limestone: brown, buff, buff-grey, bioclastic, micro- and very fine-grained; some interbedded shale: grey, calcareous; and siltstone: grey, argillaceous, calcareous
6405-6468 (1952.2-1971.4)	Limestone: brown, dark brown, buff, grey, micro- to fine-grained, in part silty or argillaceous
<u>Headless Member</u> (Thickness: 61.6 m/202 ft.)	
6468-6670 (1971.4-2033.0)	Limestone: brown, buff, aphanitic, trace pelletal, in part micrograined; some shale: dark brown-grey to black, silty, calcareous
Landry Formation	
Top at 1518.2 m (4981 ft.) below sea level	
Thickness: 78.0 m (256 ft.)	
6670-6760 (2033.0-2060.4)	Limestone: brown, dark brown, buff to white, some aphanitic, some fine grained, pelletal
6760-6926 (2060.4-2111.0)	Limestone: as above; some limestone: dark brown-grey, argillaceous; possibly some shale: dark, calcareous

Borehole Depth feet (m)	Lithology
Arnica Formation	
Top at 1596.2 m (5237 ft.) below sea level Thickness: 88.1 m (289 ft.)	
6926-7215 (2111.0-2199.1)	Dolomite: brown, grey-brown, grey-buff, microcrystalline to very fine and fine crystalline; microsucrosic in upper part
Fort Norman Formation	
Top at 1684.3 m (5526 ft.) below sea level Thickness: 459.3 m (1507 ft.)	
7215-8722 (2199.1-2658.5)	Anhydrite: with some dolomite below ~8150 feet (8240-8625 ft./2511.5-2628.9 m; "Arnica Platform" dolomite of Williams, 1975)
Delorme Group	
Top at 2143.7 m (7033 ft.) below sea level Thickness: >289.3 m (>949 ft.)	
8722-9671 (2658.5-2947.7)	Dolomite: brown, buff, grey, micro- and very fine-crystalline, in part silty; some anhydrite
Total depth: 2947.7 m	

10.	B-45
Log of Candel East Mackay B-45 Location: 64°44'09"N, 125°38'18"W Elevation of Kelly Bushing: 259.4 m (851 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	

MESOZOIC AND (?)TERTIARY

Thickness: 1210.1 m (3970 ft.)
Basal beds (Lower Cretaceous?)

3890-3990 (1185.7-1216.2)	Shale: dark grey to black, hard to fissile Sandstone: grey, very fine grained, silty, hard Siltstone: grey and dark grey with bituminous and/or carbonaceous streaks Trace pyrite
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CAMBRIAN-SILURIAN

Ronning Group

Thickness: >393.2 m (>1290 ft.)

Franklin Mountain Formation

Top at 956.8 m (3139 ft.) below sea level
Thickness: >393.2 m (>1290 ft.)

Cherty member
(Thickness: 317.0 m/1040 ft.)

3990-~4330 (1216.2-~1319.8)	Dolomite: pale grey and pale buff to white, mostly fine crystalline; some chert and clear quartz; trace shale; very pale green; trace pale pink and pale green colouring; some pyrite
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Borehole Depth feet (m)	Lithology
~4330-~4730 (~1319.8-~1441.7)	Dolomite: as above, pale buff, yellow, creamy white, pink, grading downward to very fine and microcrystalline; some chert, white and pale buff, and clear quartz, chert abundant locally; some shale: green, waxy; and some shale: pale green, intercrystalline
~4730-~4980 (~1441.7-~1517.9)	Dolomite: pink and buff, micro- to very fine-crystalline; some chert: white, pale buff, pale grey; trace floating sand grains, medium, quartz, rounded
~4980-5030 (~1517.9-1533.1)	Dolomite: as above, buff, pale buff; some chert: as above. At 4000-5000 feet (1219.2-1524 m) - conodonts, dated Early Ordovician, early Arenigian, T.T. Uyeno (see Appendix 1)
Rhythmic member (Thickness: >78.0 m/>256 ft.)	
5030-5250 (1533.1-1600.2)	Dolomite: buff, brown, grey-buff, very fine to microcrystalline, in part microsucrosic; traces of pink colouring, glauconite and pyrite
5250-5286 (1600.2-1611.2)	Samples missing
Total depth: 1611.2 m	

11.	B-46
Log of Imperial Ray No. 1 Location: 65°15'06"N, 127°08'08"W Elevation of Kelly Bushing: 136.2 m (447 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log; sample quality very poor.	

MESOZOIC

Thickness: >553.5 m (>1816 ft.)
Basal beds (Lower Cretaceous?)

1785-1890 (544.1-576.1)	Sandstone: very pale grey, very fine grained, quartz-rich, in part very glauconitic; probably some siltstone and shale
1890-1896 (576.1-577.9)	Sand: coarse grained, subrounded, frosted; one medium-sand sized grain of glauconite

UPPER DEVONIAN

Imperial Formation

Top at 441.7 m (1449 ft.) below sea level
Thickness: 390.1 m (1280 ft.)

1896-2404 (578.0-732.7)	Siltstone: pale grey, coarse grained, micromicaceous Siltstone: grey, argillaceous, micromicaceous; Shale: dark grey, micromicaceous
2404-3176 (732.7-968.0)	Shale: dark grey, micromicaceous; rare siltstone: argillaceous

DEVONIAN

Horn River Group

Thickness: >195.4 m (>641 ft.)

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
Canol Formation		1114-1196 (339.5-364.5)	Shale: brown-grey, slightly calcareous, micromicaceous; some pyrite; bituminous odour; abundant micro-organism impressions
Top at 831.8 m (2729 ft.) below sea level Thickness: 25.0 m (82 ft.)		Ramparts Reef or Platform member (Thickness: 48.5 m/159 ft.)	
3176-3250 (968.0-990.6)	Very poor samples	1196-1355 (364.5-413.0)	Limestone: pale buff to creamy white, coarse grained, bioclastic and fossiliferous (reef organisms, crinoid and shell fragments); some siltstone: pale grey, calcareous, in part very pyritic
3250-3258 (990.6-993.0)	Shale: black; some pyrite; some (?) siltstone: coarse grained, calcareous	1290-1325 feet (393.2-403.9 m), shale: brown-black, micaceous; and siltstone: buff-grey, micaceous	
Ramparts Formation		Grey shale member (Thickness: 175.6 m/576 ft.)	
Top at 856.8 m (2811 ft.) below sea level Thickness: 140.8 m (462 ft.)		1355-1931 (413.0-588.6)	Shale: grey to dark grey and black, and buff-grey and grey-brown, very micaceous, grading downward through grey, very micaceous, calcareous to green-grey, micaceous
Reef member (Thickness: 112.2 m/368 ft.)		Bluefish Member (Thickness: 35.7 m/117 ft.)	
3258-3626? (993.0-1105.2?)	Reef limestone: oil stain near top	1931-2048 (588.6-624.2)	Shale: very dark brown-grey to black, bituminous, slightly calcareous, in part very calcareous with white calcitic streaks and specks; at the base grading to limestone: black and white, very argillaceous, bituminous
Platform member (Thickness: 28.7 m/94 ft.)		Hume Formation	
3626?-3720 (1105.2?-1133.9)	Some limestone: buff and brown, very fine grained; oily odour	Top at 491.0 m (1611 ft.) below sea level Thickness: 146.9 m (482 ft.)	
Hare Indian Formation		Upper member (Thickness: 55.5 m/182 ft.)	
Top at 997.6 m (3273 ft.) below sea level Thickness: >29.6 m (>97 ft.)		2048-2230 (624.2-679.7)	Limestone: buff to pale buff, micrograined to aphanitic, some fine grained, bioclastic
Grey shale member		Middle member (Thickness: 59.7 m/196 ft.)	
3720-3817 (1133.9-1163.4)	Shale: buff-grey, slightly calcareous, micaceous; probably some siltstone or thin limestone in top 10 m	2230-2338 (679.7-712.6)	Limestone: buff, micro- to fine-grained, in part bioclastic; trace shale: grey, flaky, calcareous (more at 2300-2338 ft./701.0-712.6 m)
Total depth: 1163.4 m		2338-2426 (712.6-739.4)	Limestone: buff, as above
12. C-21		Headless Member (Thickness: 31.7 m/104 ft.)	
Log of Aquit Brackett Lake C-21 Location: 65°10'02"N, 125°05'08"W Elevation of Kelly Bushing: 133.2 m (437 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.		2426-2530 (739.4-771.1)	Very poor samples – probably limestone and shale: grey, calcareous
MESOZOIC		Landry Formation	
Thickness: 239.0 m (784 ft.) Basal beds (Lower Cretaceous?)		Top at 637.9 m (2093 ft.) below sea level Thickness: 35.4 m (116 ft.)	
1071-1090 (326.4-332.2)	Very poor samples – sandstone: pale grey, fine to medium grained, poorly sorted, quartzose	2530-2646 (771.1-806.5)	Limestone: buff to brown, trace pink, mostly aphanitic
1090-1114 (332.2-339.5)	Samples missing	Arnica Formation	
DEVONIAN		Top at 673.3 m (2209 ft.) below sea level Thickness (incl. Landry tongue): 99.4 m (326 ft.)	
Horn River Group		2646-2779 (806.5-847.0)	Dolomite: pale buff to brown, mostly microcrystalline; trace pinpoint porosity; some very fine crystalline with intercrystalline porosity
Thickness: 284.7 m (934 ft.)		2779-2872 (847.0-875.4)	(Landry tongue) limestone: buff, aphanitic to micrograined; trace dolomite: as above
Hare Indian/Ramparts formations			
Top at 206.3 m (677 ft.) below sea level Total thickness: 284.7 m (934 ft.)			
Grey shale member (Thickness: 25.0 m/82 ft.)			

Borehole Depth feet (m)	Lithology
2872-2972 (875.4-905.9)	Dolomite: very pale buff to buff in lower part, micro- and very fine-crystalline
Tsetso Formation	
Top at 772.7 m (2535 ft.) below sea level Thickness: 81.7 m (268 ft.)	
2972-3062 (905.9-933.3)	Dolomite: very pale buff, very pale grey, pale green, trace pink, aphanitic to microcrystalline; in part possibly anhydritic; in part argillaceous; grading to Shale: pale green, brick-red
3062-3240 (933.3-987.5)	Dolomite: pale buff, pale grey, pink, pale green, purple, aphanitic and microcrystalline Shale: brick-red, pale green, purple, in part dolomitic
CAMBRIAN-SILURIAN	
Roan Group	
Thickness: >548.6 m (>1800 ft.)	
Franklin Mountain Formation	
Top at 854.4 m (2803 ft.) below sea level Thickness: >548.6 m (>1800 ft.)	
Cherty member (Thickness: 330.4 m/1084 ft.)	
3240-4324 (987.5-1318.0)	Dolomite: creamy white to pale buff, fine, medium and coarse crystalline, some very coarse crystalline; abundant chert: milky white to pale buff, much of it oolitic. At 3878-3891 feet (1182.0-1186.0) – conodonts, dated Early Ordovician (T.T. Uyeno, in <u>Brideaux W.W. et al., 1975</u>)
Rhythmic member (Thickness: >218.2 m/>716 ft.)	
4324-5040 (1318.0-1536.2)	Dolomite: buff to pale buff and pale grey, trace pink, micro- to fine-crystalline, grading downward to grey and buff to pale buff and brown, mostly micro- and very fine-crystalline
Total depth: 1536.2 m	

13. C-25

Log of Northwest C-2
Location: 65°14'N, 126°50'W
Elevation of Kelly Bushing: 51.8 m (170 ft.)
Well log prepared by the writer based on drill cuttings;
no logs available; samples dirty.

MESOZOIC

Thickness: 189.0 m (620 ft.)

UPPER DEVONIAN

Imperial Formation

Top at 155.4 m (510 ft.) below sea level
Thickness: 448.1 m (1470 ft.)

680(R)-2150?(R)
(207.3-655.3?)

Very poor samples

Borehole Depth feet (m)	Lithology
DEVONIAN	
Thickness: >276.5 m (>907 ft.)	
Horn River Group	
Thickness: 254.5 m (835 ft.)	
Canol Formation (may include top Hare Indian beds)	
Top at 603.5 m (1980 ft.) below sea level Thickness: 128.0 m (420 ft.)	
2150?(R)-2570(R) (655.3-783.3)	Shale: dark brown-grey, siliceous
Ramparts Formation	
Top at 731.5 m (2400 ft.) below sea level Thickness: 10.7 m (35 ft.)	
Platform member	
2570(R)-2605(R) (783.3-794.0)	Limestone: buff and brown, bioclastic, in part siliceous; at the top, much chert: buff, brown, white, bioclastic structure; some pyrite
Hare Indian Formation	
Top at 742.2 m (2435 ft.) below sea level Thickness: 115.8 m (380 ft.)	
Grey shale member (Thickness: 13.7 m/45 ft.)	
2605(R)-2940(S) (794.0-896.1)	Shale: grey, slightly calcareous, micaceous; some ironstone: buff
Bluefish Member (Thickness: 13.7 m/45 ft.)	
2940(S)-2985(R) (896.1-909.8)	Shale: brown-black, very bituminous; some pyrite in the lower part; some limestone: brown-black, argillaceous, bituminous
Hume Formation	
Top at 858.0 m (2815 ft.) below sea level Thickness: >21.9 m (>72 ft.)	
2985(R)-3057 (909.8-931.8)	Limestone: pale buff, buff, micrograined
Total depth: 931.8 m	

14. D-02

Log of Mobil Sadene D-02
Location: 68°51'01"N, 126°47'15"W
Elevation of Kelly Bushing: 236.8 m (777 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to sonic log.

MESOZOIC

Thickness: 72.5 m (238 ft.)
Basal beds (Lower Cretaceous?)

-388
(-118.3)

Poor samples – trace **shale:** grey; **sandstone:** poorly sorted, fine to very fine grained, silty; and **sandstone** or **siltstone:** very pyritic

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
	Some shale : very dark grey, brown-grey, green, in part micromicaceous		Franklin Mountain Formation
	<u>Member d</u> (Thickness: 39.6 m/130 ft.)		Top at 535.2 m (1756 ft.) above sea level Thickness: 465.1 m (1526 ft.)
5570-5700 (1697.7-1737.4)	Shale : green and very dark brown-grey to black Dolomite : as above, some very fine and fine crystalline	340(S)-1400 (103.6-426.7)	<u>Rhythmic member</u> (Thickness: 465.1 m/1526 ft.) Dolomite : very pale buff, in parts some pink and some pale yellow, microcrystalline, very fine and fine crystalline, some medium crystalline; trace shale: pale green and maroon; dolomite grades downward to very pale buff to pink, micro- to very fine-crystalline
5700-5715 (1737.4-1741.9)	<u>Member c</u> (Thickness: 4.6 m/15 ft.) Dolomite : dark brown to brown and buff, very fine and fine crystalline with trace of vuggy porosity and bitumen	~1400-1564 (~426.7-476.7)	Dolomite : pale buff, pink, pale grey, microcrystalline to aphanitic, in part argillaceous
5715-5770 (1741.9-1758.7)	<u>Member b</u> (Thickness: 16.8 m/55 ft.) Shale : grey-green, some brown and maroon, micromicaceous		<u>Cyclic member</u> (Thickness: 92.0 m/302 ft.)
	<u>Member a</u> (Thickness: 47.9 m/157 ft.)	1564-1866 (476.7-568.8)	Dolomite : grey buff to buff and grey, microcrystalline, argillaceous; some interbedded shale : grey to grey-green, dolomitic, in part pyritic
5770-5888 (1758.7-1794.7)	Dolomite : brown, very fine and fine crystalline Shale : dark green and very dark brown-grey; at 5850-5870 feet (1783.1-1789.2 m) some varicoloured shale At base some sandstone : white, very fine grained, silty, quartzitic, slightly dolomitic		CAMBRIAN
5888-5927 (1794.7-1806.5)	Dolomite : brown to pale brown, very fine, fine and medium crystalline, trace bitumen Sandstone : grey-brown to white, fine and very fine grained, siliceous Shale : dark green, maroon, olive-green, very dark grey, in part micromicaceous		Saline River Formation
	PROTEROZOIC		Top at 70.1 m (230 ft.) above sea level Thickness: 239.0 m (784 ft.)
	Shale unit		<u>Upper clastic member</u> (Thickness: 100.6 m/330 ft.)
	Top at 1569.7 m (5150 ft.) below sea level Thickness: >51.2 m (>168 ft.)	1866-2030 (568.8-618.7)	Shale : maroon, green, grey-green, purple, in part dolomitic, in part waxy; some interbedded dolomite : grey, buff, pink, microcrystalline; trace anhydrite
5927-6095 (1806.5-1857.8)	Shale : maroon to purple and brown, some dark green to pale green, in part micromicaceous, mostly silty to very silty; trace siltstone: pale green	2030-2196 (618.7-669.3)	Shale : green to grey-green and maroon; interbedded with, and brecciated into Anhydrite : pink, white and pale buff
	Total depth: 1857.8 m		<u>Salt member</u> (Thickness: 109.1 m/358 ft.)
		2196-2554 (669.3-778.5)	Halite : interbedded with shale and anhydrite in the lower part
		2554-2650 (778.5-807.7)	<u>Lower clastic member</u> (Thickness: 29.3 m/96 ft.) Shale : buff-grey, green, very dark grey; interbedded with Dolomite : grey to grey-brown, argillaceous and some anhydrite
			Mount Cap Formation
15.	D-45		Top at 168.9 m (554 ft.) below sea level Thickness: 159.4 m (523 ft.)
	Log of Union Colville D-45 Location: 67°14'09"N, 125°09'21"W Elevation of Kelly Bushing: 638.9 m (2096 ft.) above sea level Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.		<u>Member g</u> (Thickness: 10.7 m/35 ft.)
	Overlying beds (erosional debris)	2650-2685 (807.7-818.4)	Dolomite : buff to brown, oolitic, siliceous, grading to chert ; interbedded with Shale : dark green, some very dark grey, splintery
0-340(S) (0-103.6)	Conglomerate : chert, some dolomite with oolites		<u>Member f</u> (Thickness: 32.0 m/105 ft.)
	CAMBRIAN-SILURIAN	2685-2790 (818.4-850.4)	Shale : dark grey-green, some olive-green, splintery to flaky, slightly dolomitic At 2713-2719 feet (826.9-828.8 m) dolomite : grey-buff, glauconitic (in part up to 50%), in part pyritic
	<u>Ronning Group</u> Thickness: 465.1 m (1526 ft.)		

Borehole Depth feet (m)	Lithology
<u>Member e</u> (Thickness: 17.7 m/58 ft.)	
2790-2848 (850.4-868.1)	Siltstone: grey-buff to grey, dolomitic, some calcareous Limestone: fine and very fine grained, in part pyritic; at base some limestone: buff to white, some brown mottling, mostly micrograined; some shale: dark green, splintery
<u>Member d</u> (Thickness: 7.6 m/25 ft.)	
2848-2873 (868.1-875.7)	Shale: dark grey-green and very dark grey, micromicaceous, splintery to flaky
<u>Member c</u> (Thickness: 17.4 m/57 ft.)	
2873-2930 (875.7-893.1)	Dolomite: buff to brown, very fine and fine crystalline, some medium crystalline; some thinly interbedded Shale: black and very dark grey-green; trace concentrations of glauconite pellets
<u>Member b</u> (Thickness: 26.5 m/87 ft.)	
2930-2952 (893.1-899.8)	Siltstone: grey-buff, very micromicaceous; with thinly interbedded Shale: dark green, splintery; and shale: very micaceous
2952-3017 (899.8-919.6)	Shale: purple-brown and grey-green, in part very micromicaceous
<u>Member a</u> (Thickness: 47.5 m/156 ft.)	
3017-3173 (919.6-967.1)	Shale and sandstone. At 3164-3173 feet (964.4-967.1 m), dolomite (cored, see well history report)
Mount Clark Formation Top at 328.3 m (1077 ft.) below sea level Thickness: 33.2 m (109 ft.)	
3173-3207 (967.1-977.5)	Sandstone with interbedded green shale: some oil-stain (cored, see well history report)
3207-3233 (977.5-985.4)	Sandstone: quartzose, with minor green shale breaks (cored, see well history report)
3233-3282 (985.4-1000.4)	Sandstone and conglomerate: quartzose, both unconsolidated and silica-cemented
PROTEROZOIC Shale unit Top at 361.5 m (1186 ft.) below sea level Thickness: >173.1 m (>568 ft.)	
3282-3850 (1000.4-1173.5)	Siltstone: (at top pale purple) grey and pale grey, mostly micaceous Siltstone: in part argillaceous, grading to Shale: silty Siltstone: in part sandy and hard, grading to Sandstone: grey, silty, siliceous, and orthoquartzite
Total depth: 1173.5 m	

16.	D-61
Log of Sinclair Wolverine Creek D-61 Location: 65°10'14"N, 124°12'52"W Elevation of Kelly Bushing: 310.0 m (1017 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
Borehole Depth feet (m)	Lithology
MESOZOIC Thickness: 862.3 m (2829 ft.) Basal beds (Lower Cretaceous)	
2729-2829 (831.8-862.3)	(Below siltstone, sandstone, shale) Sand: coarse, very coarse and larger; quartz, very poorly sorted
DEVONIAN Thickness: 577.0 m (1893 ft.)	
Arnica Formation Top at 552.3 m (1812 ft.) below sea level Thickness: 20.4 m (67 ft.)	
2829-2896 (862.3-882.7)	Dolomite: pale buff, microcrystalline, almost "earthy"-textured, many black microstreaks and specks; grades downward to pale buff to buff and brown, microcrystalline
Fort Norman Formation Top at 572.7 m (1879 ft.) below sea level Thickness: 344.4 m (1130 ft.)	
2896-4026 (882.7-1227.1)	Anhydrite: pale buff to pale grey; below 3500 feet (1066.8 m) with some dolomite: buff to grey-brown, microcrystalline
Tsetso Formation Top at 917.1 m (3009 ft.) below sea level Thickness: 212.1 m (696 ft.)	
4026-4370 (1227.1-1332.0)	Anhydrite and dolomite: some buff, some pale green-grey, aphanitic, argillaceous; trace shale: grey-green, waxy
4370-4554 (1332.0-1388.1)	Dolomite: pale buff to pale grey, buff and pink, some red, some pale green-grey, aphanitic and microcrystalline, in part argillaceous Anhydrite: white to pale buff and pink Shale: brick-red to maroon, some pale green, dolomitic, in part silty
4554-4722 (1388.1-1439.3)	Dolomite: pale purple to mottled brick-red, pale grey-green to pale buff and pale grey, aphanitic and microcrystalline, in part argillaceous; grading to Shale: brick-red, pale green, some purple, in part dolomitic, micromicaceous Trace anhydrite
CAMBRIAN-SILURIAN Ronning Group Thickness: 278.3 m (913 ft.)	
Mount Kindle Formation Top at 1129.3 m (3705 ft.) below sea level Thickness: 143.9 m (472 ft.)	

Borehole Depth feet (m)	Lithology
<u>Upper pale member</u> (Thickness: 66.5 m/218 ft.)	
4722-4940 (1439.3-1505.7)	Dolomite: buff to pale buff, very fine to fine crystalline grading downward to buff to brown, micro- and very fine-crystalline
<u>Lower dark member</u> (Thickness: 74.4 m/244 ft.)	
4940-5184 (1505.7-1580.1)	Dolomite: buff to dark grey-brown, micro- to very fine-crystalline, some fine crystalline; some chert: buff to pale buff-grey
<u>Basal member</u> (Thickness: 3.0 m/10 ft.)	
5184-5194 (1580.1-1583.1)	Shale: brown-grey, flaky
Franklin Mountain Formation	
Top at 1273.1 m (4177 ft.) below sea level Thickness: 134.4 m (441 ft.)	
<u>Rhythmic member</u> (Thickness: 90.8 m/298 ft.)	
5194-5492 (1583.1-1674.0)	Dolomite: creamy white to pale buff and pink, trace pale green, very fine, fine and medium crystalline; some shale: green, trace red, waxy, some filling intercrystalline pores; grades downward to mostly pale buff to grey-buff, microcrystalline dolomite
<u>Cyclic member</u> (Thickness: 43.6 m/143 ft.)	
5492-5635 (1674.0-1717.5)	Dolomite: some grey-buff to brown-grey, argillaceous, some pale buff to creamy white with trace pink, micro-crystalline
CAMBRIAN	
Saline River Formation	
Top at 1407.6 m (4618 ft.) below sea level Thickness: 44.2 m (145 ft.)	
5635-5780 (1717.5-1761.7)	Shale: purple, brown, maroon, pale green, in part very dolomitic grading to dolomite; thinly interbedded dolomite and anhedrite: white, pale green, pink, buff
PROTEROZOIC	
Unit 1 (Cap Mountain)	
Top at 1451.8 m (4763 ft.) below sea level Thickness: >170.1 m (>558 ft.)	
5780-6338 (1761.7-1931.8)	Shale: pale grey-green, "sparkly", siliceous; increasingly siliceous downward to give appearance in drill cuttings of either orthoquartzite or chert or schist
Total depth: 1931.8 m	
17.	D-65
Log of Decalta Dahadinni D-65 Location: 63°54'12"N, 124°27'55"W Elevation of Kelly Bushing: 258.2 m (847 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	

Borehole Depth feet (m)	Lithology
MESOZOIC	
Thickness: 579.1 m (1900 ft.) Basal beds (Lower Cretaceous?)	
1788-1895 (545.0-578.0)	Shale: black, bituminous, micromicaceous, in part silty
1895-1900 (577.6-579.1)	Silicified dolomite: pale buff, in part sandy or silty; trace orthoquartzite
UPPER DEVONIAN	
Imperial Formation	
Top at 321.0 m (1053 ft.) below sea level Thickness: 695.6 m (2282 ft.)	
1900-2400 (579.1-731.5)	Siltstone: pale grey-green, micaceous Shale: grey, green-grey, micromicaceous; Trace sandstone: fine grained, poorly sorted, lithic trace shale: very pale buff, waxy At 2343-2353 feet (714.1-717.2 m), sandstone: fine to medium grained, poorly sorted, micaceous, grains of various metamorphic or igneous rocks
~2400-3700 (~731.5-1127.8)	Shale: grey, brown-grey, micromicaceous; some shale: very pale buff, waxy; some siltstone: green-grey, micaceous; trace sandstone: fine grained, poorly sorted; grades downward to mainly Shale: grey, some brown-grey, micromicaceous, with traces of siltstone, sandstone and waxy shale, as above
~3700-4182 (~1127.8-1274.7)	Shale: slightly green-grey, some dark grey, flaky to splintery, micromicaceous
DEVONIAN	
Thickness: >449.3 m (>1474 ft.)	
Horn River Group	
Thickness: 336.5 m (1104 ft.)	
Canol Formation	
Top at 1016.5 m (3335 ft.) below sea level Thickness: 23.8 m (78 ft.)	
4182-4260 (1274.7-1298.4)	Shale: black, bituminous, micromicaceous; trace pyrite
Hare Indian Formation	
Top at 1040.3 m (3413 ft.) below sea level Thickness: 312.7 m (1026 ft.)	
<u>Black shale member</u> (Thickness: 66.4 m/218 ft.)	
4260-4478 (1298.4-1364.9)	Shale: black, silty, siliceous, bituminous, micromicaceous; some pyrite
<u>Grey shale member</u> (Thickness: 235.9 m/774 ft.)	
4478-5252 (1364.9-1600.8)	Shale: pale grey to olive-grey with faint, dark micromarkings, flaky, noncalcareous, micromicaceous; grading downward into (below 5000 ft./1524.0 m) Shale: grey, brown-grey, dark grey, some black, micromicaceous
<u>Bluefish Member</u> (Thickness: 10.4 m/34 ft.)	
5252-5286 (1600.8-1611.2)	Shale: black, calcareous, grading from faint white streaks and specks to bioclastic mosaics to Limestone: white and black

Borehole Depth feet (m)	Lithology
Hume Formation	
Top at 1353.0 m (4439 ft.) below sea level Thickness: >112.8 m (>370 ft.)	
Upper member (Thickness: >112.8 m/>370 ft.) (structurally thickened?)	
5286-5656 (1611.2-1723.9)	Limestone: grey-buff, chalky buff with white specks, brown and white, dark brown, micrograined, fossiliferous; at base much white calcite
FAULT	
DEVONIAN	
Thickness: >714.5 (>2344 ft.)	
Horn River Group	
Thickness: 47.9 m (157 ft.)	
Hare Indian Formation	
Top at 1465.8 m (4809 ft.) below sea level Thickness: 47.9 m (157 ft.)	
Grey shale member (Thickness: 38.1 m/125 ft.)	
5656-5781 (1723.9-1762.0)	Shale: very dark brown-grey, noncalcareous, micromicaceous
Bluefish Member (Thickness: 9.8 m/32 ft.)	
5781-5813 (1762.0-1771.8)	As above, at 5252-5286 feet (1600.8-1611.2 m)
Hume Formation	
Top at 1513.6 m (4966 ft.) below sea level Thickness: 175.6 m (576 ft.)	
Upper member (Thickness: 53.9 m/177 ft.)	
5813-5990 (1771.8-1825.8)	Limestone: grey-buff, chalky buff with white specks, brown and white, dark brown, micrograined, fossiliferous
Middle member (Thickness: 71.6 m/235 ft.)	
5990-6156 (1825.8-1876.3)	Limestone: grey, brown, white, micro- and very fine-grained, some aphanitic, fossiliferous; some shale: grey, green-grey, black, noncalcareous, micromicaceous
6156-6225 (1876.3-1897.4)	Limestone: dark grey-brown to buff and white, micro- and very fine-grained
Headless Member (Thickness: 50.0 m/164 ft.)	
6225-6389 (1897.4-1947.4)	Limestone: buff-grey to very dark brown-grey, mostly micrograined and argillaceous, some very fine grained; some shale: buff-grey and black, noncalcareous; trace chert: buff
Landry Formation	
Top at 1689.2 m (5542 ft.) below sea level Thickness: 57.0 m (187 ft.)	
6389-6576 (1947.4-2004.4)	Limestone: grey, brown-grey, pale grey, micro- to very fine-grained Limestone: grey-buff to brown, aphanitic Limestone: buff to grey, very fine grained and in part pelletal

Borehole Depth feet (m)	Lithology
Arnica Formation	
Top at 1746.2 m (5729 ft.) below sea level Thickness: 35.4 m (116 ft.)	
6576-6692 (2004.4-2039.7)	Dolomite: buff, brown, grey, dark brown, very fine and microcrystalline, some fine crystalline
Fort Norman Formation	
Top at 1781.6 m (5845 ft.) below sea level Thickness: >398.7 m (>1308 ft.)	
6692-8000 (2039.7-2438.4)	Anhydrite and dolomite
Total depth: 2438.4 m	
18.	E-11
Log of Union Blackwater E-11 Location: 63°40'20"N, 123°03'30"W Elevation of Kelly Bushing: 504.4 m (1655 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log; very poor samples to 2700 feet (823.0 m)	
MESOZOIC	
Thickness: 623.6 m (2046 ft.) Basal beds (Lower Cretaceous?)	
-2046 (-623.6)	Shale: grey, dark grey, splintery to flaky, micromicaceous; basal sample is very sandy, highly glauconitic; pyrite nodule
DEVONIAN	
Thickness: 929.9 m (3051 ft.)	
Hume Formation	
Top at 119.2 m (391 ft.) below sea level Thickness: 117.7 m (386 ft.)	
Upper member (Thickness: 35.4 m/116 ft.)	
2046-2162 (623.6-659.0)	Limestone: buff, micrograined, some very fine grained, some bioclastic
Middle member (Thickness: 52.1 m/171 ft.)	
2162-2333 (659.0-711.1)	Limestone: as above(?)
Headless Member (Thickness: 30.2 m/99 ft.)	
2333-2432 (711.1-741.3)	Limestone and shale
Landry Formation	
Top at 236.8 m (777 ft.) below sea level Thickness: 35.7 m (117 ft.)	
2432-2549 (741.3-776.9)	Limestone: pale buff, aphanitic; in the lower part with some dolomite: pale buff, microcrystalline

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
Arnica Formation		Dolomite: pale buff, pale grey, some buff, some pink and pale green, fine, medium and coarse crystalline with some very fine crystalline grading downward to mainly very fine to microcrystalline; some silty and sandy zones and floating sand grains	
Top at 272.5 m (894 ft.) below sea level Thickness: 15.5 m (51 ft.)		5852-6293 (1783.7-1918.1)	
2549-2600 (776.9-792.5)	Dolomite: pale buff, microcrystalline and aphanitic; some pelletal structure		
Fort Norman Formation		6293-6544 (1918.1-1994.6)	Dolomite: pale buff and pale grey to brown and dark grey-brown, micro- and very fine-crystalline; in the lower part argillaceous and silty with some thin black shale breaks
Top at 288.0 m (945 ft.) below sea level Thickness: 486.5 m (1596 ft.)			Cyclic member (Thickness: 45.1 m/148 ft.)
2600-4196 (792.5-1278.9)	Anhydrite and dolomite (decreasing downward): pale buff to pale grey to brown-grey, microcrystalline to aphanitic	6544-6692 (1994.6-2039.7)	Dolomite: buff and buff-grey to dark brown-grey, mostly microcrystalline, in part argillaceous and silty grading to shale ; some sandy zones; more shaly in basal 10 m
Tsetso Formation		CAMBRIAN	
Top at 774.5 m (2541 ft.) below sea level Thickness: 274.6 m (901 ft.)		Saline River Formation	
4196-4500 (1278.9-1371.6)	Anhydrite: pale buff; and Dolomite: pale buff, some pale grey, some very pale green, aphanitic and microcrystalline; some silty and sandy zones; trace pyrite; dolomite increases downward	Top at 1535.3 m (5037 ft.) below sea level Thickness: 89.0 m (292 ft.)	
4500-5097 (1371.6-1553.6)	Dolomite: buff to brown and grey, aphanitic and microcrystalline; some anhydrite and some silty zones	Upper clastic member (Thickness: 29.3 m/96 ft.)	
CAMBRIAN-SILURIAN		6692-6788 (2039.7-2069.0)	Shale: maroon, pale green, purple, brown, pink, slightly dolomitic Siltstone: pale grey, pale brown, dolomitic; some Anhydrite: white, pink, pale grey, mostly in streaks in shale, some in siltstone
Ronning Group		Salt member (Thickness: 42.7 m/140 ft.)	
Thickness: 486.2 m (1595 ft.)		6788-6928 (2069.0-2111.6)	Halite
Mount Kindle Formation		Lower clastic member (Thickness: 17.1 m/56 ft.)	
Top at 1049.1 m (3442 ft.) below sea level Thickness: 230.1 m (755 ft.)		6928-6984 (2111.6-2128.7)	Shale: grey, brown, maroon, green-grey, dolomitic; some anhydrite: some siltstone: dolomitic
Upper pale member (Thickness: 77.1 m/253 ft.)		Mount Cap Formation	
5097-5350 (1553.6-1630.7)	Dolomite: buff to pale buff, very fine and fine crystalline, some medium crystalline; trace chert: pale buff, pale grey, grey-buff	Top at 1624.3 m (5329 ft.) below sea level Thickness: 6.7 m (22 ft.)	
Lower dark member (Thickness: 137.5 m/451 ft.)		6984-7006 (2128.7-2135.4)	Shale: olive-green, brown, dolomitic Sandstone: pale grey, pale green, fine to very fine grained, quartzose Dolomite: black, silty, siliceous; grading to Chert: in part oolitic Some glauconite concentrations
5350-5510 (1630.7-1679.4)	Dolomite: grey-buff to dark brown-grey, micro- to very fine-crystalline, in part very silty	Mount Clark Formation	
5510-5801 (1679.4-1768.1)	Dolomite: grey-buff to very dark brown-grey, some pale buff, micro- and very fine-crystalline; much chert: very dark brown-grey to black, some grey-buff	Top at 1631.0 m (5351 ft.) below sea level Thickness: 21.3 m (70 ft.)	
Basal member (Thickness: 15.5 m/51 ft.)		7006-7076 (2135.4-2156.8)	Sandstone: clear, some pink and pale green colouring, fine to medium grained with some very fine and some coarse grained, subrounded, quartzose; some green specks (glauconite?)
5801-5838 (1768.1-1779.4)	Dolomite: brown-grey to very dark brown-grey, argillaceous and silty; some crinoid ossicles	PROTEROZOIC	
5838-5852 (1779.4-1783.7)	Shale: very dark brown-grey to black, dolomitic, silty, in part very sandy	Unit 1 (Cap Mountain)	
Franklin Mountain Formation		Top at 1652.3 m (5421 ft.) below sea level Thickness: >13.4 m (>44 ft.)	
Top at 1279.2 m (4197 ft.) below sea level Thickness: 256.0 m (840 ft.)			
Rhythmic member (Thickness: 210.9 m/692 ft.)			

