

FINAL
GEOLOGICAL REPORT
ON

"MACKENZIE RIVER AREA FROM
CAMSELL BEND TO FORT NORMAN"

N.W.T. (Canada)

IMPERIAL OIL LTD., CANCL PROJECT

Assignment No. 34.

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Date submitted: February 23, 1944

Read and accepted by: Max A. Link

Date: 3/1/44

Max A. Link
Cosburn

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RIVER AREA FROM CAMSILL BEND TO
PORT NORMAN"
Scale: 1" - 4 mi.



1902 MAP OF
 NORTH WESTERN CANADA SHOWING
 MACKENZIE RIVER AREA, CAMPBELL BEND TO FT NORMAN

FINAL GEOLOGICAL REPORT

ON

"MACKENZIE RIVER AREA FROM CASSELL BEND TO FORT NORMAN"

A B S T R A C T

A geological survey was made of the area adjacent to the Mackenzie River from Cassell Bend to Fort Norman, N.W.T. The purpose of this survey was to determine available information regarding the change in facies of the "Norman Series", as well as to obtain all other pertinent geologic information within reasonable distance of the Mackenzie River. "Norman Series" outcrops studied apparently correlate with the "Hay River" limestones and interbedded shales, and several beds that are the equivalent of the Norman Sandstones of the Norman Wells area were recognized. The geologic structures observed in the mountainous area are not regarded as favorable oil structures, and no significant structures were observed in the other parts of the area examined. This report is therefore primarily a stratigraphic contribution to the geology of the area.

Chapter I

INTRODUCTION

A geologic survey was made of the area neighbouring the Mackenzie River for a distance of approximately 250 miles from Cansell Bend to Fort Norman. Party 'J', for this Assignment No. 34, was composed of Gordon D. Bath, geologist; Steve S. Cosburn, assistant geologist; and James E. Baugh, helper.

The geologic party was outfitted with a small United States Army "heavy pontoon" propelled with a 24-horsepower outboard motor. A canoe was used to give greater flexibility to the survey party, both along the Mackenzie River and in ascending some of the larger tributaries.

The party and equipment were transported upstream to Cansell Bend from Norman Wells on the steamboat "Distributor", operated by the Hudson Bay Company. This trip upstream served as preliminary reconnaissance, airplane reconnaissance not being available at the time. The Mackenzie River and surrounding area was surveyed downstream to Fort Norman, and the islands from Fort Norman to Norman Wells were investigated for rock outcrops. The party left Norman Wells August 22, 1943 and returned September 30, 1943.

Accessibility

The area between Cansell Bend and Fort Norman can be reached in the summer by water travel on the Mackenzie River, and in the winter, when the ground is frozen, by winter road. Locations inland from the river could be initially approached by winter road, and later, if justified, by an all-weather road. The thick mantle of Pleistocene and Recent gravel deposits could be utilized in the building of an all-weather road by locating the road in or near the river and creek valleys.

Acknowledgment

The party used, as a field guide, the Summary Reports of the Canadian Geological Survey containing maps and descriptions of the greater part of the area traversed. The reports include:

Summary Report, 1921, Part B. "Exploration East of Mackenzie River, between Simpson and Wrigley".
M.Y. Williams.

Summary Report, 1921, Part B. "North Nahanni and Root River Areas, and Caribou Island, Mackenzie River District". G.S. Hume

Summary Report, 1921, Part B. "Geological Structure of the Mackenzie River Region". D.B. Dowling.

Summary Report, 1922, Part B. "The Geology of the Northern Extension of Franklin Mountains, N.W.T.". M.Y. Williams.

Summary Report, 1923, Part B. "Mackenzie River Area, District of Mackenzie, N.W.T.". G.S. Hume.

Helpful suggestions were received from Dr. T.A. Link. Since the original discovery at Norman Wells in 1920, Dr. Link has travelled the distance from Cassell Bend to Fort Norman on numerous occasions by boat and airplane. The west side of the Mackenzie River from Wrigley to the Johnson River was worked in collaboration with Lt. V.B. Monnett. The fossils collected have been identified and subsequent correlations have been made by Mr. C.R. Stelck.

TOPOGRAPHY

The Mackenzie River flows into the foothills of the Mackenzie Mountains at Cassell Bend where the river is deflected sharply away into the more flat lying areas to the east. The bend in the river is adjacent to a 2000 to 3000 foot eastwardly facing fault scarp. The topographic effect of this fault can be traced one hundred miles from the North Nahanni River, crossing the Root River, paralleling the Wrigley River, and crossing the Mackenzie River to extend beyond Roche-qui-trempe a-l'En.

