SURFACE GEOLOGICAL RECONNAISSANCE

YUKON AND NORTHWEST TERRITORIES

ADJACENT TO MACKENZIE RIVER

7-1-6-51

Imperial Oil Enterprises Ltd.
Dawson Creek, B.C. 1964.


GEOLOGICAL & EVALUATION
RESOURCES DIVISION
JUN 8 1965
OTTAWA, CANADA
Dept. of Northern Affairs & National Resources

SURFACE GEOLOGICAL RECONNAISSANCE

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INTRODUCTION

Area Covered

The area of study of the 1964 surface exploration program is shown on a map. (Figure 1). This map shows a broad swath on either side of the Liard and Mackenzie rivers. These swaths represent the total area in the Yukon and Northwest Territories which was within efficient helicopter working-range of the party. Within these bounds, the areas of concerted effort are shown by crosshatching. These areas of concerted effort are: (1) the Liard Plateau; (2) the Mackenzie Mountains - Norman Wells - Fort Good Hope region; and, (3) the Peel Plateau - Northern Richardson Mountains - Arctic Coastal Plain region. More than 60,000 square miles was covered by this study.

Accessibility

Access to this remote region is difficult. In summer, access is restricted to air or water transport. In winter, overland transport is feasible; subject to adequate, advance preparation.

Airstrips suitable for use by large aircraft are located at Fort Simpson, Wrigley, Norman Wells and Inuvik where radio facilities and aviation fuel can be made available. The region is served three times weekly by Pacific Western Airlines, scheduled flights; using

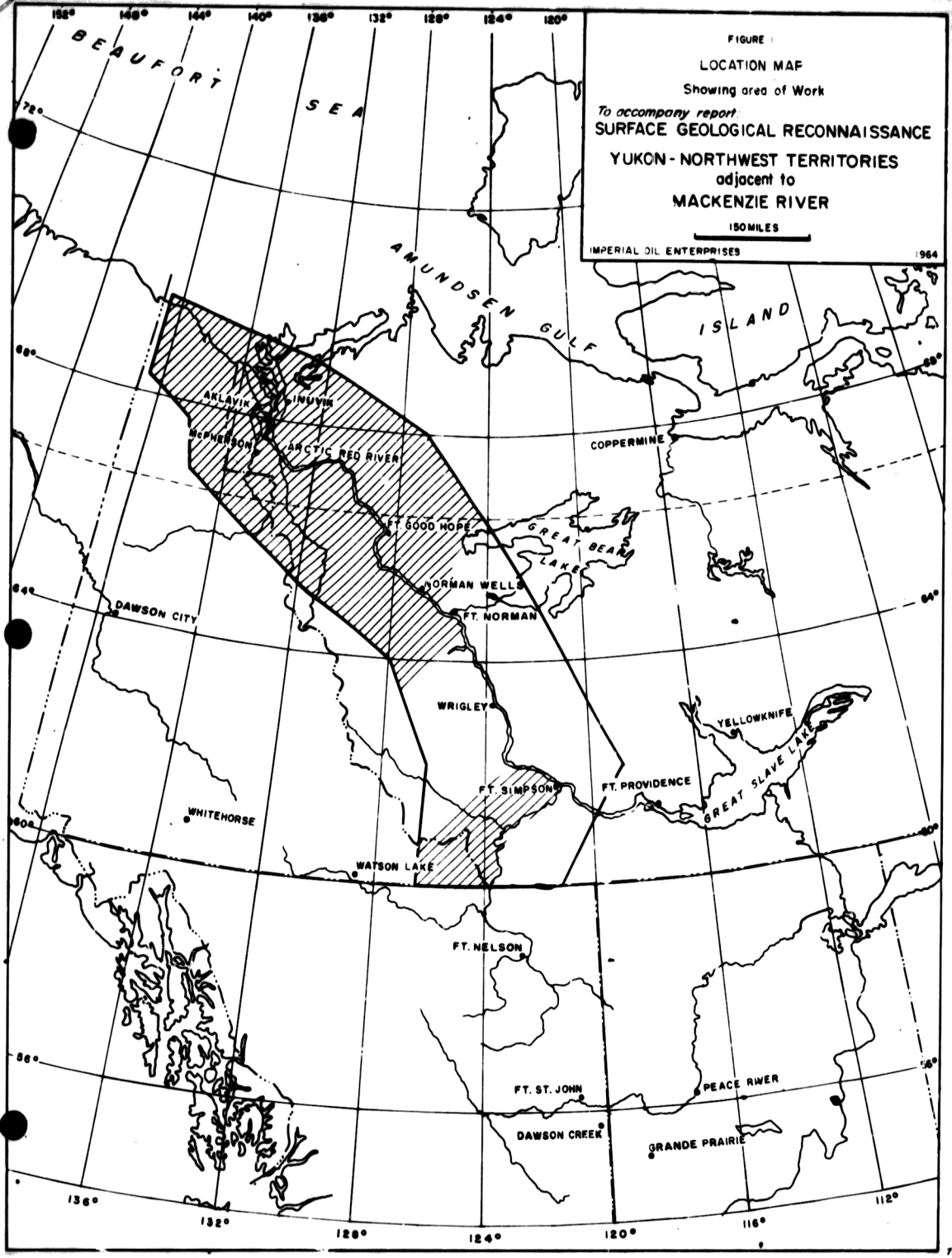
FIGURE 1
LOCATION MAP
Showing area of Work
To accompany report
SURFACE GEOLOGICAL RECONNAISSANCE
YUKON - NORTHWEST TERRITORIES
adjacent to
MACKENZIE RIVER
150 MILES
IMPERIAL OIL ENTERPRISES
1964
BEAUFORT SEA
AMUNDSEN GULF
ISLAND
ARLAVIK
INUVIK
McPHERSON
ARCTIC RED RIVER
COPPERMINE
FT. GOOD HOPE
GREAT BEAR LAKE
NORMAN WELLS
FT. NORMAN
DAWSON CITY
WRIGLEY
YELLOWKNIFE
GREAT SLAVE LAKE
FT. SIMPSON
FT. PROVIDENCE
WHITEHORSE
WATSON LAKE
FT. NELSON
FT. ST. JOHN
PEACE RIVER
DAWSON CREEK
GRANDE PRAIRIE
152°
148°
144°
140°
136°
132°
128°
124°
120°
116°
112°
72°
68°
64°
60°
56°