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Reported core descriptions
7076-7120 (2156.8-2170.2)	Shale: maroon to brick-red and purple, some brown and olive-green, dolo- mitic, in part silty and sandy, grading to sandstone and argillaceous dolomite Total depth: 2170.2 m		Upper clastic member (Thickness: 119.8 m/393 ft.)
		3757-3883 (1145.1-1183.5)	Shale: maroon, brown, green, slightly dolomitic; thinly interbedded siltstone and anhydrite
		3883-4150 (1183.5-1264.9)	Shale: green, some red; some anhydrite as thin beds and filling fractures; rare siltstone beds
			Salt member (Thickness: 110.9 m/364 ft.)
		4150-4514 (1264.9-1375.9)	Halite, with interbedded shale, anhydrite and dolomite
			Lower clastic member (Thickness: 29.8 m/98 ft.)
		4514-4612 (1375.9-1405.7)	Shale: dark green, green, brown and grey; interbedded Dolomite: brown-grey, argillaceous, and anhydrite
			Mount Cap Formation
			Top at 1018.9 m (3343 ft.) below sea level Thickness: 105.2 m (345 ft.)
			Member f (Thickness: 8.5 m/28 ft.)
		4612-4640 (1405.7-1414.3)	Shale: black and green; dolomite; some chert
			Member e (Thickness: 18.3 m/60 ft.)
		4640-4700 (1414.3-1432.6)	Dolomite, some shale
			Member d (Thickness: 19.8 m/65 ft.)
		4700-4765 (1432.6-1452.4)	Limestone: fossiliferous Shale: black and green
			Member c (Thickness: 10.7 m/35 ft.)
		4765-4800 (1452.4-1463.0)	Dolomite: fine and coarse crystalline Shale: black
			Member b (Thickness: 15.8 m/52 ft.)
		4800-4852 (1463.0-1478.9)	Shale: green, red, grey; some pyrite; rare dolomite: coarse crystalline; 4755- 4856 feet (1449.3-1480.1 m) - early Middle Cambrian, W.H. Fritz (in Barnes, et al., 1974)
			Member a (Thickness: 32.0 m/105 ft.)
		4852-4872 (1478.9-1485.0)	9 inches at top - dolomite: coarse crystal- line, very glauconitic; siltstone: pale grey, dolomitic
		4872-4912 (1485.0-1497.2)	Siltstone: dolomitic, argillaceous Shale: green, pyritic 4900-4902 feet (1493.5-1494.1 m) - late Early Cambrian, W.H. Fritz (in Barnes et al., 1974)
		4912-4922 (1497.2-1500.2)	Dolomite: grey to brown, coarse crystalline; some glauconite
		4922-4957 (1500.2-1510.9)	Siltstone: grey and brown Dolomite: coarse crystalline; some glauconite and pyrite
19.	E-15		
	Log of Mobil Colville E-15 Location: 67°14'18"N, 126°18'26"W Elevation of Kelly Bushing: 386.8 m (1269 ft.) Well log prepared by the writer based on reported core descriptions; depth adjusted to gamma ray-neutron log.		
Borehole Depth feet (m)	Reported core descriptions ¹		
	DEVONIAN		
	Arnica-Landry formations		
	Top at 386.8 m (1269 ft.) above sea level Thickness: 91.4 m (300 ft.)		
	CAMBRIAN-SILURIAN		
	Ronning Group		
	Thickness: 1053.7 m (3457 ft.)		
	Franklin Mountain Formation		
	Top at 295.4 m (969 ft.) above sea level Thickness: 1053.7 m (3457 ft.)		
	Cherty member (Thickness: 753.5 m/2472 ft.)		
300(R)-2772 (91.4-844.9)	Dolomite: white and pale grey, fine and medium crystalline, grading downward to (below 2100 ft./640.1 m) dark grey, brown and buff, microcrystalline, and to grey and pale grey-brown at base Chert: at 500 feet (152.4 m), 700 feet (213.4 m), 900 feet (274.3 m), 1100- 1150 feet (335.3-350.5 m); oolitic chert at 1940 feet (591.3 m), 2070 feet (630.9 m), and 2640-2760 feet (804.7- 841.2 m)		
	Rhythmic member (Thickness: 171.3 m/562 ft.)		
2772-3334 (844.9-1016.2)	Dolomite: grey, pale grey-brown, micro- crystalline, in part argillaceous		
	Cyclic member (Thickness: 128.9 m/423 ft.)		
3334-3566 (1016.2-1086.9)	Dolomite: grey, brown, argillaceous, with some interbedded shale		
3566-3757 (1086.9-1145.1)	Dolomite: as above, with interbedded shale: green and grey		
	CAMBRIAN		
	Saline River Formation		
	Top at 758.3 m (2488 ft.) below sea level Thickness: 260.6 m (855 ft.)		

¹Well history report.

Borehole Depth feet (m)	Reported core descriptions	Borehole Depth feet (m)	Lithology
Mount Clark Formation		Cherty member (Thickness: 375.2 m/1231 ft.)	
Top at 1124.1 m (3688 ft.) below sea level Thickness: 18.6 m (61 ft.)		913~1300 (278.3~396.2)	Dolomite: buff to pale buff and white, trace pale green, micro- and very fine-crystalline, some fine and medium crystalline; trace chert: white, pale buff; some pyrite. Dolomite: grades downward to mainly buff, fine crystalline; 910-925 feet (277.3-281.9 m) - no conodonts, T.T. Uyeno (see Appendix 1)
4957-5018 (1510.9-1529.5)	Sandstone: white, fine to coarse grained, rounded, quartzose At base - 1 foot of pebble conglomerate		
PROTEROZOIC			
Shale unit (Reference section)		~1300~1700 (~396.2~518.2)	Dolomite: (at top in part calcareous), buff, grey, brown, pale buff, white, micro- to very fine-crystalline; some chert: white and pale buff; and clear quartz (abundant in places); at 1300 feet (396.2 m) some sand: coarse, quartz; 1600-1700 feet (487.7-518.2 m) trace pink colouring; 1325-1336 feet (403.9-407.2 m) - no conodonts, T.T. Uyeno (see Appendix 1)
Top at 1142.7 m (3749 ft.) below sea level Thickness: >298.1 m (>978 ft.)			
5018-5186 (1529.5-1580.7)	Shale and siltstone: varicoloured, interbedded; some sandstone		
5186-5650 (1580.1-1722.1)	Siltstone, sandstone and shale: 5377-5404 feet (1638.9-1647.1 m) - mainly sandstone; 5506-5512 feet (1678.2-1680.1 m) - orthoquartzite	~1700~1800 (~518.2~548.6)	Dolomite: brown to buff, micro- and very fine-crystalline Shale: buff-grey to green-grey, dolomitic; grades downward to Dolomite: brown, grey-brown, pink, buff, in part argillaceous, grading to dolomitic shale
5650-5850 (1722.1-1783.1)	Mainly sandstone: very fine grained; trace of glauconite		
5850-5958 (1783.1-1816.0)	Shale, sandstone and siltstone		
5958-5980? (1816.0-1822.7?)	Conglomerate: of sandstone, chert and quartz; some siltstone and sandstone interbedded	~1800-1983 (~548.6-604.4)	Dolomite: brown, buff to pale buff and white, micro- and very fine-crystalline; trace of white and pale buff chert
5980?-5996 (1822.7?-1827.6)	Shale, sandstone, siltstone and orthoquartzite	1983-2144 (604.4-653.5)	Dolomite: buff to white, microcrystalline Chert: white and pale buff Quartz: clear Sand: coarse and very coarse grained, subrounded, quartzose Trace shale: pale green
Total depth: 1827.6 m			
		Rhythmic member (Thickness: >133.8 m/>439 ft.)	
20.	E-30	2144-2500 (653.5-762.0)	Limestone: brown, pink, red-streaked and orange, micrograined, dolomitic
Log of Aquit. Old Fort Point E-30 Location: 64°49'26"N, 124°50'16"W Elevation of Kelly Bushing: 127.1 m (417 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.		2500-2583 (762.0-787.3)	Limestone: as above, and Dolomite: brown, orange, buff, pink, micro-crystalline; some dolomite: dark grey, argillaceous; 2568-2583 feet (782.7-787.3 m) - no conodonts, T.T. Uyeno (see Appendix 1)
Borehole Depth feet (m)	Lithology	Total depth: 787.3 m	
MESOZOIC		F-39	
Thickness: 122.8 m (403 ft.) Basal beds (Lower Cretaceous ?)		Log of Imperial Raider Island No. 1 Location: 65°18'15"N, 127°06'57"W Elevation of Kelly Bushing: 65.8 m (216 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log.	
760-913 (231.6-278.5)	(Overlain by sandstone) Conglomerate: pebbles (and larger?) of buff, grey, and white chert		
CAMBRIAN-SILURIAN		MESOZOIC	
Ronning Group		Thickness: 104.6 m (343 ft.) Basal beds (Lower Cretaceous ?)	
Thickness: >509.0 m (>1670 ft.)			
Franklin Mountain Formation			
Top at 151.2 m (496 ft.) below sea level Thickness: >509.0 m (>1670 ft.)			

Borehole Depth feet (m)	Lithology	22.	F-49
275-393 (83.8-119.8)	Sandstone: very pale grey, very fine grained, very silty, mainly quartzose, micaceous; some siltstone: grey, coarse grained; some shale: dark grey, silty; traces glauconite; at base some sandstone: medium grained, poorly sorted, quartzose, slightly glauconitic; and some sand: coarse grained, subrounded quartz		Log of Cdn. Res. Keller Lake F-49 Location: 63°58'20"N, 121°53'30"W Elevation of Kelly Bushing: 281.0 m (922 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.
Borehole Depth feet (m)	Lithology		
UPPER DEVONIAN		MESOZOIC	
Imperial Formation		Thickness: 25.3 m (83 ft.) Basal beds (Lower Cretaceous ?)	
Top at 53.9 m (177 ft.) below sea level Thickness: 426.7 m (1400 ft.)		443-477 (135.0-145.4)	Siltstone: grey-buff to brown-grey, argillaceous, highly micaceous, in part sandy Sandstone: clear, pale buff, some black, very poorly sorted; some sand, up to very coarse grained, quartzose; some pyrite nodules
393-1003 (119.8-305.7)	Siltstone: grey, micromicaceous, in part argillaceous Siltstone: pale grey, coarse grained, micromicaceous Shale: dark grey, micromicaceous, in part silty		
1003-1793 (305.7-546.5)	Shale: dark grey, micromicaceous, rarely silty; rare siltstone, argillaceous		
Horn River Group		DEVONIAN	
Thickness: >121.1 m (>397 ft.)		Thickness: >71.5 m (>234.7 ft.)	
Canol Formation		Landry Formation	
Top at 480.7 m (1577 ft.) below sea level Thickness: 79.6 m (261 ft.)		Top at 135.6 m (445 ft.) above sea level Thickness: 7.0 m (23 ft.)	
1793-1868 (546.5-569.4)	Shale: dark brown-grey, brittle; some pyrite; trace limestone: brown, fine grained, argillaceous	477-500 (145.4-152.4)	Limestone: pale buff, aphanitic and some pelletal
1868-1932 (569.4-588.9)	Shale: brown-black, bituminous; some pyrite nodules	Arnica Formation	
1932-2035 (588.9-620.3)	Shale: very dark brown-grey, brittle; trace shell fragments, black, non-calcareous	Top at 128.6 m (422 ft.) above sea level Thickness: 47.5 m (156 ft.)	
Allochthonous limestone (Thickness: 5.8 m/19 ft.)		500-560 (152.4-170.7)	Dolomite: pale buff, microcrystalline, "earthy"-textured
2035-2054 (620.3-626.1)	Limestone: brown to brown-black, fine-grained fragments in black, silty, argillaceous material Shale: brown-black, silty, calcareous	560-590 (170.7-180.0)	Limestone: pale buff, micrograined and very fine grained Dolomite: very pale buff, chalky textured; some shale: pale grey-green, waxy
Ramparts Formation		590-600 (180.0-182.9)	Shale: pale green, dolomitic, grading to very argillaceous dolomite
Top at 560.2 m (1838 ft.) below sea level Thickness: 7.9 m (26 ft.)		600-656 (182.9-200.0)	Limestone: pale buff and buff, micro- and very fine-crystalline Dolomite: pale and very pale buff, micro-crystalline, in part chalky-textured
Platform member		Fort Norman Formation	
2054-2080 (626.1-634.0)	Limestone: pale buff, micrograined, some fine and coarse grained; some limestone: brown, micrograined	Top at 81.1 m (266 ft.) above sea level Thickness: >16.8 m (>55 ft.)	
Hare Indian Formation		656-711 (200.0-216.7)	Anhydrite: pale buff
Top at 568.1 m (1864 ft.) below sea level Thickness: >33.5 m (>110 ft.)		Total depth: 216.7 m	
Grey shale member			
2080-2190 (634.0-667.5)	Shale: buff-grey, micromicaceous; 2130-2190 feet (649.2-667.5 m) samples include some siltstone: white, pale grey and grey, in part coarse grained and slightly sandy, calcareous, micaceous	23.	F-62
Total depth: 667.5 m		Log of Arco Lost Hill Lake F-62 Location: 65°41'23"N, 123°12'20"W Elevation of Kelly Bushing: 267.9 m (879 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
		MESOZOIC	
		Thickness: 502.3 m (1648 ft.) Basal beds (Lower Cretaceous ?)	

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
1669-1748 (508.7-532.8)	(Overlain by sandstone and siltstone). Sand: coarse grained, very coarse grained and larger, quartz, subangular to subrounded	3210-3389 (978.4-1033.0)	Dolomite: very pale buff to buff, aphanitic to microcrystalline; 3290-3321 feet (1002.8-1012.2 m) – much dolomite: buff, grey, aphanitic and very argillaceous
DEVONIAN		Cyclic member (Thickness: 38.1 m/125 ft.)	
Tsetso Formation		3389-3514 (1033.0-1071.1)	Dolomite: buff and grey, aphanitic to microcrystalline, in part argillaceous; some shale: buff-grey, dolomitic; 3500-3514 feet (1066.8-1071.1 m) – some shale: grey-green, dolomitic
Top at 264.9 m (869 ft.) below sea level Thickness: 45.7 m (150 ft.)		CAMBRIAN	
1748-1898 (532.8-578.5)	Dolomite: pale grey-green to pale buff, microcrystalline, mostly silty and argillaceous; grading to Dolomitic siltstone and dolomitic shale; some pyrite; trace shale: maroon, dolomitic	Saline River Formation	
CAMBRIAN-SILURIAN		Top at 803.1 m (2635 ft.) below sea level Thickness: 253.9 m (833 ft.)	
Ronning Group		Upper clastic member (Thickness: 55.5 m/182 ft.)	
Thickness: 492.6 m (1616 ft.)		3514-3577 (1071.1-1090.3)	Interbedded dolomite and shale. Dolomite: buff-grey to pale grey-buff, microcrystalline to aphanitic, in part argillaceous Shale: pale green-grey to pale grey-green and pale green, trace maroon, mostly dolomitic
Mount Kindle Formation		3577-3696 (1090.3-1126.5)	Shale: maroon, green, pale green, purple, dolomitic Dolomite: pale buff to grey-buff and pink, microcrystalline, in part silty; some anhydrite
Top at 310.6 m (1019 ft.) below sea level Thickness: 132.9 m (436 ft.)		Salt member (Thickness: 156.7 m/514 ft.)	
Upper pale member (Thickness: 67.7 m/222 ft.)		3696-4210 (1126.5-1283.2)	Halite
1898-2120 (578.5-646.2)	Dolomite: buff and pale buff, microcrystalline; some shale: pale grey-green, in part micropyrritic	Lower clastic member (Thickness: 41.8 m/137 ft.)	
Lower dark member (Thickness: 64.3 m/211 ft.)		4210-4347 (1283.2-1325.0)	Dolomite: grey, grey-brown, some buff, aphanitic to microcrystalline, mostly argillaceous Shale: green-grey to grey-green, olive-green, trace maroon, in part dolomitic
~2120-2331 (~646.2-710.5)	Dolomite: buff to grey-brown, microcrystalline; some chert: grey-buff; grades downward to buff, micro- to very fine-crystalline dolomite	Mount Cap Formation	
Basal member (Thickness: 0.9 m/3 ft.)		Top at 1057.0 m (3468 ft.) Thickness: >66.8 m (>219 ft.)	
2331-2334 (710.5-711.4)	Shale: buff-grey, slightly dolomitic, pyritic	Members d and e (Thickness: 29.6 m/97 ft.)	
Franklin Mountain Formation		4347-4444 (1325.0-1354.5)	Shale: grey-green and olive-green to dark green-grey, some purple-grey (much maroon at top), splintery, slightly dolomitic; some siltstone: brown-grey, dolomitic, hard; some dolomite: buff, micro- and very fine-crystalline
Top at 443.5 m (1455 ft.) below sea level Thickness: 359.7 m (1180 ft.)		Member c (Thickness: 6.7 m/22 ft.)	
Upper dolomite member (Thickness: 45.7 m/150 ft.)		4444-4466 (1354.5-1361.2)	Dolomite: buff, medium crystalline; some thinly interbedded shale: black, brittle, slightly dolomitic
2334-2484 (711.4-757.1)	Dolomite: pale grey to pale buff and milky white, medium and coarse crystalline; trace pale green intercrystalline clay; trace pyrite	Member b (Thickness: >30.5 m/>100 ft.)	
Cherty member (Thickness: 123.7 m/406 ft.)		4466-4566 (1361.2-1391.7)	Shale: purple and brown to grey and green, mostly very micaceous, in part dolomitic, in part with glauconite pellets; some siltstone: white to buff and grey, in part very micaceous, dolomitic, in part highly glauconitic; trace dolomite: brown, pelletal-structured
2484-2810 (757.1-856.5)	Dolomite: buff to creamy white, trace pink and pale green, very fine and microcrystalline; some chert: white, pale buff, pale buff-grey	Total depth: 1391.7 m	
~2810-2890 (~856.5-880.9)	Dolomite: pale grey-buff to brown, some pale buff, micro- and very fine-crystalline; some chert: grey-buff		
Rhythmic member (Thickness: 152.1 m/499 ft.)			
2890-2923 (880.9-890.9)	Dolomite: grey-buff to brown, microcrystalline; some dolomite: buff-grey, very argillaceous; grading to shale: grey, very dolomitic		
2923-3210 (890.9-978.4)	Dolomite: very pale buff to buff and brown, micro- to very fine-crystalline; trace fine crystalline; trace chert		

24.	G-02	Borehole Depth feet (m)	Lithology
Log of Elf Horton River G-02 Location: 69°51'23"N, 127°15'56"W Elevation of Kelly Bushing: 38.1 m (125 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.			
Borehole Depth feet (m)			Lithology
MESOZOIC			
Thickness: 553.2 m (1815 ft.) Basal beds (Lower Cretaceous)			
1737-1815 (529.4-553.2)	Sand: fine to very coarse grained, sub-rounded, quartzose		
DEVONIAN			
Thickness: 551.1 m (1808 ft.)			
<u>Horn River Group</u>			
Thickness: 152.4 m (500 ft.)			
<u>Hare Indian Formation</u>			
Top at 515.1 m (1690 ft.) below sea level Thickness: 152.4 m (500 ft.)			
<u>Grey shale member</u> (Thickness: 124.7 m/409 ft.)			
1815-2224 (553.2-677.9)	Shale: pale grey to brown-grey, flaky, slightly calcareous, micromicaceous		
<u>Bluefish Member</u> (Thickness: 27.7 m/91 ft.)			
2224-2300 (677.9-701.0)	Shale: black, bituminous, flaky, non-calcareous		
~2300-2315 (~701.0-705.6)	Shale: grey-brown to very dark brown-grey, calcareous, with white and brown calcite; grading to Limestone: grey-brown, very argillaceous		
<u>Hume Formation</u>			
Top at 667.5 m (2190 ft.) below sea level Thickness: 45.7 m (150 ft.)			
2315-2465 (705.6-751.3)	Limestone: grey-buff to grey and brown and white, micrograined, in part argillaceous; some shale: grey, calcareous; shell fragments; below 2380 feet (725.4 m) - increasingly argillaceous and fossiliferous, with more interbedded shale downward		
<u>Landry Formation</u>			
Top at 713.2 m (2340 ft.) below sea level Thickness: 196.6 m (645 ft.)			
2465-2900 (751.3-883.9)	Limestone: buff to brown, aphanitic to micrograined, some pelletal; some interbedded shale: dark brown-grey to black; grades downward to		
~2900-3000 (~883.9-914.4)	Limestone: buff and grey-buff, mostly aphanitic and pelletal, some micro-grained; trace shale: pale grey-green		
~3000-3110 (~914.4-947.9)	Limestone: pale buff to creamy white, some buff to brown, mostly aphanitic; some dolomite: buff and pale buff, microcrystalline; some interbedded shale: dark brown-grey to black with traces pale green, purple and pink		
		Borehole Depth feet (m)	Lithology
		Arnica Formation	
		Top at 909.8 m (2985 ft.) below sea level Thickness: 138.7 m (455 ft.)	
		3110-3200 (947.9-975.4)	Dolomite: pale buff to creamy white, very fine and fine crystalline
		~3200-3565 (~975.4-1086.6)	Dolomite: pale buff and buff, some brown, very fine and fine crystalline, some microcrystalline, in part sucrosic with intercrystalline porosity
		Tatsieta Formation	
		Top at 1048.5 m (3440 ft.) below sea level Thickness: 17.7 m (58 ft.)	
		3565-3623 (1086.6-1104.3)	Limestone: white to pale buff, aphanitic; some shale: pale green to pale green-grey, micropyrictic; some dolomite: creamy white, microcrystalline, calcareous
		CAMBRIAN-SILURIAN	
		<u>Ronning Group</u>	
		Thickness: >1373.7 m (>4507 ft.)	
		<u>Peel Formation</u>	
		Top at 1066.2 m (3498 ft.) below sea level Thickness: 355.7 m (1167 ft.)	
		3623-3910 (1104.3-1191.8)	Dolomite: pale buff to pale grey, microcrystalline, microsucrosic; trace shale: pale green
		3910-4400 (1191.8-1341.1)	Dolomite: as above; some dolomite: grey-buff to brown, microcrystalline, in part argillaceous; some shale: dark grey to black, in part silty; trace shale: grey-green
		~4400-~4630 (~1341.1-~1411.2)	Dolomite: pale buff to buff-grey, microcrystalline and microsucrosic; some fine and medium crystalline
		~4630-4750 (~1411.2-1447.8)	Dolomite: pale buff to creamy white and pale grey, mostly medium crystalline with some coarse and some fine crystalline; some good intercrystalline porosity
		4750-4790 (1447.8-1460.0)	Dolomite: buff and brown to dark brown, microcrystalline, very fine and fine crystalline, some microcrystalline, tight; some dolomite: grey to dark brown-grey, argillaceous; grading to shale
		Mount Kindle Formation	
		Top at 1421.9 m (4665 ft.) below sea level Thickness: 144.8 m (475 ft.)	
		4790-5265 (1460.0-1604.8)	Dolomite: buff to brown, micro- to fine-crystalline
		Franklin Mountain Formation	
		Top at 1566.7 m (5140 ft.) below sea level Thickness: >873.3 m (>2865 ft.)	
		<u>Upper dolomite member</u> (Thickness: 315.5 m/1035 ft.)	
		5265-5460 (1604.8-1664.2)	Dolomite: buff to grey, pale buff, brown, coarse crystalline and fine crystalline

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
5460~6300 (1664.2~1920.2)	Dolomite: pale to very pale buff and pale grey, coarse crystalline, some medium and fine crystalline; some inter-crystalline quartz; trace shale; pale green to pale green-grey	Horn River Group	
	Cherty member (Thickness: 359.7 m/1180 ft.)	Thickness: 272.8 m (895 ft.)	
~6300-7335 (~1920.2-2235.7)	Dolomite: as above; some chert: pale buff to white, in part oolitic; trace quartz; at 6730-6740 feet (2051.3-2054.3 m) some sandy dolomite and trace sandstone: fine to medium grained, rounded to subrounded; quartzose with dolomitic cement; around 7300 feet (2225.0 m) much chert and some quartz	Canol Formation	
		Top at 806.5 m (2646 ft.) below sea level Thickness: 60.7 m (199 ft.)	
7335-7480 (2235.7-2279.9)	Dolomite: pale to very pale buff and pale grey, microcrystalline, very fine, fine and medium to coarse crystalline; some chert: pale buff to pale buff-grey; chert decreases downward to trace	3083-3282 (939.7-1000.4)	Shale: black, bituminous
	(?)Rhythmic member (Thickness: >198.1 m/>650 ft.)	Hare Indian Formation	
7480-8130 (2279.9-2478.0)	Dolomite: grey-buff to pale buff, some grey-brown, mostly micro- to very fine-crystalline, some fine and medium crystalline; trace chert: white, pale buff and pale grey	Top at 867.2 m (2845 ft.) below sea level Thickness: 212.1 m (696 ft.)	
	Total depth: 2478.0 m	Black shale member (Thickness: 89.6 m/294 ft.)	
		3282-3550 (1000.4-1082.0)	Shale: black, siliceous, bituminous; some very thin calcite veins; in lower part some siltstone: brown-grey, very calcareous
		3550-3576 (1082.0-1090.0)	Shale: black, very calcareous, with limy specks and streaks
		Grey shale member (Thickness: 107.9 m/354 ft.)	
		3576-3930 (1090.0-1197.9)	Shale: brown-grey, flaky, slightly calcareous, micromicaceous
		Bluefish Member (Thickness: 14.6 m/48 ft.)	
		3930-3978 (1197.9-1212.5)	Shale: black, in the lower part calcareous with some chalky limestone patches
25. G-12		Hume Formation	
Log of Imperial Loonex No. 1 Location: 65°11'19"N, 127°02'33"W Elevation of Kelly Bushing: 133.2 m (437 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log.		Top at 1079.3 m (3541 ft.) below sea level Thickness: 100.0 m (328 ft.)	
MESOZOIC		3978-4170 (1212.5-1271.0)	Limestone: grey-brown and buff, micro-grained, in part argillaceous
Thickness: 399.3 m (1310 ft.) Basal beds (Lower Cretaceous ?)		4170-4220 (1271.0-1286.3)	Shale: dark grey, calcareous Limestone: grey-brown, argillaceous
1300-1320 (396.2-402.3)	(Overlain by sandstone and siltstone.) Sandstone: medium and coarse grained, quartzose, very glauconitic; one very coarse sand grain of quartz	4220-4306 (1286.3-1312.5)	Limestone: grey-brown, grey, buff-grey, in part argillaceous; some shale: calcareous
UPPER DEVONIAN		Landry Formation	
Imperial Formation		Top at 1179.3 m (3869 ft.) below sea level Thickness: 21.0 m (69 ft.)	
Top at 269.1 m (883 ft.) below sea level Thickness: 537.4 m (1763 ft.)		4306-4375 (1312.5-1333.5)	Limestone: brown, buff, aphanitic and micrograined, some pelletal
1320-2230 (402.3-679.7)	Shale: dark grey, micromicaceous Siltstone: grey, argillaceous, micromicaceous	Arnica Formation	
2230-3083 (679.7-939.7)	Shale: dark grey, micromicaceous; at 2770-2780 feet (844.3-847.3 m) - some glauconite concentrations that look to be in-place	Top at 1200.3 m (3938 ft.) below sea level Thickness: 22.9 m (75 ft.)	
DEVONIAN		4375-4450 (1333.5-1356.4)	Dolomite: brown, buff, micro- and very fine-crystalline, in part microsucrosic
Thickness: >451.4 m (>1481 ft.)		Fort Norman Formation	
		Top at 1223.2 m (4013 ft.) below sea level Thickness: >34.7 m (>114 ft.)	
		4450-4564 (1356.4-1391.1)	Anhydrite: buff, grey-buff, grey; probably some interbedded dolomite
		Total depth: 1391.1 m	

26.	G-22
Log of BP Losh Lake, G-22 Location: 65°51'29"N, 123°19'35"W Elevation of Kelly Bushing: 293.2 m (962 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
Borehole Depth feet (m)	Lithology

MESOZOIC

Thickness: 328.6 m (1078 ft.)
Basal beds (Lower Cretaceous ?)

1212-1228 (369.4-374.3)	(Overlain by sandstone) Sandstone: pale grey, fine to very fine grained, poorly sorted, and fine to coarse and very coarse grained, very poorly sorted, quartzose; interbedded with Shale: dark grey and black, very pyritic; much pyrite in sandstone; some Sand: coarse grained and very coarse grained and larger, quartz
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CAMBRIAN-SILURIAN

Ronning Group

Thickness: 440.1 m (1444 ft.)

Mount Kindle Formation

Top at 81.1 m (266 ft.) below sea level
Thickness: 84.1 m (276 ft.)

1228-1370 (374.3-417.6)	Dolomite: pale buff to grey-buff, microcrystalline to aphanitic; trace darker streaks and patches; some shale: very pale green
1370-1504 (417.6-458.4)	Dolomite: buff, mostly microcrystalline, some very fine crystalline; 1400-1420 feet (426.7-432.8 m) - some pink colouring and some chert: white and pink

Franklin Mountain Formation

Top at 165.2 m (542 ft.) below sea level
Thickness: 356.0 m (1168 ft.)

Upper dolomite member
(Thickness: 35.1 m/115 ft.)

1504-1619 (458.4-493.5)	Dolomite: pale grey to pale buff and milky white, some pink, medium and coarse crystalline; some pale green, intercrystalline clay; 1600-1619 feet (487.7-493.5 m) - pale green colouring and more pale green clay
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Cherty member
(Thickness: 126.8 m/416 ft.)

1619-~1880 (493.5-~573.0)	Dolomite: buff to creamy white, very fine to microcrystalline, some fine and medium crystalline; near top some pink and pale green colouring; trace oolite; trace chert: milky white and pale buff; trace shale: pale green
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~1880-2035 (~573.0-620.3)	Dolomite: pale grey-buff to brown, micro- and very fine-crystalline, some pale grey, pale buff and dark brown; trace chert: pale grey-buff; 1990-2000 feet (606.6-609.6 m) - some dolomite: buff-grey, very argillaceous
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Rhythmic member
(Thickness: 157.0 m/515 ft.)

2035-2060 (620.3-627.9)	Dolomite: grey-buff to brown, microcrystalline, in part argillaceous; some shale: dark brown-grey, dolomitic
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Borehole Depth feet (m)

Lithology

2060-2120
(627.9-646.2) **Dolomite:** creamy white to grey, buff, brown and pale green-grey, microcrystalline; trace shale: grey and green

2120-~2300
(646.2-~701.0) **Dolomite:** creamy white to buff, microcrystalline

~2300-2550
(~701.0-777.2) **Dolomite:** pale buff to grey-brown, microcrystalline to aphanitic; in lower part, in part argillaceous; 2450-2485 feet (746.8-757.4 m) some very argillaceous dolomite

Cyclic member
(Thickness: 37.2 m/122 ft.)

2550-2672
(777.2-814.4) **Dolomite:** buff and grey, aphanitic to microcrystalline, in part argillaceous; much shale: buff-grey to green-grey, dolomitic

CAMBRIAN

Saline River Formation

Top at 521.2 m (1710 ft.) below sea level
Thickness: 241.7 m (793 ft.)

Upper clastic member
(Thickness: 55.2 m/181 ft.)

2672-2722
(814.4-829.7) **Interbedded dolomite and shale.**
Dolomite: pale buff to grey-brown, microcrystalline to aphanitic, in part argillaceous; trace pink colouring in dolomite
Shale: grey-green to pale green and green-grey, mostly dolomitic

2722-2853
(829.7-869.6) **Shale:** maroon, green, pale green, purple, dolomitic
Dolomite: pale buff to grey-buff and pink, some milky white and some pale green colouring, microcrystalline to aphanitic, in part argillaceous and in part silty; trace anhydrite

Salt member
(Thickness: 146.6 m/481 ft.)

2853-3334
(869.6-1016.2) **Halite**

Lower clastic member
(Thickness: 39.9 m/131 ft.)

3334-3465
(1016.2-1056.1) **Shale:** green-grey, olive-green, brown-grey, in part dolomitic
Dolomite: grey to grey-brown and grey-buff, mostly aphanitic and argillaceous; trace anhydrite, associated with shale and dolomite in very thin layers

Mount Cap Formation

Top at 762.9 m (2503 ft.) below sea level
Thickness: 82.6 m (271 ft.)

Members e and d
(Thickness: 26.5 m/87 ft.)

3465-3552
(1056.1-1082.6) **Shale:** dark grey-green to olive-green, maroon and brown, splintery, dolomitic, grading downward to mostly grey-green, splintery to flaky; some dolomite: pale buff to brown with some heavy glauconite concentrations; some siltstone: brown-grey, dolomitic

Member c
(Thickness: 7.3 m/24 ft.)

3552-3576
(1082.6-1090.0) **Dolomite:** brown to buff, medium to coarse crystalline, at the top highly glauconitic; some interbedded shale: very dark brown-grey to black, brittle

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
<u>Member b</u> (Thickness: 37.2 m/122 ft.) 3576-3698 (1090.0-1127.2) Shale: green to purple, grey and brown, mostly very micaceous, in part dolomitic; in the lower part some dolomite: buff to brown, very silty; grading to siltstone: very dolomitic, micaceous <u>Member a</u> (Thickness: 11.6 m/38 ft.) 3698-3736 (1127.2-1138.7) Siltstone: white, coarse grained, micro-glaucinitic, in part sandy, quartzose Sandstone: very fine to fine grained, some medium and coarse grained, quartzose; some sandstone: green and pale grey, very poorly sorted, highly glauconitic (to more than 50%) 3722-3732 feet (1134.5-1137.5 m) – late Early Cambrian, W.H. Fritz (see Appendix 1) Mount Clark Formation Top at 845.5 m (2774 ft.) below sea level Thickness: 64.3 m (211 ft.) 3736-3947 (1138.7-1203.0) Sand: pink, fine to very coarse grained and larger, quartz PROTEROZOIC Unit 1 (Cap Mountain) Top at 909.8 m (2985 ft.) below sea level Thickness: >22.3 m (>73 ft.) 3947-4020 (1203.0-1225.3) Shale: maroon to brick-red and pale purple, hard, slightly dolomitic, micromicaceous; some dolomite: pale buff to pink and some pale green, microcrystalline; some chert: pale buff and pink; trace shale: pale olive-green, waxy Total depth: 1225.3 m		Canol Formation Top at 175.6 m (576 ft.) below sea level Thickness: 74.1 m (243 ft.) 759-822 (231.3-250.5) At top (sample "760"), limestone: chalky brown, silty Limestone: dark brown, very fine and fine grained, argillaceous and silty Shale: dark brown-grey, brittle; some pyrite 822-880 (250.5-268.2) Shale: black, hard, bituminous, with pyritic chert nodules 880-980 (268.2-298.7) Shale: dark brown-grey, brittle; some thinly interbedded siliceous limestone; some pyrite <u>Allochthonous limestone</u> (Thickness: 6.7 m/22 ft.) 980-1002 (298.7-305.4) Limestone: brown, buff, reef, bioclastic and other; some shale: black, silty Ramparts Formation Top at 249.6 m (819 ft.) below sea level Thickness: 30.5 m (100 ft.) <u>Reef member</u> (Thickness: 7.3 m/24 ft.) 1002-1026 (305.4-312.7) Limestone: reef <u>Platform member</u> (Thickness: 23.2 m/76 ft.) 1026-1060 (312.7-323.1) Siltstone: brown, calcareous, oily Limestone: brown, buff, silty, fossiliferous Shale: grey-brown, fossiliferous 1060-1102 (323.1-335.9) Limestone: pale buff, buff, reefoid, bioclastic, fossiliferous; some siltstone: coarse grained, slightly calcareous, micaceous Hare Indian Formation Top at 280.1 m (919 ft.) below sea level Thickness: 153.6 m (504 ft.) <u>Grey shale member</u> (Thickness: 137.5 m/451 ft.) 1102-1155 (335.9-352.0) Shale: grey, silty, very micaceous, slightly calcareous 1155-1553 (352.0-473.4) Shale: grey, micromicaceous, slightly calcareous, in part very micaceous <u>Bluefish Member</u> (Thickness: 16.2 m/53 ft.) 1553-1606 (473.4-489.5) Shale: black bituminous; spores; some pyrite; 1580-1606 feet (481.6-489.5 m), much calcite, brown and white, and pyrite Hume Formation Top at 433.7 m (1423 ft.) below sea level Thickness: 101.8 m (334 ft.) 1606-1700(S) (489.5-518.2) Limestone: brown and buff; mostly micrograined 1700(S)-1740(S) (518.2-530.4) Limestone: pale buff, fine and medium grained, reefoid and bioclastic 1740(S)-1830(S) (530.4-557.8) Limestone: grey and brown-grey, mostly argillaceous and silty, in part medium grained and rubbly	
27.	G-44	Log of Imperial Morrow Creek No. 1 Location: 65°23'15"N, 127°23'07"W Elevation of Kelly Bushing: 55.8 m (183 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log. UPPER DEVONIAN Imperial Formation Top above 40.5 m (above 133 ft.) above sea level Thickness: >216.1 m (>709 ft.) above 50(R)-759 (15.2-231.3) Shale: dark grey, mostly silty, micaceous DEVONIAN Thickness: >385.6 m (>1265 ft.) <u>Horn River Group</u> Thickness: 258.2 m (847 ft.)	

Borehole Depth feet (m)	Lithology
~1830(S)-~1940(S) (~557.8~591.3)	Limestone: brown, grey-brown, buff, grey-buff, grey, mostly very fine grained to medium grained, in part argillaceous and silty; trace shale: green
Landry Formation	
Top at 535.5 m (1757 ft.) below sea level Thickness: 6.1 m (20 ft.)	
~1940(S)- 1950(S) (~591.3~594.4)	Limestone: brown, pelletal
1950(S)-1960(S) (594.4~597.4)	Limestone: pale buff, soft, very argillaceous
Arnica Formation	
Top at 541.6 m (1777 ft.) below sea level Thickness: >19.5 m (>64 ft.)	
1960(S)-2024 (597.4~616.9)	Dolomite: buff and brown, micro- and very fine-crystalline; at 2000 feet (609.6 m) some pale buff and pale grey, anhydritic
Total depth: 616.9 m	
28. G-51c	
Log of Imperial Canyon Creek No. 1 Location: 65°10'22"N, 126°24'51"W Elevation of Kelly Bushing: 54.9 m (180 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log.	
UPPER DEVONIAN	
Imperial Formation	
Top at 54.9 m (180 ft.) above sea level Thickness: 417.6 m (1370 ft.)	
0-300 (0-91.4)	Siltstone: grey, slightly calcareous, micaceous; siltstone: grey, coarse grained, slightly calcareous, micaceous; grading to Sandstone: very fine grained, silty Shale: dark grey, silty, micaceous
300-325 (91.4-99.1)	Sandstone: pale green-grey, fine grained, calcareous, micaceous; some sandstone: green-brown, fine grained Siltstone: green-grey, coarse grained, calcareous, micaceous
325-1225 (99.1-373.4)	Shale: dark grey, micromicaceous
Canyon Creek sandstone lentil (Reference section) (Thickness: 27.7 m/91 ft.)	
1225-1316 (373.4-401.1)	Sandstone: pale grey, very fine grained, silty, quartz-rich, micaceous
1316-1370 (401.1-417.6)	Shale: dark grey, micromicaceous
DEVONIAN	
Thickness: >212.1 m (>696 ft.)	
Horn River Group	
Thickness: 197.5 m (648 ft.)	