At a point five miles from its mouth, the Root River cuts into and follows, for over twenty miles, a broad mountainous area which, in places, is over 1000 feet above the river elevation.

The Franklin Mountains make their first appearance just north of the Willow Lake River. These mountains are the result of an anticlinorium whose axis gradually plunges to the south. Mountains, reaching an elevation of 5000 feet (with rocks of Cambrian age) near Wrigley, extend thirty miles to the south where Devonian limestones outcrop at a much lower elevation and finally plunge under Willow Lake River. The topography of this area consists of rather low limestone mountains with a prominent east-facing escarpment.

The Franklin Mountains on the east side of the Mackenzie River, between the Ochre and Blackwater Rivers, are composed of a heterogeneous mass of erosional remnants. In the vicinity of the Blackwater River and Blackwater Lake there are a series of limestone ridges and hills whose topographic effect dies out as the ridges trend toward the northwest. A relatively low, anticlinal ridge extends from the big bend near the mouth of the Blackwater River for twenty miles to a point a few miles east of Birch Island in the Mackenzie River. At this point the ridge dies out

toward the Saline River. The Saline River valley has a gradual slope toward the high ground of Mount Clark. Mount Clark is a narrow mountain rising 4,500 feet in elevation and strikes to the north where the trend is represented by isolated low mountains and knobs extending to Mount Charles on the Great Bear River.

On the west side of the Mackenzie River, from Wrigley to Fort Norman, the topography is relatively low and uniform. There is a series of low-lying ridges both north and south of the Johnson River which generally parallel the Mackenzie River. Other ridges of note include the ridge south of the mouth of the Blackwater River, and "Sandstone" and "Crescent" ridges in the Dahadinni area.

STRATIGRAPHY

The lack of information, together with the variation of the Devonian sediments over short distances, makes the preparation of a complete geologic section inadvisable at this time. It is the purpose of this chapter of the report to give definite and somewhat detailed descriptions of the outcrops observed, and to correlate these outcrops as well as possible with the field evidence in hand.

The outcrops of the Bear Rock dolomite along Amos Creek in the Blackwater River area is the most southerly extension of the Bear Rock formation observed. This formation, being barren of fossils, was identified by similar lithological characteristics as seen in the dolomites of the Norman Wells area. It is possible that the Lone Mountain formation, observed on Lone Mountain and in the Willow Lake area, is the equivalent of the Bear Rock formation.

The Rasparts Beaver-tail formation overlies the Lone Mountain formation. The shale horizons which are present in the normal Rasparts formation are missing in the region to the south of Wrigley. The first appearance of these shale horizons, going north from Lone Mountain, is at Roche-qui-trempe-a-l'Eau near Wrigley. The absence of the shales underlying the Beaver-tail formation makes the Beaver-tail limestone difficult to identify in the field. By the use of fossils, the Beaver-tail limestone can be separated from the Rasparts limestone. Limestones of Beaver-tail age are found on the top of Lone Mountain, at Old Fort Island, and on the cliffs opposite Wrigley at "Rocky Island" limestones of Rasparts age outcrop.

The shales overlying the Beaver-tail-Rasparts formation, referred to as Simpson shales in the area to the south of Wrigley, are lithologically similar to the Fort Creek formation. The shales are divided into the two

characteristic zones, the upper soft grey shales and the lower more resistant dark grey to black carbonaceous shales.

Norman Series outcrops of Hay River limestones and interbedded shales were found overlying the Simpson shales on the Root River. Shales and limestones of a similar age were found on the west side of the Mackenzie river between Wrigley and the Johnson River.

Cretaceous deposits found north of the Dahadinni are thought to be higher in the stratigraphic section than the Cretaceous outcrops along the Dahadinni River.

Saline River Formation

Over 150 feet of interbedded, resistant shales, limestones and underlying gypsum beds were found three miles from the Mackenzie River along the Saline River. The small creeks in the vicinity are quite salty, and near the rock outcrops thin layers of salt collect on rocks in the creek bottom. The formation is lithologically similar to rocks previously seen of Silurian age. M.Y. Williams (Summary Report, 1923, Part B) has previously placed the outcrops in the Cambrian section (*Lingulella* sp and *Micrometra* fossils). The correlation of Williams is accepted, as no fossils were found by the writer.