DC-6B or DC-4 aircraft, flying from Edmonton, Alberta. Light aircraft, Cessna 170 to deHavilland Otter size, fitted with either floatgear or skis as the season warrants, are available for charter at most centres. Numerous, unprepared landing places can be used by these light aircraft.

The most economical mode of transporting equipment and supplies is by water. Large shallow draft barges, propelled by diesel-engined tugboats ply the Mackenzie River between the delta and the highway at Hay River. Freight is accepted by the two common carriers, Yellowknife Transportation Co. and Northern Transportation Co. Several smaller companies can be hired on a charter basis.

Travel by wheeled vehicles is possible as far as Fort Simpson, in winter, with no special preparation. Beyond Fort Simpson, traffic can follow the Canadian National Telegraph pole-line. Prior arrangements must be made for use of this line. In the Arctic Coastal Plain area, travel in both winter and summer with tracked vehicles seems feasible.

Purpose of Study

The purpose of this study was twofold. The purpose, first, was to provide information at many scattered localities to supplement previously obtained and published data. The second purpose was to gather stratigraphic information about rocks of all ages in and adjacent to the Peel Plateau, Northern Richardson Mountains, and the Arctic Coastal Plain.

Weather. — Generally good weather prevailed through June and July. A few days were lost in these months due to rain and low cloud or high winds. August weather was poor; sixteen and one-half (16½) working days were lost completely, ten or more (10+) days permitted work in only certain parts of the area.

Communications. — Radio communications were disappointingly poor in view of the fact that the supplier was given a free hand in choice and installation of the base camp radio. The base camp radio, a Spilsbury and Tindall Model MT 721, which was to have provided ground-to-air, ground-to-ground, and radiophone contact, was totally unreliable.

Daily radio schedules from flycamps to basecamp and ground-to-air contact were provided by Spilsbury and Tindall PRT-20 model transistorized transceivers. These light radios, powered by dry cell batteries radiate one and one-half watts (1½ w.) of radio-energy when properly tuned and loaded with the correct antenna. Their performance, considering their low power, was satisfactory.