Borehole Depth feet (m)	Lithology
Canol Formation	
Top at 362.7 m (1190 ft.) below sea level Thickness: 64.9 m (213 ft.)	
1370-1444 (417.6-440.1)	Shale: black, bituminous Siltstone: brown-grey, coarse grained, argillaceous; some Dolomite: brown, micro- and very fine-crystalline; trace pyrite
1444-1583 (440.1-482.5)	Shale: dark brown-grey, black, bituminous
Hare Indian Formation	
Top at 427.6 m (1403 ft.) below sea level Thickness: 132.6 m (435 ft.)	
Black shale member (Thickness: 86.6 m/284 ft.)	
1583-1733 (482.5-528.2)	Shale: brown-black, siliceous, in part calcareous; trace pyrite; some shale: grey, very micaceous
1733~1840 (528.2~560.8)	Shale: black, slightly calcareous, bituminous, micromicaceous
~1840-1867 (~560.8-569.0)	Shale: brown-black, calcareous, very bituminous; some pyrite
Grey shale member (transitional) (Thickness: 31.4 m/103 ft.)	
1867-1970 (569.0-600.5)	Shale: dark brown-grey, hard, very siliceous, micromicaceous; shale: brown-black, noncalcareous, bituminous, micromicaceous; some shale: grey, brown-grey, very micaceous; trace pyrite
Bluefish Member (Thickness: 14.6 m/48 ft.)	
1970-1996 (600.5-608.4)	Shale: brown-black, silty, slightly calcareous, bituminous
1996-2018 (608.4-615.1)	Shale: brown-black, very calcareous, bituminous; thin calcitic streaks
Hume Formation	
Top at 560.2 m (1838 ft.) below sea level Thickness: >14.6 m (>48 ft.)	
2018-2060 (615.1-627.9)	Limestone: pale buff to brown, micro-grained, bioclastic, fossiliferous
Total depth: 629.7 m	
29. G-51p	
Log of Aquit Plateau G-51 Location: 63°50'22"N, 125°25'04"W Elevation of Kelly Bushing: 814.4 m (2672 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
UPPER DEVONIAN	
Imperial Formation	
Top at 814.4 m (2672 ft.) above sea level Thickness: 587.7 m (1928 ft.)	
0~1000 (0~304.8)	Shale: dark grey, silty, micromicaceous; rare quartzitic siltstone or sandstone

Borehole Depth feet (m)	Lithology
~1000-~1800 (~304.8-~548.6)	Shale: dark grey, splintery to flaky, micromicaceous
~1800-1928 (~548.6-587.7)	Shale: dark grey, silty, micromicaceous, in part grading to siltstone: argillaceous; siltstone increases downward

DEVONIAN

Thickness: >1530.1 m (>5020 ft.)

Horn River Group

Thickness: 347.5 m (1140 ft.)

Canol Formation

Top at 226.8 m (744 ft.) above sea level
Thickness: 54.3 m (178 ft.)

1928-2106 (587.7-641.9)	Shale: very dark grey to black, in part silty, pyritic
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Hare Indian Formation

Top at 172.5 m (566 ft.) above sea level
Thickness: 293.2 m (962 ft.)

Black shale member
(Thickness: 229.8 m/754 ft.)

2106-2730 (641.9-832.1)	Shale: black, silty, bituminous, siliceous, pyritic (micromicaceous and nodular)
2730-2860 (832.1-871.7)	Shale: very dark grey and black, in part siliceous, in part pyritic

Bluefish Member
(Thickness: 63.4 m/208 ft.)

2860-3008 (871.1-916.8)	Shale: very dark brown-grey to black, in part siliceous, in part calcareous; some calcite veins and streaks; some pyrite
3008-3068 (916.8-935.1)	Shale: as above, and Limestone: black and white, argillaceous, bituminous; some calcite crystals

Hume Formation

Top at 120.7 m (396 ft.) below sea level
Thickness: 285.3 m (936 ft.)

Upper member
(Thickness: 88.4 m/936 ft.)

3068-3358 (935.1-1023.5)	Limestone: grey, pale grey, dark grey, mostly micrograined, in part argillaceous and silty, in part bioclastic; some shell fragments
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Middle member
(Thickness: 118.3 m/388 ft.)

3358-3640 (1023.5-1109.5)	Limestone: as above, argillaceous and silty; grading to Shale: grey, silty, calcareous
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3640-3746 (1109.5-1141.8)	Limestone: grey to dark grey, micro- to very fine-grained, in part argillaceous
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Headless Member
(Thickness: 78.6 m/258 ft.)

3746-4004 (1141.8-1220.4)	Shale: dark grey to black, calcareous; interbedded Limestone: grey to grey-buff, micro-grained, in part argillaceous
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Landry Formation
(transitional to Funeral Formation)

Top at 406.0 m (1332 ft.) below sea level
Thickness: 199.9 m (656 ft.)

Borehole Depth feet (m)	Lithology
4004-4660 (1220.4-1420.4)	Limestone: brown-grey to very dark brown-grey and black, aphanitic, pelletal, argillaceous; grading to, and interbedded with shale: black, calcareous; increasing amount downward of limestone: grey-buff, dark grey-brown, aphanitic; at 4500-4520 feet (1371.6-1377.7 m) much shale: grey, calcareous, pyritic

Arnica Formation

Top at 605.9 m (1988 ft.) below sea level
Thickness: >698.0 m (>2290 ft.)

4660-~4900 (1420.4-~1493.5)	Dolomite: dark grey, dark grey-brown, microcrystalline, in part calcareous, in part with pelletal structure; some anhydrite
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~4900-6900 (~1493.5-2103.1)	Dolomite: grey-buff, grey, white, dark grey, micro- and very fine-crystalline; some anhydrite
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Total depth: 2118.4 m

30. G-52

Log of Shell Blackwater Lake G-52
Location: 64°01'20"N, 122°55'12"W
Elevation of Kelly Bushing: 370.0 m (1214 ft.)
Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log. Sample quality in part very poor.

MESOZOIC

Thickness: 23.5 m (77 ft.)
Basal beds (Lower Cretaceous ?)

669-686 (203.9-209.1)	Shale: pale buff and pale grey, waxy; some pyrite
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DEVONIAN

Thickness: 628.5 m (2062 ft.)

Hume Formation

Top at 160.9 m (528 ft.) above sea level
Thickness: 37.8 m (124 ft.)

Middle member
(Thickness: 26.8 m/88 ft.)

686-730 (209.1-222.5)	Limestone: grey-brown to buff and pale buff, some dark grey-brown, micro- to very fine-grained, bioclastic
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730-774 (222.5-235.9)	Very poor samples - limestone: brown, micrograined (R)
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Headless Member
(Thickness: 11.0 m/36 ft.)

774-~810 (235.9-~246.9)	Limestone (R)
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Arnica Formation

Top at 123.1 m (404 ft.) above sea level
Thickness: 67.1 m (220 ft.)

~810-1030 (~246.9-313.9)	Dolomite: buff to grey-brown and dark grey-brown, microcrystalline
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Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
Fort Norman Formation		<u>Lower dark member</u> (Thickness: 142.6 m/468 ft.)	
Top at 56.1 m (184 ft.) above sea level Thickness: 239.3 m (785 ft.)		4328-4796 (1319.2-1461.8)	Dolomite: grey-brown to very dark brown-grey, micro- to very fine-crystalline; some chert: buff-grey, grey-brown, very dark brown
1030-1400 (313.9-426.7)	Very poor samples – anhydrite and dolomite (R)	<u>Basal member</u> (Thickness: 11.0 m/36 ft.)	
1400-1815 (426.7-553.2)	Anhydrite: pale buff to white; some dolomite: buff, brown, micro- and very fine-crystalline	4796-4824 (1461.8-1470.4)	Siltstone: dark grey, argillaceous, very dolomitic; crinoid ossicles, shell fragments
Tsetso Formation		4824-4832 (1470.4-1472.8)	Shale: very dark grey, dolomitic
Top at 183.2 m (601 ft.) below sea level Thickness: 284.4 m (933 ft.)		Franklin Mountain Formation	
1815-2748 (553.2-837.6)		Top at 1102.8 m (3618 ft.) below sea level Thickness: 277.1 m (909 ft.)	
CAMBRIAN-SILURIAN		<u>Cherty member</u> (Thickness: 67.7 m/222 ft.)	
<u>Ronning Group</u>		4832-5054 (1472.8-1540.5)	Dolomite: white to pale buff, microcrystalline, very fine, fine and medium crystal-line; in the lower part some pink colouring and some shale: green, waxy, in part micropyrritic
Mount Kindle Formation		<u>Rhythmic member</u> (Thickness: 166.4 m/546 ft.)	
Top at 467.6 m (1534 ft.) below sea level Thickness: 150.3 m (493 ft.)		5054-5320 (1540.5-1621.5)	Dolomite: grey-buff to grey-brown and dark brown, micro- and very fine-crystalline, in part argillaceous
<u>Upper pale member</u> (Thickness: 90.8 m/298 ft.)		5320-5464 (1621.5-1665.4)	Dolomite: creamy white to buff and some dark brown, micro- and very fine-crystalline
2748-3046 (837.6-928.4)	Dolomite: pale buff, mainly micro- to very fine-crystalline, in part micro-sucrosic; rare chert: pale buff or pale grey	5464-5600 (1665.4-1706.9)	Dolomite: grey-buff to grey-brown and very dark brown-grey, aphanitic and microcrystalline, in part argillaceous
<u>Lower dark member</u> (Thickness: 59.4 m/195 ft.)		<u>Cyclic member</u> (Thickness: 43.0 m/141 ft.)	
3046-3241 (928.4-987.9)	Dolomite: brown and dark brown, micro-crystalline to aphanitic	5600-5741 (1706.9-1749.9)	Dolomite: grey-brown to very dark brown-grey, mostly argillaceous, in part grading to very dolomitic shale
FAULT		CAMBRIAN	
DEVONIAN		Saline River Formation	
Tsetso Formation		Top at 1379.8 m (4527 ft.) below sea level Thickness: 82.9 m (272 ft.)	
Top at 617.8 m (2027 ft.) below sea level Thickness: 241.4 m (792 ft.)		<u>Upper clastic member</u> (Thickness: 43.6 m/143 ft.)	
3241-4033 (987.9-1229.3)	Dolomite and anhydrite: with some inter-bedded shale: very dark brown-grey; 3748-3796 feet (1142.4-1157.0 m) – shale: dull red, dark green and grey-green, dolomitic, grading to argillaceous dolomite	5741-5884 (1749.9-1793.4)	Shale: purple, grey-green, maroon, pink, dolomitic, in part silty; some dolomite: pale buff, in part pink, in part anhydritic
CAMBRIAN-SILURIAN		<u>Salt member</u> (Thickness: 20.1 m/66 ft.)	
<u>Ronning Group</u>		5884-5950 (1793.4-1813.6)	Shale: brick-red, green, dark grey, dolomitic; some anhydrite: pale buff to pale grey
Thickness: 520.6 m (1708 ft.)		<u>Lower clastic member</u> (Thickness: 19.2 m/63 ft.)	
Mount Kindle Formation		5950-6013 (1813.6-1832.8)	Shale: purple to maroon and brick-red, some grey-green and grey, dolomitic; some dolomite: pale buff and pink; some siltstone and trace sandstone; clear, fine grained, quartzose
Top at 859.2 m (2819 ft.) below sea level Thickness: 243.5 m (799 ft.)			
<u>Upper pale member</u> (Thickness: 89.9 m/295 ft.)			
4033-4328 (1229.3-1319.2)	Dolomite: pale buff and buff, micro-, very fine, and fine-crystalline, with some sucrosic texture; trace chert: pale buff; in the lower part trace black shale partings		

Borehole Depth feet (m)	Lithology
Mount Clark Formation	
Top at 1462.7 m (4799 ft.) below sea level Thickness: 41.5 m (136 ft.)	
6013-6149 (1832.8-1874.2)	Sandstone: clear, fine grained, possibly subrounded, quartzitic

PROTEROZOIC

Unit 1 (Cap Mountain)

Top at 1504.2 m (4935 ft.) below sea level
Thickness: >107.0 m (>351 ft.)

6149-6317 (1874.2-1925.4)	Dolomite: pink to purple, micro- and very fine-crystalline; some dolomite: pale buff and pink-buff, aphanitic
6317-6370 (1925.4-1941.6)	Shale: green, grey-green, purple, dark grey, dolomitic, in part silty; some sandstone: buff, grey, poorly sorted, quartzose, argillaceous
~6370-6422 (~1941.6-1957.4)	Shale: brick-red to purple, grey-green, pale green, olive-green, in part mottled, in part silty and sandy Siltstone: varicoloured, argillaceous, in part sandy, grading to Sandstone: varicoloured, very fine, fine, to medium and coarse grained, quartzose, mostly silty and argillaceous
6422-6490 (1957.4-1978.2)	Dolomite: pink to purple, some buff, microcrystalline, some aphanitic, in part silty and argillaceous; grading to Shale: brick-red, purple, pale green, silty, dolomitic
Total depth: 1981.2 m	

31. G-60

Log of H.B. Fish Lake G-60
Location: 63°09'30"N, 122°55'00"W
Elevation of Kelly Bushing: 389.2 m (1277 ft.)
Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.

MESOZOIC

Thickness: 219.5 m (720 ft.)
Basal beds (Lower Cretaceous ?)

610-700 (185.9-213.4)	Shale: dark brown-grey to black, micromicaceous Siltstone: grey, in part coarse grained and sandy, glauconitic, slightly calcareous
700-720 (213.4-219.5)	Samples missing – sonic log suggests possible basal sand

UPPER DEVONIAN

Imperial Formation

Top at 169.8 m (557 ft.) above sea level
Thickness: 199.0 m (653 ft.)

729-1001 (222.2-305.1)	Shale: grey, flaky to splintery, micromicaceous
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Borehole Depth feet (m)	Lithology
1001-1316 (305.1-401.1)	Shale: dark grey, very micromicaceous, and black, bituminous, micromicaceous; trace pyrite
1316-1373 (401.1-418.5)	Shale: very dark grey and black, bituminous, micromicaceous

DEVONIAN

Thickness: 865.0 m (2838 ft.)

Horn River Group

Thickness: 85.0 m (279 ft.)

Canol Formation

Top at 29.3 m (96 ft.) below sea level
Thickness: 66.4 m (218 ft.)

1373-1591 (418.5-485.0)	Shale: black, bituminous, slightly siliceous, micromicaceous; some pyrite
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Ramparts Formation

Top at 95.7 m (314 ft.) below sea level
Thickness: 18.6 m (61 ft.)

Siltstone lentil and Platform member
(interfingering with Hare Indian Formation shale facies)

1591-1652 (485.0-503.5)	Shale: very dark grey, slightly calcareous Siltstone: brown-grey, argillaceous, very calcareous, in part pyritic Limestone: white, grey, buff, micro-grained, chalky, fragmental, bioclastic, in part very argillaceous and silty, pyritic
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Hume Formation

Top at 114.3 m (375 ft.) below sea level
Thickness: 117.0 m (384 ft.)

Middle member
(Thickness: 78.9 m/259 ft.)

1652-1911 (503.5-582.5)	Limestone: white to buff and brown, mostly micrograined, in part chalky, bioclastic, fossiliferous (including crinoid ossicles)
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Headless Member
(Thickness: 38.1 m/125 ft.)

1911-2036 (582.5-620.6)	Limestone: buff to white, some pale grey, mostly aphanitic; some interbedded shale: green-grey, splintery, noncalcareous
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Landry Formation

Top at 231.3 m (759 ft.) below sea level
Thickness: 31.7 m (104 ft.)

2036-2140 (620.6-652.3)	Limestone: buff, aphanitic and pelletal
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Arnica Formation

Top at 263.0 m (863 ft.) below sea level
Thickness: 42.4 m (139 ft.)

2140-2279 (652.3-694.6)	Dolomite: buff, grey-buff, some dark grey-brown, mostly microcrystalline, some very fine crystalline, in part microsucrosic
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Borehole Depth feet (m)	Lithology	32.	G-70
Fort Norman Formation		Log of Shell Wrigley G-70 Location: 63°09'17"N, 124°11'50"W Elevation of Kelly Bushing: 549.9 m (1804 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
Top at 305.4 m (1002 ft.) below sea level Thickness: 439.2 m (1441 ft.)		Borehole Depth feet (m)	
2279-3720 (694.6-1133.9)	Anhydrite: pale buff to white and buff grey; traces dolomite	Lithology	
Tsetso Formation		UPPER DEVONIAN	
Top at 744.6 m (2443 ft.) below sea level Thickness: 149.7 m (491 ft.)		Imperial Formation	
3720-4211 (1133.9-1283.5)	Dolomite: grey-buff to brown, aphanitic to microcrystalline, in part anhydritic; some anhydrite	Top at 549.9 m (1804 ft.) above sea level Thickness: 684.3 m (2245 ft.)	
CAMBRIAN-SILURIAN		0-2000 (0-609.6)	
Ronning Group		Shale: grey to dark grey and dark brown-grey, micromicaceous, mostly silty, in parts very silty and very micaceous	
Thickness: >389.8 m (>1279 ft.)		~2000-2245 (~609.6-684.3)	
Mount Kindle Formation		Shale: as above, grading downward to dark grey to black at base	
Top at 894.3 m (2934 ft.) below sea level Thickness: 239.9 m (787 ft.)		DEVONIAN	
Upper pale member (Thickness: 85.6 m/281 ft.)		Thickness: 2688.3 m (8820 ft.)	
4211-4292 (1283.5-1308.2)	Dolomite: buff to pale buff, medium-crystalline, in part with good inter-crystalline porosity	Horn River Formation	
4292-4350 (1308.2-1325.9)	Dolomite: grey-buff to white, aphanitic, in part microcrystalline; trace shale: dark grey	Thickness: 197.5 m (648 ft.)	
4350-4492 (1325.9-1369.2)	Dolomite: buff to pale buff, fine crystalline grading downward to very fine crystalline	Canol Formation	
Lower dark member (Thickness: 128.3 m/421 ft.)		Top at 134.4 m (441 ft.) below sea level Thickness: 38.7 m (127 ft.)	
4492-4913 (1369.2-1497.5)	Dolomite: grey-brown to dark brown-grey, mostly microcrystalline; below 4780 feet (1456.9 m) mostly micro- to very fine-crystalline	2245-2372 (684.3-723.0)	
Basal member (Thickness: 25.9 m/85 ft.)		Shale: black, bituminous, micromicaceous, siliceous; some pyrite; basal part very siliceous, grading to chert: black with white microspecks	
4913-4998 (1497.5-1523.4)	Dolomite: dark brown-grey to black, microcrystalline, in part argillaceous and silty, in part pyritic; some chert: black, in part pyritic; some shale: black, silty	Hare Indian Formation	
Franklin Mountain Formation		Top at 173.1 m (568 ft.) below sea level Thickness: 158.8 m (521 ft.)	
Top at 1134.2 m (3721 ft.) below sea level Thickness: >150.0 m (>492 ft.)		Black shale member (Thickness: 75.6 m/248 ft.)	
Cherty member (Thickness: 46.9 m/154 ft.)		2372-2620 (723.0-798.6)	
4998-5152 (1523.3-1570.3)	Dolomite: creamy white to pale buff with some pink; micro- and very fine-crystalline; pyritic near top; at 5050-5060 feet (1539.2-1542.3 m) some chert, white; some sandy zones (very fine to medium grains of quartz)	Shale: black, bituminous, micromicaceous, siliceous; some pyrite	
Rhythmic member (Thickness: >103.0 m/>338 ft.)		Grey shale member (Thickness: 48.5 m/159 ft.)	
5152-5490 (1570.3-1673.3)	Dolomite: grey-buff to dark grey-brown, very fine crystalline, grading downward to pale buff to grey-brown, micro- and very fine-crystalline; some silty and sandy zones	2620-2779 (798.6-847.0)	
Total depth: 1674.9 m		Shale: grey to very dark grey, flaky, micromicaceous	
		Bluefish Member (Thickness: 34.7 m/114 ft.)	
		2779-2850 (847.0-868.7)	
		Shale: black, bituminous, siliceous, slightly calcareous; some pyrite	
		~2850-2893 (~868.7-881.8)	
		Shale: black, bituminous, calcareous, in part very calcareous with bioclastic mosaics; near base grading to limestone: black and white, bioclastic, argillaceous and bituminous	
		Hume Formation	
		Top at 331.9 m (1089 ft.) below sea level Thickness: 238.7 m (783 ft.)	
		Upper member (Thickness: 72.5 m/238 ft.)	

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
2893-3131 (881.8-954.3)	Limestone: grey to grey-buff, grey-brown and white, micrograined, bioclastic, fossiliferous	6700-7750 (2042.2-2362.2)	Dolomite: buff to buff-grey, microcrystalline or aphanitic; some anhydrite
	<u>Middle member</u> (Thickness: 103.9 m/341 ft.)	~7750-8180 (~2362.2-2493.3)	Dolomite: buff, aphanitic, anhydritic, to dark grey-brown, aphanitic and microcrystalline; rare anhydrite
3131-3472 (954.3-1058.3)	Limestone: as above, possibly in part argillaceous or with some interbedded shale	8180-8635 (2493.3-2631.9)	Anhydrite and dolomite: buff to grey-brown, aphanitic and microcrystalline
	<u>Headless Member</u> (Thickness: 62.2 m/204 ft.)	8635-8690 (2631.9-2648.7)	Dolomite: as above; some sandstone: very fine to fine grained, silty, dolomitic, quartzose; some anhydrite
3472-3676 (1058.3-1120.4)	Limestone: grey, pale grey, grey-buff, micrograined, argillaceous and silty; much shale: grey to very dark grey and black; limestone: in part bioclastic, in part pelletal	8690-9850 (2648.7-3002.3)	Dolomite: grey-buff to pale buff, some grey-brown to dark brown-grey, microcrystalline and aphanitic, in part anhydritic; some anhydrite
	Landry Formation	9850-9896 (3002.3-3016.3)	Dolomite: grey-buff, aphanitic, in part anhydritic, in part argillaceous; dolomite: pale buff, aphanitic, anhydritic
	Top at 570.6 m (1872 ft.) below sea level Thickness: 117.0 m (384 ft.)	9896-9948 (3016.3-3032.2)	Dolomite: buff to grey-brown, mostly microcrystalline, in part microcrystalline
3676-3920 (1120.4-1194.8)	Limestone: buff, grey-buff to dark grey-brown, aphanitic, some pelletal, some micrograined, mostly argillaceous	9948-10 076 (3032.2-3071.2)	Dolomite: buff-grey to dark brown-grey, microcrystalline, in part silty and argillaceous; some interbedded shale: black; 9980-10 000 feet (3041.9-3048.0 m), some sandstone: white to grey, fine to medium grained, quartzose, in part quartzitic
3920-3980 (1194.8-1213.1)	Limestone: as above, in part dolomitic; some shale: very pale green-grey, waxy	10 076-10 820 (3071.2-3298.0)	Dolomite: buff to buff-grey, aphanitic, some microcrystalline, in part anhydritic, grading to dolomitic anhydrite; some dolomite: dark brown-grey, argillaceous; grading to shale: black, dolomitic
3980-4060 (1213.1-1237.5)	Limestone: as above, aphanitic and pelletal; some interbedded dolomite: pale buff, pale grey, microcrystalline	10 820-11 065 (3298.0-3372.6)	Dolomite: buff-grey to dark brown-grey, aphanitic and microcrystalline, in part argillaceous, in part anhydritic
	Arnica Formation		CAMBRIAN-SILURIAN
	Top at 687.6 m (2256 ft.) below sea level Thickness: 499.9 m (1640 ft.)		<u>Ronning Group</u>
4060-~4100 (1237.5-~1249.7)	Dolomite: buff to brown and dark brown, microcrystalline, microcrystalline; some interbedded shale: black, dolomitic		Mount Kindle Formation
~4100-4320 (~1249.7-1316.7)	Dolomite: grey, fine to medium and coarse crystalline		Top at 2822.8 m (9261 ft.) below sea level Thickness: >361.2 m (>1185 ft.)
4320-~5700 (1316.7-~1737.4)	Dolomite: grey-buff to brown-grey, microcrystalline, microcrystalline; some zones are very fine to fine crystalline sucrosic; intercrystalline porosity; grades downward to dolomite: grey-buff to pale buff and grey-brown, mostly microcrystalline and microcrystalline, some very fine crystalline; some white dolomite veins	11 065-12 250 (3372.6-3733.8)	Dolomite: grey-buff to grey-brown, microcrystalline, very fine and fine crystalline; in upper 400 feet (121.9 m) traces of chert
	Arnica Platform		Total depth: 3733.8 m
	Top at 1187.5 m (3896 ft.) below sea level Thickness: 176.5 m (579 ft.)		
~5700-6279 (~1737.4-1913.8)	Dolomite: mostly very dark brown-grey, microcrystalline, oily odour; grades downward to grey-buff to very dark brown-grey		
	Fort Norman Formation		
	Top at 1364.0 m (4475 ft.) below sea level Thickness: 128.3 m (421 ft.)		
6279-6700 (1913.8-2042.2)	Anhydrite: mostly pale buff with some dolomite: anhydritic		
	<u>Delorme Group</u>		
	Top at 1492.3 m (4896 ft.) below sea level Thickness: 1330.5 m (4365 ft.)		
			UPPER DEVONIAN
			Imperial Formation
			Top at 68.0 m (223 ft.) above sea level Thickness: 323.1 m (1060 ft.)

33.

G-78

Log of Imperial Loon Creek No. 2
Location: 65°07'20"N, 126°28'51"W
Elevation of Kelly Bushing: 110.6 m (363 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to electric log.

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
140(S)-170 (42.7-51.8)	Siltstone: pale grey, coarse grained, micaceous Siltstone: grey, micaceous Shale: dark grey, silty, micromicaceous	1990-2052 (606.6-625.4)	Shale: grey, slightly calcareous; some limestone: grey, white, buff, fine grained and medium grained, bioclastic
170-360 (51.8-109.7)	Cavings	2052-2100 (625.4-640.1)	Limestone: grey-buff, grey, white, micro- grained and very fine grained, bioclastic
360-450(S) (109.7-137.2)	Very poor samples – some sandstones: pale green-grey, very fine grained, silty, slightly calcareous, micaceous	2100-2168 (640.1-660.8)	Limestone: grey-buff, grey, brown, white, micrograined, very fine and fine grained, bioclastic Shale: grey, calcareous
450(S)-1090 (137.2-332.2)	Shale: dark grey, micromicaceous		
	<u>Canyon Creek sandstone lentil</u> (Thickness: 33.5 m/110 ft.)		Landry Formation
1090-1200 (332.2-365.8)	Sandstone: buff, very fine grained, silty, dolomitic, siliceous, quartz-rich	Top at 550.2 m (1805 ft.) below sea level Thickness: 19.5 m (64 ft.)	
		2168-2232 (660.8-680.3)	Limestone: brown, some buff, aphanitic, some pelletal
	DEVONIAN		Arnica Formation
	Thickness: 652.2 m (2140 ft.)		Top at 569.7 m (1869 ft.) below sea level Thickness: 28.7 m (94 ft.)
	<u>Horn River Group</u>		
	Thickness: 180.7 m (593 ft.)	2232-2326 (680.3-709.0)	Dolomite: brown, buff, micro- and very fine-crystalline, some fine crystalline, in part sucrosic
	Canol Formation		Fort Norman Formation
	Top at 255.1 m (837 ft.) below sea level Thickness: 46.6 m (153 ft.)		Top at 598.3 m (1963 ft.) below sea level Thickness: 309.1 m (1014 ft.)
1200-1236 (365.8-376.7)	Shale: brown-black, bituminous; some siltstone: brown-black, hard, bitu- minous; trace limestone: pale buff, aphanitic; trace pyrite	2326-2370 (709.0-722.4)	Anhydrite: and some dolomite: as above
1236-1353 (376.7-412.4)	Shale: dark brown-grey to brown-black, bituminous	2370-3340 (722.4-1018.0)	Anhydrite: buff, pale buff, brown, pale grey, white, in part with some anhydritic dolomite
	Hare Indian Formation		
	Top at 301.8 m (990 ft.) below sea level Thickness: 134.1 m (440 ft.)		CAMBRIAN-SILURIAN
	<u>Black shale member</u> (Thickness: 88.7 m/291 ft.)		<u>Ronning Group</u>
1353-1504 (412.4-458.4)	Shale: brown-black, silty, hard, bitu- minous; some pyrite		Franklin Mountain Formation
1504-1644 (458.4-501.1)	Shale: brown-black, hard, bituminous, slightly calcareous, becoming more calcareous downward; some pyrite		Top at 907.4 m (2977 ft.) below sea level Thickness: 386.5 m (1268 ft.)
	<u>Grey shale member</u> (Thickness: 31.1 m/102 ft.)		(?)Cherty member (Thickness: 386.5 m/760 ft.)
1644-1746 (501.1-532.1)	Shale: grey, buff-grey, in part micaceous; around 1720 feet (524.3 m) some siltstone: brown-black, calcareous, bituminous	3340-4100 (1018.0-1249.7)	Dolomite: pale buff, pale buff-grey, creamy white with traces pink and green, microcrystalline, very fine, fine, medium and coarse crystalline; some shale: pale green, waxy, in part inter-crystalline filling; dolomite: generally more finely crystalline downward with some darker coloured bands; some relict oolitic structures (Note: no chert or quartz seen)
	<u>Bluefish Member</u> (Thickness: 14.3 m/47 ft.)		<u>Rhythmic member</u> (Thickness: 111.3 m/365 ft.)
1746-1773 (532.1-540.4)	Shale: brown-black, silty, slightly cal- careous, bituminous		
1773-1793 (540.4-546.5)	Shale: brown-black, very calcareous, bitu- minous; white bioclasts	4100-4465 (1249.7-1360.9)	Dolomite: buff-grey to grey-brown, some pale buff, fine and very fine- crystalline, grading downward to grey- brown to buff-grey, microcrystalline
	Hume Formation		<u>Cyclic member</u> (Thickness: 43.6 m/143 ft.)
	Top at 435.9 m (1430 ft.) below sea level Thickness: 114.3 m (375 ft.)		
1793-1990 (546.5-606.6)	Limestone: buff, brown, white, very fine and fine grained, bioclastic	4465-4608 (1360.9-1404.5)	Dolomite: grey-buff to grey, argillaceous; some shale: grey, trace green, dolomitic

Borehole Depth feet (m)	Lithology
CAMBRIAN	
Saline River Formation	
Top at 1293.9 m (4245 ft.) below sea level Thickness: >143.9 m (>472 ft.)	
Upper clastic member (Thickness: 28.0 m/92 ft.)	
4608-4700 (1404.5-1432.6)	Shale: maroon, grey-green, olive-green, dolomitic, in part anhydritic; some anhydrite: pink to buff, dolomitic
Salt member (Thickness: >115.8 m/>380 ft.)	
4700-4775 (1432.6-1455.4)	Anhydrite: pink to buff, in part dolomitic Shale: maroon, olive-green, pale green Halite (casts): compaction structures
4775-5080 (1455.4-1548.4)	Halite: possibly with anhydrite and shale , red and green
Total depth: 1552.3 m	
34.	H-15
Log of Imperial Hossier Ridge No. 1 Location: 65°24'16"N, 127°32'14"W Elevation of Kelly Bushing: 131.1 m (430 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log; sample quality poor.	
DEVONIAN	
Thickness: 764.1 m (2507 ft.)	
Horn Group River	
Thickness: 313.3 m (1028 ft.)	
Canol Formation	
Top at 131.1 m (430 ft.) above sea level Thickness (R): 3.0 m (10 ft.)	
Ramparts Formation	
Top at 128.0 m (420 ft.) above sea level Thickness: 170.7 m (560 ft.)	
Reef member (Thickness: 106.7 m/350 ft.)	
10(R)-360 (3.0-109.7)	Limestone: pale buff, reef
Platform member (Thickness: 41.1 m/135 ft.)	
360-495 (109.7-150.9)	(?)
Siltstone lenti (Thickness: 22.9 m/75 ft.)	
495-570 (150.9-173.7)	Siltstone: grey, coarse grained, calcareous, micaceous
Hare Indian Formation	
Top at 42.7 m (140 ft.) below sea level Thickness: 139.6 m (458 ft.)	
Grey shale member (Thickness: 123.4 m/405 ft.)	
~570-975 (~173.7-297.2)	Shale: grey, silty, slightly calcareous, micaceous

Borehole Depth feet (m)	Lithology
Bluefish Member (Thickness: 16.1 m/53 ft.)	
975-1028 (297.2-313.3)	Shale: black, bituminous; some pyrite; 1024 feet (312.1 m) – spore study by A.R. Sweet (see Appendix 1)
Hume Formation	
Top at 182.3 m (598 ft.) below sea level Thickness: 104.2 m (342 ft.)	
1028-1068 (313.3-325.5)	Limestone: brown-grey, micrograined, argillaceous; trace pyrite; trace shale: grey, calcareous
1068-1160 (325.5-353.6)	Limestone: buff, grey-buff, micrograined
~1160-1220 (~353.6-~371.9)	Limestone: grey-brown, fine grained, some chalky, bioclastic
~1220-1370 (~371.9-417.6)	Limestone: grey, silty, in part argillaceous; limestone: buff, micrograined; shale: grey, silty, calcareous; shell fragments
Landry Formation	
Top at 286.5 m (940 ft.) below sea level Thickness: 10.4 m (34 ft.)	
1370-1404 (417.6-427.9)	Limestone: buff, aphanitic, micrograined; some limestone: brown, very fine grained; trace limestone: pelletal; some pyrite; 1390-1404 feet (423.7-427.9 m) – some shale: pale green and grey green
Arnica Formation	
Top at 296.9 m (974 ft.) below sea level Thickness: 32.6 m (107 ft.)	
1404-~1430 (427.9-~435.9)	Dolomite: brown, microcrystalline, calcareous
~1430-1511 (~435.9-460.6)	Dolomite: brown, buff, very fine crystalline
Fort Norman Formation	
Top at 329.5 m (1081 ft.) below sea level Thickness: 303.5 m (996 ft.)	
1511-2455 (460.6-748.3)	Anhydrite: in the upper part, dolomite: brown and white, anhydritic, decreasing downward
Basal beds (Thickness: 15.8 m/52 ft.)	
2455-2507 (748.3-764.1)	Very poor samples – some cuttings of very silty dolomite: some green shale reported by Tassonyi (1969, Fig. 9)
CAMBRIAN-SILURIAN	
Ronning Group	
Franklin Mountain Formation	
Top at 633.1 m (2077 ft.) below sea level Thickness: >45.4 m (>149 ft.)	
Upper dolomite member (Thickness: 37.5 m/123 ft.)	
2507-2630 (764.1-801.6)	Dolomite: creamy white to buff-grey, fine, medium and coarse crystalline; 2610-2620 feet (795.5-798.6 m) some pink dolomite

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
	Cherty member (Thickness: >7.9 m/26 ft.)	~3300-3379 (~1005.8-1029.9)	Anhydrite: some dolomite
2630-2656 (801.6-809.6)	Dolomite: creamy white to pale buff and pale grey, fine, medium and coarse crystalline; some chert: white		Tsetso Formation
Total depth: 809.6 m		Top at 799.2 m (2622 ft.) below sea level Thickness: 177.1 m (581 ft.)	
		3379-3466 (1029.9-1056.4)	Dolomite: pale grey, pale buff, pale grey- green, microcrystalline, in part very sandy; grading to Sandstone: pale grey, some pale green, very poorly sorted, dolomitic Some anhydrite: pale buff, trace pink; grading to dolomite: anhydritic; some shale: pale green, slightly dolomitic
35.	H-34	3466-3498 (1056.4-1066.2)	Dolomite: brick-red, some pale buff, microcrystalline and aphanitic Sandstone: brick-red to pale buff and pale grey, very poorly sorted, quartzose, dolomitic and quartzitic Shale: brick-red to purple-brown, dolo- mitic Some anhydrite: pink and pale buff
Log of Arco W. Whitefish River H-34 Location: 65°33'24"N, 127°35'45"W Elevation of Kelly Bushing: 230.7 m (757 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.		3498-3690 (1066.2-1124.7)	Dolomite: pale buff to white, micro- and very fine-crystalline; some anhydrite: colour gradation downward to very pale buff to white and pink; 3570- 3620 feet (1088.1-1103.4 m) some interbedded sandstone and shale: brick-red
MESOZOIC		3690-3720 (1124.7-1133.9)	Dolomite: pale purple, pink, white, pale buff, aphanitic and microcrystalline; some shale: brick-red, pale purple, pale green, dolomitic
2442-2506 (744.3-763.8)	Sandstone: fine grained, poorly sorted, quartzose, slightly glauconitic; some medium to coarse grained, poorly sorted, quartzose; probably some interbedded shale: black, splintery, trace pyrite	3720-3960 (1133.9-1207.0)	Dolomite: brick-red, maroon, pale purple, pale green, pale buff, aphanitic and microcrystalline Shale: brick-red, purple-brown, pale green, dolomitic; shale increases downward Trace anhydrite
DEVONIAN			CAMBRIAN-SILURIAN
Thickness: 663.2 m (2176 ft.) Basal beds (Lower Cretaceous?)			Ronning Group
2506-2530 (763.8-771.1)	Samples missing	Thickness: 318.5 m (1045 ft.)	
2530-2568 (771.1-782.7)	Limestone: buff to brown, aphanitic, microcrystalline, some pelletal		Mount Kindle Formation
Arnica Formation		Top at 976.3 m (3203 ft.) below sea level Thickness: 132 m (433 ft.)	
Top at 552.0 m (1811 ft.) below sea level Thickness: 47.9 m (157 ft.)		Upper pale member (Thickness: 79.2 m/260 ft.)	
2568-2610 (782.7-795.5)	Dolomite: pale buff, microcrystalline, almost "earthy"-textured; numerous black specks and dark streaks; some pinpoint porosity	3960-4220 (1207.0-1286.3)	Dolomite: pale buff, very fine crystalline, grading downward to mostly micro- crystalline
2610-2640 (795.5-804.7)	Limestone: buff and brown to dark brown, micrograined, in part argillaceous	Lower dark member (Thickness: 47.5 m/156 ft.)	
2640-2690 (804.7-819.9)	Dolomite: pale buff to brown with dark bituminous patches, microcrystalline; pinpoint and vuggy porosity	4220-4330 (1286.3-1319.8)	Dolomite: buff and grey-brown, micro- and very fine-crystalline; some chert: grey-buff
2690-2710 (819.9-826.0)	Dolomite: buff to pale buff, some thin black streaks, microcrystalline; trace porosity	4330-4376 (1319.8-1333.8)	Dolomite: as above, buff to brown
2710-2725 (826.0-830.6)	Dolomite: brown, microcrystalline and dark grey-brown, argillaceous		Basal member (Thickness: 5.2 m/17 ft.)
Fort Norman Formation		4376-4393 (1333.8-1339.0)	Dolomite: dark grey-brown, microcrystal- line, argillaceous; some dolomite: grey, microcrystalline; some shale: black, dolomitic, in part silty; some pyrite, abundant at base
Top at 599.8 m (1968 ft.) below sea level Thickness: 199.3 m (654 ft.)			
2725-3200 (830.6-975.4)	Anhydrite: some dolomite downward		
~3200-~3300 (~975.4-~1005.8)	Dolomite: buff and brown, micro- and very fine crystalline; some inter- crystalline and vuggy porosity; some anhydrite		