The following is a generalized description of the outcrops seen:

- | | |
|----------|---|
| 100 feet | Hard, grey, red and green shales and interbedded shaley limestones. Yellow stain over much of the outcrop. |
| 50 feet | Red, gypsiferous beds, with interbedded white gypsum and red to green shale. Green colors below high water level. |

Lone Mountain and Beavertail-Bamparts Formations

Over 800 feet of outcrops were observed on Lone Mountain. The

top 300 feet of dense greenish-grey limestone was found to contain Beaver-tail and Ramparts fossils (*Prismatophyllum*, *Productella*, and *Actinopteria* ?) and is designated as Beavertail Ramparts formation. The lower 500 feet consists of calcareous deposits of metamorphosed limestones and dolomites containing secondary calcite, anhydrite, and quartz. The lower deposits are called the Lone Mountain formation as no definite correlation can be made with the normal section at the Norman Wells area.

Several lithological samples were taken of the Lone Mountain outcrops. The samples were not available when this report was written and the following generalized section, together with the sample markings, is given so that further lithological descriptions or chemical tests can be made of the Lone Mountain outcrops at a later date:

Beavertail Ramparts Formation (300 feet plus)

- 125 feet Resistant, grey, massive limestones. Lower 25 feet thin bedded, shaley, grey limestone.
- 50 feet Greenish grey, dense, semi-crystalline limestone.
- 125 feet Mostly talus with occasional outcrops of greenish grey, dense limestone.

Lone Mountain Formation (500 feet plus)

(Sample N4 was taken at contact of greenish-grey, massive limestone and thinly bedded, grey, metamorphosed limestones with secondary calcareous material).

- 75 feet Metamorphosed calcareous matrix. Chemical weathering evident in solution cavities and generally rounded appearance of outcrops. Sample N5.
- 25 feet Talus slopes. 10 foot outcrop calcareous matrix. Sample N6.
- 20 feet Talus slopes.
- 30 feet Dark limestones in calcareous matrix. Sample N7.

- 25 feet Dark limestones. (Sample #8).
- 100 feet Talus with occasional limestone outcrop.
- 75 feet More resistant grey limestones. Sample #9.
- 150 feet Resistant grey limestone with secondary calcite predominate along numerous fractures.

Fort Creek Formation

Several outcrops of Fort Creek shale were observed along the Root River. The shale thickness is at least 800 feet, and is probably 1000 feet. The upper section of the shale consists of the typical fissile, bluish-grey shale and interbedded ironstones. Occasional 4 to 6 inch beds of hard, grey, shaley limestones, with a few scattered fossils (Coquina with Tentaculites and Chonetes), were found approximately 650 feet below the overlying Hay River limestones and shales. The lower section seen only in one place, is the more resistant dark grey to black carbonaceous shale with a few scattered thin, dark brown limestone beds. Fossils found in these thin limestone beds include Hypothyridina, Athyris, Atrypa, Atrypa reticularis, Crinoid stems, and small Pelecypods.

Hay River Formation

In the Root River area, overlying the Simpson shales, were found 165 feet of light grey, massive limestones and interbedded shales containing abundant Leiorhynchus fossils. The limestones and shales of this horizon has been referred to as the Leiorhynchus zone by Dr. G.S. Huxie (Summary Report, 1921, Part B). In this report the beds are called Hay River Limestones and interbedded Shales. Fossils collected include the following:

Leiorhynchus (abundant)
 Cyrtospirifer (common)
 Sphenotus
 Atrypa reticularis
 Pugnoides
 Camarotoechia
 Athyris
 Actinopteria
 Schuchertella (?)
 Pelecypods

The following is a generalized section with sample markings of lithological samples taken of the Bay River limestones and interbedded shales.

- | | |
|---------|---|
| 60 feet | Light grey to buff semi-crystalline limestone. Weathers to grey color. Nodular appearance. Fossiliferous. |
| 20 feet | Nonresistant outcrops (talus slope). |
| 10 feet | Resistant, light brown to grey, massive limestone. Forms protective cap rock. Sample R2-7. |
| 15 feet | Greenish grey shale and interbedded thin limestone beds. |
| 5 feet | Light brown to grey, massive limestones. Nodular appearance. Fossiliferous. Sample R2 6. |
| 18 feet | Greenish grey shale and interbedded thin limestone beds. |
| 2 feet | Brown massive limestone. Very fossiliferous. Sample R2-5. |
| 9 feet | Greenish grey shale and interbedded thin limestone beds. |
| 3 feet | Thin bedded grey limestone. Nodular appearance. Grades into shale. Sample R2-4. |
| 12 feet | Greenish grey shale with interbedded nodular limestones. Sample R2-3. |
| 2 feet | Thin bedded grey shaley limestone. Sample R2-2. |
| 4 feet | Grey limy shale with interbedded thin limestone beds containing a few fossils. |
| 5 feet | Thin bedded grey shaley limestone. Sample R2-1. |