Previous Investigations

Numerous reports have been published, about the geology of the area, in the past sixty years. Among these, reports by the Geological Survey of Canada are available for most of the area. Reports by major oil companies and consulting geologists are also available for many parts of the area.

Economic Geology

The hydrocarbon-producing potential of this vast region, is, as yet, largely unknown. At the present time only one oilfield is known, at Norman Wells. This field was discovered in the early part of this century and has produced petroleum products for the small local market for more than forty years. More recently, natural gas and oil has been discovered in the Yukon Territory, in the Liard and Eagle Plains areas. Exploration for oil and gas is continuing at a rapid pace.

Method of Study

Crew. — A seven-man geological party spent more than ninety days in the field between May 30, 1964 and August 29, 1964. The crew was increased by as many as four geological personnel for periods ranging up to two weeks, upon two occasions.

Base Camp. — The project was worked from a unique base camp. This camp consisted of a river tugboat and two barges, all on charter to Imperial Oil Enterprises Ltd. One of the barges carried aviation fuel, diesel fuel, and non-perishable equipment. The second barge carried the camp proper, which was composed of five "skid shack" trailers. This very mobile camp was successfully used to cover the much spread-out area of study.

Aircraft. — Support aircraft included —

Two (2) Hiller Model 12E helicopters	Okanagan Air Services Ltd.

Operations. -- The 1964 surface program required that work be done at numerous localities. These localities were scattered from the southern boundary of the Northwest Territories to the Arctic Coast. The area could be worked conventionally either by fielding several small parties or by moving one party the required number of times by aircraft. The complications and costs of such efforts seemed excessive. Since most of the work was within easy helicopter range of the Liard and Mackenzie rivers, it was decided that a novel, travelling, self-contained base camp could be used.

The expedition originated at Fort Nelson, B.C. Equipment and supplies were brought to Fort Nelson by truck. A wooden barge was loaded with: 6,000 gallons of aviation gas in ten gallon kegs, several drums of diesel fuel, outboard motor gas, naphtha, bulk quantities of oil and greases, and some of the more durable equipment. A second barge, steel, was loaded with: two sleeping trailers, each with accommodation for four men, a completely equipped "seismic" kitchen trailer, a mess trailer, an office trailer with living accommodation for two, a 1,000 gallon propane tank, a 23-cubic foot deepfreeze, and a 5 KW lighting plant. The clean, dry area below decks of the steel barge was used to store a season's supply of non-perishable foodstuffs and camping equipment. Motive power for this flotilla, together with sleeping accommodation for seven, was provided by the river tug, "New Era".

The large deepfreeze plus two ordinary electric refrigerators

provided safe storage for frozen meats and vegetables. The stock of frozen goods was replenished at Norman Wells, N.W.T. from a cache established by Company-owned DC-3 during the winter of 1964. Minor amounts of fresh foods were purchased at ports-of-call.

The aviation gas supply was replenished before leaving Norman Wells. Some 2,000 gallons of gasoline had been used by this time.

This travelling base camp eliminated nearly all fixed-wing support flying. One flight, by P.W.A. Beaver, was required to evacuate a helicopter engineer injured while in camp on the Hare Indian River. Some Otter flying time was used to transport materials from the campsite at Aklavik to Inuvik.

This barge-based camp provided two distinct advantages. First, nearly all the supplies required were with the party. No time was lost from operations waiting on fuel, or ferrying fuel and supplies. Second, moving the camp did not entail disruption of the operations. Normally, one or two days are lost in preparation for the move, and one or two days are lost in resettling. This year, moving camp entailed little more than weighing anchor and moving off. Stratigraphic reconnaissance was continued, as usual, the helicopters meeting the camp that night at some pre-arranged rendezvous. The arrangement proved to be an efficient method of working an extensive field area. A total area of nearly two hundred thousand square miles was within helicopter range.

The field party was subdivided into two sub-crews, each

with a senior geologist and one or two junior assistants. They operated from fly camps engaged in measuring section, or in doing river traverses by canoe. The duration of these fly camps varied from two days to two weeks. After each section was completed, these sub-crews returned to base camp to write-up field notes and plot logs of the outcrop sections.

The field party included an assistant party chief. Two helicopters were used, with the party chief and the assistant party chief doing stratigraphic reconnaissance, each using a helicopter. A total of 600 hours was flown by the helicopters.