Borehole Depth feet (m)	Lithology
Franklin Mountain Formation	
Top at 1108.3 m (3636 ft.) below sea level Thickness: 186.5 m (612 ft.)	
	<u>Cherty member</u> (Thickness: 2 m/7 ft.)
4893~4400 (1491.4~1341.1)	Dolomite: medium and coarse crystalline
	<u>Rhythmic member</u> (Thickness: 165.2 m/542 ft.)
~4400-4566 (~1341.1-1391.7)	Dolomite: pale buff to pale grey, trace pink, micro- and very fine-crystalline
4566~4780 (1391.7~1456.9)	Dolomite: creamy white to very pale grey and pale buff with scattered pale green patches, mostly micro- and very fine-crystalline; trace shale: pale green
~4780-4942 (~1456.9-1506.3)	Dolomite: creamy white to buff, microcrystalline to aphanitic; some shale: pale green and green; 4780-4840 feet (1456.9-1475.2 m) some dolomite: pale grey, pink and very pale green
	<u>Cyclic member</u> (Thickness: 19.2 m/63 ft.)
4942-5005 (1506.3-1525.5)	Dolomite: grey-buff to dark grey-brown, microcrystalline, in part argillaceous; grades downward to grey-buff to grey, argillaceous dolomite; with inter-bedded Shale: grey, dolomitic
CAMBRIAN	
Saline River Formation	
Top at 1294.8 m (4248 ft.) below sea level Thickness: 63.1 m (207 ft.)	
	<u>Upper clastic member</u> (Thickness: 36.0 m/118 ft.)
5005-5123 (1525.5-1561.5)	Shale: green, brown, maroon, purple, olive-green, dolomitic, with inter-bedded Dolomite: pale buff to brown, microcrystalline; trace anhydrite
	<u>Salt member</u> (Thickness: 10.1 m/33 ft.)
5123-5156 (1561.5-1571.5)	Halite
	<u>Lower clastic member</u> (Thickness: 17.1 m/56 ft.)
5156-5212 (1571.5-1588.6)	Shale: varicoloured; with some dolomite: grey to buff, microcrystalline
Mount Cap Formation	
Top at 1357.9 m (4455 ft.) below sea level Thickness: 29.3 m (96 ft.)	
	<u>Members d and e</u> (Thickness: 4.9 m/16 ft.)
5212-5228 (1588.6-1593.5)	Siltstone: dark grey, siliceous, dolomitic, argillaceous; grading to Shale: dark grey, silty
	<u>Member c</u> (Thickness: 6.1 m/20 ft.)
5228-5248 (1593.5-1599.6)	Dolomite: buff-grey to dark grey, very fine to fine crystalline, mostly hard

Borehole Depth feet (m)	Lithology
	<u>Member b</u> (Thickness: 14.6 m/48 ft.)
5248-5296 (1599.6-1614.2)	Siltstone: brown-grey, micaceous, siliceous; siltstone: white, coarse grained, and sandstone: white, very fine grained; some dolomite: pale buff to grey-buff, very fine crystalline
	<u>Member a</u> (Thickness: 3.7 m/12 ft.)
5296-5308 (1614.2-1617.9)	Dolomite: buff to buff-grey, siliceous Sandstone: 50% glauconite, very poorly sorted, quartzose, dolomitic
Mount Clark Formation	
Top at 1387.1 m (4551 ft.) below sea level Thickness: 31.4 m (103 ft.)	
5308-5405 (1617.9-1647.4)	Sand: fine to very coarse grained, sub-rounded, quartzose, frosted Sandstone: white, fine to very fine grained, quartzose; fragments of larger-than-sand-size quartz grains
5405-5411 (1647.4-1649.3)	As above with some shale: olive-green, trace maroon
PROTEROZOIC	
Dolomite unit	
Top at 1418.5 m (4654 ft.) below sea level Thickness: >5.2 m (>17 ft.)	
5411-5428 (1649.3-1654.5)	Dolomite: buff to pink and very pale grey with some thin blood-red streaks, microcrystalline
	Total depth: 1654.5 m
36.	H-40
Log of Imperial Judile No. 1 Location: 65°29'24"N, 127°35'58"W Elevation of Kelly Bushing: 93.6 m (307 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log. Sample quality poor.	
MESOZOIC	
	Thickness: 77.4 m (254 ft.) Basal beds (Lower Cretaceous ?)
-314 (-95.7)	Siltstone: pale grey, some coarse grained, glauconitic; shale(?) ; at base, possibly sandstone: argillaceous, very glauconitic
UPPER DEVONIAN	
Imperial Formation	
Top at 2.1 m (7 ft.) below sea level Thickness: 285.6 m (937 ft.)	
314~770 (95.7~234.7)	Siltstone: grey, in part coarse grained, variably calcareous and micro-micaceous; interbedded Shale: dark grey, silty, micromicaceous At ~450-460 feet (~137.2-140.2 m) limestone: buff, coarse grained, bioclastic

Borehole Depth feet(m)	Lithology	Borehole Depth feet (m)	Lithology
~770-1251 (~234.7-381.3)	Shale: dark grey, micromicaceous, in part silty	2255-2303 (687.3-702.0)	Limestone: grey-buff to brown, argillaceous, some chalky; interbedded Shale: grey, calcareous
DEVONIAN		2303-2495 (702.0-760.5)	Limestone: buff to grey-brown, fine grained, bioclastic, fossiliferous; ~2400-2495 feet (~731.5-760.5 m) interbedded shale: grey, calcareous
Thickness: >476.7 m (>1564 ft.)		Headless Member (Thickness: 18.3 m/60 ft.)	
Horn River Group		2495-2555 (760.5-778.8)	Limestone: grey-buff, fine grained, bioclastic Shale: grey, calcareous
Thickness: 306.0 m (1004 ft.)		Landry Formation	
Canol Formation		Top at 685.2 m (2248 ft.) below sea level Thickness: 9.1 m (30 ft.)	
Top at 287.7 m (944 ft.) below sea level Thickness: 16.2 m (53 ft.)		2555-2585 (778.8-787.9)	Limestone: brown, pelletal; some limestone: buff and brown, aphanitic
1251-1272 (381.3-387.7)	Dolomite: brown, fine crystalline, siliceous	Arnica Formation	
1272-1293 (387.7-394.1)	Probably shale: black, pyritic	Top at 694.3 m (2278 ft.) below sea level Thickness: 26.8 m (88 ft.)	
Allochthonous limestone (Thickness: 3.4 m/11 ft.)		2585-2673 (787.9-814.7)	Dolomite: buff and brown, very fine crystalline, microsucrosic; stylolites; oil-staining at sample labelled 2648 feet (807.1 m) and at base
1293-1304 (394.1-397.5)	Probably shale: black, calcareous, and limestone debris	Fort Norman Formation	
Ramparts Formation		Top at 721.2 m (2366 ft.) below sea level Thickness: >43.3 m (>142 ft.), est. 260 m	
Top at 303.9 m (997 ft.) below sea level Thickness: 170.1 m (558 ft.)		2673-2815 (814.7-858.0)	Anhydrite: pale buff, some brown; at 2780-2790 feet (847.3-850.4 m) possibly some dolomite
Reef member (Thickness: 129.8 m/426 ft.)		Total depth: 858.0 m	
1304~1620 (397.5~493.8)	Limestone: pale buff, reef	37. H-61 Log of SOBC St. Charles Creek H-61 Location: 64°50'24"N, 123°56'28"W Elevation of Kelly Bushing: 262.7 m (862 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
~1620-1730 (~493.8-527.3)	Limestone: pale buff and white, reef		
Platform Member (Thickness: 14.6 m/48 ft.)			
1730-1778 (527.3-541.9)	Limestone: pale buff and grey-buff, fine grained and medium grained, bioclastic, some aphanitic; limestone: possibly in part silty (unable to determine whether interbedded shale is present)		
Siltstone lentil (Thickness: 25.6 m/84 ft.)			
1778-1862 (541.9-567.5)	Siltstone: pale grey, much coarse grained, calcareous, micaceous		
Hare Indian Formation		MESOZOIC	
Top at 474.0 m (1555 ft.) below sea level Thickness: 119.8 m (393 ft.)		Thickness: 459.3 m (1507 ft.) Basal beds (Lower Cretaceous ?)	
Grey shale member (Thickness: 100.0 m/328 ft.)		1428-1657 (435.3-505.1)	Sandstone: pale grey to buff, very fine grained, in part glauconitic, in part silty, grading to Siltstone: buff-grey; siltstone: grey, argillaceous; grading to Shale: dark grey, silty, micromicaceous; shale: black, splintery; near base some Sandstone: pale grey, fine to very fine grained, with glauconite concentrations; at base some pyrite
1862-2190 (567.5-667.5)	Shale: pale grey, micaceous, calcareous, colour probably grades downward to brown-grey	DEVONIAN	
Bluefish Member (Thickness: 19.8 m/65 ft.)		Thickness: 597.1 m (1959 ft.)	
2190-2255 (667.5-687.3)	Shale: black, bituminous; <u>top</u> 15 feet (4.6 m) calcareous		
Hume Formation			
Top at 593.8 m (1948 ft.) below sea level Thickness: 91.4 m (300 ft.)			

Borehole Depth feet(m)	Lithology
Landry Formation	
Top at 242.3 m (795 ft.) below sea level Thickness: 60.7 m (199 ft.)	
1657-1856 (505.1-565.7)	Limestone: buff and brown, aphanitic, in part pelletal; below 1810 feet (551.7 m) some limestone: pale buff, chalky-textured, dolomitic
Arnica Formation	
Top at 303.0 m (994 ft.) below sea level Thickness: 31.1 m (102 ft.)	
1856-1880 (565.7-573.0)	Dolomite: buff to very pale buff, microcrystalline
1880-1958 (573.0-596.8)	Dolomite: buff to brown, very fine and microcrystalline, microscrosic
Fort Norman Formation	
Top at 334.1 m (1096 ft.) below sea level Thickness: 349.0 m (1145 ft.)	
1958-3103 (596.8-945.8)	Anhydrite: pale buff and pale grey; below 2500 feet (762.0 m) some dolomite
Tsetso Formation	
Top at 683.1 m (2241 ft.) below sea level Thickness: 156.4 m (513 ft.)	
3103-3342 (945.8-1018.6)	Anhydrite: as above; some dolomite: some shale: pale green, dolomitic, anhydritic
3342-3530 (1018.6-1075.9)	Dolomite: grey-buff to pale buff, some mottled brick-red, some pale green-grey, aphanitic and microcrystalline Anhydrite: pale buff to white Shale: brick-red, dolomitic, silty; some shale: pale green, dolomitic
3530-3600 (1075.9-1097.3)	Shale: pale green, pale brown, brick-red, in part very dolomitic Dolomite: pale purple to pale buff-grey, microcrystalline to aphanitic, argillaceous Siltstone: pale buff to white, dolomitic
3600-3616 (1097.3-1102.2)	Shale: brick-red, some dark brown-grey, in part silty, in part dolomitic Siltstone: pale grey, pale buff, some pale grey-green and brick-red, in part very sandy (very fine to medium grained, quartz), in part very dolomitic; grading to Dolomite: pale buff to pale grey and pink, microcrystalline to aphanitic, in part silty or sandy
CAMBRIAN-SILURIAN	
Ronning Group	
Franklin Mountain Formation	
Top at 839.4 m (2754 ft.) below sea level Thickness: >7.3 m (>24 ft.)	
Cherty member	
3616-3640 (1102.2-1109.5)	Dolomite: pale buff, trace pink colouring, aphanitic and microcrystalline; some chert: milky white and pale buff
Total depth: 1114.7 m	

38.	H-71
Log of Banff Oscar Creek H-71 Location: 65°30'20"N, 127°13'26"W Elevation of Kelly Bushing: 234.7 m (770 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
Borehole Depth feet (m)	Lithology
DEVONIAN	
Thickness: >432.2 m (>1418 ft.)	
Horn River Group	
Thickness: 221.9 m (728 ft.)	
Hare Indian Formation	
Top at 234.7 m (770 ft.) above sea level Thickness: 221.9 m (728 ft.)	
Grey shale member (Thickness: 199.3 m/654 ft.)	
0(R)-654 (0-199.3)	Very poor samples (cavings, cement)
Bluefish Member (Thickness: 22.6 m/74 ft.)	
654-681 (199.3-207.6)	Possibly chert: black and smoky translucent
681-728 (207.6-221.9)	Shale: black, bituminous; spores abundant; some calcite and calcareous shale; 640-730 feet (195.1-222.5 m) - spore study by D.C. McGregor (see Appendix 1)
Hume Formation	
Top at 12.8 m (42 ft.) above sea level Thickness: 83.2 m (273 ft.)	
728-800 (221.9-243.8)	Limestone: grey-buff, pale buff, brown, micrograined to fine grained, bioclastic; 760-800 feet (231.6-243.8 m) - some shale: grey, calcareous, micromicaceous
800-946 (243.8-288.3)	Limestone: pale buff and grey-buff, bioclastic, in part reefoid; 892-946 feet (271.8-288.3 m) - in part argillaceous
Headless Member (Thickness: 17.4 m/57 ft.)	
946-1001 (288.3-305.1)	Limestone: buff, grey, white, fine grained and medium grained, some aphanitic and argillaceous, bioclastic; some interbedded shale: grey, calcareous, silty, micromicaceous
Landry Formation	
Top at 70.4 m (231 ft.) below sea level Thickness: 11.3 m (37 ft.)	
1001-1038 (305.1-316.4)	Limestone: brown, pelletal; 1001-1010 feet (305.1-307.8 m) some buff, aphanitic limestone
Arnica Formation	
Top at 81.7 m (268 ft.) below sea level Thickness: 40.2 m (132 ft.)	

Borehole Depth feet(m)	Lithology
1038-1170 (316.4-356.6)	Dolomite: brown and buff, micro- and very fine-crystalline, microsucrosic
Fort Norman Formation	
Top at 121.9 m (400 ft.) below sea level Thickness: >75.6 m (>248 ft.) est. 220 m	
1170-1418 (356.6-432.2)	Anhydrite: pale buff, some pale grey
Total depth: 432.2 m	
39.	H-77

Log of Pacific Oscar Creek H-77
Location: 65°26'22"N, 127°28'15"W
Elevation at ground level: 60.1 m (197 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to electric log.

MESOZOIC

Thickness: 66.1 m (217 ft.)
Basal beds (Lower Cretaceous ?)

255-307
(77.7-93.5) (Overlain by glauconitic siltstone and shale)
Sand: medium and coarse grained, quartz

UPPER DEVONIAN

Imperial Formation

Top at 33.5 m (110 ft.) below sea level
Thickness: 343.5 m (1127 ft.)

307-800
(93.5-243.8) **Siltstone:** grey, in part coarse grained, micromicaceous
Shale: dark grey, in part silty, micromicaceous

~800-1434
(~243.8-437.1) **Shale:** dark grey, micromicaceous; in the upper part, rare siltstone: as above

DEVONIAN

Horn River Group

Thickness: >175.6 m (>576 ft.)

Canol Formation

Top at 377.0 m (1237 ft.) below sea level
Thickness: 64.0 m (210 ft.)

1434-1640
(437.1-499.9) **Shale:** brown-black, bituminous; trace pyrite; ~1550-1640 feet (~472.4-499.9 m) **shale:** slightly calcareous; some shell impressions

Allochthonous limestone
(Thickness: 1.2 m/4 ft.)

1640-1644
(499.9-501.1) **Limestone:** black and white, argillaceous and bituminous
Shale: black, calcareous

Ramparts Formation

Top at 441.0 m (1447 ft.) below sea level
Thickness: 48.8 m (160 ft.)

Borehole Depth feet (m)	Lithology
Reef member (Thickness: 19.8 m/65 ft.)	
1644-1709 (501.1-520.9)	Limestone: pale buff, coarse grained
Siltstone lentil (Thickness: 20.1 m/66 ft.)	
1709-1740 (520.9-530.4)	Siltstone: grey-buff, grey, in part coarse grained, calcareous and very calcareous
1740-1775 (530.4-541.0)	Siltstone: brown-grey, slightly calcareous, very micaceous
Platform member (Thickness: 8.8 m/29 ft.)	
1775-1804 (541.0-549.9)	Limestone: pale buff, fine grained and coarse grained, bioclastic, fossiliferous

Hare Indian Formation

Top at 489.8 m (1607 ft.) below sea level
Thickness: >62.8 m (>206 ft.)

Grey shale member

1804-2010
(549.9-612.7) **Shale:** grey, pale grey, slightly calcareous, micromicaceous

Total depth: 612.7 m

40. I-01

Log of Decalta Keele River I-01
Location: 64°20'40"N, 125°00'07"W
Elevation of Kelly Bushing: 289.9 m (951 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to sonic log.

MESOZOIC AND TERTIARY

Thickness: 1113.1 m (3652 ft.)
Basal beds (Lower Cretaceous ?)

3609-3672
(1100.0-1119.2) **Sandstone:** fine to very fine grained, quartz-rich, glauconitic; some shale: black, trace carbonaceous fragments; some pyrite

DEVONIAN

Thickness: 468.8 m (1538 ft.)

Hume Formation

Top at 829.4 m (2721 ft.) below sea level
Thickness: 91.7 m (301 ft.)

Middle member
(Thickness: 49.7 m/163 ft.)

3672-3835
(1119.2-1168.9) **Limestone:** buff, grey-brown, white, micrograined, some fine grained, fossiliferous

Headless Member
(Thickness: 42.1 m/138 ft.)

3835-3973
(1168.9-1211.0) **Limestone:** brown and white, bioclastic, fossiliferous; some shale: grey, dark grey, calcareous

Borehole Depth feet (m)	Lithology
Landry Formation	
Top at 921.1 m (3022 ft.) below sea level Thickness: 56.1 m (184 ft.)	
3973-4157 (1211.0-1267.1)	Limestone: grey-buff and dark brown, aphanitic and micrograined with trace pelletal structure, in part argillaceous and silty; grading to Shale: dark grey-brown, silty, calcareous
Arnica Formation	
Top at 977.2 m (3206 ft.) below sea level Thickness: 38.7 m (127 ft.)	
4157-4284 (1267.1-1305.8)	Dolomite: pale buff to buff, micro-crystalline, in part microcrystalline; some intercrystalline porosity and some bituminous residue
Fort Norman Formation (includes Arnica platform)	
Top at 1015.9 m (3333 ft.) below sea level Thickness: 282.2 m (926 ft.)	
4284-4790 (1305.8-1460.0)	Dolomite: grey-brown, white, grey to dark grey, buff and brown, mostly micro-crystalline; much bituminous residue in poor porosity and cracks; dolomite grades downward to white to buff and some grey-brown, micro- and very fine-crystalline; some limestone: pale buff and white, very fine grained; much breccia structure throughout
Arnica Platform (Thickness: 94.5 m/310 ft.)	
4790-5100 (1460.0-1554.5)	Dolomite: buff to brown, microcrystalline
5100-5210 (1554.5-1588.0)	Dolomite: brown, grey, white, micro- and very fine-crystalline; breccia structure
CAMBRIAN-SILURIAN	
Ronning Group	
Franklin Mountain Formation	
Top at 1298.1 m (4259 ft.) below sea level Thickness: >118.9 m (>390 ft.)	
Rhythmic member	
5210-5300 (1588.0-1615.4)	Limestone: white to buff, micrograined, in part silty and sandy (quartz), and very sandy; grading to Sandstone: fine and medium grained, rounded, quartzose, calcareous
~5300-5512 (~1615.4-1680.1)	Dolomite and limestone: pale buff, pale grey and white, microcrystalline (micrograined), in part sandy; grading to Sandstone: poorly sorted, very fine, fine and medium grained, quartzose, rounded
5512-5600 (1680.1-1706.9)	Dolomite: pale buff to white, pink, pale grey and trace pale green, micro-crystalline, some aphanitic, in part sandy; some dolomite: brick-red, argillaceous; some clear quartz filling
Total depth: 1706.9 m	

41.	I-15
Log of Shell Ochre River I-15 Location: 63°24'45"N, 122°46'57"W Elevation of Kelly Bushing: 507.2 m (1664 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
Borehole Depth feet (m)	Lithology
MESOZOIC	
Thickness: 383.7 m (1259 ft.) Basal beds (Lower Cretaceous ?)	
1380-1539 (420.6-469.1)	Siltstone: dark brown-grey, in part coarse grained, in part argillaceous, very micaceous; oily odour; some shale: black, flaky to splintery; trace orthoquartzite: pink, very thinly interbedded with black shale
DEVONIAN	
Thickness: 943.0 m (3094 ft.)	
Horn River Group	
Thickness: 63.7 m (209 ft.)	
Hare Indian Formation	
Top at 38.1 m (125 ft.) above sea level Thickness: 63.7 m (209 ft.)	
Grey shale member (may include a tongue of Ramparts Formation, Platform member)	
1539-1596 (469.1-486.5)	Limestone: brown-grey, micrograined, very argillaceous, grading to Shale: very calcareous; some shell fragments
1596-1748 (486.5-532.8)	Shale: grey to dark brown-grey, flaky, micromicaceous
Hume Formation	
Top at 25.6 m (84 ft.) below sea level Thickness: 118.9 m (390 ft.)	
Upper member (Thickness: 36.6 m/120 ft.)	
1748-1868 (532.8-569.4)	Limestone: grey-buff to brown and white, micrograined, some very fine grained, in part bioclastic, fossiliferous
Middle member (Thickness: 49.4 m/162 ft.)	
1868-2030 (569.4-618.7)	Limestone: as above
Headless Member (Thickness: 32.9 m/108 ft.)	
2030-2138 (618.7-651.7)	Limestone: grey-buff to grey and white, very fine grained, bioclastic, in part silty or argillaceous; some shale: grey, calcareous; some shale: black, splintery (cavings ?); some limestone: grey-buff, aphanitic; some limestone: grey, aphanitic, argillaceous or silty

Borehole Depth feet(m)	Lithology
Landry Formation	
Top at 144.5 m (474 ft.) below sea level Thickness: 21.3 m (70 ft.)	
2138-2208 (651.7-673.0)	Limestone: buff to pale buff, aphanitic; trace microcrystals of pyrite
Arnica Formation	
Top at 165.8 m (544 ft.) below sea level Thickness: 40.2 m (132 ft.)	
2208-2340 (673.0-713.2)	Dolomite: pale buff, some pale grey, microcrystalline; at top some bio- structure preserved
Fort Norman Formation	
Top at 206.0 m (676 ft.) below sea level Thickness: 489.5 m (1606 ft.)	
2340-3946 (713.2-1202.7)	Dolomite and anhydrite. Dolomite: buff to pale buff, pale grey, grey-brown, microcrystalline and aphanitic, in part anhydritic, decreasing downward to minor amounts
Tsetso Formation (Type Section)	
Top at 695.6 m (2282 ft.) below sea level Thickness: 209.4 m (687 ft.)	
3946-3991 (1202.7-1216.5)	Dolomite: pale buff, pale grey, micro- crystalline to aphanitic; some floating quartz sand grains
3991-4006 (1216.5-1221.0)	Sandstone: pale grey, some buff, very fine to coarse grained, rounded, quartzose, mostly dolomitic; grading to sandy dolomite
4006-4025 (1221.0-1226.8)	Dolomite: pale buff, pale grey, micro- crystalline to aphanitic, in part sandy
4025-4247 (1226.8-1294.5)	Dolomite: as above, with some anhydrite and trace sand grains; some sand grains at 4100-4110 feet (1249.7- 1252.7 m); much anhydrite at 4190- 4247 feet (1277.1-1294.5 m)
4247-4633 (1294.5-1412.1)	Dolomite: pale buff, pale grey, pink, microcrystalline and aphanitic, in part anhydritic, in part silty; grading to siltstone: dolomitic, in part sandy; some anhydrite
CAMBRIAN-SILURIAN	
<u>Ronning Group</u>	
Mount Kindle Formation	
Top at 905.0 m (2969 ft.) below sea level Thickness: >76.2 m (>250 ft.)	
4633-4883 (1412.1-1488.3)	Dolomite: buff to pale buff, very fine and fine crystalline, some medium crystal- line; around 4800 feet (1463.0 m), some chert: milky white to pale buff
Total depth: 1488.3 m	

42.	I-46
Log of Shell Cloverleaf I-46 Location: 63°55'44"N, 124°52'39"W Elevation of Kelly Bushing: 443.8 m (1456 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
Borehole Depth feet (m)	Lithology
MESOZOIC	
Thickness: 731.8 m (2401 ft.) Basal beds (Lower Cretaceous ?)	
2080-2401 (634.0-731.8)	Shale: dark grey to black, micromica- ceous; some interbedded sandstone: very fine and fine grained, quartz/chert; some siltstone; at base probably shale: black, bituminous; and some shale: very pale green, waxy, micaceous
UPPER DEVONIAN	
Imperial Formation	
Top at 288.0 m (945 ft.) below sea level Thickness: 622.4 m (2042 ft.)	
2401-2700 (731.8-823.0)	Siltstone: grey, buff-grey, green-grey, micaceous, in part argillaceous; some shale: grey, dark grey, buff-grey, brown-grey, green-grey, micromica- ceous
2700-3720 (823.0-1133.9)	Samples missing. Siltstone may continue to 3500 feet (1066.8 m)
3720-4443 (1133.9-1354.2)	Shale: grey, dark grey, brown-grey, micromicaceous, in part silty, grading to siltstone: micaceous
DEVONIAN	
Thickness: >2095.5 m (>6875 ft.)	
<u>Horn River Group</u>	
Thickness: 327.7 m (1075 ft.)	
Canol Formation	
Top at 910.4 m (2987 ft.) below sea level Thickness: 30.2 m (99 ft.)	
4443-4542 (1354.2-1384.4)	Shale: black, bituminous; trace pyrite
Hare Indian Formation	
Top at 940.6 m (3086 ft.) below sea level Thickness: 297.5 m (976 ft.)	
<u>Grey shale member</u> (including Black shale tongue) (Thickness: 267.0 m/876 ft.)	
4542-4741 (1384.4-1445.1)	Shale: grey, brown-grey, dark grey, flaky to splintery, micromicaceous, in part silty and very micaceous
<u>Tongue of Black shale member</u> (Thickness: 132.6 m/435 ft.)	
4741-5176 (1445.1-1577.6)	Shale: black, bituminous, siliceous, pyritic, micromicaceous

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
	<u>Grey shale member</u> (continued)	7310-7700 (2228.1-2347.0)	Dolomite and anhydrite. Dolomite: grey, grey-buff, micro- and very fine-crystalline, sucrosic
5176-5418 (1577.6-1651.4)	Shale: grey, brown-grey to very dark grey and black, flaky to splintery, in part micromicaceous, noncalcareous	7700-10 622 (2347.0-3237.6)	Dolomite: as above; some anhydrite
	<u>Bluefish Member</u> (Thickness: 30.5 m/100 ft.)	10 622-10 652 (3237.6-3246.7)	Lost circulation, fault at 10 625 feet (3238.5 m)(R)
5418-5490 (1651.4-1673.4)	Shale: black, bituminous, in part slightly calcareous; trace pyrite	Arnica Platform	
5490-5518 (1673.4-1681.9)	Shale: as above; calcite and calcitic streaks and speckles; in part grading to limestone: black and white, bituminous, argillaceous; trace pyrite	Top at 2802.9 m (9196 ft.) below sea level Thickness: >203.0 m (>666 ft.)	
Hume Formation		10 652-11 318 (3246.7-3449.7)	Dolomite: dark grey to grey, micro- to very fine-crystalline; some fine crystalline; white dolomite veins; trace fossil structures
Top at 1238.1 m (4062 ft.) below sea level Thickness: 231.6 m (760 ft.)		Total depth: 3449.7 m	
	<u>Upper member</u> (Thickness: 70.1 m/230 ft.)		
5518-5748 (1618.9-1752.0)	Limestone: chalky buff, speckled white to brown and white, micrograined, fossiliferous		
	<u>Middle member</u> (Thickness: 91.4 m/300 ft.)		
5748-5949 (1752.0-1813.3)	Limestone: grey-buff, grey-brown, chalky buff, brown, white, micrograined to very fine grained, some aphanitic; some shale: grey, calcareous, in part silty, micromicaceous		
5949-6048 (1813.3-1843.4)	Limestone: grey, grey-buff, grey-brown, mostly micrograined (poor samples)		
	<u>Headless Member</u> (Thickness: 70.1 m/230 ft.)		
6048-6278 (1843.4-1913.5)	(Poor samples - cavings and drilling materials). Limestone: grey, brown, white, micrograined and very fine grained, in part argillaceous; some shale: black, grey, in part silty		
Landry Formation (Transitional to Funeral Formation)			
Top at 1469.7 m (4822 ft.) below sea level Thickness: 191.7 m (629 ft.)			
6278-6530 (1913.5-1990.3)	Limestone: grey, pale grey, brown-grey, micrograined to fine grained; some limestone: grey-buff and brown, aphanitic; some limestone: dark brown-grey, argillaceous, silty with oily odour		
6530-6800 (1990.3-2072.6)	Limestone: grey-buff, aphanitic; some limestone: grey to buff and white, very fine grained, in part bioclastic, in part argillaceous; trace pyrite		
~6800-6907 (~2072.6-2105.3)	Limestone: as above; some dolomite: buff, micro- and very fine-crystalline, in part microsucrosic		
Arnica Formation			
Top at 1661.5 m (5451 ft.) below sea level Thickness: 122.8 m (403 ft.)			
6907-7310 (2105.3-2228.1)	Dolomite: grey, micro- to very fine-crystalline, in part sucrosic		
Fort Norman Formation			
Top at 1784.3 m (5854 ft.) below sea level Thickness: 1018.6 m (3342 ft.)			
		43.	I-54b
		Log of Buttes Blackwater Lake I-54A Location: 64°33'44"N, 122°39'40"W Elevation of Kelly Bushing: 242.0 m (794 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
		MESOZOIC	
		Thickness: 43.0 m (141 ft.)	
		564(R)-705(R) (171.9-214.9)	Samples missing
		DEVONIAN	
		Thickness: 630.9 m (2070 ft.)	
		Arnica Formation	
		Top at 27.1 m (89 ft.) above sea level Thickness: 52.7 m (173 ft.)	
		705(R)-790 (214.9-240.8)	Samples missing
		790-878 (240.8-267.6)	Dolomite: very pale buff to very pale grey and creamy white, microcrystalline to aphanitic and chalky-textured; some dark brown stains and very thin black streaks and stylolites; some shale: pale green, waxy
		Fort Norman Formation	
		Top at 25.6 m (84 ft.) below sea level Thickness: 327.4 m (1074 ft.)	
		878-~1400 (267.6-~426.7)	Anhydrite: pale buff to white, some buff to brown and grey
		~1400-1952 (~426.7-595.0)	Anhydrite: as above; some dolomite
		Tsetso Formation	
		Top at 353.0 m (1158 ft.) below sea level Thickness: 250.9 m (823 ft.)	
		1952-2250 (595.0-685.8)	Anhydrite: pale buff to brown and grey, some pink colouring; some dolomite: brick-red, argillaceous; and shale: dolomitic

Borehole Depth feet (m)	Lithology
Canol Formation	
Top at 314.6 m (1032 ft.) above sea level Thickness: 82.9 m (272 ft.)	
341-613 (103.9-186.8)	Shale: black, bituminous, siliceous, micro-micaceous; some pyrite concentrations
Ramparts Formation	
Top at 231.6 m (760 ft.) above sea level Thickness: 19.5 m (64 ft.)	
<u>Platform member</u>	
613-677 (186.8-206.3)	Limestone: brown-grey, very argillaceous and silty
Hare Indian Formation	
Top at 212.1 m (696 ft.) above sea level Thickness: 177.1 m (581 ft.)	
<u>Grey shale member</u> (Thickness: 158.8 m/521 ft.)	
677-1198 (206.3-365.2)	Shale: grey, flaky, calcareous, micro-micaceous, grading downward through grey and brown-grey, slightly calcareous, to grey to dark brown-grey, noncalcareous
<u>Bluefish Member</u> (Thickness: 18.3 m/60 ft.)	
1198-1240 (365.2-378.0)	Shale: black, bituminous, pyritic, noncalcareous
1240-1258 (378.0-383.4)	Shale: black with white calcitic biopatterns; grading to Limestone: argillaceous, bituminous
Hume Formation	
Top at 35.1 m (115 ft.) above sea level Thickness: 250.9 m (823 ft.)	
<u>Upper member</u> (Thickness: 62.5 m/205 ft.)	
1258-1463 (383.4-445.9)	Limestone: buff to grey-brown, pale buff and white, mostly micrograined; some calcite and quartz crystals throughout
<u>Middle member</u> (Thickness: 123.4 m/405 ft.)	
1463-1747 (445.9-532.5)	Limestone: as above, in part argillaceous; some interbedded shale: dark brown-grey
1747-1868 (532.5-569.4)	Very poor samples (cavings)
<u>Headless Member</u> (Thickness: 64.9 m/213 ft.)	
1868-2081 (569.4-634.2)	Mostly shale cavings
Landry Formation	
Top at 215.8 m (708 ft.) below sea level Thickness: >71.6 m (>235 ft.)	
2081-2260 (634.2-688.8)	Limestone: buff to grey-brown, micro-grained to aphanitic; abundant calcite in lower part
2260-2316 (688.8-705.9)	Samples missing

Borehole Depth feet (m)	Lithology
FAULT	
Hume Formation	
Top at 287.4 m (943 ft.) below sea level Thickness: 35.4 m (116 ft.)	
<u>Headless Member</u>	
2316-2370 (705.9-722.4)	Samples missing
2370-2432 (722.4-741.3)	Limestone and shale(?)
Landry Formation	
Top at 322.8 m (1059 ft.) below sea level Thickness: 104.5 m (343 ft.)	
2432-2775 (741.3-845.8)	Very poor samples. Stratigraphic interpretation of contact at "2775 feet"/"845.8 m" is based on acid reaction of powdery samples, adjusted to sonic log
Arnica Formation	
Top at 427.3 m (1402 ft.) below sea level Thickness: 294.1 m (965 ft.)	
2775-2880 (845.8-877.8)	Very poor or missing samples
2880-2950 (877.8-899.2)	Dolomite: grey-buff to dark brown-grey, micro- to very fine-crystalline
2950-3010 (899.2-917.4)	Dolomite: pale grey to dark grey, fine, medium and coarse crystalline; much dolomite: white, very coarse crystalline
3010-3130 (917.4-954.0)	Dolomite: grey-buff to dark brown-grey, micro- to very fine-crystalline
3130-3190 (954.0-972.3)	Dolomite: pale buff to brown-grey, fine, medium and coarse crystalline; much dolomite: white, very coarse crystalline
3190-3512 (972.3-1070.5)	Dolomite: grey-buff to dark brown-grey, micro- to very fine-crystalline; 3320-3360 feet (1011.9-1024.1 m) dolomite: buff to grey-brown, fine, medium and coarse crystalline
3512-3740 (1070.5-1140.0)	Dolomite: buff to pale buff, some brown-grey, microcrystalline to aphanitic, in part anhydritic
Fort Norman Formation (Including Arnica platform)	
Top at 721.5 m (2367 ft.) below sea level Thickness: 426.7 m (1400 ft.)	
3740-4250 (1140.0-1295.4)	Anhydrite: pale buff; and Dolomite: buff to pale buff and brown-grey, microcrystalline to aphanitic Grades downward through mostly anhydrite to mostly dolomite
<u>Arnica platform</u> (Thickness: 129.5 m/425 ft.)	
4250-4500 (1295.4-1371.6)	Dolomite: grey-brown to very dark brown-grey, micro- to very fine-crystalline; oily odour
4500-4605 (1371.6-1403.6)	Dolomite: white, very coarse crystalline Breccia: anhydrite and dolomite
4605-4675 (1403.6-1424.9)	Dolomite: dark grey-brown, microcrystalline
4675-5140 (1424.9-1566.7)	Anhydrite, some dolomite

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
Delorme Group		Delorme Group	
Tsetso Formation		Arnica Platform	
Top at 1148.2 m (3767 ft.) below sea level Thickness: >402.3 m (>1320 ft.)		Top at 533.4 m (1750 ft.) below sea level Thickness: 219.5 m (720 ft.)	
5140-6460 (1566.7-1969.0)	Anhydrite and dolomite: at 5160-5170 feet (1572.8-1575.8 m) and 5260-5270 feet (1603.2-1606.3 m), some pale green colouring and dolomite: in part silty and sandy; at 5300-5340 feet (1615.4-1627.6 m), dolomite: in part very sandy (very fine, fine, medium and coarse grained, rounded quartz); 5830-5880 feet (1777.0-1792.2 m), dolomite: grey-brown to very dark brown-grey, microcrystalline, and some anhydrite; 6180-6200 feet (1883.7-1889.8 m), oily samples	4112-4520 (1253.3-1377.7)	Dolomite: grey and grey-buff to very dark grey and black, micro- and very fine-crystalline, in part micro-sucrosic; some anhydrite
Total depth: 1969.0 m		Delorme Group	
45. I-70d		Top at 752.9 m (2470 ft.) below sea level Thickness: >2066.5 m (>6780 ft.)	
Log of IOE Dahadinni I-70 Location: 63°19'41"N, 124°56'35"W Elevation of Kelly Bushing: 844.3 m (2770 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log below 4000 feet (1219.2 m).		5240-7990 (1597.2-2435.4)	Anhydrite and some dolomite: pale grey, pale buff, in part microcrystalline, in part anhydritic
DEVONIAN		7990-8240 (2435.4-2511.6)	Dolomite: grey-buff to dark brown-grey, aphanitic to microcrystalline, in part anhydritic
Thickness: >3657.6 m (>12 000 ft.)		8240-12 020 (2511.6-3663.7)	Anhydrite and dolomite: pale buff and pale grey, aphanitic; some dolomite: grey-buff, aphanitic to micro-crystalline
Hume Formation		Total depth: 3663.7 m	
Top at 838.2 m (2750 ft.) above sea level Thickness: 9.1 m (30 ft.)		46. I-70L	
Headless Member		Log of Candex Little Bear I-70 Location: 64°39'44"N, 125°56'35"W Elevation of Kelly Bushing: 416.4 m (1366 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
20(S)-50(S) (6.1-15.2)	Very poor samples, possibly limestone and shale: grey and black	MESOZOIC AND (?)TERTIARY	
Landry Formation		Thickness: 1734.3 m (5690 ft.) Basal beds (Lower Cretaceous ?)	
Top at 829.1 m (2720 ft.) above sea level Thickness: 73.8 m (242 ft.)		5750-5850 (1752.6-1783.1)	Shale: black, bituminous Sandstone: grey, very pale green, fine grained, slightly glauconitic
50(S)-292(R) (15.2-89.0)	Limestone: brown and buff (characteristic "chocolate and fudge"), aphanitic; abundant white calcite veining in bottom 50 feet (15.2 m)	UPPER DEVONIAN	
Arnica Formation		Imperial Formation	
Top at 755.3 m (2478 ft.) above sea level Thickness: 1288.7 m (4228 ft.)		Top at 1366.7 m (4484 ft.) below sea level Thickness: >356.6 m (>1170 ft.), est. 500 m	
292(R)-~1500 (89.0-~457.2)	Dolomite: grey, buff-grey, micro- to very fine-crystalline, micro-sucrosic	5850-6347 (1783.1-1934.6)	Shale: grey, some dark grey, micro-micaceous; some thinly interbedded siltstone and rare sandstone
~1500-~1900 (~457.2-~579.1)	Dolomite: as above, mainly very fine crystalline, micro-sucrosic	Jungle Ridge limestone member (Thickness: 39.3 m/129 ft.)	
~1900-2440(S) (~579.1-743.7)	Dolomite: buff-grey, mainly micro-crystalline	6347-6476 (1934.6-1973.9)	Limestone: grey-buff to very pale buff, micrograined, in part argillaceous (increasingly near base)
2440(S)-~2760 (743.7-~841.2)	Limestone: brown-grey to very dark grey and black, micrograined to aphanitic, argillaceous	6476-6976 (1973.9-2126.3)	Shale: grey, some dark grey, micromicaceous; some thinly interbedded siltstone
~2760-4112 (~841.2-1253.3)	Dolomite: grey to grey-buff, micro- and very fine crystalline, micro-sucrosic	6976-7020 (2126.3-2139.7)	Siltstone: brown, coarse grained, in part siliceous, very slightly calcareous; oily odour; interbedded with Shale: black, splintery, with some carbonaceous remains
		Total depth: 2139.7 m	

47.	1-74
Log of Sinclair Mahony Lake 1-74 Location: 65°23'36"N, 124°43'30"W Elevation of Kelly Bushings: 310.3 m (1018 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	

Borehole Depth feet (m)	Lithology
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MESOZOIC

Thickness: 880.9 m (2890 ft.)
Basal beds (Lower Cretaceous ?)