Outcrops equivalent to Norman Sandstone

Deposits of Norman Series sandy shale and interbedded limy beds were found on the west side of the Mackenzie River ten miles north of Wrigley (just north of P.M.S. 76). The lower part of the exposed outcrops is quite fossiliferous. Fossils collected include:

Geniatite
 Stropheodonta
 Cyrtospirifer (flat sulcus)
 Atrypa
 Cladopora
 Orthoceras
 Cyathophyllum
 Chonetes
 Gastropod
 Bellerophon
 Cyrtospirifer (alate)
 Fenestella
 Plant remains
 Ostracods
 Alveolite

A detailed description of the 235 feet of exposed outcrops follow:

- 12 feet Fissile, grey to brown shale. Occasional 1/4 to 1/2 inch lense of shaley, grey limestone. Sample M6-1.
- 1 1/2 inches Limey grey shale. Sample M6-1.
- 1 1/2 feet Interbedded thin, shaley, grey limestone beds in grey to brown, sandy shale.
- 10 feet Grey to brown, sandy shale.
- 1 1/2 inches Resistant, limey, grey shale.
- 26 inches Interbedded resistant shaley limestone in shale. Sample M6-3. 1 1/2" shale, 2" limey shale, 1/4" shale, 1" limey shale, 6" shale, 1/2" limey shale, 1" shale, 1/2" limey shale, 4" shale, 1" limey shale, 1" shale, 3" limey shale, 1" shale, 2" limey shale, 1/2" shale, 1" limey shale.
- 2 feet Grey, sandy shale.
- 2 1/2 feet Interbedded limey, grey shale and shale. Sample M6-4.
- 6 feet Grey, sandy shale
- 1 inch Resistant limey shale lense
- 4 inches Horizon of black limestone concretions. Sample M6-5.
- 3 feet Grey, sandy shale.
- 2 feet Interbedded resistant, limey shale and soft shale.

- 5 feet Grey, sandy shale.
- 5 feet Interbedded resistant, limey shale and soft shale. Sample M6-6.
- 25 feet Grey, sandy shale with occasional interbedded limey shale.
- 5 inches Grey, massive limestone grading into limey shale. Plant impressions on limestone. Sample M6-7.
- 10 feet Grey, sandy shale. Fossil plant. Occasional thin, limey shale beds. Sample M6-8.
- 10 inches Grey to dark brown, massive limestone. Fossiliferous. Sample M6-9.
- 5 feet Soft, grey shale.
- 6 inches Dark, fossiliferous, massive limestone. Sample M6-10.
- 40 feet Grey, sandy shale. Sample M6-11.
- 3 inches Ironstone concretion horizon. Sample M6-12.
- 14 inches Interbedded ironstone lenses and shale.
- 5 feet Soft, grey shale.
- 2 inches Resistant, limey, ironstone concretion. Sample M6-13.
- 3 feet Grey, sandy shale.
- 3 inch Ironstone concretion. Sample M6-14.
- 4 feet Grey, sandy shale.
- 16 inches Fossiliferous, grey limestone.
- 30 feet Grey, sandy shale.
- 5 feet Interbedded, 4 to 6 inch, limey, ironstone concretions and shale.
- 50 feet Interbedded ironstone concretions in grey, sandy shale. Limey cone-in-cone concretions are from this horizon.

Norman Series sediments stratigraphically lower than the 235 feet described above were found 6000 feet downstream on the west bank of the

Mackenzie River at a point $2\frac{3}{4}$ miles south of the Ochre River. These sediments consist of ten feet of nodular appearing, fossiliferous, grey, massive limestones overlying grey shale. The outcrops can best be seen in the late summer when the Mackenzie River is at low water level.

Fossils collected include:

Atrypa devoniana (abundant)
Cystiphyllum
Pugnax
Leptaena
Productella
Chonetes
Cyrtospirifer
Pleurotomaria

Norman Series sediments, stratigraphically lower than the limestone outcrops, were found for several miles on both sides of the Mackenzie River in the area a few miles south of the Johnson River. These deposits consist of gray, fissile shale with interbedded thin, grey, shaley, limestones and occasional 2 to 8 inch cone in cone concretions. No fossils were found in place, but many large blocks of limestone consistently overlie the outcrops. Fossils found in the limestone float include *Atrypa spinosa*, *Atrypa reticularis*, Cup coral, Punctate Brachiopod.

Cretaceous Sediments

Cretaceous outcrops were found along the west bank of the Mackenzie River at a point two miles below the mouth of the Dahadimzi River and continue downstream for about three miles. Another outcrop occurs three miles farther down. Cretaceous fossils were found. A lithological description of the 175 feet of Cretaceous sediments follows:

3 feet	Medium-grained, grey sandstone.
15 feet	Soft, sandy, grey shale.
3 feet	Massive, medium-grained, grey sandstone.
40 feet	Soft, sandy, grey shale and interbedded ironstone concretions.