Sections measured were sampled at regular intervals. Measurements were made by tape and brunton, plane table and alidade, or Jacob's staff. Quality of exposures was good to fair, with the best exposures found in creek beds or along ridges above tree line.

Time spent in the various areas is as follows:

Fort Liard - Nahanni - Fort Simpson Area	9 days
Norman Wells - Fort Good Hope Area	30 days
Peel Plateau - Northern Richardson Mtns. - Arctic Coastal Plain Area	53 days

STRATIGRAPHY

General Remarks

Rocks ranging in age from Proterozoic to Tertiary occur in the area. The sedimentary section ranges from an estimated 30,000 feet in the Liard area to estimates of more than 50,000 feet in Norman Wells and Peel Plateau - Arctic Coastal Plain areas. This total thickness will not be encountered in any one locality because of local erosion or non-deposition.

The stratigraphic sequence within the area of study is summarized by a table of formations. (Figure 2). The stratigraphic sequence within each area, the measured or reported thickness, a brief lithologic description, and the probable correlation between areas is shown by this table. The names and locations of sections measured in 1964 are shown on a map. (Figure 3). Strip logs, showing the lithology and thickness at these measured sections are enclosed. (In Pocket). It is understood that, the submission of these logs and locations fulfills our obligation to the government.

Proterozoic

Liard Area. — Precambrian rocks are not definitely identified. The lowermost rocks in the area occur to the west. These consist of thinly bedded argillites overlain unconformably by massive conglomerate.

	LIARD - NAHANNI AREA			NORMAN WELLS - FORT GOOD HOPE AREA			PEEL PLATEAU - RICHARDSON MTNS. - ARCTIC COASTAL PLAIN		
AGE	FORMATION	THICKNESS	LITHOLOGY	FORMATION	THICKNESS	LITHOLOGY	FORMATION	THICKNESS	LITHOLOGY
TERTIARY				Unnamed	1000'±	Unconsolidated sands, clays, lignite, gravel.	Unnamed	?	Sandstone, fine to coarse, friable feldspathic, coaly.
CRETACEOUS	Fort Nelson Lepine Scatter Garbutt	3000' to 7000'	Shale and sandstone sequence with basal conglomerate in many places.	East Fork Little Bear Slater River Sans Sault	0' to 6000'	Shale, grey Sandstone and shale with coal. Shale, dark grey to black, sandy, silty. Sandstone, glauconitic, fine grained to conglomerate.	Upper Cretaceous ? Lower Cretaceous ?	2000'+	Sands, coals, shales, bentonite.
JURASSIC							Goodenough	600'+	Quartzitic sandstone, shales, conglomerate.
							Donna River	1100'±	Dark rubbly shales.
TRIASSIC		0' to 60'	Micaceous silty shales.				Martin Creek	850'±	Sandstone and shale.
PERMIAN	Prophet	400'	Dark cherts and mudstones.				Bag Creek	500'±	Sandstone and shale.
CARBONIFEROUS	Mattson	0' to 5000'	Sandstone, limy, massive becoming shale toward base.				Unnamed	0' to 4000'	Conglomerate, breccia, sands, shales
				Imperial	0' to 2000'	Sandstone, fine grained, chloritic.			
DEVONIAN	Besa River	0' to 2000'	Limestone with shale and shaly siltstone, grading to limy shales.	Canol	0' to 600'	Shale, dark grey, siliceous, platy.	Imperial	0' to 4000'	Shale, sands, siltstones.
				Kee Scarp	0' - 700'	Reef limestone			
				Hare Indian	200'-800'	Shale, limy to shaly limestone.			
	Nahanni	700'	Limestone, dark grey, shaly.	Hume	250'-600'	Limestone grey, silty and argillaceous.	Hume - Bear Rock Equivalents ?	0' to 2000'	Limestone, dolomite, minor shales.
SILURIAN	Unnamed	5000'+	Dolomites, banded dark and medium grey.	Bear Rock	200' to 1000'	Dolomite, brown, fine grained brecciated and limestone, brown; with anhydrite, grey, massive.			
ORDOVICIAN				Ronning	1000' to 3000'	Dolomite, grey, finely crystalline with silicified fossils.	Ronning Equivalents	0' to 5000' ?	Dolomite, shale, limestone, silicified fossils.
				Saline River	0' to 3000' ?	Halite. In outcrop formation is thin, mainly gypsiferous shale.			
CAMBRIAN		100'	Quartzite conglomerate and boulder conglomerate.	Mount Cap	0' to 1000'	Dark shale.			
						Sandstone, limestone, dolomite.			
				Mount Clark	0' to 3000'	Orthoquartzite fine to coarse grained.			
PROTEROZOIC	Unnamed	?	Argillites, thinly bedded, platy, green.	Unnamed	?	Reddish weathering sandstones, shales and dolomite. Diorite sills.	Unnamed Shales	?	Shale, dark, siliceous, metamorphosed to argillites in part.