3070-3130 (935.7-954.0)	Sandstone: fine to very coarse grained, quartzose; some sandstone: fine grained, glauconitic; shale: dark grey, in part highly glauconitic; some pyrite nodules; probably a basal coarse sand or pebbles
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DEVONIAN

Thickness: 635.2 m (2084 ft.)

Hume Formation

Top at 643.7 m (2112 ft.) below sea level
Thickness: 23.2 m (76 ft.)

Headless Member

3130-3206 (954.0-977.2)	Limestone: buff to buff-grey, micro-grained, in part bioclastic and fossiliferous, in part argillaceous Shale: grey, flaky
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Landry Formation

Top at 666.9 m (2188 ft.) below sea level
Thickness: 22.6 m (74 ft.)

3206-3280 (977.2-999.7)	Limestone: pale buff to brown, aphanitic, some micrograined, trace pelletal and bioclastic
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Arnica Formation

Top at 689.5 m (2262 ft.) below sea level
Thickness: 15.2 m (50 ft.)

3280-3330 (999.7-1015.0)	Dolomite: buff, microcrystalline
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Fort Norman Formation

Top at 704.7 m (2312 ft.) below sea level
Thickness: 382.2 m (1254 ft.)

3330-4584 (1015.0-1397.2)	Anhydrite (abundant cavings)
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Tsetso Formation

Top at 1086.9 m (3566 ft.) below sea level
Thickness: 192.0 m (630 ft.)

4584-4632 (1397.2-1411.8)	Dolomite: buff to pale grey, pale green, aphanitic and microcrystalline, in part anhydritic, in part argillaceous, in part sandy; grading to Sandstone: fine to medium grained, very dolomitic, quartzose; some Shale: pale olive-green to green, in part dolomitic
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Borehole Depth feet (m)	Lithology
4632-5178 (1411.8-1578.3)	Dolomite and shale. Dolomite: brick-red, maroon, purple, pale buff, pale grey, pink, pale green, aphanitic and microcrystalline, in part sandy; grading to sandstone Shale: varicoloured, dolomitic; trace anhydrite; shale increases downward
5178-5214 (1578.3-1589.2)	Dolomite and anhydrite: pale buff, pink, brick-red; some shale: pale green, brick-red, dolomitic

CAMBRIAN-SILURIAN

Ronning Group

Franklin Mountain Formation

Top at 1278.9 m (4196 ft.) below sea level
Thickness: 232.6 m (763 ft.)

Rhythmic member

5214-5470 (1589.2-1667.3)	Dolomite: buff to pale buff and pale grey, trace pink, microcrystalline, some very fine crystalline
5470-5650 (1667.3-1722.1)	Dolomite: buff to dark brown, micro- and very fine-crystalline
5650-5800 (1722.1-1767.8)	Dolomite: creamy white to very pale buff and very pale grey with some scattered pale green patches, coarse crystalline and micro- to very fine-crystalline; shale: pale green, in pores, specks and partings; some pyrite
5800-5977 (1767.8-1821.8)	Dolomite: creamy white to buff and pale grey and some brown, microcrystalline and aphanitic; trace shale: pale green and green; near the base, dolomite is pale buff to grey-brown, microcrystalline, in part argillaceous

Includes trace of Cyclic member at base

CAMBRIAN

Saline River Formation

Top at 1511.5 m (4959 ft.) below sea level
Thickness: 32.6 m (107 ft.)

Upper clastic member (Thickness: 13.1 m/43 ft.)

5977-6020 (1821.8-1834.9)	Shale: green, maroon, slightly dolomitic
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Salt member (Thickness: 11.0 m/36 ft.)

6020-6056 (1834.9-1845.9)	Anhydrite and shale: grey, hard, slightly dolomitic
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Lower clastic member (Thickness: 8.5 m/28 ft.)

6056-6084 (1845.9-1854.4)	Shale: pale green, maroon, purple, in part dolomitic
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PROTEROZOIC

Dolomite unit (Reference section)

Top at 1544.1 m (5066 ft.) below sea level
Thickness: >29.3 m (>96 ft.)

Borehole Depth feet (m)	Lithology
6084-6119 (1854.4-1865.1)	Dolomite: maroon to pale pink with some thin blood-red streaks, microcrystalline, mostly siliceous; some chert: white to very pale buff and very pale pink
6119-6180 (1865.1-1883.7)	Dolomite: pale purple to pale red-brown and pink, argillaceous and siliceous
Total depth: 1883.7 m	

48. J-20

Log of Imperial Canyon Creek No. 2
Location: 65°09'36"N, 126°17'35"W
Elevation of Kelly Bushing: 100.3 m (329 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to electric log.

UPPER DEVONIAN

Imperial Formation

Top at 100.3 m (329 ft.) above sea level
Thickness: 240.5 m (789 ft.)

0-60(S)
(0-18.3) **Siltstone:** pale grey, coarse grained, calcareous, micaceous; **siltstone:** grey, micaceous, argillaceous
Shale: dark grey, micromicaceous

60(S)-667
(18.3-203.3) **Shale:** dark grey, micromicaceous

Canyon Creek sandstone lentil
(Thickness: 27.4 m/90 ft.)

667-757
(203.3-230.7) **Sandstone:** pale buff, very fine grained, quartz-rich, silty; grading to
Siltstone: coarse grained

757-789
(230.7-240.5) **Shale:** dark grey, micromicaceous

DEVONIAN

Horn River Group

Canol Formation

Top at 140.2 m (460 ft.) below sea level
Thickness: >4.3 m (>14 ft.)

789-800
(240.5-243.8) **Shale:** brown-black, bituminous

Total depth: 244.8 m

49. J-42

Log of Imperial Redstone No. 1
Location: 64°11'42"N, 124°38'19"W
Elevation of Kelly Bushing: 71.6 m (235 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to electric log; no log below
4230 feet (1289.3 m); sample quality poor.

MESOZOIC

Thickness: 146.3 m (480 ft.)
Basal beds (Lower Cretaceous ?)

Borehole Depth feet (m)	Lithology
470-520? (143.3-158.5?)	Sandstone: pale grey, fine to medium grained, poorly sorted, silty, chert/quartz, slightly calcareous, in part very micaceous; some black shale partings and fine disseminated pyrite; at base sandstone is medium to coarse grained

UPPER DEVONIAN

Imperial Formation

Top at 86.9 m (285 ft.) below sea level
Thickness: 384.0 m (1260 ft.)

520?-1780
(158.5?-542.5) **Shale:** dark grey, micromicaceous

DEVONIAN

Thickness: >941.8 m (>3090 ft.)

Horn River Group

Thickness: 257.6 m (845 ft.)

Canol Formation

Top at 470.9 m (1545 ft.) below sea level
Thickness: 73.2 m (240 ft.)

1780-2020
(542.5-615.7) **Shale:** black and very dark grey, bituminous, siliceous; some pyrite

Hare Indian Formation

Top at 544.1 m (1785 ft.) below sea level
Thickness: 184.4 m (605 ft.)

Grey shale member
(Thickness: 176.8 m/580 ft.)

2020-2600
(615.7-792.5) **Shale:** grey to buff-grey, flaky- to splintery, micromicaceous

Bluefish Member
(Thickness: 7.6 m/25 ft.)

2600-2625
(792.5-800.1) Very poor samples – some **shale:** black, and some pyrite

Hume Formation

Top at 728.5 m (2390 ft.) below sea level
Thickness: 214.9 m (705 ft.)

Upper member
(Thickness: 47.2 m/155 ft.)

2625-2780
(800.1-847.3) **Limestone:** grey-brown, grey-buff, micro- to very fine-grained

Middle member
(Thickness: 118.9 m/390 ft.)

2780-2965
(847.3-903.7) **Limestone and shale**

2965-3170
(903.7-966.2) **Limestone:** grey, grey-brown and white, micrograined and very fine grained

Headless Member
(Thickness: 48.8 m/160 ft.)

3170-3330
(966.2-1015.0) **Limestone:** in part argillaceous, in part aphanitic
Shale: very dark grey, splintery

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
	Landry Formation		
Top at 943.4 m (3095 ft.) below sea level Thickness: 91.4 m (300 ft.)		460-480 (140.2-146.3)	Poor samples – calcite and reef debris(?)
3330-3630 (1015.0-1106.4)	Limestone: grey to buff, aphanitic, some micro- to very fine-grained		Hare Indian Formation
			Top at 71.3 m (234 ft.) above sea level Thickness: 153.3 m (503 ft.)
	Arnica Formation		<u>Grey shale member</u> (Thickness: 140.2 m/460 ft.)
Top at 1034.8 m (3395 ft.) below sea level Thickness: 27.4 m (90 ft.)		480-600 (146.3-182.9)	Shale: pale grey, silty, very micaceous
3630-3720 (1106.4-1133.9)	Dolomite: grey-buff, grey-brown, micro-crystalline, tight	600-940 (182.9-286.5)	Shale: grey, brown-grey, slightly silty, slightly calcareous, micromicaceous, grading downward through grey, pale grey and brown-grey, flaky, slightly calcareous, micromicaceous, to dark brown-grey, noncalcareous in lower 100 feet (30.5 m)
	Fort Norman Formation		<u>Bluefish Member</u> (Thickness: 13.1 m/43 ft.)
Top at 1062.2 m (3485 ft.) below sea level Thickness: 237.7 m (780 ft.)		940-968 (286.5-295.1)	Shale: black, bituminous with spores
3720-4500 (1133.9-1371.6)	Anhydrite	968-983 (295.1-299.6)	Shale: black with calcite and white calcitic streaks
	Arnica Platform		Hume Formation
Top at 1300.0 m (4265 ft.) below sea level Thickness: >112.8 m (>370 ft.)			Top at 82.0 m (269 ft.) below sea level Thickness: 85.0 m (279 ft.)
4500-4870 (1371.6-1484.4)	Dolomite: buff to brown, microcrystalline		<u>Upper member</u> (Thickness: 34.1 m/112 ft.)
Total depth: 1485.6 m		983-1018 (299.6-310.3)	Poor samples – limestone: buff and grey-buff, micrograined; possibly some shale
		1018-1043 (310.3-317.9)	Shale: grey, calcareous
		1043-1095 (317.9-333.8)	Limestone: buff, pale buff, white, micro-grained, fossiliferous
			<u>Middle member</u> (Thickness: 31.1 m/102 ft.)
		1095-1140 (333.8-347.5)	Limestone: as above; some interbedded shale: grey, calcareous
		1140-1158 (347.5-353.0)	Shale (?)
		1158-1198 (353.0-365.2)	Limestone: buff to white, very fossiliferous; interbedded Shale: grey, calcareous
			<u>Headless Member</u> (Thickness: 19.5 m/64 ft.)
		1198-1262 (365.2-384.7)	Shale: black, flaky, slightly calcareous, micromicaceous; some limestone: buff to white, very fossiliferous, and interbedded shale: grey, flaky, slightly calcareous, micromicaceous
	UPPER DEVONIAN		
	Imperial Formation		
Top at 217.6 m (714 ft.) above sea level Thickness: 54.3 m (178 ft.)			
0-140 (0-42.7)	Samples missing		
140-178 (42.7-54.3)	Shale: dark grey, micromicaceous Siltstone: grey, argillaceous, micaceous		
	DEVONIAN		
Thickness: >406.6 m (>1334 ft.)			
	<u>Horn River Group</u>		
Thickness: 245.4 m (805 ft.)			
	Canol Formation		
Top at 163.4 m (536 ft.) above sea level Thickness: 92.0 m (302 ft.)			
178-408 (54.3-124.4)	Shale: black, bituminous; some free bitumen	1262-1298 (384.7-395.6)	Limestone: brown, some buff, in part pelletal, in part aphanitic
	<u>Allochthonous limestone</u> (Thickness: 21.9 m/72 ft.)		Arnica Formation
408-460 (124.4-140.2)	Shale: black with shell fragments and much calcite, pale buff; trace reef limestone		Top at 178.0 m (584 ft.) below sea level Thickness: 42.7 m (140 ft.)

Borehole Depth feet (m)	Lithology
1298-1438 (395.6-438.3)	Dolomite: buff, brown, very fine crystalline, some microcrystalline, in part microcrystalline; some bitumen residue in intercrystalline porosity; possible anhydrite around 1400 feet (426.7 m)
Fort Norman Formation	
Top at 220.7 m (724 ft.) below sea level Thickness: >22.6 m (>74 ft.)	
1438-1455 (438.3-443.5 m)	Dolomite: buff, anhydritic; some anhydrite
1455-1490 (443.5-454.1)	Anhydrite: pale buff and white
1490-1512 (454.1-460.9)	Samples missing
Total depth: 460.9 m	

51.	J-65
Log of Candel Tate J-65 Location: 64°24'39"N, 125°26'48"W Elevation of Kelly Bushing: 607.5 m (1993 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	

MESOZOIC

Thickness: 1664.8 m (5462 ft.)
Basal beds (Lower Cretaceous ?)

5725-5742 (1745.0-1750.2)	Sandstone: fine grained, siliceous, quartz/chert; some pyrite; trace glauconite
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DEVONIAN

Thickness: 567.5 m (1862 ft.)

Horn River Group

Thickness: 78.3 m (257 ft.)

Hare Indian Formation

Top at 1142.7 m (3749 ft.) below sea level
Thickness: 78.3 m (257 ft.)

Black shale member
(Thickness: 29.9 m/98 ft.)

5742-5840 (1750.2-1780.0)	Shale: black, noncalcareous, bituminous, in part siliceous; some pyrite; some thin calcite veins
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Grey shale member
(Thickness: 32.6 m/107 ft.)

~5840-5947 (~1780.0-1812.6)	Shale: very dark grey, very micromaceous; some fine disseminated pyrite; some siltstone: grey and dark grey
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Bluefish Member
(Thickness: 15.8 m/52 ft.)

5947-5999 (1812.6-1828.5)	Shale: black bituminous, noncalcareous; some limestone: black with white streaks, hard
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Borehole Depth feet (m)	Lithology
Hume Formation	
Top at 1221.0 m (4006 ft.) below sea level Thickness: 123.4 m (405 ft.)	
Upper member (Thickness: 31.4 m/103 ft.)	
5999-6102 (1828.5-1860.0)	Dolomite: buff to white, fine, medium and coarse crystalline
Middle member (Thickness: 45.1 m/148 ft.)	
6102-6197 (1860.0-1888.9)	Limestone: grey-buff, micrograined, in part argillaceous; trace pyrite
6197-6250 (1888.9-1905.0)	Limestone: grey-buff, micrograined; some limestone: pale buff, chalky
Headless Member (Thickness: 46.9 m/154 ft.)	
6250-6404 (1905.0-1951.9)	Limestone: buff-grey, micrograined, pyritic; some limestone: very fine grained, argillaceous; some shale: grey, calcareous

Landry Formation

Top at 1344.5 m (4411 ft.) below sea level
Thickness: 50.6 m (166 ft.)

6404-6477 (1951.9-1974.2)	Limestone: buff, brown, dark brown, pale buff, white, micrograined, very fine and fine grained, in part argillaceous
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6477-6570 (1974.2-2002.5)	Limestone: buff, aphanitic, in part micrograined; some limestone: dark brown, argillaceous; probably some interbedded shale: black, calcareous
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Arnica Formation

Top at 1395.1 m (4577 ft.) below sea level
Thickness: 24.4 m (80 ft.)

6570-6650 (2002.5-2026.9)	Dolomite: buff, pale buff, microcrystalline, in part microcrystalline, in part argillaceous
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Fort Norman Formation

(Breccia equivalent)

Top at 1419.5 m (4657 ft.) below sea level
Thickness: 167.6 m (550 ft.)

~6650-~7200 (~2026.9-~2194.6)	Dolomite: grey-brown, grey, buff, white, micro- and very fine-crystalline, in part heavily veined - appearance of solution breccia
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Arnica Platform

Top at 1587.1 m (5207 ft.) below sea level
Thickness: 123.1 m (404 ft.)

~7200-7604 (~2194.6-2317.7)	Dolomite: mainly buff, microcrystalline; possibly some dolomite, as above
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CAMBRIAN-SILURIAN

Ronning Group

Franklin Mountain Formation

Top at 1710.2 m (5611 ft.) below sea level
Thickness: >516.3 m (>1694 ft.)

Cherty member
(Thickness: 160.3 m/526 ft.)

Borehole Depth feet (m)	Lithology
7604-8130 (2317.7-2478.0)	Dolomite: pale grey, pale buff, micro- to fine-crystalline; top 30 feet (9.1 m) sandy, in part grading to sandstone: quartzose, dolomitic; floating sand; medium and coarse grained, quartz, rounded; rare traces of pale green and pink colouring; trace shale: pale green; dolomite: grading downward to micro-crystalline to aphanitic; very rare chert: milky white, trace pink at base
	Rhythmic member (Thickness: 247.5 m/812 ft.)
8130-~8400 (2478.0-~2560.3)	Dolomite: dark grey-brown to grey-buff, aphanitic to microcrystalline, in part slightly argillaceous; probably some interbedded shale: very dark grey, dolomitic; grading to argillaceous dolomite
~8400-8942 (~2560.3-2725.5)	Dolomite: dark grey-brown, brown-grey, grey, buff, mostly microcrystalline, in part argillaceous; some interbedded shale: very dark grey, dolomitic
	Cyclic member (Thickness: >108.5 m/>356 ft.)
8942-9298 (2725.5-2834.0)	Dolomite: grey, brown-grey, buff-grey, mostly argillaceous and in part silty; some shale: green-grey, dolomitic
	Total depth: 2839.0 m
52.	J-76

Log of Imperial Mac No. 1
Location: 65°15'30"N, 126°59'00"W
Elevation of Kelly Bushing: 50.9 m (167 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to electric log.

MESOZOIC

Thickness: >154.2 m (>506 ft.)
Basal beds (Lower Cretaceous)

785-800 (239.3-243.8)	Sandstone: very pale grey, fine to very fine grained, quartz-rich, slightly glauconitic, in part micaceous
800-806 (243.8-245.7)	Sample missing

UPPER DEVONIAN

Imperial Formation

Top at 194.8 m (639 ft.) below sea level
Thickness: 364.5 m (1196 ft.)

806-1315 (245.7-400.8)	Siltstone: grey, micaceous Sandstone: pale grey, very fine grained, silty, micaceous, grading to sandy siltstone Siltstone: grey, argillaceous, micromicaceous Shale: dark grey, micromicaceous; 1024 feet (312.1 m) – spore study by D.C. McGregor (see Appendix 1)
1315-2002 (400.8-610.2)	Shale: dark grey, flaky to splintery, micromicaceous; some siltstone: green-grey, micaceous in the upper half

Borehole Depth feet (m)	Lithology
	DEVONIAN
	Thickness: >348.7 m (>1144 ft.)
	Horn River Group
	Thickness: 340.8 m (1118 ft.)
	Canol Formation
	Top at 559.3 m (1835 ft.) below sea level Thickness: 27.4 m (90 ft.)
2002-2044 (610.2-623.0)	Limestone: brown, translucent, fine grained, crystalline textured, siliceous; some shale: brown, noncalcareous; some limestone: brown, siliceous, argillaceous
2044-2071 (623.0-631.2)	Shale: dark brown-grey, bituminous; some shale: hard, dolomitic, bituminous
2071-2092 (631.2-637.6)	Shale: dark grey-brown, dolomitic and/or calcareous, hard, bituminous
	Ramparts Formation
	Top at 586.7 m (1925 ft.) below sea level Thickness: 150.3 m (493 ft.)
	Reef member (Thickness: 117.7 m/386 ft.)
2092-2478 (637.6-755.3)	Limestone: reef; 2262 feet (689.5 m) – Middle or Late Devonian, 2290 feet (698.0 m) – Late Devonian, <i>mackensiense</i> Zone (Geological Survey of Canada, Paper 71-15, p. 21)
	Platform member (Thickness: 32.6 m/107 ft.)
2478-2585 (755.3-787.9)	Limestone: pale buff, mostly fine to coarse grained, bioclastic and fossiliferous
	Hare Indian Formation
	Top at 737.0 m (2418 ft.) below sea level Thickness: 163.1 m (535 ft.)
	Grey shale member (Thickness: 154.5 m/507 ft.)
2585-2640 (787.9-804.7)	Shale: grey, slightly calcareous, very micaceous Siltstone: grey, slightly calcareous, micaceous
2640-3092 (804.7-942.4)	Shale: grey, slightly calcareous, very micaceous, in part silty
	Bluefish Member (Thickness: 8.5 m/28 ft.)
3092-3120 (942.4-951.0)	Shale: brown-black, calcareous, bituminous, micromicaceous Limestone: brown, dark brown, in part argillaceous, much bituminous residue; trace fibrous calcite 3105-3110 feet (946.4-947.9 m) – spore study by D.C. McGregor (see Appendix 1). 3110 feet (947.9 m) – spore study by A.R. Sweet (see Appendix 1)
	Hume Formation
	Top at 900.1 m (2953 ft.) below sea level Thickness: >7.9 m (>26 ft.)
3120-3146 (951.0-958.9)	Limestone: buff, brown, aphanitic and micrograined, fossiliferous
	Total depth: 958.9 m

53.	K-03
Log of Aquit. Dodo Canyon K-03 Location: 65°02'33"N, 126°46'14"W Elevation of Kelly Bushing: 308.5 m (1012 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	

Borehole Depth feet (m)	Lithology
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MESOZOIC

Thickness: 907.1 m (2976 ft.)
Basal beds (Lower Cretaceous ?)

2876-2976 (876.6-907.1)	Sandstone: very pale grey, fine to very fine grained, quartz-rich, calcareous, glauconitic Siltstone: pale grey, coarse grained, slightly calcareous, slightly glauconitic; siltstone: grey, argillaceous, micromicaceous 2953-2976 feet (900.1-907.1 m) – trace sandstone: fine grained, quartzose, glauconitic
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UPPER DEVONIAN

Imperial Formation

Top at 598.6 m (1964 ft.) below sea level
Thickness: 675.4 m (2216 ft.)

2976-~3400 (907.1-1036.3)	Shale: dark grey, micromicaceous; interbedded with Siltstone: grey, in part coarse grained, micaceous
~3400-4266 (~1036.3-1300.3)	Sandstone: pale grey, pale green-grey, very fine grained, micaceous Siltstone: grey, coarse grained, very micaceous, slightly calcareous; siltstone: grey, micaceous Shale: dark grey, silty, micromicaceous
4266-5192 (1300.3-1582.5)	Shale: dark grey to black, micromicaceous; some thinly interbedded siltstone

DEVONIAN

Thickness: 706.8 m (2319 ft.)

Horn River Group

Thickness: 188.1 m (617 ft.)

Canol Formation

Top at 1274.1 m (4180 ft.)
Thickness: 52.1 m (171 ft.)

5192-5313 (1582.5-1619.4)	Shale: brown-black, bituminous, hard, siliceous; some pyrite; some chert: brown, dolomitic; some black shell fragments; trace "beefy" calcite; trace dolomite: brown, siliceous
5313-5363 (1619.4-1634.6)	Shale: very dark brown-grey and black, bituminous

Hare Indian Formation

Top at 1326.2 m (4351 ft.) below sea level
Thickness: 135.9 m (446 ft.)

Black shale member
(Thickness: 121.6 m/399 ft.)

Borehole Depth feet (m)	Lithology
5363-5762 (1634.6-1756.3)	Shale: brown-black, siliceous, variably calcareous, bituminous (some free bitumen), micromicaceous; some pyrite; some black shell fragments; some chert: brown to black with white specks; trace limestone: brown, pale brown, brown-black, in part siliceous; trace glauconite concentrations in black shale; 5740-5760 feet (1750.0-1755.6 m) – trace shale: green-grey, very micaceous

Bluefish Member
(Thickness: 14.3 m/47 ft.)

5762-5785 (1756.3-1763.3)	Shale: brown-black, slightly calcareous, bituminous
5785-5809 (1763.3-1770.6)	Shale: brown-black, very calcareous; some thin white calcite structures; 5750-5810 feet (1752.6-1770.9 m) – spore study by D.C. McGregor (see Appendix 1)

Hume Formation

Top at 1462.1 m (4797 ft.) below sea level
Thickness: 118.6 m (389 ft.)

Upper member
(Thickness: 61.6 m/202 ft.)

5809-6011 (1770.6-1832.2)	Limestone: buff, brown, some aphanitic, some fine grained, some silty and micaceous (Note: "chocolate" brown and buff coloured aphanitic limestone gives Upper member here a Landry-like appearance)
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Middle member
(Thickness: 31.7 m/104 ft.)

6011-6079 (1832.2-1852.9)	Limestone: grey-brown, white and buff, bioclastic, fossiliferous Shale: grey, calcareous, micromicaceous
6079-6115 (1852.9-1863.9)	Limestone: buff-grey, white, grey-brown, bioclastic, fossiliferous, micro- to fine-grained

Headless Member
(Thickness: 25.3 m/83 ft.)

6115-6198 (1863.9-1889.2)	Limestone: as above, silty and argillaceous; some shale: grey, silty, calcareous, micromicaceous
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Landry Formation

Top at 1580.7 m (5186 ft.) below sea level
Thickness: 17.7 m (58 ft.)

6198-6256 (1889.2-1906.8)	Limestone: brown ("chocolate") and buff ("fudge"), aphanitic and pelletal
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Arnica Formation

Top at 1598.4 m (5244 ft.) below sea level
Thickness: 29.0 m (95 ft.)

6256-6351 (1906.8-1935.8)	Dolomite: buff to brown, very fine crystalline, sucrosic; in part anhydritic near base
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Fort Norman Formation

Top at 1627.3 m (5339 ft.) below sea level
Thickness: 353.6 m (1160 ft.)

6351-7511 (1935.8-2289.4)	Anhydrite: generally buff and pale buff; some interbedded dolomite, especially in lower 150 feet (45.7 m)
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Borehole Depth feet (m)	Lithology
CAMBRIAN-SILURIAN	
<u>Ronning Group</u>	
Thickness: 443.5 m (1455 ft.)	
Mount Kindle Formation	
Top at 1980.9 m (6499 ft.) below sea level Thickness: 23.8 m (78 ft.)	
7511-7589 (2289.4-2313.1)	Dolomite: buff, fine and medium crystalline, in part pyritic
Franklin Mountain Formation	
Top at 2004.7 m (6577 ft.) below sea level Thickness: 419.7 m (1377 ft.)	
<u>Upper dolomite member</u> (Thickness: 13.7 m/45 ft.)	
7589-7608 (2313.1-2318.9)	Dolomite: very pale buff-grey to white, microscurosis
7608-7634 (2318.9-2326.8)	Dolomite: pale buff to creamy white, trace pink, fine, medium and coarse crystalline; some shale: green, green-grey, waxy, in part filling porosity
<u>Cherty member</u> (Thickness: 177.4 m/582 ft.)	
7634-7680 (2326.8-2340.9)	Dolomite: pale buff, very fine crystalline; some chert: white and clear quartz
7680-8216 (2340.9-2504.2)	Dolomite: pale buff to creamy white, buff, pink, very fine, fine medium and coarse crystalline; traces shale: green, waxy, in part filling porosity; trace chert: white; dolomite grades downward to pale buff, buff, grey-buff, pink, some green, very fine to medium crystalline; trace chert: white
<u>Rhythmic member</u> (Thickness: 189.0 m/620 ft.)	
8216-8836 (2504.2-2693.2)	Dolomite: grey-buff, brown, pale buff, white, microcrystalline, very fine, and fine crystalline; at 8450-8460 feet (2575.6-2578.6 m) one fragment of oolitic chert; dolomite grades downward to brown, buff, grey, micro- and very fine-crystalline
<u>Cyclic member</u> (Thickness: 39.6 m/130 ft.)	
8836-8966 (2693.2-2732.8)	Dolomite: grey-brown, grey-buff, micro-crystalline, in part argillaceous Shale: brown-grey, dolomitic

CAMBRIAN

Saline River Formation

Top at 2424.4 m (7954 ft.) below sea level
Thickness: >13.4 m (>44 ft.)

Upper clastic member

8966-9010
(2732.8-2746.2) Shale: maroon, grey-green, dolomitic

Total depth: 2746.2 m

54.	K-14
Log of Candel Fort Norman K-14 Location: 64°53'42"N, 125°18'08"W Elevation of Kelly Bushing: 115.5 m (379 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	

Borehole Depth feet (m)	Lithology
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MESOZOIC AND (?)TERTIARY

Thickness: 676.0 m (2218 ft.)
Basal beds (Lower Cretaceous ?)

2150-2210 (655.3-673.6)	Poor samples – mainly shale
2210-2218 (673.6-676.0)	Probably a basal bed of sandstone: white and some pale pink, fine to very coarse grained, very poorly sorted, quartzose and quartzitic

CAMBRIAN-SILURIAN

Ronning Group

Franklin Mountain Formation

Top at 560.5 m (1839 ft.) below sea level
Thickness: >180.4 m (>592 ft.)

Cherty member

2218-2250 (676.0-685.8)	Abundant chert: white; some dolomite: secondary pyrite; possibly partly dissolved beds at paleo-erosion surface
2250-2810 (685.8-856.5)	Dolomite: buff to creamy white, very fine to medium crystalline; some chert: white; in upper part, evidence of leaching, and quartz sand grains and traces green shale; dolomite grades downward to mainly buff, grey-buff, brown, traces of pink and pale green colouring, very fine and fine crystalline; trace shale: green, waxy; trace quartz crystals and chert: pale buff and white, oolitic

Total depth: 856.5 m

55.	K-24
Log of Ashland Tedji Lake K-24 Location: 67°43'38"N, 126°49'56"W Elevation of Kelly Bushing: 346.9 m (1138 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	

DEVONIAN

Thickness: 170.4 m (559 ft.)

Landry Formation

Top at 306.6 m (1006 ft.) above sea level
Thickness: 124.4 m (408 ft.)