2 feet	Fine-grained sandstone with ironstone concretions and lenses.
6 feet	Soft, grey shale.
1 foot	Fine-grained, grey sandstone.
4 feet	Soft, grey shale containing carbonaceous material.
2 feet	Massive, fine grained, bedded, grey sandstone. Interbedded ironstone concretions and shale.
50 feet	Soft, sandy, grey, carbonaceous shale. Ironstone and limy concretions containing fossil wood, and Inoceramus, Acanthoceras, and Arctica fossils.
6 feet	Resistant, fine-grained, carbonaceous sandstone. Interbedded shale and ironstone concretions.
40 feet	Soft, sandy, carbonaceous, grey shale.

Tertiary Sediments

Tertiary sediments of sandstone and shales, with interbedded lignite and burnt shale, were found north of Old Fort Point, the best outcrops being just north of P.M. 12N and P.M. 19N. The sandstones and shales are soft and unconsolidated. The burnt shales are hard and resistant, and contain numerous imprints of fossil plants. The lignite is low grade and much has been destroyed by the underground fire which has been burning for over a hundred years. The deposits contain considerable other carbonaceous material, there being large logs and tree branches, some of which have been partially replaced by silica.

A lithologic description of the Tertiary outcrops observed is as follows:

90 feet	Medium grained, "salt and pepper", type grey sandstone. Non-resistant unconsolidated. Prominent crossbedding. Occasional pebble horizons, usually overlain by a thin bed of soft, sandy shale. Some horizons are carbonaceous.
---------	--

- 14
- 7 feet Red and orange, burnt shales with large clinker masses. Few inches of lignite only. Fire has destroyed most of the organic matter. Leaf and plant impressions in shale.
 - 15 feet Soft, green, coarse grained sandstone. Unconsolidated, Crossbedding, Carbonaceous.
 - 2 feet Lignite lenses in soft greenish grey shale.
 - 2 feet Carbonaceous clay shale.
 - 3 feet Lignite seam with slate and "wooly" horizons near the top.
 - 3 feet Soft, grey clay and shale.
 - 2 feet Somewhat resistant dark, carbonaceous shale.

Chapter IV

S T R U C T U R E

The structure in the mountainous area is complex and generally consists of folds and faults which have been formed by compressive forces from the west. In places, where greater force has acted, the folds are overturned, and in many cases the folding has become so tight that faulting has occurred to relieve the compression and tension in the rigid limestones and dolomites which results in the structures overthrusting toward the east. In the field it is difficult to distinguish between an asymmetrical fold, overturned fold, and an overthrust. In this area, when a remnant of a flank can be found the structure is called an asymmetrical or an overturned fold, while if there is no visible flank outcrops, the structure is called an overthrust. Lone Mountain is called an overturned fold, based on overturned strata found along the North Nahanni River banks, while the mountain front to the northwest is called an overthrust fault scarp, as no remnant of a flank to the east can be found.

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The accompanying outcrop map has been drawn to outline generally the structural trends of the area. The structures observed, to become potential oil structures, would necessitate production from the Lone Mountain or stratigraphically lower horizons. Structures formed of younger strata undoubtedly occur, but either the younger beds do not outcrop due to the lack of thick resistant horizons, or the younger beds have been removed and covered by Quaternary erosion and sedimentation.

Chapter V.

MINERAL DEPOSIT ON OLD FORT ISLAND

On the northern tip of Old Fort Island are mineral deposits which form an excellent example of mineral depositing in tension fractures on the crest of an anticline. There are several parallel fractures along which secondary solutions and vapors have deposited galena, sphalerite, and other related sulphides forming calcareous vein matter up to 18 inches thick in limestones of Rasparts age.

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APPENDIX

Edmonton, Alberta,
January 7, 1944.

TO: Dr. T. A. Link

RE: Fossil Identification

The attached list is a tentative identification
of fossils collected by Lt. Bath on Assignment No. 34,
Camsell Bend to Ft. Norman.