Figure 2

TABLE OF FORMATIONS

To accompany report:

SURFACE GEOLOGICAL RECONNAISSANCE

YUKON - NORTHWEST TERRITORIES

ADJACENT TO

MACKENZIE RIVER

Imperial Oil Enterprises

Dawson Creek, B.C.

1964

Norman Wells - Fort Good Hope Area. -- Precambrian rocks occur in the Mackenzie and Wernecke mountains. These rocks consist of dark brown and reddish-brown weathering sandstones, siltstones, shales and dolomites. The beds are intruded by diorite sills and dikes. These sills and dikes have been well-described by Hogan (1956). The Precambrian rocks are unconformably overlain by conglomerates or dolomite.

Peel Plateau - Northern Richardson Mountains - Arctic Coastal Plains. Precambrian rocks are not positively identified. Strata of possible late Proterozoic age were observed near Imuvik, where green schistose shale, rusty siltstone and minor carbonates are exposed, in fault contact with dolomite.

Lower Paleozoic

Liard Area. -- The Lower Paleozoic rocks are poorly known. A massive boulder conglomerate showing marked angular disconformity with underlying strata is considered to be the basal, early Paleozoic deposit. Overlying banded dark and grey dolomites are tentatively assigned to the Ordovician or Silurian. In the northeast part of the Liard area these dolomites grade into the Middle Devonian Nahanni formation of Hage (1945).

Norman Wells - Fort Good Hope Area. -- The lowermost Paleozoic deposits are the quartzose sands of the Mount Clark formation. The