132-540 (40.2-164.6)	Limestone: buff to pale buff, mostly aphanitic
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Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
Arnica Formation		Upper clastic member (Thickness: 48.8 m/160 ft.)	
Top at 182.3 m (598 ft.) above sea level Thickness: 46.0 m (151 ft.)		3050-3210 (929.6-978.4)	Shale: maroon, green, grey-green, purple, brown; some interbedded dolomite: pale buff to pale grey, micro-crystalline to aphanitic; trace anhydrite
540-640 (164.6-195.1)	Dolomite: buff to brown, very fine crystalline and microcrystalline		Salt member (Thickness: 51.2 m/168 ft.)
~640-691 (~195.0-210.6)	Dolomite: pale buff to grey-buff and grey, microcrystalline to aphanitic	3210-3378 (978.4-1029.6)	Halite
CAMBRIAN-SILURIAN		Lower clastic member (Thickness: 24.1 m/79 ft.)	
Ronning Group		3378-3457 (1029.6-1053.7)	Shale: grey-green, olive-green, grey Dolomite: grey-buff to grey Anhydrite: pale grey and pale buff to white
Thickness: 719.0 m (2359 ft.)		Mount Cap Formation	
Mount Kindle Formation		Top at 706.8 m (2319 ft.) below sea level Thickness: 88.1 m (289 ft.)	
Top at 136.2 m (447 ft.) above sea level Thickness: 94.5 m (310 ft.)		Member f (Thickness: 3.4 m/11 ft.)	
691-960 (210.6-292.6)	Dolomite: pale buff, some pale grey-buff, mostly very fine crystalline, some microcrystalline and fine crystalline; grades downward to pale buff, pale grey, very fine and fine crystalline with intercrystalline porosity	3457-3468 (1053.7-1057.0)	Shale: black and green
960-1001 (292.6-305.1)	Dolomite: buff to brown, very fine to fine crystalline, tight	Member e (Thickness: 15.8 m/52 ft.)	
Franklin Mountain Formation		3468-3520 (1057.0-1072.9)	Dolomite: brown, very fine and fine crystalline; some medium crystalline
Top at 41.8 m (137 ft.) above sea level Thickness: 624.5 m (2049 ft.)		Member d (Thickness: 21.3 m/70 ft.)	
Cherty member (Thickness: 429.5 m/1409 ft.)		3520-3590 (1072.9-1094.2)	Shale: black and green; some dolomite: as above
1001-2410 (305.1-734.6)	Dolomite: white to pale grey and pale buff, medium and coarse crystalline; some chert (1001-1140 ft./305.1-347.5 m, very much chert, some after oolite); at top some shale: green, and some intercrystalline green clay and trace pyrite; dolomite grades downward through very fine, fine and medium crystalline to pale buff to pale grey, some micro- and very fine-crystalline, some fine, medium and coarse crystalline and in parts some chert	3590-3622 (1094.2-1104.0)	Dolomite: brown, very fine and fine crystalline; some medium crystalline
Rhythmic member (Thickness: 112.8 m/370 ft.)		Member b (Thickness: 16.8 m/55 ft.)	
2410-2780 (734.6-847.3)	Dolomite: mostly pale buff and pale grey, some grey-buff, micro- and very fine-crystalline; trace green shale and clay and pale green colouring	3622-3677 (1104.0-1120.7)	Shale: dark grey-green, slightly dolomitic
Cyclic member (Thickness: 82.3 m/270 ft.)		Member a (Thickness: 21.0 m/69 ft.)	
2780-2997 (847.3-913.5)	Dolomite: buff to grey and brown, mostly microcrystalline to aphanitic and argillaceous; increasing amounts downward of interbedded Shale: grey, brown-grey, green, grey, slightly dolomitic	3677-3706 (1120.7-1129.6)	Shale: as above; interbedded with Dolomite: brown, fine, medium and coarse crystalline
2997-3050 (913.5-929.6)	Dolomite: grey to buff and brown, micro-crystalline to aphanitic, in part argillaceous; interbedded Shale: green to grey-green	3706-3726 (1129.6-1135.7)	Dolomite: brown and dark brown, fine, medium and coarse crystalline; some glauconite pellets
CAMBRIAN		3726-3744 (1135.7-1141.2)	Shale: dark grey-green and olive-green, in part splintery to flaky, in part waxy
Saline River Formation		3744-3746 (1141.2-1141.8)	Dolomite: brown to pale buff, fine and medium crystalline; some glauconite
Top at 582.8 m (1912 ft.) below sea level Thickness: 124.1 m (407 ft.)		Mount Clark Formation	
CAMBRIAN		Top at 794.9 m (2608 ft.) below sea level Thickness: 5.5 m (18 ft.)	
Saline River Formation		3746-3747 (1141.8-1142.1)	Sandstone: brown, fine grained, poorly sorted, in part silty, quartzose; some sand: medium and coarse grained, quartz, subrounded

Borehole Depth feet (m)	Lithology
3747-3751 (1142.1-1143.3)	Siltstone: white to buff, mostly coarse grained, siliceous, slightly dolomitic
3751-3764 (1143.3-1147.3)	Sandstone: mostly brown, very fine grained, silty, quartzose, oil-stained; samples contain some sand: medium and coarse grained, quartz, rounded; 3752 feet (1143.6 m) (R) sidewall core – shale: dark green with traces sandstone, dolomite and anhydrite (Note: sample 3760-3770 ft./1146.0-1149.1 m, is 40-50% dolomite: pale grey and pale buff, aphanitic; this constitutes an average of 10% of the deeper borehole samples)
PROTEROZOIC	
Shale unit	
Top at 800.4 m (2626 ft.) below sea level Thickness: >65.8 m (>216 ft.)	
3764-3797 (1147.3-1157.3)	Siltstone: maroon, coarse grained, hard, siliceous, in part argillaceous Shale: maroon, purple-brown, olive-green, grey-green, mostly hard, in part silty
3797-3980 (1157.3-1213.1)	Siltstone: grey to dark brown-grey, coarse grained, siliceous, grading to and thinly interbedded with Sandstone: very fine grained, silty, siliceous Some very thinly interlaminated shale: black Total depth: 1213.1 m
56.	K-29
Log of Amoco Red Dog K-29 Location: 64°08'43"N, 125°34'55"W Elevation of Kelly Bushing: 560.5 m (1839 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
DEVONIAN	
Thickness: >2148.8 m (>7050 ft.)	
Hume Formation	
Top at 560.5 m (1839 ft.) above sea level Thickness: 33.5 m (110 ft.)	
Headless Member	
0-50 (0-15.2)	Samples missing
50-110(S) (15.2-33.5)	Looks like limestone: bioclastic, fossiliferous
Landry Formation	
Top at 527.0 m (1729 ft.) above sea level Thickness: 204.2 m (670 ft.)	
110(S)-640 (33.5-195.1)	Limestone: dark brown to dark grey and grey-buff, micrograined to aphanitic; trace pellets
~640-780 (-195.1-237.7)	Limestone: grey-buff and brown, micrograined, dolomitic Dolomite: buff, very fine crystalline

Borehole Depth feet (m)	Lithology
Arnica Formation	
Top at 322.8 m (1059 ft.) above sea level Thickness: 176.2 m (578 ft.)	
~780-1260 (-237.7-384.0)	Dolomite: mainly buff, very fine crystalline, some fine crystalline, sucrosic, intercrystalline porosity; some dolomite: buff, microcrystalline with pinpoint porosity
1260-1358 (384.0-413.9)	Samples missing
Fort Norman Formation	
Top at 146.6 m (481 ft.) above sea level Thickness: 271.9 m (892 ft.)	
1358-1550 (413.9-472.4)	Samples missing
1550-1610 (472.4-490.7)	Dolomite and anhydrite – possibly much breccia
1610-2010 (490.7-612.6)	Samples missing
2010-2020 (612.6-615.7)	Dolomite and anhydrite: as above
2020-2250 (615.7-685.8)	Samples missing
Arnica Platform	
Top at 125.3 m (411 ft.) below sea level Thickness: 204.2 m (670 ft.)	
2250-2670 (685.8-813.8)	Samples missing
2670-2920 (813.8-890.0)	Dolomite: dark grey to grey-buff, very fine and fine crystalline; much veining
Delorme Group	
Top at 329.5 m (1081 ft.) below sea level Thickness: >1258.8 m (>4130 ft.)	
2920-2970 (890.0-905.3)	Very poor samples
2970-3350 (905.3-1021.1)	Dolomite: grey-buff to pale buff, microcrystalline Anhydrite: pale buff
3350-3400 (1021.1-1036.3)	Dolomite: buff, microcrystalline, micro-sucrosic
3400-5460 (1036.3-1664.2)	Anhydrite and dolomite: mainly pale buff, microcrystalline, very fine and fine crystalline; some zones of buff-grey to dark brown-grey and, very rare, pale green colouring of dolomite
5460-6330 (1664.2-1929.4)	Dolomite: buff-grey, grey-buff to pale buff with rare, slightly green colouring and very rare pink, mainly microcrystalline; some anhydrite in upper part decreasing downward to trace, except some at 6275-6285 feet (1912.6-1915.7 m)
Tsetso Formation (Morrow, 1987)	
6330-6471 (1929.4-1972.4)	Dolomite: mainly grey-buff, microcrystalline; some anhydrite
6471-6567 (1972.4-2001.6)	Dolomite: dark brown-grey, microcrystalline, argillaceous; grading to dolomite: black, argillaceous; some pyrite; oily odour

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
6567-6685 (2001.6-2037.6)	Dolomite: buff to dark buff-grey, micro-crystalline, in part argillaceous	Mount Cap Formation	
6685-7050 (2037.6-2148.8)	Dolomite: pale to dark buff-grey, micro-crystalline; some anhydrite	Top at 380.1 m (1247 ft.) below sea level Thickness: 96.3 m (316 ft.)	
Total depth: 2148.8 m		Member g (Thickness: 4.0 m/13 ft.)	
		2451-2460 (747.1-749.8)	Samples missing
		2460-2464 (749.8-751.0)	Dolomite: brown, medium crystalline
57.	K-44	Member f (Thickness: 10.4 m/34 ft.)	
Log of Union Stopover K-44 Location: 67°33'31"N, 123°38'32"W Elevation of Kelly Bushing: 367.0 m (1204 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to density log.		2464-2498 (751.0-761.4)	Shale: dark green to dark grey-green, some very dark grey to black
(Overlain by surficial deposits of igneous, metamorphic and dolomitic rocks)		Members d and e (Thickness: 22.8 m/75 ft.)	
		2498-2573 (761.4-784.3)	Dolomite: brown, medium crystalline Siltstone: grey, brown, pale green-grey, dolomitic, in part glauconitic Shale: dark green to dark grey-green to black
CAMBRIAN-SILURIAN		Member c (Thickness: 15.8 m/52 ft.)	
Ronning Group		2573-2625 (784.3-800.1)	Dolomite: brown, some buff, mostly medium crystalline; some thinly interbedded shale: green; at 2613- 2625 feet (796.4-800.1 m), dolomite: in part argillaceous and interbedded with shale: dark grey-brown, dolomitic
Franklin Mountain Formation		Member b (Thickness: 15.8 m/52 ft.)	
Top at 315.2 m (1034 ft.) above sea level Thickness: 512.7 m (1682 ft.)		2625-2631 (800.1-801.9)	Siltstone: grey to buff and brown, in part very dolomitic, grading to Dolomite, in part highly glauconitic, in part argillaceous; grading to Shale: silty, very micaceous
Cherty member (Thickness: 203.6 m/668 ft.)		2631-2677 (801.9-815.9)	Shale: interlaminated dark grey-green and very dark grey, in part very micaceous Siltstone: green-grey to pale grey, very micaceous, slightly glauconitic
170-630 (51.8-192.0)	Dolomite: very pale buff, very pale grey, milky white, some pale buff and pale grey, very fine, fine, medium and coarse crystalline; some micro- crystalline; some chert: white to very pale buff; trace pyrite throughout	Member a (Thickness: 27.4 m/90 ft.)	
630-838(R) (192.0-255.4)	Samples missing (no returns)	2677-2767 (815.9-843.4)	Siltstone: pale buff, pink-buff, some brick-red, mostly glauconitic and micaceous, in part sandy; grading to Sandstone: very silty Probably some shaly interbeds
Rhythmic member (Thickness: 222.5 m/730 ft.)		Mount Clark Formation	
838(R)-1568(R) (255.4-447.9)	Samples missing (no returns)	Top at 476.4 m (1563 ft.) below sea level Thickness: 24.4 m (80 ft.)	
Cyclic member (Thickness: 86.6 m/284 ft.)		2767-2847 (843.4-867.8)	(R) core - sandstone: red, white, pink, fine and medium grained, quartzose, rounded
1568(R)-1852 447.9-564.5)	Samples missing (no returns)	PROTEROZOIC	
CAMBRIAN		Dolomite unit	
Saline River Formation		Top at 500.8 m (1643 ft.) below sea level Thickness: >74.7 m (>245 ft.)	
Top at 197.5 m (648 ft.) below sea level Thickness: 182.6 m (599 ft.)		2847-2900 (867.8-883.9)	Dolomite: pink, some pale grey, micro- crystalline, tight, in part siliceous; 2880-2900 feet (877.8-883.9 m) some shale: green, splintery
Upper clastic member (Thickness: 83.8 m/275 ft.)			
1852-2127 (564.5-648.3)	Samples missing		
Salt member (Thickness: 55.2 m/181 ft.)			
2127-2308 (648.3-703.5)	Samples missing		
Lower clastic member (Thickness: 43.6 m/143 ft.)			
2308-2451 (703.5-747.1)	Samples missing		

Borehole Depth feet(m)	Lithology	Borehole Depth feet (m)	Lithology
2900-2970 (883.9-905.3)	Dolomite: grey to pale grey and buff, microcrystalline and aphanitic, in part argillaceous; grading to Shale: grey, very dolomitic Some oolite structures	Canol Formation Top at 980.8 m (3218 ft.) below sea level Thickness: 65.2 m (214 ft.)	
2970-3000 (905.3-914.4)	Dolomite: buff to brown and grey, microcrystalline, in part aphanitic and argillaceous	3716-3815 (1132.6-1162.8)	Shale: black, bituminous, in part siliceous; some pyrite
3000-3092 (914.4-942.4)	Dolomite: pale buff, pale grey, some pink and pale green, microcrystalline and aphanitic, in part argillaceous; some shale: pale green, dark green, olive-green, waxy; trace chert: pale green, pale buff; 3050-3060 feet (929.6-932.7 m) dolomite, mostly pink Total depth: 942.4 m	3815-3930 (1162.8-1197.9)	Shale: very dark grey to black, fissile, bituminous; trace pyrite
		Hare Indian Formation Top at 1046.1 m (3432 ft.) below sea level Thickness: 124.7 m (409 ft.)	
		Black shale member (Thickness: 107.0 m/351 ft.)	
		3930-4152 (1197.9-1265.5)	Shale: brown-black, hard, siliceous; trace pyrite
		4152-4281 (1265.5-1304.8)	Shale: brown-black, bituminous, micromicaceous
		Bluefish Member (Thickness: 17.7 m/58 ft.)	
		4281-4339 (1304.8-1322.5)	Shale: brown-black, bituminous, variably calcareous; trace pyrite; at base some limestone: black and white, bituminous, argillaceous
		Hume Formation Top at 1170.7 m (3841 ft.) below sea level Thickness: 136.9 m (449 ft.)	
		Upper member (Thickness: 55.8 m/183 ft.)	
		4339-4522 (1322.5-1378.3)	Limestone: buff, white, brown, micro- to fine-grained, bioclastic
		Middle member (Thickness: 45.4 m/149 ft.)	
		4522-4642 (1378.3-1414.9)	Limestone: grey-buff, white, brown, aphanitic to micrograined, in part argillaceous Shale: grey, brown-grey, calcareous, micromicaceous
		4642-4671 (1414.9-1423.7)	Limestone: grey-buff to white, micro-grained
		Headless Member (Thickness: 35.7 m/117 ft.)	
		4671-4788 (1423.7-1459.4)	Limestone: grey-buff, brown, white, micrograined to fine grained, bioclastic, in part argillaceous; some shale: dark grey, splintery, calcareous
		Landry Formation Top at 1307.6 m (4290 ft.) below sea level Thickness: 36.3 m (119 ft.)	
		4788-4907 (1459.4-1495.7)	Limestone: brown, buff, white, dark brown, in part aphanitic, in part micro- to fine-grained, pelletal
		Arnica Formation Top at 1343.9 m (4409 ft.) below sea level Thickness: 25.3 m (83 ft.)	
		4907-4990 (1495.7-1521.0)	Dolomite: buff and pale buff, micro- to very fine-crystalline, sucrosic
58.	K-71		
Log of C.S. Bluefish K-71 Location: 64°50'30"N, 125°59'30"W Elevation of Kelly Bushing: 151.8 m (498 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.			
MESOZOIC Thickness: 435.5 m (1428 ft.) Basal beds (Lower Cretaceous ?)			
-2018 (-615.1)	Shale: very dark grey, flaky to splintery, micromicaceous		
2018-2028 (615.1-618.1)	Sandstone: weathered rusty, fine grained, very micaceous, in bentonitic clay matrix (Devonian regolith ?)		
UPPER DEVONIAN Imperial Formation Top at 466.3 m (1530 ft.) below sea level Thickness: 514.5 m (1688 ft.)			
2028-2039 (618.1-621.5)	Sandstone: pale green-grey, very fine grained, silty, micaceous, partly weathered rusty		
2039-2580 (621.5-786.4)	Siltstone: pale green-grey, coarse grained, micaceous; siltstone: grey, argillaceous, micromicaceous, grading to Shale: grey, green-grey, silty, micromicaceous Sandstone: pale green-grey, very fine grained, silty, micaceous Traces rusty colouring throughout		
~2580-3716 (-786.4-1132.6)	Shale: dark grey, micromicaceous; rare siltstone: green-grey		
DEVONIAN Thickness: >442.3 m (>1451 ft.) Horn River Group Thickness: 189.9 m (623 ft.)			

Borehole Depth feet(m)	Lithology
Fort Norman Formation	
Top at 1369.2 m (4492 ft.) below sea level Thickness: >53.9 m (>177 ft.)	
4990-5167 (1521.0-1574.9)	Anhydrite
Total depth: 1574.9 m	
59.	K-76
Log of Sinclair Whitefish River K-76 Location: 65°35'32"N, 124°29'16"W Elevation of Kelly Bushing: 241.4 m (792 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
MESOZOIC	
Thickness: 517.6 m (1698 ft.) Basal beds (Lower Cretaceous ?)	
2550-2668 (777.2-813.2)	Sandstone: pale buff, fine to very coarse grained, very poorly sorted, quartzose Shale: very dark grey, splintery, some black, carbonaceous At the base, some coal
DEVONIAN	
Thickness: 322.2 m (1057 ft.)	
Landry Formation	
Top at 571.8 m (1876 ft.) below sea level Thickness: 7.9 m (26 ft.)	
2668-2694 (813.2-821.1)	Limestone: grey-brown to buff and white, micrograined, some pelletal, in part dolomitic
Arnica Formation	
Top at 579.7 m (1902 ft.) below sea level Thickness: 109.4 m (359 ft.)	
2694-2794 (821.1-851.6)	Dolomite: buff to brown, some pale buff, almost "earthy" texture, micro- crystalline
2794-2870 (851.6-874.8)	Dolomite: pale buff, microcrystalline
2870-3053 (874.8-930.6)	Dolomite: buff and brown, micro- to very fine-crystalline, sucrosic; in the lower part, some dolomite: grey-buff, micro- crystalline to aphanitic, anhydritic
Fort Norman Formation	
Top at 689.2 m (2261 ft.) below sea level Thickness: 14.3 m (47 ft.)	
3053-3100 (930.6-944.9)	Anhydrite
Tsetso Formation	
Top at 703.5 m (2308 ft.) below sea level Thickness: 190.5 m (625 ft.)	
3100-3140 (944.9-957.1)	Dolomite: pale buff, pale grey-green, pale grey, microcrystalline to aphanitic, in part very sandy; grading to Sandstone: pale grey, pale green, pink, very poorly sorted, quartzose, dolomitic Shale: pale green, in part dolomitic Trace anhydrite

Borehole Depth feet (m)	Lithology
3140-3250 (957.1-990.6)	Dolomite: brick-red to pale buff, micro- crystalline to aphanitic Shale: brick-red to purple-brown, trace pale green, in part dolomitic Sandstone: varicoloured, quartzose, dolomitic, in part quartzitic Some anhydrite: pink and pale buff
3250-3374 (990.6-1028.4)	Dolomite: pale buff, microcrystalline; some anhydrite: white, pink; some interbedded shale: brick-red
3374-3479 (1028.4-1060.4)	Anhydrite and dolomite: pale buff, pale purple to pink and pale green, micro- crystalline to aphanitic, in part argillaceous
3479-3725 (1060.4-1135.4)	Dolomite: maroon to pale purple, brick- red, pale buff, pale green, aphanitic and microcrystalline Shale: brick-red, purple-brown, pale green, dolomitic, increasing in amount downward Trace of siltstone and sandstone: varicoloured
CAMBRIAN-SILURIAN	
Ronning Group	
Thickness: 370.6 m (1216 ft.)	
Mount Kindle Formation	
Top at 894.0 m (2933 ft.) below sea level Thickness: 140.5 m (461 ft.)	
Upper pale member (Thickness: 86.9 m/285 ft.)	
3725-4010 (1135.4-1222.3)	Dolomite: buff and pale buff, micro- and very fine-crystalline; trace chert: pale buff
Lower dark member (Thickness: 50.6 m/166 ft.)	
4010-4176 (1222.3-1272.8)	Dolomite: as above, little colour change noticeable – top from sonic log cor- relation
Basal member (Thickness: 3.1 m/10 ft.)	
4176-4186 (1272.8-1275.9)	Dolomite: as above, and siltstone: pale buff, coarse grained, dolomitic
Franklin Mountain Formation	
Top at 1034.5 m (3394 ft.) below sea level Thickness: 230.1 m (755 ft.)	
Rhythmic member (Thickness: 214.6 m/704 ft.)	
4186-4300 (1275.9-1310.6)	Dolomite: pale grey to pale buff and creamy white, fine, medium and coarse crystalline; some pale green patches; some pyrite; trace shale: green, waxy
~4300-4425 (~1310.6-1348.7)	Dolomite: pale buff to pale grey, pale green-grey and milky white, micro- and very fine-crystalline; some shale: pale green, waxy
4425-4630 (1348.7-1411.2)	Dolomite: creamy white to very pale grey and pale buff with some green patches, micro- to fine-crystalline, some medium and coarse crystalline; some shale: pale grey-green

Borehole Depth feet (m)	Lithology
~4630-4890 (~1411.2-1490.5)	Dolomite: pale buff to pink, some pale purple, trace pale green, microcrystalline to aphanitic; some shale: pale green and pale purple <u>Cyclic member</u> (Thickness: 15.5 m/51 ft.)
~4890-4941 (~1490.5-1506.0)	Dolomite: grey-buff to dark grey-brown, microcrystalline, in part argillaceous; some shale: buff-grey and grey, dolomitic, in part grading to dolomite: very argillaceous
CAMBRIAN	
Saline River Formation	
Top at 1264.6 m (4149 ft.) below sea level Thickness: 72.8 m (239 ft.)	
<u>Upper clastic member</u> (Thickness: 36.3 m/119 ft.)	
4941-5060 (1506.0-1542.3)	Shale: green, maroon, brown, purple, grey-green, olive-green; interbedded Dolomite: grey-buff, microcrystalline
<u>Salt member</u> (Thickness: 17.7 m/58 ft.)	
5060-5118 (1542.3-1560.0)	Dolomite: grey-buff, microcrystalline and aphanitic, in part anhydritic Anhydrite: white, pale buff, trace pink
<u>Lower clastic member</u> (Thickness: 18.9 m/62 ft.)	
5118-5180 (1560.0-1578.9)	Shale: maroon, purple, green, olive-green, brown Dolomite: pale buff-grey to grey-brown, microcrystalline
Mount Cap Formation	
Top at 1337.5 m (4388 ft.) below sea level Thickness: >28.0 m (>92 ft.)	
<u>Members d and e</u> (Thickness: 12.2 m/40 ft.)	
5180-5220 (1578.9-1591.1)	Siltstone: white to pale grey, coarse grained, slightly dolomitic; some siltstone: grey, siliceous Shale: grey-green, maroon, in part glauconitic Trace dolomite: brown and white, oolitic; in part glauconitic
<u>Member c</u> (Thickness: >15.8 m/>52 ft.)	
5220-5272 (1591.1-1606.9)	Siltstone: white to grey and pale buff, coarse grained and fine grained, dolomitic, in part highly glauconitic (some 50-90% concentrations) Dolomite: buff to grey and brown, siliceous
Total depth: 1606.9 m	
60.	L-04
Log of Shell Keele River L-04 Location: 64°23'37"N, 125°01'43"W Elevation of Kelly Bushing: 262.7 m (862 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	

MESOZOIC AND TERTIARY

Thickness: 698.0 m (2290 ft.)
Basal beds (Lower Cretaceous ?)

Borehole Depth feet (m)	Lithology
2220-2290 (676.7-698.0)	(Overlain by shale). Sandstone: fine to medium grained, poorly sorted, quartz/chert, siliceous, in part with black shale matrix, in part pyritic Shale: black, sandy; some chert fragments (pebbles?) at top; some siltstone: dark brown, sandy
CAMBRIAN	
Mount Cap Formation	
Top at 435.3 m (1428 ft.) below sea level Thickness: >595.0 m (>1952 ft.)	
2290-2486 (698.0-757.7)	Shale: grey, slightly dolomitic, flaky; some shale: pale green, slightly dolomitic Dolomite: brown to buff and white, microcrystalline, siliceous and with quartz veins; at 2392-2398 feet (729.1-730.9 m), dolomite: dark grey-brown, argillaceous and silty
2486-4230 (757.7-1289.3)	Shale: grey-green to grey and brown, in part slightly dolomitic, in part very micromicaceous, and in part silty; rare dolomite: brown, microcrystalline, argillaceous; rare siltstone: brown, grey-green, argillaceous; 3233-3255 feet (985.4-992.1 m) - Middle Cambrian, (W.H. Fritz, Geological Survey of Canada, Paper 70-15, p. 18)
Total depth: 1293.0 m	
61.	L-21
Log of Pex N. Colville L-21 Location: 67°40'37"N, 126°05'37"W Elevation of Kelly Bushing: 308.8 m (1013 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
CAMBRIAN-SILURIAN	
Ronning Group	
Thickness: 821.4 m (2695 ft.)	
Mount Kindle Formation	
Top at 287.4 m (943 ft.) above sea level Thickness: 156.4 m (513 ft.)	
70(S)-430 (21.3-131.1)	Dolomite: buff and pale buff, micro- and very fine-crystalline, some fine crystalline, in part with vuggy porosity
430-550 (131.1-167.6)	Dolomite: very pale grey-buff to pale grey, very fine crystalline; trace pyrite
550-583 (167.6-177.7)	Dolomite: buff with some grey mottling, fine crystalline; trace chert

Franklin Mountain Formation

Top at 131.1 m (430 ft.) above sea level
Thickness: 665.1 m (2182 ft.)

Cherty member
(Thickness: 322.2 m/1057 ft.)

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
583~1640 (177.7~499.9)	Dolomite: pale buff to pale grey and white, fine, medium and coarse crystalline; some chert throughout; abundant chert, milky white, and some quartz, at 640-670 feet (195.1-204.2 m) and 690-730 feet (210.3-222.5 m) Rhythmic member (Thickness: 263.7 m/865 ft.)		Member d (Thickness: 21.0 m/69 ft.)
~1640-2505 (~499.9-763.5)	Dolomite: buff, grey, in parts pale buff and pale grey to white, some grey to brown, micro- and very fine-crystalline, in parts fine and medium crystalline Cyclic member (Thickness: 79.2 m/260 ft.)	3500-3530 (1066.8-1075.9)	Interbedded dolomite and shale. Dolomite: as above Shale: olive-green, pale green
2505-2536 (763.5-773.0)	Dolomite: buff, pale buff, brown, grey, microcrystalline, in part argillaceous; grading to Shale: dolomitic	3530-3569 (1075.9-1087.8)	Siltstone: pale grey, pale buff, pale green, in part coarse grained, dolomitic; some shale: dark green and black; some dolomite: brown, very fine, fine and medium crystalline, in part silty
2536-2580 (773.0-786.4)	Dolomite: pale grey to pale buff and white, microcrystalline, some fine and very fine crystalline		Member c (Thickness: 9.8 m/32 ft.)
2580-2716 (786.4-827.8)	Dolomite: grey-buff to grey and some dark grey-brown, microcrystalline to aphanitic, argillaceous; some shale: very dark grey, dolomitic	3569-3601 (1087.8-1097.6)	Dolomite: mostly brown, very fine, fine and medium crystalline
2716-2765 (827.8-842.8)	Dolomite: as above Shale: brown-grey to very dark grey and some green-grey, dolomitic; traces of micropyrrite		Member b (Thickness: 20.7 m/68 ft.)
	CAMBRIAN	3601-3669 (1097.6-1118.3)	Shale: dark brown to dark grey, some dark red-brown, slightly dolomitic, very micromicaceous
	Saline River Formation		Member a (Thickness: 27.7 m/91 ft.)
	Top at 534.0 m (1752 ft.) below sea level Thickness: 203.0 m (666 ft.)	3669-3683 (118.3-1122.6)	Siltstone: grey to buff, in part very micromicaceous, some white, coarse grained, glauconitic Dolomite: brown, fine and medium crystalline
	Upper clastic member (Thickness: 49.7 m/163 ft.)	3683-3693 (1122.6-1125.6)	Shale: black, micromicaceous
2765-2928 (842.8-892.5)	Shale: maroon, green, purple, brown and black; some dolomite: pale buff, microcrystalline to aphanitic; trace anhydrite Salt member (Thickness: 134.7 m/442 ft.)	3685-3760 (1123.2-1146.1)	Cored
2928-3370 (892.5-1027.2)	Halite Lower clastic member (Thickness: 18.6 m/61 ft.)	3693-3706(R) (1125.6-1129.6)	Shale: pale green and black; some sandstone: pale green, very fine grained
3370-3431 (1027.2-1045.8)	(Very poor samples) – possibly shale, dolomite and anhydrite	3706-3709(R) (1129.6-1130.5)	Dolomite: dark brown, very fine crystalline, vuggy
	Mount Cap Formation	3709-3712(R) (1130.5-1131.4)	Sandstone: pale brown, very fine grained, slightly dolomitic
	Top at 737.0 m (2418 ft.) below sea level Thickness: 100.3 m (329 ft.)	3712-3717(R) (1131.4-1132.9)	Dolomite: dark brown-grey, very fine to medium crystalline, vuggy; some anhydrite
	Member f (Thickness: 14.0 m/46 ft.)	3717-3747(R) (1132.9-1142.1)	Dolomite: glauconitic Sandstone: very fine grained, glauconitic
3431-3477 (1045.8-1059.8)	(Poor samples). Shale: dark green and black, in part slightly dolomitic	3747-3760(R) (1142.1-1146.1)	Sandstone: very fine grained and fine grained, glauconitic, in part silty and shaly; some interbedded shale: green, maroon
	Member e (Thickness: 7.0 m/23 ft.)		Mount Clark Formation
3477-3500 (1059.8-1066.8)	Chert: brown, dark brown, grey-buff (chert mainly at top) Dolomite: brown, buff, some pale buff, in part medium crystalline, in part microcrystalline		Top at 837.3 m (2747 ft.) below sea level Thickness: 13.4 m (44 ft.)
		3760-3804 (1146.1-1159.5)	Shale: maroon, in part very silty and hard; some shale: pale green, waxy Orthoquartzite: pale grey to maroon, in part argillaceous; trace sand: medium and coarse grained
			PROTEROZOIC
			Shale unit
			Top at 850.7 m (2791 ft.) below sea level Thickness: >35.7 m (>117 ft.)
		3804-3900 (1159.5-1188.7)	Siltstone: grey and brown, in part argillaceous; grading to Silty shale: in part sandy and hard; grading to Sandstone: grey, silty, hard; some orthoquartzite

Borehole Depth feet (m)	Lithology
3900-3921 (1188.7-1195.1)	Samples missing
	Total depth: 1195.1 m
62.	L-28
Log of Imperial Seepage Lake No. 1A Location: 65°17'40"N, 126°50'24"W Elevation of Kelly Bushing: 68.3 m (224 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log.	
 UPPER DEVONIAN	
Imperial Formation	
Top at 48.5 m (159 ft.) above sea level Thickness: 176.5 m (579 ft.)	
?65-644 (?19.8-196.3)	Shale: dark grey, micromicaceous
 DEVONIAN	
Thickness: >302.4 m (>992 ft.)	
Horn River Group	
Thickness: 270.7 m (888 ft.)	
Canol Formation	
Top at 128.0 m (420 ft.) below sea level Thickness: 54.3 m (178 ft.)	
644-750 (196.3-228.6)	Shale: very dark grey to black; some pyrite Limestone: very dark grey-brown, micro-grained, argillaceous, bituminous, siliceous
750-822 (228.6-250.5)	Shale: dark brown-grey, siliceous, trace pyrite
Ramparts Formation	
Top at 182.3 m (598 ft.) below sea level Thickness: 57.3 m (188 ft.)	
Platform/Reef equivalent (Thickness: 49.7 m/163 ft.)	
822-930 (250.5-283.5)	Shale: brown-grey, siliceous Limestone: grey-brown, very fine grained, siliceous, argillaceous, bituminous Shale: more siliceous downward, grading to argillaceous chert ; some pyrite
930-985 (283.5-300.2)	Limestone: brown, fine grained, argillaceous, siliceous, bituminous Shale: dark brown-grey, siliceous Some chert : brown; trace pyrite
Siltstone lenticle (Thickness: 7.6 m/25 ft.)	
985-1010 (300.2-307.8)	Siltstone: buff-grey, coarse grained, very calcareous, micaceous, grading in part to very silty limestone ; some shale : grey, calcareous, silty, micaceous
Hare Indian Formation	
Top at 239.6 m (786 ft.) below sea level Thickness: 159.1 m (522 ft.)	

Borehole Depth feet (m)	Lithology
	Grey shale member (Thickness: 144.8 m/475 ft.)
1010-1485 (307.8-452.6)	Shale: buff-grey, calcareous, very micaceous; some ironstone : buff
	Bluefish Member (Thickness: 14.3 m/47 ft.)
1485-1532 (452.6-467.0)	Shale: black, slightly calcareous, bituminous, with spores and shell impressions; in lower part some limestone : brown, shaly, bituminous
 Hume Formation	
Top at 398.7 m (1308 ft.) below sea level Thickness: >31.7 m (>104 ft.)	
1532-1630 (467.0-496.8)	Limestone: pale buff, some brown, micro-grained, in part bioclastic
Total depth: 498.7 m	
63.	L-57
Log of Imperial Goose Island No. 20 L-57 Location: 65°16'34"N, 126°56'10"W Elevation of Kelly Bushing: 46.9 m (154 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
 MESOZOIC	
Thickness: 50.6 m (166 ft.)	
Samples missing	
 UPPER DEVONIAN	
Imperial Formation	
Top at 3.7 m (12 ft.) below sea level Thickness: 349.0 m (1145 ft.) – true vertical; depths (TVD) 166-1311 ft. (50.6-399.6 m)	
200-1300 (61.0-396.2)	Samples missing
1300-1578 (396.2-481.0)	Shale: dark to very dark grey, micromicaceous; some shale : grey-brown, in part silty, micromicaceous
 DEVONIAN	
Horn River Group	
Thickness: >109.7 m (>360 ft.) – TVD 1311-1671 ft. (399.6-509.3 m)	
(?)Canol Formation	
Top at 352.7 m (1157 ft.) below sea level Thickness: 41.5 m (136 ft.) – TVD 1311-1447 ft. (399.6-441.0 m)	
1578-1622 (481.0-494.4)	Limestone: pale brown and brown, fine grained, slightly argillaceous; limestone: dark brown, micrograined, argillaceous and slightly silty Shale: black, bituminous, micromicaceous
1622-1647 (494.4-502.0)	Siltstone: dark brown, argillaceous, bituminous, micaceous; siltstone: grey, coarse grained

Borehole Depth feet (m)	Lithology
1647-1698 (502.0-517.6)	Shale: dark grey, siliceous; trace pyrite
1698-1742 (517.6-531.0)	Shale: brown-black, bituminous, non-calcareous, slightly siliceous, pyritic
Ramparts Formation	
Top at 394.1 m (1293 ft.) below sea level Thickness: >68.3 m (>224 ft.) – TVD 1447-1671 ft. (441.0-509.3 m)	
<u>Reef member</u>	
1742-2012 (531.0-613.3)	Limestone: reef
Total depth: 613.3 m	

64.	L-66
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Log of Candel Police Island L-66
Location: 64°45'38"N, 125°12'57"W
Elevation of Kelly Bushing: 148.1 m (486 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to sonic log.

MESOZOIC AND TERTIARY

Thickness: 943.1 m (3094 ft.)
Basal beds (Lower Cretaceous ?)

3098-3124 (944.3-952.2)	(Overlain by sandstone) Conglomerate: of chert (white, in part oolitic), quartz, dolomite; some sand; coarse grained to granules, quartz
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CAMBRIAN-SILURIAN

Ronning Group

Franklin Mountain Formation

Top at 804.1 m (2638 ft.) below sea level
Thickness: 340.2 m (1116 ft.)

(?)Rhythmic member
(Thickness: 209.7 m/688 ft.)

3124-3812 (952.2-1161.9)	Limestone: brown-grey to pale grey-buff, micrograined, slightly argillaceous; some dolomite: buff to white and pink, micro- and very fine-crystalline; some shale: red and green; grades downward to Dolomite: pale buff to white and pink, micro- to very fine-crystalline; dolomite: in part argillaceous, grading to Shale: red, dolomitic Limestone: as above
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Cyclic member
(Thickness: 130.5 m/428 ft.)

3812-4240 (1161.9-1292.4)	Dolomite: grey-buff to pale buff, mostly argillaceous, in part grading to dolomitic shale, and mostly calcareous; in part grading to limestone: dolomitic, argillaceous; increasing amount downward of shale: grey-green, dolomitic or calcareous; trace shale: red
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Borehole Depth feet (m)	Lithology
CAMBRIAN	
Saline River Formation	
Top at 1144.2 m (3754 ft.) below sea level Thickness: >53.0 m (>174 ft.)	
<u>Upper clastic member</u>	
4240-4414 (1292.4-1345.4)	Siltstone: grey, buff, pink, dolomitic Shale: pale green, maroon, dolomitic
Total depth: 1345.4 m	

65.	M-04
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Log of B.P. White M-04
Location: 65°33'56"N, 123°46'30"W
Elevation of Kelly Bushing: 210.9 m (692 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to sonic log.

MESOZOIC

Thickness: 400.5 m (1314 ft.)
Basal beds (Lower Cretaceous ?)

1407-1464 (428.9-446.2)	(Overlain by sandstone, siltstone, shale) Shale: contains quartz: coarse to very coarse grained and larger
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DEVONIAN

Arnica Formation

Top at 235.3 m (772 ft.) below sea level
Thickness: >36.6 m (>120 ft.)

1464-1500 (446.2-457.2)	Dolomite: buff to pale buff, micro-crystalline, some pinpoint and micro-vuggy porosity
~1500-1542 (~457.2-470.0)	Dolomite: pale grey-buff to pale buff, microcrystalline to aphanitic; trace bitumen
1542-1584 (470.0-482.8)	Dolomite: buff, microcrystalline, micro-sucrosic, some very fine crystalline; some intercrystalline and microvuggy porosity
Total depth: 482.8 m	

66.	M-07
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Log of B.P. Russel M-07
Location: 65°26'58"N, 123°31'50"W
Elevation of Kelly Bushing: 274.6 m (901 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to sonic log.

MESOZOIC

Thickness: 433.7 m (1423 ft.)
Basal beds (Lower Cretaceous ?)

