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FINAL
GEOLOGICAL REPORT
ON
"THE RAMPARTS RIVER AREA"
N.W.T. (Canada)
IMPERIAL OIL LTD. - CANOL PROJECT
Assignment No. 16.

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Date Submitted: January 31, 1944.

Read and Accepted by: *Mark A. Link*

Date: *Feb. 3rd. 1944.*

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FINAL GEOLOGICAL REPORT

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"THE RAMPARTS RIVER AREA"

N.W.T. (Canada)

A B S T R A C T

As determined by the survey of the Ramparts River, the area between the Mackenzie Mountains and Mackenzie River is a wide shallow synclinal basin in Cretaceous sediments, whose axis lies about ten miles downstream from the front of the mountains. On the downstream side of the syncline is a low, broad, structurally positive feature similar in form and position to structural trends also discovered on Arctic Red River to the west and on Mountain River and Hume River to the east. It is suggested that these structural features are continuous with one another, and that they form a long low anticlinal fold whose axis parallels the Mackenzie Mountains and extends from Mountain River at least as far as Arctic Red River. Data now available indicate that this structural feature is better developed in the Mountain River area. Because of this, and since the Ramparts River area is remote and inaccessible, no further development is recommended on Ramparts River until the Mountain River area has been tested.

INTRODUCTION

General Statement

Assignment No. 16 - a survey of Ramparts river, was completed by E. F. Huff, I. D. Crawford and the writer during the month of July 1943. A preliminary report on the area was submitted by the writer at Norman Wells in August 1943 (1).

Location and Extent

Ramparts river leaves the Mackenzie mountains at a point about 125 miles northwest of Norman Wells. The river drains that part of the western side of the Mackenzie basin lying between Hume river and Arctic Red river, and flows north and east to join the Mackenzie just above the head of the Ramparts, near the 66th. parallel, 25 miles upstream from Fort Good Hope.

Field Work

On July 5th a preliminary aerial reconnaissance flight was made and a lake suitable for landing the party was found one mile east of the river and about two miles downstream from the mountain front. The party was flown into the area on July 6th, and work began on July 8th, after portaging the canoes and supplies to the river.

The survey was begun where Ramparts river leaves the mountains, and was continued downstream to the Mackenzie River, with side traverses up all major tributary streams. U.S.A.A.F. vertical aerial photographs (roll 314V-21 to 106) were used in mapping the river. Several plane table traverses were run for river gradient determination and for photo scale and orientation control. Completion of the assignment required 24 days and the party was picked up on the Mackenzie river on August 2nd by the motor boat "T.A. Link".

TOPOGRAPHY

In the Ramparts river area the front of the Mackenzie mountains trends east and west. The mountains are devoid of trees, and the first range rises abruptly almost 3,000 feet above a relatively high, sparsely-wooded, well-drained plateau country which extends northward from the mountain front for almost 50 miles.

Downstream from the mountains the river flows in many interlacing channels through a deep thickly-wooded valley about one half mile wide. The current is swift and the valley walls are generally steep, with abundant rock exposures on both sides.

For almost fifty miles downstream from the mountain front the river takes a general northerly direction, with several wide, deeply-incised meanders. The stream pattern over this area forms a trellis system, the river flowing alternately across the strike and along the strike of the underlying gently-dipping bed rock formations.

Fifty miles north of the mountains the plateau country drops off northward in an irregular, receding, east-west trending erosional escarpment which is also a prominent physiographic feature on Arctic Red river to the west (2). Below the escarpment the river swings off its northerly course, making a wide bend to the east, and continuing in a general easterly direction, with many loops and bends, to the Mackenzie.

This lower half of the river lies in a wide, flat, lake-strewn muskeg plain in which it has formed a continuous belt of meanders, with many ox-bow lakes and cut-offs. There is almost no river valley,

and outcrops are entirely absent.

Fifteen miles above the river's mouth the meanders once more become incised and the river makes a long southward loop before entering the Mackenzie.

Accessibility

The Dempster river area is inaccessible except by air during the summer months. The river is too shallow near its mouth to permit of navigation by any vessels larger than canoes, and a wide belt of lakes and muskegs in the area near the Mackenzie prohibits cross-country travel. In winter the area could be reached overland by constructing a tractor road.

STRATIGRAPHY

Since the survey of Ramparts river was not extended upstream into the Mackenzie mountains, no study was made of the limestone rocks of the first range. In this report discussions of stratigraphy are therefore limited to the Upper Devonian and Cretaceous rocks which were observed downstream from the mountain front. The various formations encountered on the survey are shown on the following table and also in the Columnar Sections (Plate III).