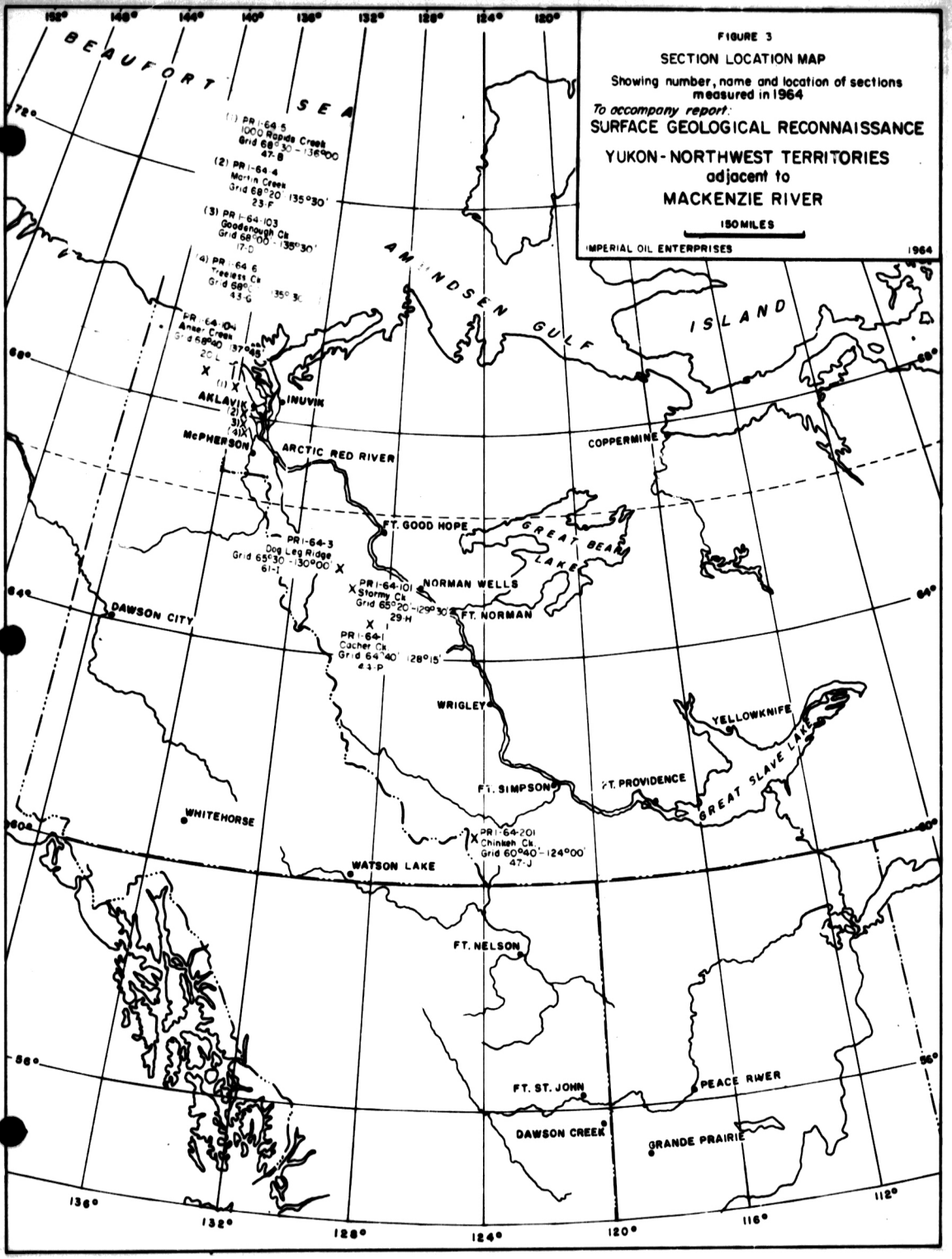

FIGURE 3

SECTION LOCATION MAP

Showing number, name and location of sections measured in 1964

To accompany report:

SURFACE GEOLOGICAL RECONNAISSANCE

YUKON - NORTHWEST TERRITORIES

adjacent to

MACKENZIE RIVER

150 MILES

IMPERIAL OIL ENTERPRISES 1964

sands are overlain by shales of the Mt. Cap formation of possible Middle Cambrian age. The Mount Cap is overlain by the evaporitic deposits and shales of the Saline River formation. A dolomite and limestone sequence of probable Ordovician - Silurian age is referred to as the Ronning formation. The Ronning formation consists principally of gray and gray-buff, striped, fine to coarsely crystalline dolomite with relic, silicified skeletal remains.

Peel Plateau - Northern Richardson Mtns. - Arctic Coastal Plain Area. The lower Paleozoic rocks are poorly exposed in this area. Lower and Middle Cambrian carbonates, together with cherts and siliceous shales, were seen at Mosquito Creek and White Dome. (Gabrielse, 1956). These beds are unconformably overlain by later beds. The "Ronning equivalent" rocks such as those around Campbell Lake, near Inuvik, are poorly known. Graptolitic shales, usually designated Cambrian to Silurian, are considered to be their equivalents in the Richardson Mountains.

LOWER AND MIDDLE DEVONIAN

Liard Area. — According to Hage (1945, p. 5) deposition during Lower and Middle Devonian time is represented by the Nahanni formation, a sequence of dark gray, medium bedded limestones. The Nahanni formation grades laterally into shaly limestones to the south and west. The relationship between these rocks and rocks of similar age to the north is not known.

Norman Wells - Fort Good Hope Area. — Lower and Middle Devonian rocks of this area can be divided, from lowest to highest, into these units: Bear Rock Formation, Hume Formation, Hare Indian Formation, Kee Scarp Formation, Canol Formation, (Bassett, 1960).

The Bear Rock formation consists of brown, finely crystalline, brecciated dolomite and brown limestone. In subsurface the dolomite is, in some places, interbedded with grey, massive anhydrite. Brecciation in outcrop seems due to collapse, after solution of the anhydrite. The Hume formation, which conformably overlies the Bear Rock formation is a gray, dense, silty limestone with recognizable skeletal remains. The Hume formation is characterized by uniformity of lithology throughout the area. Above the Hume formation, the rocks of the Hare Indian formation are shale with thin limestone beds, grading laterally to a very silty argillaceous limestone near Fort Good Hope, with a zone of bituminous shale near the base of the unit. The Hare Indian formation is overlain, in some areas, by the Kee Scarp formation; a reef limestone containing fragments of branching colonial organisms, encrusting corals, and stromatoporoids. This reef forms the reservoir in the Norman Wells field. The uppermost unit in the area, the Canol formation, overlies the Kee Scarp reefs, where these are developed, and the Hare Indian formation. The Canol consists of shale, dark grey to brown, siliceous, bituminous, and pyritic.