1596-1613 (486.5-491.6)	(Overlain by sandstone and shale) Sand: very coarse grained and larger, quartz
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Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
DEVONIAN		Bluefish Member (Thickness: 20.4 m/67 ft.)	
Arnica Formation		3480-3547 (1060.7-1081.1)	
Top at 217.0 m (712 ft.) below sea level Thickness: >38.4 m (>126 ft.)		Hume Formation	
1613-1622 (491.6-494.4)	Dolomite: pale grey-buff, microcrystal- line to aphanitic, almost "earthy-" textured	Top at 830.6 m (2725 ft.) below sea level Thickness: 234.4 m (769 ft.)	
1622-1663 (494.4-506.9)	Dolomite: buff, microcrystalline, micro- sucrosic, some pinpoint porosity	Upper member (Thickness: 67.1 m/220 ft.)	
1663-1712 (506.9-521.8)	Dolomite: buff to dark brown, micro- crystalline to aphanitic, calcareous; grading to Limestone: dolomitic	3547-3767 (1081.1-1148.2)	3710.5 feet (1131.0 m) – conodont study by T.T. Uyeno (see Appendix 1)
1712-1739 (521.8-530.0)	Dolomite: buff, microcrystalline, micro- sucrosic; some pinpoint to microvuggy porosity; some dolomite: calcareous, as above	Middle member (Thickness: 86.9 m/285 ft.)	
Total depth: 530.0 m		3767-4052 (1148.2-1235.0)	3805-4048 feet (1159.8-1233.8 m) Middle Devonian, Eifelian, A.E.H. Pedder (see Appendix 1)
		Headless Member (Thickness: 80.5 m/264 ft.)	
		4052-4316 (1235.0-1315.5)	4314 feet (1314.9 m) – gastropods, age not determinable (see Appendix 1)
		Landry Formation	
		Top at 1065.0 m (3494 ft.) below sea level Thickness: >43.9 m (>144 ft.)	
		4316-4460 (1315.5-1359.4)	4413 feet (1345.1 m) – probably Middle Devonian (see Appendix 1)
		FAULT	
		Hume Formation	
		Top at 1108.9 m (3638 ft.) below sea level Thickness: 47.9 m (157 ft.)	
		Headless Member	
		4460-4617 (1359.4-1407.3)	
		Landry Formation	
		Top at 1156.7 m (3795 ft.) below sea level Thickness: 84.7 m (278 ft.)	
		4617-4895 (1407.3-1492.0)	4622.5-4627.5 feet (1408.9-1410.5 m) – conodont study by T.T. Uyeno (see Appendix 1)
		Arnica Formation	
		Top at 1241.4 m (4073 ft.) below sea level Thickness: 36.6 m (120 ft.)	
		4895-5015 (1492.0-1528.6)	4986 feet (1519.7 m) – Middle Devonian (see Appendix 1)
		Fort Norman Formation	
		Top at 1278.0 m (4193 ft.) below sea level Thickness: 1443.2 m (4735 ft.)	
		5015-~29750 (1528.6-~2971.8)	
		Arnica Platform	
		Top at 2721.3 m (8928 ft.) below sea level Thickness: >159.1 m (>522 ft.)	
		~9750-10 272 (~2971.8-3130.9)	Dolomite: dark grey, fossiliferous
		Total depth: 3130.9 m	
67.	M-43		
Log of Candex Dahadinni M-43A Location: 63°52'59"N, 124°39'15"W Elevation of Kelly Bushing: 250.6 m (822 ft.) Tops determined from core descriptions (see Well History Report) adjusted to sonic log.			
UPPER DEVONIAN			
Imperial Formation			
Top at 125.6 m (412 ft.) above sea level Thickness: 702.0 m (2303 ft.)			
410(R)-2713 (125.0-826.9)			
DEVONIAN			
Thickness: >2212 m (>7258 ft.)			
Horn River Group			
Thickness: 254.2 m (834 ft.)			
Canol Formation			
Top at 576.4 m (1891 ft.) below sea level Thickness: 52.4 m (172 ft.)			
2713-2885 (826.9-879.3)			
Hare Indian Formation			
Top at 628.8 m (2063 ft.) below sea level Thickness: 201.8 m (662 ft.)			
Black shale member (Thickness: 57.3 m/188 ft.)			
2885-3073 (879.3-936.7)			
Grey shale member (Thickness: 124.1 m/407 ft.)			
3073-3480 (936.7-1060.7)			

68.	M-48	Borehole Depth feet (m)	Lithology
Log of Union Maunoir M-48 Location: 66°57'54"N, 124°24'00"W Elevation of Kelly Bushing: 382.8 m (1256 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to gamma ray-neutron log.			Mount Cap Formation (Reference section) Top at 184.4 m (605 ft.) below sea level Thickness: 192.9 m (633 ft.) <u>Member h</u> (Thickness: 36.3 m/119 ft.) 1861-1980 (567.2-603.5) Shale: dark green and grey-green, some grey-brown, splintery, micromicaeous; some very thinly interbedded dolomite: buff, microcrystalline <u>Member g</u> (Thickness: 21.3 m/70 ft.) 1980-2050 (603.5-624.8) Dolomite: buff to brown, micro- to very fine-crystalline, some fine to medium crystalline; some interbedded shale: dark green, dark grey-brown and black <u>Member f</u> (Thickness: 36.6 m/120 ft.) 2050-2170 (624.8-661.4) Shale: dark green to dark green-grey, splintery with some slickensiding; at 2090-2100 feet (637.0-640.1 m), some dolomite: brown, medium crystalline and very fine crystalline; trace glauconite concentrations <u>Member e</u> (Thickness: 13.4 m/44 ft.) 2170-2214 (661.4-674.8) Dolomite: pale buff to buff and brown, micro- and very fine-crystalline, in part with glauconite concentration up to 90%; some limestone: pale buff, micrograined, dolomitic; some shale: dark green; some siltstone: pale grey to pale green, very micaceous, dolomitic <u>Member d</u> (Thickness: 10.7 m/35 ft.) 2214-2249 (674.8-685.5) Poor samples - probably shale: as above <u>Member c</u> (Thickness: 8.8 m/29 ft.) 2249-2278 (685.5-694.3) Dolomite: brown and dark brown, micro- and very fine-crystalline; some shale: dark green, grey-green, micaceous <u>Member b</u> (Thickness: 49.7 m/163 ft.) 2278-2441 (694.3-744.0) Poor samples - probably shale and siltstone: dolomitic - both very micaceous and very glauconitic <u>Member a</u> (Thickness: 16.2 m/53 ft.) 2441-2476 (744.0-754.7) Sandstone: clear, some buff and pink, fine and very fine grained, quartzose, in part glauconitic; some sandstone: medium and coarse grained, very poorly sorted Siltstone: white to pale grey and buff, in part coarse grained, mostly very glauconitic Dolomite: buff, micro- and very fine-crystalline, glauconitic Some beds highly glauconitic 2476-2494 (754.7-760.2) Probably shale and siltstone Mount Clark Formation Top at 377.3 m (1238 ft.) below sea level Thickness: 53.0 m (174 ft.)
Borehole Depth feet (m)	Lithology		
CAMBRIAN-SILURIAN <u>Ronning Group</u> Franklin Mountain Formation Top at 317.3 m (1041 ft.) above sea level Thickness: 218.8 m (718 ft.) (?)Rhythmic member (Thickness: 160.3 m/526 ft.) 215?~500 (65.5~152.4) Dolomite: creamy white to pale buff, some yellow, microcrystalline, some very fine crystalline; some vuggy porosity with trace bituminous residue ~500-741 (~152.4-225.9) Dolomite: mostly creamy white with trace pink, microcrystalline to aphanitic, with chalky (microsucrosic) texture; some microvuggy porosity <u>Cyclic member</u> (Thickness: 58.5 m/192 ft.) 741-877 (225.9-267.3) Dolomite: buff to grey, microcrystalline, in part argillaceous; some shale: grey and green-grey, dolomitic 877-933 (267.3-284.4) Dolomite: pale buff to grey-buff, microcrystalline, in part argillaceous; interbedded Shale: grey, dolomitic, and shale: grey-green, in part pyritic CAMBRIAN Saline River Formation Top at 98.5 m (323 ft.) above sea level Thickness: 282.9 m (928 ft.) <u>Upper clastic member</u> (Thickness: 108.5 m/356 ft.) 933~960 (284.4~292.6) Shale: green, maroon, in part pyritic; some dolomite ~960-1153 (~292.6-351.4) Shale: green, some grey-green and olive-green, dolomitic, in part micaceous, in part pyritic; some interbedded dolomite: pale buff, pale grey, trace pink, microcrystalline 1153-1289 (351.4-392.9) Shale: pale green to green and grey-green and maroon, dolomitic; interbedded Anhydrite: pale buff to white, some pink <u>Salt member</u> (Thickness: 155.1 m/509 ft.) 1289-1798 (392.9-548.0) Halite <u>Lower clastic member</u> (Thickness: 19.2 m/63 ft.) 1798-1861 (548.0-567.2) Poor samples - probably shale: green, grey-green, maroon, and anhydrite and dolomite: grey-buff			

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
2494-2668? (760.2-813.2?)	Very poor samples – some sand and sandstone: medium, coarse and very coarse grained, quartz, subrounded	349-710 (106.4-216.4)	Dolomite: creamy white to pale buff, trace pink, very fine, fine and medium crystalline; much Chert: white to milky white (some samples almost 100% chert)
PROTEROZOIC		710-1590 (216.4-484.6)	Dolomite: pink and pale buff, grading downward – through pale buff, pale grey, some pink, very fine, fine and medium crystalline; some chert: pale grey to pale buff, trace pink and green, micro- to very fine-crystalline, and fine to coarse crystalline, with traces of intercrystalline green clay and pyrite; traces throughout of chert: white and buff
Shale unit(?)		1590-? (484.6?)	Samples missing
Top at 430.4 m (1412 ft.) below sea level Thickness: >49.4 m (>162 ft.)		<u>Rhythmic member</u> (Thickness: ?)	
2668?-2820 (813.2?-859.5)	Cavings – no new lithology seen	?-2265 (?-690.4)	Samples missing
Total depth: 862.6 m		Cyclic member (Thickness: 64.3 m/211 ft.)	
69.	M-63	2265-2476? (690.4-754.7?)	Samples missing
Log of Mobil Belot, Hills M-63 Location: 67°02'45"N, 126°27'45"W Elevation of Kelly Bushing: 461.8 m (1515 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to acoustic log.		CAMBRIAN	
DEVONIAN		Saline River Formation	
Thickness: 106.4 m (349 ft.)		Top at 292.9 m (961 ft.) below sea level Thickness: 151.5 m (497 ft.)	
Hume Formation equivalent		<u>Upper clastic member</u> (Thickness: 39.0 m/128 ft.)	
Top at 461.8 m (1515 ft.) above sea level Thickness: 67.1 m (220 ft.)		2476?-2604 (754.7?-793.7)	Samples missing
0(R)-80 (0-24.4)	Samples missing	<u>Salt member</u> (Thickness: 75.9 m/249 ft.)	
80-150(S) (24.4-45.7)	Limestone: pale buff to pale grey, micrograined to aphanitic and highly fossiliferous (macro shell fragments) Shale: buff, calcareous, flaky, very micaceous	2604-2853 (793.7-869.6)	Samples missing
150(S)-160(S) (45.7-48.8)	Limestone: some grey and white with breccia-like structure; some white and red, and white and buff, streaked, in part with black, noncalcareous pellets (some pellets show black and white concentric "onion" structure)	<u>Lower clastic member</u> (Thickness: 36.6 m/120 ft.)	
160(S)-220(S) (48.8-67.1)	Limestone: pale grey to pale buff-grey, aphanitic, argillaceous, pyritic	2853-2973 (869.6-906.2)	Samples missing
Landry Formation		Mount Cap Formation	
Top at 394.7 m (1295 ft.) above sea level Thickness: 39.3 m (129 ft.)		Top at 444.4 m (1458 ft.) below sea level Thickness: 142.3 m (467 ft.)	
220(S)-349 (67.1-106.4)	Limestone: buff (characteristic "fudge" colour) and some brown, aphanitic, trace pellets	2973?-3097 (906.2?-944.0)	Members f and g (Thickness: 37.8 m/124 ft.) Samples missing
CAMBRIAN-SILURIAN		3097-3136 (944.0-955.9)	<u>Member e</u> (Thickness: 11.9 m/39 ft.) Samples missing
<u>Ronning Group</u>		<u>Member d</u> (Thickness: 35.1 m/115 ft.)	
Franklin Mountain Formation		3136-3251? (955.9-990.9?)	Samples missing
Top at 355.4 m (1166 ft.) above sea level Thickness: 648.3 m (2127 ft.)		<u>Member c</u> (Thickness: 2.4 m/8 ft.)	
<u>Cherty member</u> (Thickness: >378.3 m/>1241 ft.)		3251?-3259 (990.9?-993.3)	Samples missing

Borehole Depth feet (m)	Lithology
	Member b (Thickness: 18.6 m/61 ft.)
3259-3320 (993.3-1011.9)	Samples missing
	Member a (Thickness: 36.6 m/120 ft.)
3320-3350 (1011.9-1021.1)	Samples missing
3350-3440 (1021.1-1048.5)	Dolomite: brown, very fine, fine, medium and coarse crystalline, in part glauconitic; some dolomite: microcrystalline, silty Shale: dark green, green, dark grey-brown and black, mostly splintery, in part micromicaceous Siltstone: buff, some pale grey and pale green, in part dolomitic, in part coarse grained and quartzitic, in part micaceous; some glauconite concentrations; traces sand and sandstone: medium to coarse grained, quartz
	Mount Clark Formation Top at 586.7 m (1925 ft.) below sea level Thickness: 14.3 m (47 ft.)
3440-3487 (1048.5-1062.8)	Sand: fine to very coarse grained, quartz; some sandstone: quartzitic
	PROTEROZOIC Thickness: >220.7 m (>724 ft.)
	Dolomite unit (Reference section) Top at 601.1 m (1972 ft.) below sea level Thickness: 112.2 m (368 ft.)
3487-3838 (1062.8-1169.8)	Dolomite: mostly pink to brick-red, trace buff, micro- and very fine-crystalline, tight; below 3600 feet (1097.3 m), as above with some shale: brick-red to purple and brown, dolomitic, hard
3838-3855 (1169.8-1175.0)	Dolomite: pale buff to brown, micro- and very fine-crystalline, in part aphanitic and very argillaceous Shale: buff to dark grey-buff, some olive-green and yellow-brown, in part dolomitic and hard, in part splintery and micaceous At base, some dolomite: buff, speckled brown and black, siliceous
	Shale unit Top at 713.2 m (2340 ft.) below sea level Thickness: >108.5 m (>356 ft.)
3855-4211 (1175.0-1283.5)	Shale: very dark brown-grey to black, hard, appears to be micromicaceous; top 100 feet (30.5 m) – some shale: dark grey-brown, very hard, siliceous and slightly dolomitic
	Total depth: 1283.5 m
70.	N-28
Log of Imperial Vermilion Ridge No. 1 Location: 65°07'51"N, 126°05'00"W Elevation of Kelly Bushing: 281.9 m (925 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log.	
	DEVONIAN Thickness: 563.9 m (1850 ft.)

Borehole Depth feet (m)	Lithology
	Horn River Group Thickness: 143.3 m (470 ft.)
	Hare Indian Formation Top at 281.9 m (925 ft.) above sea level Thickness: 143.3 m (470 ft.)
	Black shale member (Thickness: 112.8 m/370 ft.)
0-370 (0-112.8)	Shale: brown-black, hard, in part calcareous, siliceous, bituminous
	Grey shale member (Thickness: 15.2 m/50 ft.)
370-420 (112.8-128.0)	Shale: brown-grey, flaky, slightly dolomitic, micromicaceous
	Bluefish Member (Thickness: 15.2 m/50 ft.)
420-450 (128.0-137.2)	Shale: black, slightly calcareous, bituminous
450-470 (137.2-143.3)	Limestone: dark brown, very fine grained, argillaceous, bituminous Shale: black, calcareous, bituminous
	Hume Formation Top at 138.7 m (455 ft.) above sea level Thickness: 115.8 m (380 ft.)
	Upper member (Thickness: 54.9 m/180 ft.)
470-650 (143.3-198.1)	Limestone: brown, grey-brown, pale brown, micrograined, very fine and fine-grained, bioclastic; some reef organisms
	Middle member (Thickness: 33.5 m/110 ft.)
650-720 (198.1-219.5)	Shale: grey, calcareous, micromicaceous Limestone: grey-buff, bioclastic, in part argillaceous
720-760 (219.5-231.6)	Limestone: grey-buff, grey-brown, micrograined, some very fine grained, in part bioclastic
	Headless Member (Thickness: 27.4 m/90 ft.)
760-850 (231.6-259.1)	Limestone: grey-buff, grey-brown, micrograined; some limestone: very pale buff, aphanitic, in part argillaceous; possibly some interbedded shale
	Landry Formation Top at 22.9 m (75 ft.) above sea level Thickness: 25.9 m (85 ft.)
850-935 (259.1-285.0)	Limestone: mainly brown and buff, in part aphanitic, some pelletal
	Arnica Formation Top at 3.0 m (10 ft.) below sea level Thickness: 30.5 m (100 ft.)
935-1035 (285.0-315.5)	Dolomite: brown, buff, pale buff, micro- and very fine-crystalline, in part sucrosic; brecciated structures – black stylolites and partings
	Fort Norman Formation Top at 33.5 m (110 ft.) below sea level Thickness: 248.4 m (815 ft.)

Borehole Depth feet (m)	Lithology
1035-1850 (315.5-563.9)	Anhydrite: mainly pale buff; some dolomite; 1760-1795 feet (536.5-547.1 m), mostly dolomite: anhydritic
CAMBRIAN-SILURIAN	
<u>Runnig Group</u>	
Thickness: 288.0 m (945 ft.)	
Mount Kindle Formation	
Top at 281.9 m (925 ft.) below sea level Thickness: 9.1 m (30 ft.)	
1850-1880 (563.9-573.0)	Dolomite: buff, very fine and fine crystalline, tight
Franklin Mountain Formation	
Top at 291.1 m (955 ft.) below sea level Thickness: 278.9 m (915 ft.)	
<u>Cherty member</u> (Thickness: 195.1 m/640 ft.)	
1880-2520 (573.0-768.1)	Dolomite: pale buff to creamy white, some grey-buff, very fine, fine, medium and coarse crystalline, grading downward through very fine and microcrystalline to microcrystalline to aphanitic; at the top, some floating medium and coarse sub-rounded sand grains of quartz; some shale: pale green, waxy, some porosity; at 2215-2220 feet (675.1-676.6 m), much chert: creamy white
<u>Rhythmic and Cyclic members</u> (Thickness: 83.8 m/275 ft.)	
2520-2795 (768.1-851.9)	Dolomite: grey-buff, grey-brown, buff-grey, microcrystalline to aphanitic, in part argillaceous; possibly increasingly argillaceous toward base Trace of Cyclic member at base
CAMBRIAN	
Saline River Formation	
Top at 570.0 m (1870 ft.) below sea level Thickness: 885.4 m (2905 ft.)	
<u>Upper clastic member</u> (Thickness: 53.3 m/175 ft.)	
2795-2970 (851.9-905.3)	Shale: maroon, olive-green, dolomitic, in part anhydritic; some dolomite: grey, buff-grey, in part anhydritic; some anhydrite
<u>Salt member</u> (Thickness: 795.5 m/2610 ft.)	
2970-3360 (905.3-1024.1)	Anhydrite, shale, and halite. Anhydrite: buff, some pink, in part dolomitic Shale: maroon, olive-green, pale green, dolomitic, anhydritic; halite casts
3360-4640 (1024.1-1414.3)	Halite: clear
4640-5580 (1414.3-1700.8)	Halite: clear and pink; some zones with dolomite and anhydrite
<u>Lower clastic member</u> (Thickness: 36.6 m/120 ft.)	
5580-5700 (1700.8-1737.4)	Shale: grey-green, dark purple, slightly dolomitic; trace dolomite and anhydrite

Borehole Depth feet (m)	Lithology
Mount Cap Formation	
Top at 1455.4 m (4775 ft.) below sea level Thickness: >82.3 m (>270 ft.)	
~5700-5970 (~1737.4-1819.7)	Very poor samples (mostly cavings); 5700-5720 feet (1737.4-1743.5 m), trace limestone with glauconite; 5788-5806 feet (1764.2-1769.7 m) - early Middle Cambrian, W.H. Fritz (see Geological Survey of Canada, Paper 71-15, p. 23)
Total depth: 1820.3 m	
71.	N-30
Log of SOBC Great Bear River N-30 Location: 64°59'45"N, 124°04'51"W Elevation of Kelly Bushing: 252.4 m (828 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.	
MESOZOIC	
Thickness: 402.9 m (1322 ft.) Basal beds (Lower Cretaceous ?)	
2172-2200 (662.0-670.6)	Siltstone: pale grey, coarse grained, in part glauconitic, in part sandy; grading to Sandstone: pale grey to grey, fine to very fine grained, silty, highly glauconitic Thinly interbedded shale: dark grey to black, micromicaceous
2200-2250 (670.6-685.8)	Samples missing (cored)
DEVONIAN	
Thickness: >80.8 m (>265 ft.)	
Landry Formation	
Top at 433.4 m (1422 ft.) below sea level Thickness: 47.9 m (157 ft.)	
2250-2310 (685.8-704.1)	Samples missing (cored)
2310-2380 (704.1-725.4)	Limestone: buff to brown, aphanitic with some pelletal structure; much white crystalline calcite; some limestone: buff, aphanitic, argillaceous, grading to shale: very calcareous; some pyrite
2380-2407 (725.4-733.7)	Limestone: pale buff to pale grey, some buff, aphanitic to micrograined and pelletal, in part argillaceous, in part very pyritic, in part with thin veins and inclusions of pink calcite
Arnica Formation	
Top at 481.3 m (1579 ft.) below sea level Thickness: 24.1 m (79 ft.)	
2407-2486 (733.7-757.7)	Dolomite: buff to brown, microcrystalline, in part microcrystalline; some intercrystalline porosity
Fort Norman Formation	
Top at 505.4 m (1658 ft.) below sea level Thickness: >8.8 m (>29 ft.)	

Borehole Depth feet (m)	Lithology
2486-2515 (757.7-766.6)	Anhydrite: pale buff to pale grey; some dolomite microbreccia
	Total depth: 766.6 m

72. N-62

Log of Decalta Keele N-62
Location: 64°21'48"N, 124°57'12"W
Elevation of Kelly Bushing: 225.6 m (740 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to sonic log.

MESOZOIC AND (?)TERTIARY

Thickness: 850.7 m (2791 ft.)
Basal beds (Lower Cretaceous ?)

2764-2841 (842.5-865.9)	Sandstone: pale grey, grey, black, very fine grained Shale: black, carbonaceous fragments, mostly silty or sandy, grading to siltstone and sandstone; in part pyritic
----------------------------	---

CAMBRIAN-SILURIAN

Ronning Group

Franklin Mountain Formation

Top at 640.4 m (2101 ft.) below sea level
Thickness: 258.8 m (849 ft.)

Rhythmic member
(Thickness: 208.5 m/684 ft.)

2841-3026 (865.9-922.3)	Limestone and dolomite: pale buff to white, some buff to brown, trace pink, micrograined or microcrystalline; 2840-3030 feet (865.6-923.5 m), no conodonts, T.T. Uyeno (see Appendix I)
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3026-3093 (922.3-942.7)	Dolomite: pale buff, pale grey, pink, microcrystalline, in part aphanitic, in part very sandy; grading to Sandstone: fine grained, quartzose, dolomitic
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3093-3525 (942.7-1074.4)	Dolomite: pink, red, buff, white, pale grey, microcrystalline and aphanitic; in part sandy to silty; grading to sandstone and siltstone; in part argillaceous; grading to shale: red or brown, silty, dolomitic; in part calcareous; grading to rare limestone
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Cyclic member
(Thickness: 50.3 m/165 ft.)

3525-3690 (1074.4-1124.7)	Dolomite: grey-brown, dark grey, grey- buff, argillaceous and calcareous, grading to Shale: dark grey, silty, calcareous; some shale: pale green, dolomitic Traces of anhydrite
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CAMBRIAN

Mount Cap Formation

Top at 899.2 m (2950 ft.) below sea level
Thickness: >155.1 m (>509 ft.)

Borehole Depth feet (m)	Lithology
3690-3920 (1124.7-1194.8)	Shale: dark grey to black, some grey- green to pale green, in part silty Dolomite: dark grey-brown, some grey- buff, argillaceous, in part grading to Shale: silty, dolomitic; some pyrite
3920-4199 (1194.8-1279.9)	Shale: dark grey to black and grey-green to pale green, flaky to splintery; trace only of dolomite
	Total depth: 1279.9 m

73. N-70

Log of B.P. Grey Goose N-70
Location: 65°19'58"N, 123°42'15"W
Elevation of Kelly Bushing: 217.9 m (715 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to sonic log.

MESOZOIC

Thickness: 571.8 m (1876 ft.)
Basal beds (Lower Cretaceous ?)

2112-2148 (643.7-654.7)	(Overlain by sandstone and shale) Sand: coarse grained, very coarse grained and larger, quartz
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DEVONIAN

Landry Formation

Top at 436.8 m (1433 ft.)
Thickness: >31.1 m (>102 ft.)

2148-2180 (654.7-664.5)	Limestone: pale grey-buff to brown, aphanitic; some dark brown; trace pelletal
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~2180-2250 (~664.5-685.8)	Limestone: pale buff-grey to grey and grey-brown and white, micrograined, slightly argillaceous; some chalky texture and some crystalline texture
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Total depth: 685.8 m

74. O-13

Log of Cdn. Res. Keller Lake O-13
Location: 64°12'53"N, 122°17'25"W
Elevation of Kelly Bushing: 457.2 m (1500 ft.)
Well log prepared by the writer based on drill cuttings;
depth adjusted to sonic log.

MESOZOIC

Thickness: 180.7 m (593 ft.)
Basal beds (Lower Cretaceous ?)

1112-1157 (338.9-352.7)	(Overlain by shale and siltstone) Siltstone: pale grey, in part coarse grained, micaceous, slightly glau- conitic; some black partings; at base, some sandstone: fine to very fine grained, quartzose
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Borehole Depth feet (m)	Lithology
DEVONIAN	
Thickness: >589.2 m (>1933 ft.)	
Arnica Formation	
Top at 104.5 m (343 ft.) above sea level Thickness: 31.1 m (102 ft.)	
1157-1191 (352.7-363.0)	Dolomite: very pale buff to very pale grey and creamy white, microcrystalline to aphanitic and some chalky texture
1191-1259 (363.0-383.7)	Dolomite: buff, microcrystalline; some pinpoint and microvuggy porosity; trace limestone: buff, micrograined
Fort Norman Formation	
Top at 73.5 m (241 ft.) above sea level Thickness: 198.4 m (651 ft.)	
1259-1910 (383.7-582.2)	Anhydrite
Tsetso Formation	
Top at 125.0 m (410 ft.) below sea level Thickness: >359.7 m (>1180 ft.)	
1910-2500 (582.2-762.0)	Anhydrite: trace pink colouring; trace shale: brick-red
2500-2836 (762.0-864.4)	Anhydrite: as above Dolomite: pale grey, anhydritic
2836-2890 (864.4-880.9)	Dolomite: grey to buff with some pink, pale green and pale purple colouring, in part argillaceous, in part anhydritic Anhydrite: pale buff to pink and white Shale: brick-red and pale green, dolomitic; some sandy zones
2890-2978 (880.9-907.7)	Dolomite: pale buff, microcrystalline to aphanitic, anhydritic; trace chert: white, at or near top
2978-3039 (907.7-926.3)	Dolomite: purple-brown to pink and grey-buff, microcrystalline, anhydritic, in part probably argillaceous; some anhydrite: pale buff to pink
3039-3090 (926.3-941.8)	Dolomite: grey-buff to pale buff, microcrystalline to aphanitic, anhydritic Anhydrite: pale buff to white Shale: grey, in part dolomitic; some shale: pale green, waxy, pyritic; 2900-3090 feet (883.9-941.8 m), no conodonts, T.T. Uyeno (see Appendix 1)
Total depth: 941.8 m	
75.	O-17
Log of Pacific Judile O-17 Location: 65°26'53"N, 127°32'35"W Elevation of Kelly Bushing: 55.8 m (183 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to gamma - ray log; sample quality poor.	
MESOZOIC	
Thickness: 74.4 m (244 ft.) Basal beds (Lower Cretaceous ?)	

Borehole Depth feet (m)	Lithology
~200-278 (~61.0-84.7)	Sandstone: pale grey, very fine grained, quartzose, glauconitic Siltstone: pale grey, some coarse grained, glauconitic Shale: dark grey, silty, micromicaceous At base, some sandstone: very fine to medium grained, poorly sorted, quartzose, glauconitic
UPPER DEVONIAN	
Imperial Formation	
Top at 29.0 m (95 ft.) below sea level Thickness: 298.7 m (980 ft.)	
278-640 (84.7-195.1)	Siltstone: grey, in part coarse grained, micromicaceous Shale: dark grey, micromicaceous Samples from 400-420 feet (121.9-128.0 m) contain some limestone: pale buff, coarse grained, biostromal, but no indication of this lithology on mechanical logs
~640-1258 (~195.1-383.4)	Shale: dark grey, in part silty, micromicaceous
DEVONIAN	
Horn River Group	
Thickness: >192.6 m (>632 ft.)	
Canol Formation	
Top at 327.7 m (1075 ft.) below sea level Thickness: 15.5 m (51 ft.)	
1258-1302 (383.4-396.8)	Shale: black, bituminous, pyritic; at top some dolomite: brown, fine crystalline
<u>(?) Allochthonous limestone</u> (Thickness: 2.1 m/7 ft.)	
1302-1309 (396.8-399.0)	Gamma-ray log suggests limy beds or limestone debris
Ramparts Formation	
Top at 343.2 m (1126 ft.) below sea level Thickness: 153.3 m (503 ft.)	
Reef member (Thickness: 123.7 m/406 ft.)	
1309-1715 (399.0-522.7)	Limestone: pale buff and white, reef
Platform member (Thickness: 12.5 m/41 ft.)	
1715-1756 (522.7-535.2)	Limestone: buff-grey, brown, very fine crystalline, in part bioclastic
Siltstone lentic (Thickness: 17.1 m/56 ft.)	
1756-1812 (535.2-552.3)	Siltstone: grey-buff, coarse grained, calcareous
Hare Indian Formation	
Top at 496.5 m (1629 ft.) below sea level Thickness: >23.8 m (>78 ft.)	

Borehole Depth feet (m)	Lithology
	<u>Grey shale member</u>
1812-1890 (552.3-576.1)	Shale: grey, silty, very micaceous; some siltstone: grey, argillaceous, mica- ceous
	Total depth: 576.1 m

76.	O-41
	Log of Pacific Judite O-41 Location: 65°30'45"N, 127°38'00"W Elevation of Kelly Bushing: 56.7 m (186 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log.

MESOZOIC

Thickness: 71.6 m (235 ft.)
Basal beds (Lower Cretaceous ?)

145(R)-380(S) (44.2-115.8)	Siltstone: pale grey and grey, some coarse grained, glauconitic Shale: dark grey, micromicaceous At base, possibly shale: black, carbon- aceous, and quartz sand
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UPPER DEVONIAN

Imperial Formation

Top at 59.1 m (194 ft.) below sea level
Thickness: 258.8 m (849 ft.)

380(S)-700 (115.8-213.4)	Siltstone: grey, in part coarse grained and micaceous; grading to Siltstone: dark grey, argillaceous; some shale: dark grey, micromicaceous
~700-1229 (~213.4-374.6)	Shale: dark grey, micromicaceous, in part silty; grading to Siltstone: argillaceous

DEVONIAN

Horn River Group

Thickness: >56.7 m (>186 ft.)

Canol Formation

Top at 317.9 m (1043 ft.) below sea level
Thickness: 40.2 m (132 ft.)

1229-1305 (374.6-397.8)	Shale: black, bituminous, pyritic
1305-1361 (397.8-414.8)	Shale: black, calcareous; some limestone: dark brown-grey, bituminous, argil- laceous; probably limestone debris at base, but cannot determine thickness of Allochthonous limestone

Ramparts Formation

Top at 358.1 m (1175 ft.) below sea level
Thickness: >16.5 m (>54 ft.)

Reef member

1361-1415 (414.8-431.3)	Limestone: pale buff to white, reef; some porosity; at top some bitumen
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Total depth: 431.3 m

77.	P-05
	Log of Imperial Mac No. 2 Location: 65°14'51"N, 127°00'52"W Elevation of Kelly Bushing: 93.0 m (305 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to electric log.

Borehole Depth feet (m)	Lithology
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MESOZOIC

Thickness: 321.0 m (1053 ft.)
Basal beds (Lower Cretaceous ?)

1030-1126 (313.9-343.2)	Sandstone: very pale grey, very fine grained, quartz-rich; some sandstone: fine grained, in part glauconitic; some siltstone: argillaceous, micromica- ceous
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1126-1138 (343.2-346.9)	Sandstone: fine to medium grained, some coarse grained, subangular to sub- rounded, quartzose, glauconitic (some medium sand-sized grain pellets of glauconite)
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UPPER DEVONIAN

Imperial Formation

Top at 253.9 m (833 ft.) below sea level
Thickness: 372.5 m (1222 ft.)

1138-1737 (346.9-529.4)	Siltstone: grey, some coarse grained, micaceous; siltstone: grey, argil- laceous, micromicaceous Shale: dark grey, micromicaceous
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1737-2360 (529.4-719.3)	Shale: dark grey, micromicaceous; rare siltstone: argillaceous, but prominent siltstone(?) marker on log at 1915- 1940 feet (583.7-591.3 m)
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DEVONIAN

Horn River Group

Thickness: >182.3 m (>598 ft.)

Canol Formation

Top at 626.4 m (2055 ft.) below sea level
Thickness: 28.3 m (93 ft.)

2360-2403 (719.3-732.4)	Shale: black, bituminous, siliceous(?)
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2403-2430 (732.4-740.7)	Shale: black, bituminous
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2430-2453 (740.7-747.7)	Shale: black, bituminous, siliceous, pyritic; some siltstone: brown-grey, argillaceous, very calcareous, pyritic, in part very pyritic
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Ramparts Formation

Top at 654.7 m (2148 ft.) below sea level
Thickness: 146.6 m (481 ft.)

Reef member

(Thickness: 128.6 m/422 ft.)

2453-2875 (747.7-876.3)	Limestone: reef; some thin black bituminous streaks
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Borehole Depth feet (m)	Lithology
	<u>Platform member</u> (Thickness: 18.0 m/59 ft.)
2875-2934 (876.3-894.3)	Limestone: buff and brown, mostly very fine to coarse grained; trace limestone: very fine grained, micrograined and aphanitic; reefal limestone and some pyritized limestone; some partings or interbeds of black shale
	Hare Indian Formation
	Top at 801.3 m (2629 ft.) below sea level Thickness: >7.3 m (>24 ft.)
	<u>Grey shale member</u>
2934-2958 (894.3-901.6)	Shale: buff-grey, noncalcareous, slightly micromicaceous
	Total depth: 901.6 m
78.	P-14
	Log of Cdn. Res. Keller Lake P-14 Location: 64°13'53"N, 122°32'00"W Elevation of Kelly Bushing: 392.3 m (1287 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.
	MESOZOIC
	Thickness: 105.5 m (346 ft.) Basal beds (Lower Cretaceous ?)
910-1113 (277.4-339.2)	Siltstone: pale grey, in part coarse grained and glauconitic Shale: dark grey, flaky to splintery, micromicaceous
	DEVONIAN
	Thickness: >145.1 m (>476 ft.)
	Landry Formation
	Top at 53.0 m (174 ft.) above sea level Thickness: 25.9 m (85 ft.)
1113-1198 (339.2-365.2)	Limestone: buff and brown, aphanitic and pelletal
	Arnica Formation
	Top at 27.1 m (89 ft.) above sea level Thickness: 48.2 m (158 ft.)
1198-1356 (365.2-413.3)	Dolomite: creamy white to very pale buff and very pale grey, microcrystalline to aphanitic and chalky-textured
	Fort Norman Formation
	Top at 21.0 m (69 ft.) below sea level Thickness: >71.0 m (>233 ft.)
1356-1589 (413.3-484.3)	Anhydrite; some dolomite: buff and grey, microcrystalline to aphanitic
	Total depth: 484.3 m

Borehole Depth feet (m)	Lithology
79.	P-78
	Log of Decalta Redstone P-78 Location: 64°07'57"N, 124°28'15"W Elevation of Kelly Bushing: 176.2 m (578 ft.) Well log prepared by the writer based on drill cuttings; depth adjusted to sonic log.
	MESOZOIC
	Thickness: 468.4 m (1537 ft.) Basal beds (Lower Cretaceous ?)
1526-1577 (465.1-480.7)	(Overlain by shale) Sandstone: pale grey, very fine to medium grained, poorly sorted, chert/quartz, very micaceous, slightly calcareous, siliceous; some thinly interbedded shale: very dark grey; some pyrite
	DEVONIAN
	Thickness: >705.0 m (>2313 ft.)
	<u>Horn River Group</u>
	Thickness: 77.1 m (253 ft.)
	Hare Indian Formation
	Top at 304.5 m (999 ft.) below sea level Thickness: 77.1 m (253 ft.)
	<u>Black shale member</u> (Thickness: 11.3 m/37 ft.)
1577-1614 (480.7-491.9)	Shale: very dark grey, soft, in part slightly bituminous
	<u>Grey shale member</u> (Thickness: 61.6 m/202 ft.)
1614-1816 (491.9-553.5)	Shale: grey, brown-grey, flaky, noncalcareous, micromicaceous; near base, some shale: very dark grey to black (1610-1620 ft./490.7-493.8 m – sample contains some dolomite: pale yellow, soft, silty, very micaceous)
	<u>Bluefish Member</u> (Thickness: 4.3 m/14 ft.)
1816-1830 (553.5-557.8)	Shale: black, bituminous, noncalcareous; some pyrite; in the lower part some limestone: black and white; argillaceous, bituminous, with some pyrite
	Hume Formation
	Top at 381.6 m (1252 ft.) below sea level Thickness: 148.7 m (488 ft.)
	<u>Upper member</u> (Thickness: 39.6 m/130 ft.)
1830-1920 (557.8-585.2)	Limestone: grey-brown, grey-buff to white, micro- to very fine-grained, fossiliferous; some limestone: dark grey-brown to black, argillaceous, bituminous
1920-1960 (585.2-597.4)	Samples missing - (R) fractured lost circulation zone
	<u>Middle member</u> (Thickness: 64.0 m/210 ft.)
1960-2119 (597.4-645.9)	(?) Limestone: with interbedded shale

Borehole Depth feet (m)	Lithology	Borehole Depth feet (m)	Lithology
2119-2170 (645.9-661.4)	(?)Limestone	Arnica Formation	
	Headless Member (Thickness: 45.1 m/148 ft.)	Top at 571.2 m (1874 ft.) below sea level Thickness: 51.2 m (168 ft.)	
2170-2318 (661.4-706.5)	Limestone: buff and brown to very dark grey-brown, micro- to very fine-grained, in part argillaceous; some shale: black and grey	2452-2460 (747.4-749.8)	Dolomite: buff, micro- to very fine-crystalline
		2460-2620 (749.8-798.6)	Samples missing
	Landry Formation	Fort Norman Formation	
	Top at 530.4 m (1740 ft.) below sea level Thickness: 40.8 m (134 ft.)	Top at 622.4 m (2042 ft.) below sea level Thickness: >387.1 m (>1270 ft.)	
2318-2452 (706.5-747.4)	Limestone: grey-buff to grey-brown, micro- and very fine-grained, some apatitic (poor samples)	2620-3890 (798.6-1185.7)	Samples missing
		Total depth: 1185.7 m	

APPENDIX 3

List of Wells with Geological Data (Stratigraphic depths in metres)

LEGEND TO APPENDIX 3

Subsea elevation (m) (+ denotes above sea level) at the top of:

Well reference		Well ref.
Well name		Well name
North latitude ° ' "		Lat.
West longitude ° ' "		Long.
NWT Land Survey System		LSS
Total depth (m)		TD
Kelly bushing (m above sea level)		KB
Mesozoic		Mes
Imperial Formation	Jungle Ridge limestone member	uDi
	Canyon Creek sandstone lentil	uDij
		uDic
Horn River Group		muDh
Canol Formation		uDc
	Allochthonous limestone	uDca
Ramparts Formation	Reef member	mDrr
	Platform member	mDrp
	Siltstone lentil	mDrst
Hare Indian Formation	Grey shale member	mDhigy
	Black shale member	mDhibk
	Bluefish Member	mDhib
Hume Formation	Upper member	mDhu
	Middle member	mDhm
	Headless Member	mDhh
Landry Formation		ImDl
Arnica Formation		ImDa
Fort Norman Formation		ImDf
"Arnica Platform"		ImDap
Tatsieta Formation		IDt
Delorme Group		SDd
Tsetso Formation		SDt
Ronning Group		€OSr
Peel Formation		SDp
Mount Kindle Formation		OSk
	Upper pale member	OSku
	Lower dark member	OSkl
	Basal member	OSkb
Franklin Mountain Formation		€Of
	Upper dolomite member	€Ofu
	Cherty member	€Ofch
	Rhythmic member	€Ofc
	Cyclic member	€Ofc
Saline River Formation	Upper clastic member	u€su
	Salt member	u€ss
	Lower clastic member	u€sl
Mount Cap Formation		Im€c
	Member h	Im€ch
	Member g	Im€cg
	Member f	Im€cf
	Member e	Im€ce
	Member d	Im€cd
	Member c	Im€cc
	Member b	Im€cb
	Member a	Im€ca
Mount Clark Formation		I€c
Proterozoic		
Dolomite unit		Pd
Shale unit		Ps
Unit 1 (Cap Mountain)		Pl