C. R. Stelck

KH/tm

FOSSIL IDENTIFICATION - MACKENZIE RIVER FROM CAMSELL BEND TO FORT NORMAN

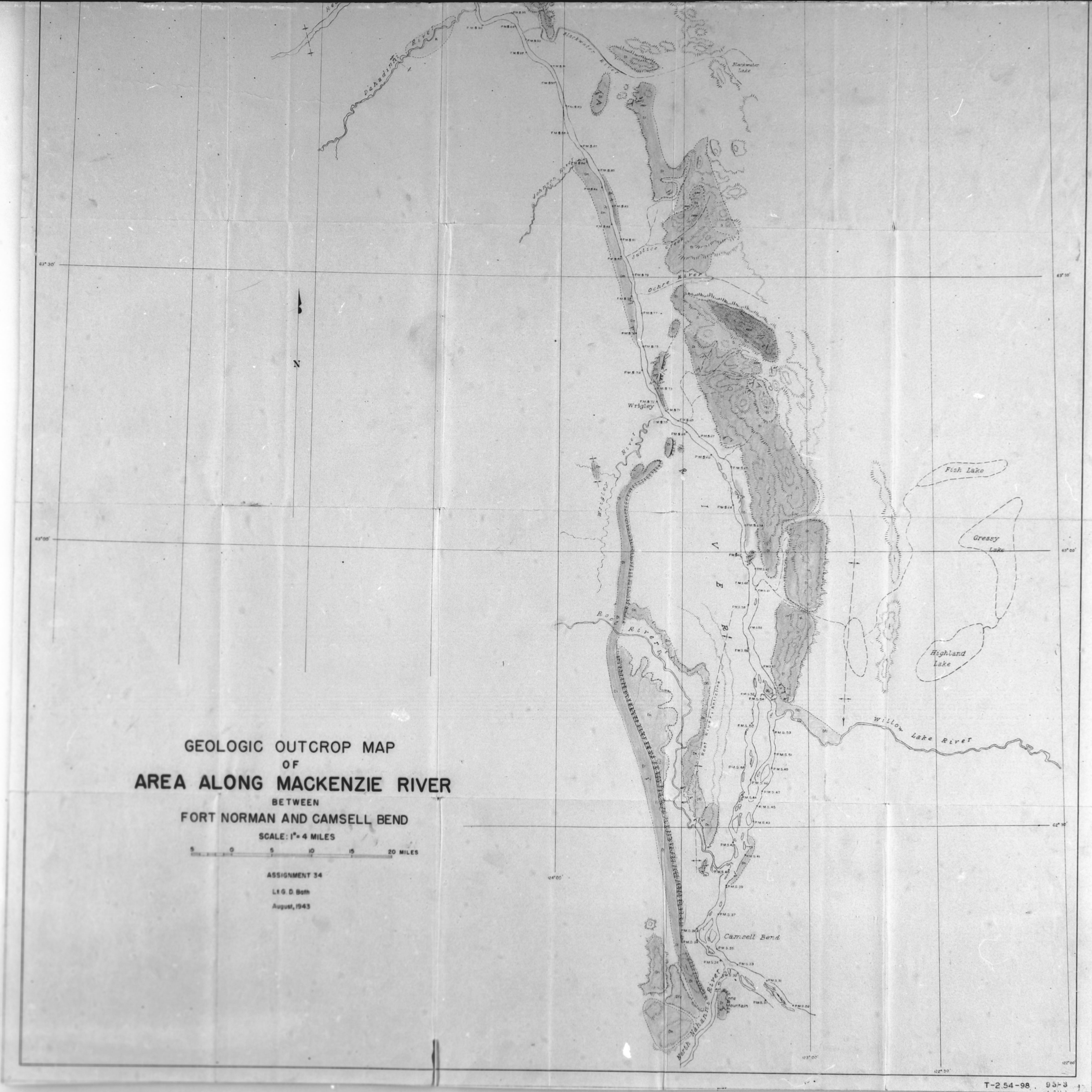
<u>Suite</u> <u>No.</u>	<u>Location</u>	<u>Fossil</u>	<u>Accession</u> <u>No.</u>	<u>Age</u>
R 4	Root River ditto	Coquina with Tentaculites Chonetes	43880 43889	Ft. Creek Ft. Creek
M 7	Mackenzie R. 1 mile S. Ochre R. Ditto " " " " "	Atrypa devoniana Cystiphyllum Pugnax Leptaena Productella Chonetes Cyrtospirifer Pleurotomaria	43881 43882 43883 43884 43885 43886 43887 43888	Norman ss " " " " " "
M 1	Lone Mountain	Favosites	43890	Devonian
M 5	Opposite Ft. Wrigley	Proetus Paracyclas Productella Cystiphyllum Phillipsastrea Cystiphyllum Reticularia Favosites Euomphalus	43899 43891 43892 43893 43894 43895 43896 43897 43898	Beavertail " " " " " " "
M 6	West Bank Mack- enzie River	Goniatite Stropheodonta Cyrtospirifer (flat sulcus) Atrypa Cladopora Orthoceras Cyathophyllum Chonetes Gastropod Bellerophon Cyrtospirifer (alate) Fenestella Plant remains Ostracods Alveolites	43900 43901 43902 43903 43904 43905 43906 43907 43908 43909 43910 43911 43912 43913 43914	Norman SS " " " " " " " " " " " "
R 2	Root River	Leiorhynchus Cyrtospirifer Sphenotus Atrypa reticularis	43915 43916 43917 43918	Hay River " " "
MF 1	Old Fort Island Mackenzie River	Cystiphyllum Productella Euomphalus Syringopora Martinia Crinoid stems	43919 43920 43921 43922 43923 43924	Beavertail " " " " "