Rael Plateau - Northern Richardson Mountains - Arctic Coastal Plain Area. -- Rocks of Lower and Middle Devonian age are known in this area. Rocks exposed at "White Dome", in the Northern Richardson Mountains and on the shore of Campbell Lake, near Inuvik, are assigned to the Lower and Middle Devonian. These rocks consist of skeletal limestone and dolomite. They are equated with the Hume and Bear Rock formations of the area to the south. Because outcrops are sparse, and because the rocks appear to have been eroded, the distribution and lateral variation is uncertain.

UPPER PALEOZOIC

Liard Area. -- The rocks above the Nahanni Formation are divided into three units. The lowermost unit, the "Bear River Formation", (Douglas and Norris, 1959, map units 4, 5 and 6), represent an interval from Upper Devonian to Mississippian. The Bear River Formation consists of dark shales, shaly limestones and thinly bedded, fine grained sandstones. The middle unit, the Mattson Formation, is composed of thick sandstones with interbeds of silty shale and limestone. These rocks represent deposition during the Mississippian through Permian. The Mattson Formation is overlain unconformably in the north by Cretaceous rocks, and in the south by the cherts, sandstones, and shales of the Permian Prophet Formation, the uppermost Paleozoic rocks found in this area.

Norman Wells - Fort Good Hope Area. -- The Canol Formation is overlain by the Upper Paleozoic Imperial Formation. The Imperial Formation consists of very fine-grained, chloritic sandstone with abundant silty and sandy shale. The sandstone grades downward into gray shale with siltstone bands. The Imperial Formation is the uppermost Paleozoic deposit in this area.

Peel Plateau - Northern Richardson Mountains - Arctic Coastal Plains Area. The Imperial Formation extends into this region. Later Paleozoic sediments of probable Permian or Pennsylvanian age are recognized in the Northern Richardson Mountains. Reddish-brown conglomerates, sands and carbonate rocks unconformably overlie strata ranging from Cambrian to Devonian. Accurate correlations cannot be made. The Late Paleozoic faunas can be compared with the Alaska sections, as suggested in reports by Nelson (1961), Perry (1960), and Martin (1957) which deal with this problem.

MESOZOIC

Liard Plateau Area. -- Exposures of maroon and green, micaceous silty shales underlie Basal Cretaceous sands and overlie the Permian cherts on Kotaneelee River. Their stratigraphic position and lithologic similarity with Triassic rocks in British Columbia suggests these are of Triassic age. They thicken rapidly southward.

The lowermost Cretaceous rocks in this area consist of coarse sands and conglomerates. These coarse rocks are overlain by mudstones, argillaceous sands and sandy shales. A report by Stott

(1960) best describes the Cretaceous section in this area.

Norman Wells - Fort Good Hope Area. — The Mesozoic Era is represented only by rocks of Cretaceous age in this area. A four-fold division of the Cretaceous is recognised. The lowermost unit, the Sans Sault formation is composed of sandstone, fine-grained chloritic, with sandy shale and conglomerate near the base. The Sans Sault Formation is overlain by dark gray to black shales with interbeds of sandstone and siltstones, the Slater River Formation. Above the Slater River, a sandstone and shale unit containing coal is recognised as Little Bear Formation. The uppermost Cretaceous rocks of the area are the grey shales of the East Fork Formation.