Well ref.	A-12	A-16	A-23	A-28	A-37b	A-37s
Well name	Decalta Johnson A-12	Imperial Hossier Ridge No. 2	Arco Smoking Hills A-23	Decalta Keele S. A-28	Imperial Bluefish 1-A	Mobil Slater River A-37
Lat. Long.	63.31.02 124.02.15	65.25.00 127.32.11	69.22.06 126.20.30	64.07.03 125.04.10	64.56.01 125.50.54	64.56.05 126.05.42
LSS TD KB	A12634012400 1227.1 563.0	A16653012730 828.5 84.1	A23693012615 596.2 292.0	A28641012500 3200.4 390.1	A37650012545 1078.7 67.1	A37650012600 1066.8 132.6
Mes	-	-	B	B	B	B
uDi uDij uDic	B +563.0 - -	B +68.9 - -	- - -	789.1 1254.3 -	426.1 426.1 -	24.4
muDh uDc uDca mDrr mDrp mDrst mDhigy mDhibk mDhib	46.9 46.9 - - 84.4 92.7 - 410.9	176.2 176.2 190.8 196.3 319.1 339.5 354.8 - 530.0	- - - - - - - - -	1861.1 1861.1 - - - 1911.1 1962.9 2154.3	513.6 513.6 - - 541.6 - 560.2 - 675.4	530.7 530.7 - - - - 602.0 712.3
mDhu mDhm mDhh ImDI ImDa ImDf ImDap IDt	418.5 467.3 531.6 580.6 627.3	563.9 ? ? 668.7 677.9 696.2	- - - 150.0 226.2	2188.4 2260.3 2352.3 2421.6 - 2549.3	702.0 754.1 805.6 816.0 823.0 829.1	729.7 785.5 833.0 864.1 896.1 915.0
SDd SDt						
€OSr SDp OSk OSku OSkl OSkb €Of €Ofu €Ofch €Ofr €Ofc						
u€su u€ss u€sl Im€c Im€ch Im€cg Im€cf Im€ce Im€cd Im€cc Im€cb Im€ca l€c						
Pd Ps Pl						

Well ref.	A-40	A-52	(A-52) Fault repeated	B-30	B-45	B-46
Well name	Union Good Hope A-40	Imperial Loon Creek No. 1		Candel Stewart B-30	Candel East Mackay B-45	Imperial Ray No. 1
Lat.	66.29.10	65.11.06		64.19.12	64.44.09	65.15.06
Long.	124.35.52	126.54.23		125.19.20	125.38.18	127.08.08
LSS	A40663012430	A52652012645		B30642012515	B45645012530	B46652012700
TD	1592.6	1661.8		2947.7	1611.2	1163.4
KB	443.8	116.4		514.8	259.4	136.2
Mes	-	B		B	B	B
uDi	-	29.9		-	-	441.7
uDij	-	-		-	-	-
uDic	-	-		-	-	-
muDh	-	558.7		1143.6	-	831.8
uDc	-	558.7		-	-	831.8
uDca	-	-		-	-	-
mDrr	-	-		-	-	856.8
mDrp	-	763.8		-	-	969.0
mDrst	-	-		-	-	-
mDhigy	-	772.3		1243.9	-	997.6
mDhibk	-	637.9		1143.6	-	-
mDhib	-	835.4		1277.1	-	-
mDhu	-	848.3		1306.7	-	-
mDhm	-	?		1381.1	-	-
mDhh	-	?		1456.7	-	-
ImDI	-	950.4		1518.2	-	-
ImDa	-	971.7		1596.2	-	-
ImDf	-	986.3		1684.3	-	-
ImDap	-	-		1996.7	-	-
IDt	-	-		-	-	-
SDd	-	-		2143.7	-	-
SDt	-	-		-	-	-
€OSr	B +443.8	1261.3			956.8	
SDp	-	-			-	
OSk	-	1261.3			-	
OSku	-	-			-	
OSkl	-	-			-	
OSkb	-	-			-	
€Of	B +443.8	1268.3	1534.1		956.8	
€Ofu	-	-	-		-	
€Ofch	B +443.8	1268.3	1534.1		956.8	
€Ofr	+22.3	1419.8			1273.8	
€Ofc	238.6					
u€su	296.9					
u€ss	392.3					
u€sl	705.9					
Im€c	745.2					
Im€ch	745.2					
Im€cg	779.9					
Im€cf	806.7					
Im€ce						
Im€cd	831.4					
Im€cc						
Im€cb	933.8					
Im€ca	1016.1					
I€c	1043.6					
Pd	1098.5					
Ps						
Pl						

Well ref.	C-21	C-25	D-02	D-45	D-61	D-65
Well name	Aquit Brackett Lake C-21	Northwest C-2	Mobil Sadene D-02	Union Colville D-45	Sinclair Wolverine Creek D-61	Decalta Dahadinni D-65
Lat. Long.	65.10.02 125.05.08	65.14 126.50	68.51.01 126.47.15	67.14.09 125.09.21	65.10.14 124.12.52	63.54.12 124.27.55
LSS TD KB	C21652012500 1536.5 133.2	C25652012645 931.8 51.8	D02690012645 1857.8 236.8	D45672012500 1173.15 638.9	D61652012400 1931.8 310.0	D65640012415 2438.4 258.2
Mes	B	B	B	-	B	B
uDi uDij uDic	- - -	155.4 - -	- - -	- - -	- - -	321.0 - -
muDh uDc uDca mDrr mDrp mDrst mDhigy mDhibk mDhib	206.3 - - 231.3 - 206.3/279.8 - 455.4	603.5 603.5 - - 731.5 - 742.2 - 844.3	- - - - - - - -	- - Chert and dolomite conglomerate	- - - - - - -	1016.5 1016.5 - - - 1106.7 1040.3 1342.6
mDhu mDhm mDhh ImDI ImDa ImDf ImDap IDt	491.0 546.5 606.2 637.9 673.3 - - -	858.0	+118.6 +87.8 150.9 -	at +638.9 -	- -	1353.0
SDd SDt	- 772.7	-	-	-	- 917.1	-
€OSr SDp OSk OSku OSkl OSkb €Of €Ofu €Ofch €Ofr €Ofc	854.4 - - - - - 854.4 - 854.4 1184.8	-	227.1 227.1 325.5 - - - 462.4 462.4 543.5 848.3 1217.1	B +535.2 - - - - - B +535.2 +162.1	1129.3 - 1129.3 1129.3 1195.7 1270.1 1273.1 - - 1273.1 1364.0	-
u€su u€ss u€sl Im€c Im€ch Im€cg Im€cf Im€ce Im€cd Im€cc Im€cb Im€ca l€c	-	-	1314.6 1381.4 1409.1 1442.0 - - - 1442.0 1460.9 1500.5 1505.1 1521.9 -	+70.1 30.5 139.6 168.9 - 168.9 179.6 211.6 229.3 236.9 254.3 280.8 328.3	1407.6 - - - - -	-
Pd Ps Pl	-	-	- 1569.7	- 361.5	- - 1451.8	-

Well ref.	(D-65) Fault repeated	E-11	E-15	E-30	F-39	F-49
Well name		Union Blackwater E-11	Mobil Colville E-15	Aquit Old Fort Point E-30	Imperial Raider Island No. 1	Cdn. Res. Keller Lake F-49
Lat.		63.40.20	67.14.18	64.49.26	65.18.15	63.58.20
Long.		123.03.30	126.18.26	124.50.16	127.06.57	121.53.30
LSS		E11635012300	E15672012615	E30645012445	F39652012700	F49640012145
TD		2170.2	1827.6	787.3	667.5	216.7
KB		504.4	386.8	127.1	65.8	281.0
Mes		B	-	B	B	B
uDi		-	-	-	53.9	-
uDij		-	-	-	-	-
uDic		-	-	-	-	-
muDh		-	-	-	480.7	-
uDc		-	-	-	480.7	-
uDca		-	-	-	554.4	-
mDrr		-	-	-	-	-
mDrp		-	-	-	560.2	-
mDrst		-	-	-	-	-
mDhigy	1465.8	-	-	-	568.1	-
mDhibk	-	-	-	-	-	-
mDhib	1503.9	-	-	-	-	-
mDhu	1513.6	119.2	-	-	-	-
mDhm	1567.5	154.6	-	-	-	-
mDhh	1639.2	206.7	-	-	-	-
ImDl	1689.2	236.8	-	-	-	+135.6
ImDa	1746.2	272.5	B +386.8	-	-	+128.6
ImDf	1781.6	288.0	-	-	-	+81.1
ImDap		-	-	-	-	-
IDt		-	-	-	-	-
SDd		-	-	-	-	-
SDt		774.5	-	-	-	-
€OSr		1049.1	+295.4	151.2	-	-
SDp		-	-	-	-	-
OSk		1049.1	-	-	-	-
OSku		1049.1	-	-	-	-
OSkl		1126.2	-	-	-	-
OSkb		1263.7	-	-	-	-
€Of		1279.2	+295.4	151.2	-	-
€Ofu		-	-	-	-	-
€Ofch		-	+295.4	151.2	-	-
€Ofc		1279.2	458.1	526.4	-	-
€Ofc		1490.1	629.4	-	-	-
u€su		1535.3	758.3	-	-	-
u€ss		1564.5	878.1	-	-	-
u€sl		1607.2	989.1	-	-	-
Im€c		1624.3	1018.9	-	-	-
Im€ch		-	-	-	-	-
Im€cg		-	-	-	-	-
Im€cf		-	1018.9	-	-	-
Im€ce		-	1027.4	-	-	-
Im€cd		-	1045.7	-	-	-
Im€cc		-	1065.5	-	-	-
Im€cb		-	1076.2	-	-	-
Im€ca		-	1092.0	-	-	-
l€c		1631.0	1124.1	-	-	-
Pd		-	-	-	-	-
Ps		-	1142.7	-	-	-
P1		1652.3	-	-	-	-

Well ref.	F-62	G-02	G-12	G-22	G-44	G-51c
Well name	Arco Lost Hill Lake F-62	Elf Horton River G-02	Imperial Loonex No. 1	B.P. Losh Lake G-22	Imperial Morrow Creek No. 1	Imperial Canyon Creek No. 1
Lat. Long.	65.41.23 123.12.20	69.51.23 127.15.56	65.11.19 127.02.33	65.51.29 123.19.35	65.23.15 127.23.07	65.10.22 126.24.51
LSS TD KB	F62655012300 1391.7 267.9	G02700012715 2478.0 38.1	G12652012700 1391.1 133.2	G22660012315 1225.3 293.2	G44653012715 616.9 55.8	G51652012615 629.7 54.9
Mes	B	B	B	B	-	-
uDi	-	-	269.1	-	B above +40.5	B +54.9
uDij	-	-	-	-	-	-
uDic	-	-	-	-	-	318.5
muDh	-	515.1	806.5	-	175.6	362.7
uDc	-	-	806.5	-	175.6	362.7
uDca	-	-	-	-	242.9	-
mDrr	-	-	-	-	249.6	-
mDrp	-	-	-	-	256.9	-
mDrst	-	-	-	-	-	-
mDhigy	-	515.1	956.8	-	280.1	514.2
mDhibk	-	-	867.2	-	-	427.6
mDhib	-	639.8	1064.7	-	417.6	545.6
mDhu	-	-	1079.3	-	433.7	560.2
mDhm	-	677.5	?	-	?	-
mDhh	-	-	?	-	?	-
ImDl	-	713.2	1179.3	-	535.5	-
ImDa	-	909.8	1200.3	-	541.6	-
ImDf	-	-	1223.2	-	-	-
ImDap	-	-	-	-	-	-
IDt	-	1048.5	-	-	-	-
SDd	-	-	-	-	-	-
SDt	264.9	-	-	-	-	-
€OSr	310.6	1066.2	-	81.1	-	-
SDp	-	1066.2	-	-	-	-
OSk	310.6	1421.9	-	81.1	-	-
OSku	310.6	-	-	-	-	-
OSkl	378.3	-	-	-	-	-
OSkb	442.6	-	-	-	-	-
€Of	443.5	1566.7	-	165.2	-	-
€Ofu	443.5	1566.7	-	165.2	-	-
€Ofch	489.2	1882.1	-	200.3	-	-
€Ofr	612.9	2241.8	-	327.1	-	-
€Ofc	765.0	-	-	484.1	-	-
u€su	803.1	-	-	521.2	-	-
u€ss	858.6	-	-	576.4	-	-
u€sl	1015.3	-	-	723.0	-	-
Im€c	1057.0	-	-	762.9	-	-
Im€ch	-	-	-	-	-	-
Im€cg	-	-	-	-	-	-
Im€cf	-	-	-	-	-	-
Im€ce	1057.0	-	-	762.9	-	-
Im€cd	-	-	-	-	-	-
Im€cc	1086.6	-	-	789.4	-	-
Im€cb	1093.3	-	-	796.7	-	-
Im€ca	-	-	-	833.9	-	-
l€c	-	-	-	845.5	-	-
Pd	-	-	-	-	-	-
Ps	-	-	-	-	-	-
Pl	-	-	-	909.8	-	-

Well ref.	G-51p	G-52	(G-52) Fault repeated	G-60	G-70	G-78
Well name	Aquit Plateau G-51	Shell Blackwater Lake G-52		H.B. Fish Lake G-60	Shell Wrigley G-70	Imperial Loon Creek No. 2
Lat. Long.	63.50.22 125.25.04	64.01.20 122.55.12		63.09.30 122.55.00	63.09.17 124.11.50	65.07.20 126.28.51
LSS TD KB	G51640012515 2118.4 814.4	G52641012245 1981.2 370.0		G60631012245 1674.9 389.2	G70631012400 3733.8 549.9	G78651012615 1552.4 110.6
Mes	-	B		B	-	-
uDi	B +814.4	-		+169.8	B +549.9	B +68.0
uDij	-	-		-	-	-
uDic	-	-		-	-	221.6
muDh	+226.8	-		29.3	134.4	255.1
uDc	+226.8	-		29.3	134.4	255.1
uDca	-	-		-	-	-
mDrr	-	-		-	-	-
mDrp	-	-		95.7	-	-
mDrst	-	-		-	-	-
mDhigy	-	-		-	248.7	390.4
mDhibk	+172.5	-		-	173.1	301.8
mDhib	57.3	-		-	297.2	421.5
mDhu	120.7	-		-	331.9	-
mDhm	209.1	+160.9		114.3	404.4	435.9
mDhh	327.4	+134.1		193.2	508.4	-
ImDl	406.0	-		231.3	570.6	550.2
ImDa	605.9	+123.1		263.0	687.6	569.7
ImDf		+56.7		305.4	1364.0	598.3
ImDap		-		-	1187.5	-
IDt		-		-	-	-
SDd		-	-	-	1492.3	-
SDt		183.2	617.8	744.6	-	-
€OSr		467.6	859.2	894.3	2822.8	907.4
SDp		-	-	-	-	-
OSk		467.6	859.2	894.3	2822.8	-
OSku		558.4	859.2	894.3	-	-
OSkl			949.1	979.9	-	-
OSkb			1091.8	1108.3	-	-
€Of			1102.8	1134.2	-	907.4
€Ofu			-	-	-	-
€Ofch			1102.8	1134.2	-	907.4
€Ofr			1170.5	1181.1	-	1139.0
€Ofc			1336.9	-	-	1250.3
u€su			1379.8	-	-	1293.9
u€ss			1423.4	-	-	1321.9
u€sl			1443.5	-	-	-
Im€c			-	-	-	-
Im€ch			-	-	-	-
Im€cg			-	-	-	-
Im€cf			-	-	-	-
Im€ce			-	-	-	-
Im€cd			-	-	-	-
Im€cc			-	-	-	-
Im€cb			-	-	-	-
Im€ca			-	-	-	-
IEc			1462.7	-	-	-
Pd						
Ps						
Pl			1504.2			

Well ref.	H-15	H-34	H-40	H-61	H-71	H-77
Well name	Imperial Hossier Ridge No. 1	Arco W. Whitefish River H-34	Imperial Judile No. 1	SOBC St. Charles Creek H-61	Banff Oscar Creek H-71	Pacific Oscar Creek H77
Lat. Long.	65.24.16 127.32.14	65.33.24 124.35.45	65.29.24 127.35.58	64.50.24 123.56.28	65.30.20 127.13.26	65.26.22 127.28.15
LSS	H15653012730	H34654012430	H40653012730	H61650012345	H71654012700	H77653012715
TD	809.6	1654.5	858.0	1114.7	432.2	612.7
KB	131.1	230.7	93.6	262.7	234.7	60.1
Mes	-	B	B	B	-	B
uDi	-	-	2.1	-	-	33.5
uDij	-	-	-	-	-	-
uDic	-	-	-	-	-	-
muDh	B +131.1	-	287.7	-	B +234.7	377.0
uDc	+131.1	-	287.7	-	-	377.0
uDca	-	-	300.5	-	-	439.8
mDrr	+128.0	-	303.9	-	-	441.0
mDrp	+21.3	-	433.7	-	-	480.9
mDrst	19.8	-	448.3	-	-	460.8
mDhigy	42.7	-	474.0	-	+234.7	489.8
mDhibk	-	-	-	-	-	-
mDhib	166.1	-	573.9	-	+35.4	-
mDhu	-	-	-	-	-	-
mDhm	182.3	-	593.8	-	+12.8	-
mDhh	-	-	666.9	-	53.0	-
ImDl	286.5	533.1	685.2	242.3	70.4	-
ImDa	296.9	552.0	694.3	303.0	81.7	-
ImDf	329.5	599.8	721.2	334.1	121.9	-
ImDap	-	-	-	-	-	-
IDt	-	-	-	-	-	-
SDd	-	-	-	-	-	-
SDt	-	799.2	-	683.1	-	-
€OSr	633.1	976.3	-	839.4	-	-
SDp	-	-	-	-	-	-
OSk	-	976.3	-	-	-	-
OSku	-	976.3	-	-	-	-
OSkl	-	1055.5	-	-	-	-
OSkb	-	1103.0	-	-	-	-
€Of	633.1	1108.3	-	839.4	-	-
€Ofu	633.1	-	-	-	-	-
€Ofch	670.6	1108.3	-	839.4	-	-
€Ofc	-	1110.3	-	-	-	-
€Ofc	-	1275.5	-	-	-	-
u€su	-	1294.8	-	-	-	-
u€ss	-	1330.8	-	-	-	-
u€sl	-	1340.8	-	-	-	-
Im€c	-	1357.9	-	-	-	-
Im€ch	-	-	-	-	-	-
Im€cg	-	-	-	-	-	-
Im€cf	-	-	-	-	-	-
Im€ce	-	1357.9	-	-	-	-
Im€cd	-	-	-	-	-	-
Im€cc	-	1362.8	-	-	-	-
Im€cb	-	1368.9	-	-	-	-
Im€ca	-	1383.5	-	-	-	-
l€c	-	1387.1	-	-	-	-
Pd	-	1418.5	-	-	-	-
Ps	-	-	-	-	-	-
P1	-	-	-	-	-	-

Well ref.	I-01	I-15	I-46	I-54A	I-54w	(I-54w) Fault repeated
Well name	Decalta Keele River I-01	Shell Ochre River I-15	Shell Cloverleaf I-46	Buttes Blackwater Lake I-54A	Decalta Wrigley I-54	
Lat. Long.	64.20.40 125.00.07	63.24.45 122.46.57	63.55.44 124.52.39	64.33.44 122.39.40	63.13.33 123.54.32	
LSS	I01643012500	I15633012245	I46640012445	I54644012230	I54632012345	
TD	1706.9	1488.3	3449.7	1376.2	1969.0	
KB	289.9	507.2	443.8	242.0	418.5	
Mes	B	B	B	B	?	
uDi	-	-	288.0	-	B +385.0	
uDij	-	-	-	-	-	
uDic	-	-	-	-	-	
muDh	-	+38.1	910.4	-	+314.6	
uDc	-	-	910.4	-	+314.6	
uDca	-	-	-	-	-	
mDrr	-	-	-	-	-	
mDrp	-	-	-	-	+231.6	
mDrst	-	-	-	-	-	
mDhigy	-	+38.1	940.6	-	+212.1	
mDhibk	-	-	1001.3-1133.9	-	-	
mDhib	-	-	1207.6	-	+53.3	
mDhu	-	25.6	1238.1	-	+35.1	
mDhm	829.4	62.2	1308.2	-	27.4	
mDhh	879.0	111.6	1399.6	-	150.9	287.4
ImDl	921.1	144.5	1469.7	-	215.8	322.8
ImDa	977.2	165.8	1661.5	+27.1		427.3
ImDf	1015.9	206.0	1784.3	25.6		721.5
ImDap	1170.1	-	2802.9	-		876.9-1006.4
IDt	-	-		-		-
SDd	-	-		-		-
SDt	-	695.6		353.0		1148.2
€OSr	1298.1	905.0		603.8		
SDp	-	-		-		
OSk	-	905.0		603.8		
OSku	-	905.0		603.8		
OSkl	-			669.3		
OSkb	-			778.5		
€Of	1298.1			789.4		
€Ofu	-			-		
€Ofch	-			789.4		
€Ofr	1298.1			862.2		
€Ofc				1066.1		
u€su				1099.7		
u€ss						
u€sl						
Im€c						
Im€ch						
Im€cg						
Im€cf						
Im€ce						
Im€cd						
Im€cc						
Im€cb						
Im€ca						
l€c						
Pd						
Ps						
Pl						

Well ref.	I-70d	I-70l	I-74	J-20	J-42	J-48
Well name	IOE Dahadinni I-70	Candex Little Bear I-70	Sinclair Mahony Lake I-74	Imperial Canyon Creek No. 2	Imperial Redstone No. 1	Banff Oscar Creek J-48
Lat. Long.	63.19.41 124.56.35	64.39.44 125.56.35	65.23.36 124.43.30	65.09.36 126.17.35	64.11.42 124.38.19	65.27.35 127.08.23.5
LSS TD KB	170632012445 3663.7 844.3	170644012545 2139.7 416.4	174653012430 1883.7 310.3	J20651012615 244.8 100.3	J42642012430 1485.6 71.6	J48653012700 460.9 217.6
Mes	-	B	B	-	B	-
uDi	-	1366.7	-	B + 100.3	86.9	B +217.6
uDij	-	1518.2-1557.5	-	-	-	-
uDic	-		-	103.0	-	-
muDh	-		-	140.2	470.9	+163.4
uDc	-		-	140.2	470.9	+163.4
uDca	-		-		-	+93.2
mDrr	-		-		-	-
mDrp	-		-		-	-
mDrst	-		-		-	-
mDhigy	-		-		544.1	+71.3
mDhibk	-		-		-	-
mDhib	-		-		720.9	68.9
mDhu	-		-		728.5	82.0
mDhm	-		-		? 775.7	116.1
mDhh	B +838.2		643.7		894.6	147.5
ImDI	+829.1		666.9		943.4	167.0
ImDa	+755.3		689.5		1034.8	178.0
ImDf	-		704.7		1062.2	220.7
ImDap	533.4		-		1300.0	
IDt	-		-			
SDd	752.9		-			
SDt	-		1086.9			
€OSr			1278.9			
SDp			-			
OSk			-			
OSku			-			
OSkl			-			
OSkb			-			
€Of			1278.9			
€Ofu			-			
€Ofch			-			
€Ofr			1278.9			
€Ofc			trace			
u€su			1511.5			
u€ss			1524.6			
u€sl			1535.6			
Im€c			-			
Im€ch			-			
Im€cg			-			
Im€cf			-			
Im€ce			-			
Im€cd			-			
Im€cc			-			
Im€cb			-			
Im€ca			-			
l€c			-			
Pd			1544.1			
Ps						
Pl						

Well ref.	J-65	J-76	K-03	K-14	K-24	K-29
Well name	Candel Tate J-65	Imperial Mac No. 1	Aquit Dodo Canyon K-03	Candel Fort Norman K-14	Ashland Tedji Lake K-24	Amoco Red Dog K-29
Lat. Long.	64.24.39 125.26.48	65.15.30 126.59.00	65.02.33 126.46.14	64.53.42 125.18.08	67.43.38 126.49.56	64.08.43 125.34.55
LSS TD KB	J65643012515 2834.0 607.5	J76652012645 958.9 50.9	K03651012645 2746.3 308.5	K14650012515 856.5 115.5	K24675012645 1213.1 346.9	K29641012530 2148.8 560.5
Mes	B	B	B	B	-	-
uDi uDij uDic	- - -	194.8 - -	598.6 - -	- - -	- - -	- - -
muDh uDc uDca mDrr mDrp mDrst mDhigy mDhibk mDhib	1142.7 - - - - - 1172.6 1142.7 1205.2	559.3 559.3 - 586.7 704.4 - 737.0 - 891.5	1274.1 1274.1 - - - - - 1326.2 1447.8	- - - - - - - - -	- - - - - - - - -	- - - - - - - - -
mDhu mDhm mDhh lmDI lmDa lmDf lmDap lDt	1221.0 1252.4 1297.5 1344.5 1395.1 1419.5 1587.1 -	900.1	1462.1 1523.7 1555.4 1580.7 1598.4 1627.3 - -	- - - - - - - -	- - - B +306.6 +182.3 - - -	- - B +560.5 +527.0 +322.8 +146.6 125.3 -
SDd SDt	- -		- -	- -	- -	329.5 -
€OSr SDp OSk OSku OSkl OSkb €Of €Ofu €Ofch €Ofr €Ofc	1710.2 - - - - - 1710.2 - 1710.2 1870.5 2118.0		1980.9 - 1980.9 - - - 2004.7 2004.7 2018.4 2195.8 2384.8	560.5 - - - - - 560.5 - 560.5 - -	+136.2 - +136.2 - - - +41.8 - +41.8 387.7 500.5	
u€su u€ss u€sl lm€c lm€ch lm€cg lm€cf lm€ce lm€cd lm€cc lm€cb lm€ca l€c			2424.4		582.8 631.5 682.8 706.8 - - 706.8 710.2 726.0 747.3 757.1 773.9 794.9	
Pd Ps Pl					800.4	

Well ref.	K-44	K-71	K-76	L-04	L-21	L-28
Well name	Union Stopover K-44	C.S. Bluefish K-71	Sinclair Whitefish River K-76	Shell Keele River L-04	Pex N. Colville L-21	Imperial Seepage Lake No. 1A
Lat. Long.	67.33.31 123.38.32	64.50.30 125.59.30	65.35.32 124.29.16	64.23.37 125.01.43	67.40.37 126.05.37	65.17.40 126.50.24
LSS TD KB	K44674012330 942.4 367.0	K71650012545 1574.9 151.8	K76654012415 1606.9 241.4	L04643012500 1293.0 262.7	L21675012600 1195.1 308.8	L28652012645 498.7 68.3
Mes	-	B	B	B	-	-
uDi	-	466.3	-	-	-	B +48.5
uDij	-	-	-	-	-	-
uDic	-	-	-	-	-	-
muDh	-	980.8	-	-	-	128.0
uDc	-	980.8	-	-	-	128.0
uDca	-	-	-	-	-	-
mDrr	-	-	-	-	-	-
mDrp	-	-	-	-	-	equiv. 182.3
mDrst	-	-	-	-	-	232.0
mDhigy	-	-	-	-	-	239.6
mDhibk	-	1046.1	-	-	-	-
mDhib	-	1153.1	-	-	-	384.4
mDhu	-	1170.7	-	-	-	398.7
mDhm	-	1226.5	-	-	-	-
mDhh	-	1271.9	-	-	-	-
ImDI	-	1307.6	571.8	-	-	-
ImDa	-	1343.9	579.7	-	-	-
ImDf	-	1369.2	689.2	-	-	-
ImDap	-	-	-	-	-	-
IDt	-	-	-	-	-	-
SDd	-	-	-	-	-	-
SDt	-	-	703.5	-	-	-
€OSr	B +315.2	-	894.0	-	B +287.4	-
SDp	-	-	-	-	-	-
OSk	-	-	894.0	-	+287.4	-
OSku	-	-	894.0	-	-	-
OSkl	-	-	980.9	-	-	-
OSkb	-	-	1031.5	-	-	-
€Of	+315.2	-	1034.5	-	+131.1	-
€Ofu	-	-	-	-	-	-
€Ofch	+315.2	-	?	-	+131.1	-
€Ofr	+111.6	-	1034.5	-	191.1	-
€Ofc	110.9	-	1249.1	-	454.8	-
u€su	197.5	-	1264.6	-	534.0	-
u€ss	281.3	-	1300.9	-	583.7	-
u€sl	336.5	-	1318.6	-	718.4	-
Im€c	380.1	-	1337.5	435.3	737.0	-
Im€ch	-	-	-	-	-	-
Im€cg	380.1	-	-	-	-	-
Im€cf	384.1	-	-	-	737.0	-
Im€ce	394.5	-	1337.5	-	751.0	-
Im€cd	-	-	-	-	758.0	-
Im€cc	417.3	-	1349.7	-	779.0	-
Im€cb	433.1	-	-	-	788.8	-
Im€ca	448.9	-	-	-	809.5	-
l€c	476.4	-	-	-	837.3	-
Pd	500.8	-	-	-	-	-
Ps	-	-	-	-	850.7	-
Pl	-	-	-	-	-	-

Well ref.	L-57	L-66	M-04	M-07	M-43	(M-43) Fault repeated
Well name	Imperial Goose Island No. 20 L-57	Candel Police Island L-66	B.P. White M-04	B.P. Russel M-07	Candex Dahadinni M-43A	
Lat. Long.	65.16.34 126.56.10	64.45.38 125.12.57	65.33.56 123.46.30	65.26.58 123.31.50	63.52.59 124.39.15	
LSS	L57652012645	L66645012500	M04654012345	M07653012330	M43640012430	
TD	509.3	1345.4	482.8	530.1	3130.9	
KB	46.9	148.1	210.9	274.6	250.6	
Mes	B	B	B	B	?	
uDi	3.7	-	-	-	+125.6	
uDij	-	-	-	-	-	
uDic	-	-	-	-	-	
muDh	352.7	-	-	-	576.4	
uDc	? 352.7	-	-	-	576.4	
uDca	-	-	-	-	-	
mDrr	394.1	-	-	-	-	
mDrp		-	-	-	-	
mDrst		-	-	-	-	
mDhigy		-	-	-	686.1	
mDhibk		-	-	-	628.8	
mDhib		-	-	-	810.2	
mDhu		-	-	-	830.6	
mDhm		-	-	-	897.7	
mDhh		-	-	-	984.5	1108.9
ImDl		-	-	-	1065.0	1156.7
ImDa		-	235.3	217.0		1241.4
ImDf		-				1278.0
ImDap		-				2721.3
IDt		-				
SDd		-				
SDt		-				
€OSr		804.1				
SDp		-				
OSk		-				
OSku		-				
OSkl		-				
OSkb		-				
€Of		804.1				
€Ofu		-				
€Ofch		-				
€Ofr		? 804.1				
€Ofc		1013.8				
u€su		1144.2				
u€ss						
u€sl						
Im€c						
Im€ch						
Im€cg						
Im€cf						
Im€ce						
Im€cd						
Im€cc						
Im€cb						
Im€ca						
IEc						
Pd						
Ps						
Pl						

Well ref.	M-48	M-63	N-28	N-30	N-62	N-70
Well name	Union Maunoir M-48	Mobil Belot Hills M-63	Imperial Vermilion Ridge No. 1	SOBC Great Bear River N-30	Decalta Keele N-62	B.P. Grey Goose N-70
Lat.	66.57.54	67.02.45	65.07.51	64.59.45	64.21.48	65.19.58
Long.	124.24.00	126.27.45	126.05.00	124.04.51	124.57.12	123.42.15
LSS	M48670012415	M63671012615	N28651012600	N30650012400	N62643012445	N70652012330
TD	862.6	1283.5	1820.3	766.6	1279.9	685.8
KB	382.8	461.8	281.9	252.4	225.6	217.9
Mes	-	-	-	B	B	B
uDi	-	-	-	-	-	-
uDij	-	-	-	-	-	-
uDic	-	-	-	-	-	-
muDh	-	-	B +281.9	-	-	-
uDc	-	-	-	-	-	-
uDca	-	-	-	-	-	-
mDrr	-	-	-	-	-	-
mDrp	-	-	-	-	-	-
mDrst	-	-	-	-	-	-
mDhigy	-	-	+169.2	-	-	-
mDhibk	-	-	+281.9	-	-	-
mDhib	-	-	+153.9	-	-	-
mDhu	-	-	+138.7	-	-	-
mDhm	-	B +461.8	+83.8	-	-	-
mDhh	-	-	+50.3	-	-	-
ImDI	-	+394.7	+22.9	433.4	-	436.8
ImDa	-	-	3.0	481.3	-	-
ImDf	-	-	33.5	505.4	-	-
ImDap	-	-	-	-	-	-
IDt	-	-	-	-	-	-
SDd	-	-	-	-	-	-
SDt	-	-	-	-	-	-
€OSr	B +317.3	+355.4	281.9	-	640.4	-
SDp	-	-	-	-	-	-
OSk	-	-	281.9	-	-	-
OSku	-	-	-	-	-	-
OSkl	-	-	-	-	-	-
OSkb	-	-	-	-	-	-
€Of	+317.3	+355.4	291.1	-	640.4	-
€Ofu	-	-	-	-	-	-
€Ofch	-	+355.4	291.1	-	-	-
€Ofr	? +317.3	?	486.2	-	? 640.4	-
€Ofc	+157.0	228.6	trace	-	848.9	-
u€su	+98.5	292.9	570.0	-	-	-
u€ss	10.1	331.9	623.3	-	-	-
u€sl	165.2	407.8	1418.8	-	-	-
Im€c	184.4	444.4	1455.4	-	899.2	-
Im€ch	184.4	-	-	-	-	-
Im€cg	220.7	444.4	-	-	-	-
Im€cf	242.0	-	-	-	-	-
Im€ce	278.6	482.2	-	-	-	-
Im€cd	292.0	494.1	-	-	-	-
Im€cc	302.7	529.2	-	-	-	-
Im€cb	311.5	531.6	-	-	-	-
Im€ca	361.2	550.2	-	-	-	-
l€c	377.3	586.7	-	-	-	-
Pd	-	601.1	-	-	-	-
Ps	430.4	713.2	-	-	-	-
Pl	-	-	-	-	-	-

Well ref.	O-13	O-17	O-41	P-05	P-14	P-78
Well name	Cdn. Res. Keller Lake O-13	Pacific Judile O-17	Pacific Judile O-41	Imperial Mac No. 2	Cdn. Res. Keller Lake P-14	Decalta Redstone P-78
Lat.	64.12.53	65.26.53	65.30.45	65.14.51	64.13.53	64.07.57
Long.	122.17.25	127.32.35	127.38.00	127.00.22	122.32.00	124.28.15
LSS	O13642012215	O17653012730	O41654012730	P05652012700	P14642012230	P78641012415
TD	941.8	576.1	431.4	901.6	484.3	1185.7
KB	457.2	55.8	56.7	93.0	392.3	176.2
Mes	B	B	B	B	B	B
uDi	-	29.0	59.1	253.9	-	-
uDij	-	-	-	-	-	-
uDic	-	-	-	-	-	-
muDh	-	327.7	317.9	626.4	-	304.5
uDc	-	327.7	317.9	626.4	-	-
uDca	-	341.1	thin	-	-	-
mDrr	-	343.2	358.1	654.7	-	-
mDrp	-	466.9		783.3	-	-
mDrst	-	479.4		-	-	-
mDhigy	-	496.5		801.3	-	315.8
mDhibk	-				-	304.5
mDhib	-				-	377.3
mDhu	-				-	381.6
mDhm	-				-	421.2
mDhh	-				-	485.2
lmDI	-				+53.0	530.4
lmDa	+104.5				+27.1	571.2
lmDf	+73.5				21.0	622.4
lmDap	-					
lDt	-					
SDd	-					
SDt	125.0					
€OSr						
SDp						
OSk						
OSku						
OSkl						
OSkb						
€Of						
€Ofu						
€Ofch						
€Ofr						
€Ofc						
u€su						
u€ss						
u€sl						
lm€c						
lm€ch						
lm€cg						
lm€cf						
lm€ce						
lm€cd						
lm€cc						
lm€cb						
lm€ca						
l€c						
Pd						
Ps						
Pl						

APPENDIX 4

Revision of Peel River Area Geological Data

As a result of the present study, some minor revisions of a few tops and thicknesses in the previously published (Pugh, 1983) Peel River area borehole data are necessary:

1. Mount Cap-Saline River boundary (op. cit., Appendices 2 and 3, Figs. 4, 5 and 24).

Borehole reference number	Mount Cap Formation corrected thickness	Mount Cap Formation corrected top		Lower clastic member corrected thickness	Saline River Formation corrected thickness
		Borehole footage	Subsea elevation		
D-40	167 m (548 ft.)	6502 ft.	1765 m (5792 ft.)	29 m (96 ft.)	136 m (446 ft.)
I-11	75 m (246 ft.)	6182 ft.	1757 m (5764 ft.)	29 m (94 ft.)	157 m (516 ft.)
J-42	>53 m (>173 ft.)	6537 ft.	1667 m (5469 ft.)	13 m (43 ft.)	166 m (545 ft.)

2. Canol Formation, lower boundary to include Allochthonous limestone (op. cit., Appendix 2, Fig. 16).

Borehole reference number	Canol Formation corrected thickness
A-23	27 m (90 ft.)
A-53	7 m (23 ft.)
D-53	6 m (21 ft.)
D-72	14 m (47 ft.)
G-56	17 m (57 ft.)
L-09	35 m (115 ft.)
O-62	apparent estimate
	>18 m (>60 ft.)
	17 m (56 ft.)