TABLE OF FORMATIONS
(RAMPARTS RIVER AREA)

Series	Formation	Lithology	Thickness
Upper (?) Cretaceous	"C" unit	Massive sandstones, alternating with minor shales and sandy shales.	1200
Lower Cretaceous	"B" unit	Dark grey fissile shales containing sulphur and marcasite. Nodular in part, and with minor thin sandstone and ironstone members	1000
		(contact not exposed)	
Upper Devonian	Bosworth	Poorly exposed - appears to consist mainly of limey grey-brown sandstones with some shales.	600 /
	Port Creek	Poorly exposed - apparently consists of dark grey to platy shales with occasional thin sandstone stringers.	250 /
		(contact not exposed)	
Middle Devonian or Older	?	Section not examined in detail. Limestone rocks of front range of Mackenzie mountains believed to belong to the Ramparts - Beavertail.	

UPPER DEVONIAN

The limestone rocks comprising the first range of the Mackenzie mountains are overthrust on a series of shales and sandstones which appear to be correlative with the Fort Creek and Bosworth formations. Unfortunately all exposures of these rocks on Ramparts river lie within the fault zone along the front of the mountains and relatively little information regarding their thickness and lithology is obtainable.

Fort Creek Formation

Beds considered to be equivalent to the Fort Creek formation outcrop on the west fork of Ramparts river, at Station 17. These beds consist of grey-black platy shales with occasional thin sandstone stringers. The exposures represent a stratigraphic interval of about 250 feet. No fossils were found and the shales are correlated with the Fort Creek on the basis of their conformable position beneath the Bosworth sandstones.

Bosworth Formation

Overlying the black, platy shales is a series of well-indurated light grey to brownish limey sandstones which contain a faunal assemblage (6552, 6554, 6558, 6559)* comparable to that of the Bosworth formation. The section is not well exposed, but a thickness of about 600 feet is represented. The top of the formation was not seen.

CRETACEOUS

Except for a narrow belt adjacent to the mountain front, all of the area traversed on the survey of Ramparts river is underlain by sediments of Cretaceous age. Since the area through which the river

* These numbers refer to fossil suites. See columnar section (Plate IV) and also Appendix.

flows is synclinal (see Structure: chapter IV) most of the Cretaceous section is traversed twice between the head of the river and its mouth. However, the base of the section is nowhere exposed on Ramparts river.

A composite columnar section (Plate III) shows the thickness of the Cretaceous to be approximately 2,200 feet. This section can be divided into two parts on the basis of lithology. The lower part is about 1,000 feet thick and consists mainly of dark gray fissile shales with minor sandstones. The shale contains sulphur and in places is marcasitic. Concretionary ironstone nodules are common throughout the lower 200 feet and the nodules contain aramonites (6557, 6566, 6567) which are thought to be Lower Cretaceous in age.

The upper part of the Cretaceous section is made up of heavy sandstone and shales, alternating with minor shales and sandy shales. This unit is about 1,200 feet thick.

The lower and upper parts of the Cretaceous on Ramparts river appear to be correlative with "B" unit and "C" unit, respectively, on Arctic Red River (2). "A" unit, the lower sandstone series, which is about 900 feet thick near the mountains on the Arctic Red, was not seen on Ramparts river where it is probably concealed by faulting.

In the upper part of Ramparts river the nodular shales ("B" unit) of the Cretaceous are faulted against the Bosworth formation. Although the base of the Cretaceous is not exposed at the lower end of Ramparts river, it is known (3) that the Beavertail limestone underlies the Cretaceous above the Ramparts on the Mackenzie.

Chapter IV.

S T R U C T U R E

Along the front of the mountains a zone of faulting occurs and structural conditions in this locality do not appear favorable for the accumulation of oil or gas. The structural aspects of the Mackenzie basin in the Ramparts river area resemble very closely those in the Arctic Red river area, and in general anything that can be said of the structure of one applies equally well to the other.

Ramparts river flows across a wide shallow synclinal basin whose axis trends east-west and crosses the river about 10 miles downstream from the front of the mountains. For about 20 miles downstream from the synclinal axis the beds are inclined gently southward with dips nowhere exceeding six degrees. Below this the beds flatten out and in the vicinity of the wide eastward loop in the river, between photo-centers 88 and 82 (see Map, Plate II), northward dips of two degrees were recorded, indicating a small anticlinal flexure almost identical to the one mapped by the writer on Arctic Red river (2). From oblique aerial photographs it appears that these two features are continuous.

Downstream from the wide river loop no measurable dips were seen, and the complete absence of outcrops across the meander belt over almost all of the lower half of Ramparts river prevents the determination of any flexures which may possibly exist in this part of the basin.