Fossil Identification

<u>Suite No.</u>	<u>Location</u>	<u>Fossil</u>	<u>Accession No.</u>	<u>Age</u>
M 1	East bank Mac- kenzie River (Opp. Root R.)	Hypothyridina	43925	Fort Creek
		Athyris	43926	Ditto
		Atrypa	43927	"
M 2	East bank Mac- kenzie River (Opp. Root R.)	Pugnoides	43928	Bosworth
		Cyrtospirifer	43929	"
		Athyris	43930	"
		Atrypa?	43931	"
MR 1	Rocky Island 2 miles S. Wrigley	Productella	43932	Rampart
		Reticularia	43933	"
		Favosites	43934	"
		Odontocephalus	43935	"
		Cyathophyllum	43936	"
		Bellerophon	43937	"
M 10	Between Johnson & Cchre Rivers (Float)	Camarotoechia	43938	"
		Atrypa spinosa	43939	Devonian
		Atrypa reticularis	43940	"
		Cup coral	43941	"
R 2	Root River	Punctate Brachiopod	43942	"
		Cyrtospirifer	43943	Hay River
		Pugnoides	43944	Ditto
		Camarotoechia	43945	"
		Athyris	43946	"
R 3	Root River	Actinopteria	43947	"
		Pugnoides	43948	Hay River
		Athyris	43949	"
		Schuchertella?	43950	"
R 1	Root River	Cyrtospirifer	43951	"
		Leiorhynchus	43952	Hay River
		Cyrtospirifer	43953	"
		Camarotoechia	43954	"
MW 1	-----	Pelecypods	43955	"
		Martinia	43956	Ramparts ?
MK 1	Mackenzie R. West bank (5 miles north Dahadinni)	Fossil wood	43950	Cretaceous
		Inoceramus	43958	"
		Acanthoceras	43959	"
		Arctica	43960	"

Fossil Identification

<u>Suite No.</u>	<u>Location</u>	<u>Fossil</u>	<u>Accession No.</u>	<u>Age</u>
---	Rock Fall	Chonetes	42974	--- ?
		Alveolites	42975	"
		Crinoidal ls.	42976	"
M 9 ?	M 9	Atrypa reticularis	42977	--- ?
Float	Lone Mountain	Prismatophyllum	42978	Beavertail
		Productella	42979	"
---	---	Alveolites	42980	--- ?
MT 2	Creek just N. of sawmill. Most southerly extent of Tertiary	Populus (leaf)	42981	Tertiary
		Conifer (frond)	42982	"
N 3	Top N.E. Lone Mountain	Actinopteria ?	42983	Ramparts
		Productella	42984	"
---	Old Fort Island	Proetus ?	42985	Ramparts
		Stromatoporoid	42986	"
		Leptaena ?	42987	"
A 1	Upper Mackenzie	Euomphalus	41084	--- ?
		Atrypa reticularis	41085	"
		Pleurotomaria	41086	"
		Cup Coral	41089	"
AN 2	Upper Mackenzie	Atrypa devoniana	41088	--- ?
AN 3	Upper Mackenzie	Productella	41089	--- ?
		Cup Coral	41090	"
		Atrypa reticularis	41091	"
		Acervularia	41092	"
		Pugnax	41093	"
		Proetus	41094	"
		Pleurotomaria	41095	"
		Euomphalus	41096	"