NOTE: For discussion of Historical Geology see Reference No. 2 -
"The Arctic Red River Area, Chapter V.

Chapter V.

CONCLUSIONS AND RECOMMENDATIONS.

It is recognized that a low broad structural arch exists in this area and it is believed that this arch is part of a positive structural trend which extends from the Whirlpool anticline on Mountain river (4) across Hume river (5) and Ramparts river to Arctic Red river (2).

Available information indicates that this positive feature is more favorable in the more accessible Mountain river area, and no further development is recommended in the Ramparts river area until the Whirlpool structure has been tested.

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B I B L I O G R A P H Y

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2. McKinnon, F.A. - "The Arctic Red River Area", Imperial Oil Ltd.-Canol Project, Assignment No. 22, Final Report, January 1944.
3. Parker, J.M. - "The Mackenzie River and Adjacent Areas from the Sans Sault Rapids to the Ramparts" Imperial Oil Ltd. Canol Project, Assignment No. 31, Final Report in preparation, January 1944.
4. Parker, J. M. - "Geological Report on the Mountain River Area", Imperial Oil Ltd. Canol Project, Assignment No. 19, Final Report in preparation, January 1944.
5. Moon, G.C. - "The Hume River Area" Imperial Oil Ltd. - Canol Project, Assignment No. 15, Preliminary Report, August, 1943.

APPENDIX

January 20, 1944.

MEMORANDUM:

TO: Dr. T. A. Link.

RE: Fossil Identification

The attached is a tentative identification of
fossils collected by F. A. McKinnon on Assignment No. 16 -
Ramparts River.

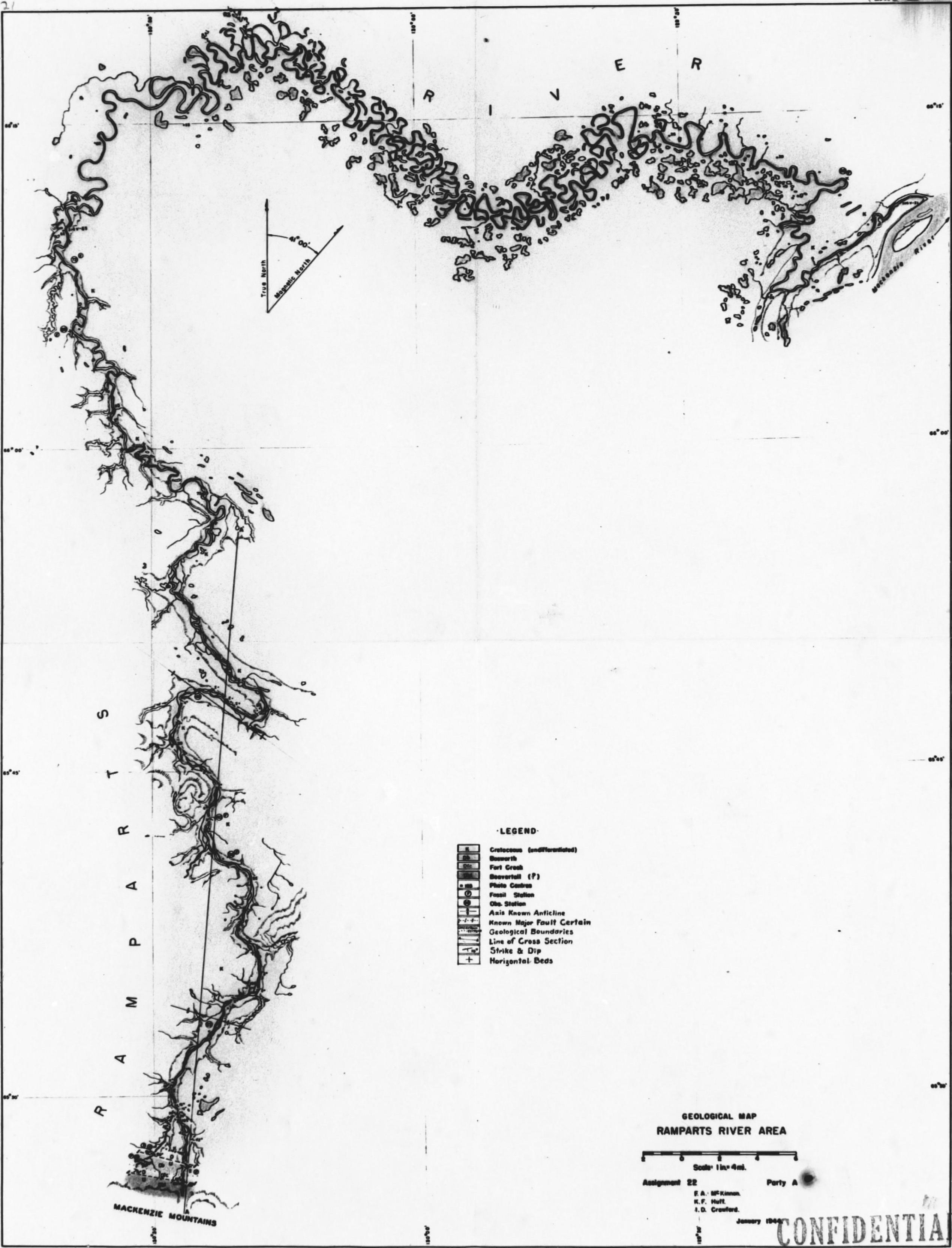
C. F. Stelck.