GEOLOGIC OUTCROP MAP
 OF
AREA ALONG MACKENZIE RIVER
 BETWEEN
 FORT NORMAN AND CAMSELL BEND

SCALE: 1" = 4 MILES
 0 5 10 15 20 MILES

ASSIGNMENT 34
 L. G. D. Bath
 August, 1943

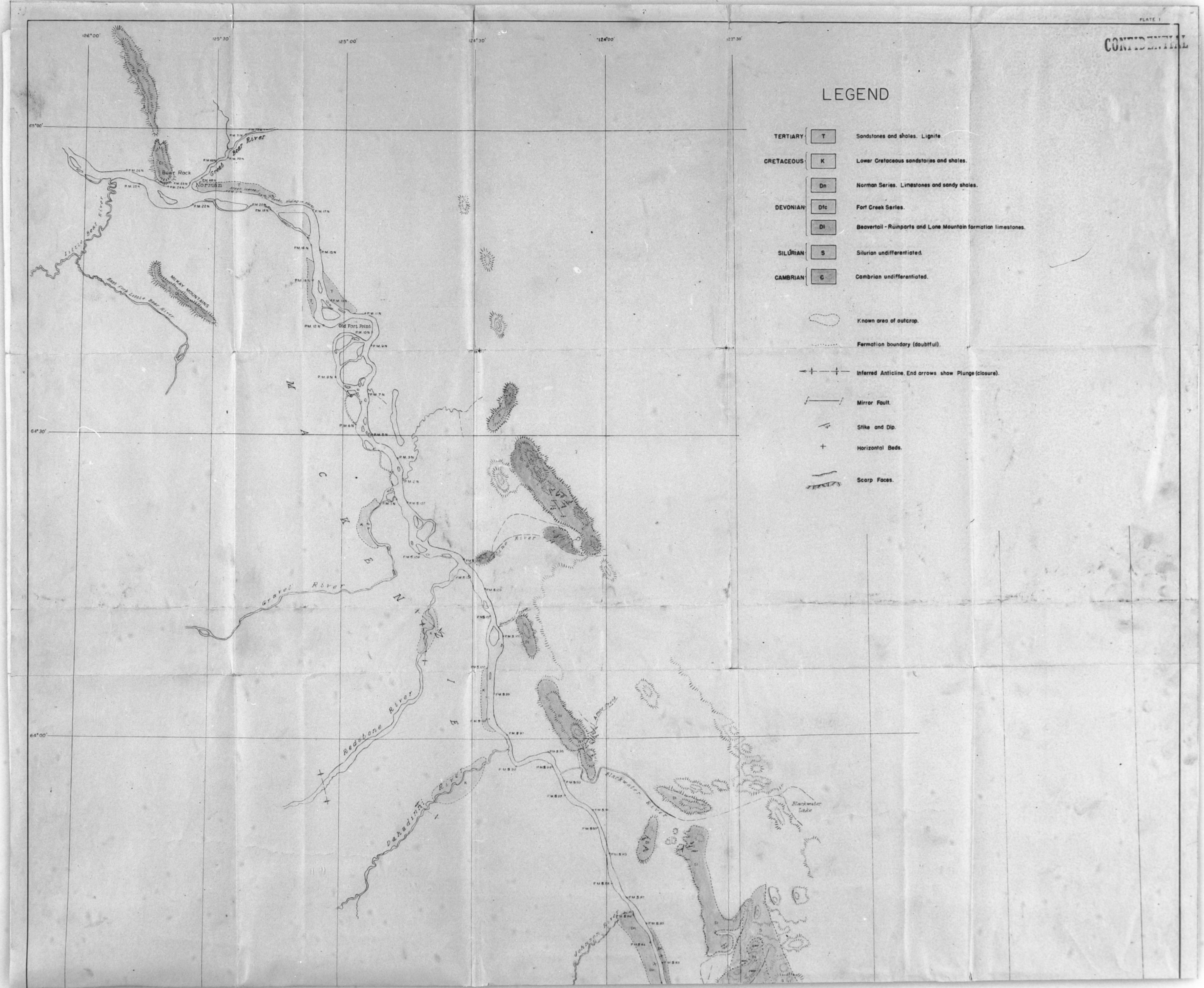
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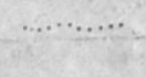
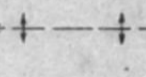
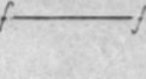
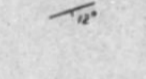


30x

West Canadian Graphic Industries Ltd.

PLATE I
CONFIDENTIAL



LEGEND

- TERTIARY T Sandstones and shales. Lignite
- CRETACEOUS K Lower Cretaceous sandstones and shales.
- Dn Norman Series. Limestones and sandy shales.
- DEVONIAN Dfc Fort Creek Series.
- Di Beavertail - Ruinparts and Lone Mountain formation limestones.
- SILURIAN S Silurian undifferentiated.
- CAMBRIAN C Cambrian undifferentiated.
-  Known area of outcrop.
-  Formation boundary (doubtful).
-  Inferred Anticline. End arrows show Plunge (closure).
-  Mirror Fault.
-  Strike and Dip.
-  Horizontal Beds.
-  Scarp Faces.



30x