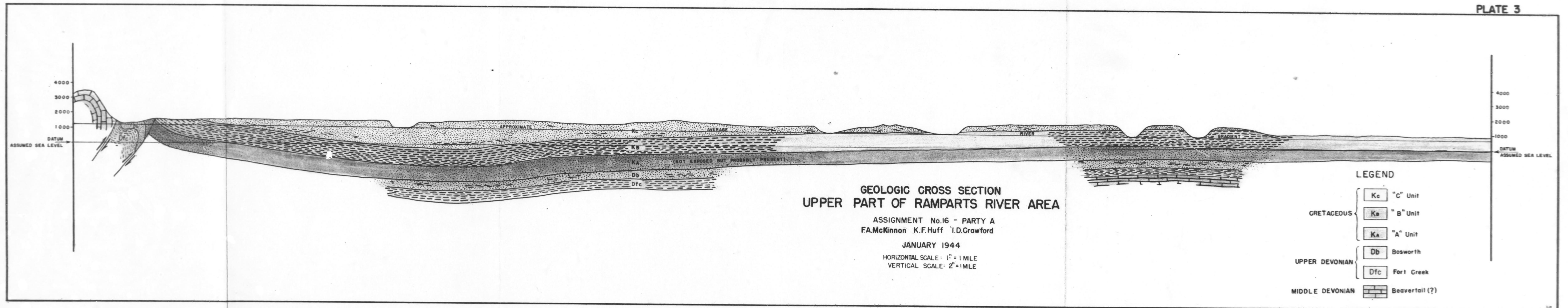
KH/cm

FOSSIL IDENTIFICATION - RAMPARTS RIVER

F. A. McKinnon

<u>Suite No.</u>	<u>Date</u>	<u>Location</u>	<u>Fossil</u>	<u>Accession No.</u>	<u>Age.</u>
6567	Aug. 1.	Sta. 80 Ramparts Rvr.	Hoplites	43683	L. Cretaceous
"	"	"	Desmoceras	43684	"
6553	July 9	Sta. 3 Ramparts Rvr.	Actinoceras	43686	Silurian ?
6567	Aug. 1	Sta. 80 Ramparts Rvr.	Beaudanticeras	43687	L. Cretaceous
6559	July 10	Sta. 20 Ramparts Rvr.	Spirifer	43688	Devonian
6552	July 9	Sta. 2 Ramparts Rvr.	Productus	43689	Devonian
"	"	"	Spirifer	43690	"
"	"	"	Leiorhynchus	43691	"
"	"	"	Gastropod	43692	"
"	"	"	Actinoceras	43693	"
"	"	"	Crinoid stem	43694	"
6554	July 9	Sta. 3 Ramparts Rvr.	Cyrtospirifer	43695	Devonian
"	"	"	Spirifer	43696	"
"	"	"	Leiorhynchus	43697	"
"	"	"	Productus	43698	"
"	"	"	Cyrtina	43699	"
"	"	"	Buchiola	43700	"
6558	July 10	Sta. 19 Ramparts Rvr.	Productus	43701	Devonian
"	"	"	Cyrtospirifer	43702	"
6557	July 10	Sta. 16 Ramparts Rvr.	Hoplites	43703	Cretaceous
6566	July 27	Sta. 68 Ramparts Rvr.	Hoplites	43704	Cretaceous
5532	July 21	Sta. 36 Ramparts Rvr.	Leaf impression	43685	L. Cretaceous





24x

COMPOSITE COLUMNAR SECTION

Ramparts River

Assignment 16 Party - A

F.A. Mc Kinnon.
K.F. Hoff.
I.D. Crawford.

January - 1944

Scale - 1 in. to 100 ft.

PLATE - IV

SUPPLEMENTAL COMPOSITE SECTION
Lower Part of Ramparts River