Peel Plateau - Northern Richardson Mountains - Arctic Coastal Plain Area. Jurassic rocks are found throughout the Northern Richardson Mountains and in the Arctic Coastal Plain. It is difficult, if not impossible, to distinguish Upper Jurassic rocks from Lower Cretaceous ones, except by paleontology. Work done by Manning (1947) and Jeletzky (1958, 1960, 1961) in this area recognises approximately the same units. The sequence consists of quartzose sandstones and shales of Upper Jurassic age separated by dark rubbly shales from Lower Cretaceous and/or Jurassic quartzitic sandstones, shales and conglomerates; overlain by thick marine sandstones and shales with some coaly beds of possible Lower to Middle Cretaceous age. Beds of sandstone and grey shales of possible Upper Cretaceous age extend

toward the Mackenzie Delta. Outcrops of Cretaceous rocks are scarce or inaccessible over much of the Peel Plateau; hence, little is known about them.

TERTIARY

Liard Area. — Nothing is known about rocks of Tertiary age in this area. No rocks of this age were recognized.

Norman Wells - Fort Good Hope Area. — Hume (1954) recognized a series of poorly consolidated sands, clays, lignite, thick terrace gravels south of Fort Norman to be of Eocene age. Rocks of this age have not been identified elsewhere in the area.

Peel Plateau - Northern Richardson Mountains - Arctic Coastal Plain Area. No rocks of Tertiary age have been recognized in the Peel Plateau and Northern Richardson Mountains. The youngest rocks exposed in the Arctic Coastal Plain may have been deposited during Tertiary time.

STRUCTURAL GEOLOGY

Liard Area. — The Liard Plateau is the southernmost expression of the Mackenzie Mountain System. The structural grain is predominantly north and south with fault planes dipping steeply to the west. Structures usually consist of relatively simple folds with broad, gentle synclines and compressed, overturned, or faulted anticlines.

Norman Wells - Fort Good Hope Area. — Three structural provinces are represented in this area; the Franklin Mountains, Mackenzie Plain and Mackenzie Mountains. The Mackenzie Plain is essentially an asymmetric syncline with the deepest part towards the Mackenzie Mountains. The Mackenzie Plain basin is a large intermontane basin flanked on the northeast by the Franklin Mountains and on the southwest by the Mackenzie Mountains. All three provinces have the same structural characteristics with folds as the dominant structures. Faults are present but play a minor role in the structures. Surface structures consist of sharply-folded anticlines and broad synclines. The anticlines are often overthrust. These thrusts may dip either to the north or the south.

Peel Plateau - Northern Richardson Mountains - Arctic Coastal Plain Area. The dominant structural grain of the area shows a northerly trend.

The Richardson Mountains are, essentially, a large anticlinorium which breaks up to the north into several large north-plunging folds. Piercement structures which bring gypsum to surface are known in the Aklavik Range. These piercements have not been explained satisfactorily. The Peel Plateau is a high area in which are preserved, in a relatively undisturbed condition, sediments deposited in the eastern part of the Western Canadian Geosyncline. The Arctic Coastal Plain is a narrow, poorly drained, low area between the Arctic Ocean or Beaufort sea and the Northern Richardson and British Mountains. The few outcrops that are present show fairly steep dips, with structures plunging to the north.

J. C. UNDERHILL
Acting Division Exploration Mgr.
Peace River Division
Imperial Oil Enterprises Ltd.

April 1, 1965.

LIST OF OUTCROP SECTIONS

Name	Location		
Cacher Creek	64°40'	128°15'	R-44
DogLeg Ridge	65°30'	130°00'	I-61
Martin Creek	68°20'	135°30'	F-23
1000 Rapids Creek	68°30'	136°00'	D-47
Treeless Creek	68°00'	135°30'	G-43
Stormy Creek	65°20'	129°30'	H-29
Goodenough Creek	68°00'	135°30'	D-17
Anker Creek	68°40'	137°45'	L-20
Chimkeh Creek	60°40'	124°00'	J-47

See Figure 3

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LOG OF OUTCROP SECTION

STATION NO. PR 1-64-1
Cacher Creek

LOCATION: LSD. SEC. TWP. RGE. W. M.
UNIT ZONE N.T.S.
SEC R-44 LAT 64° 40' LONG. 128° 15'

Description of location: measured south to North along Southward Flowing Creek at headwaters of Cacher Creek

ELEVATION: MEASURED
METHOD

FORMATIONS

TO ACCOMPANY REPORT

BY:
DATE:

To accompany report
SURFACE GEOLOGICAL RECONNAISSANCE
YUKON-NORTHWEST TERRITORIES
adjacent to
MACKENZIE RIVER

IMPERIAL OIL ENTERPRISES 1964

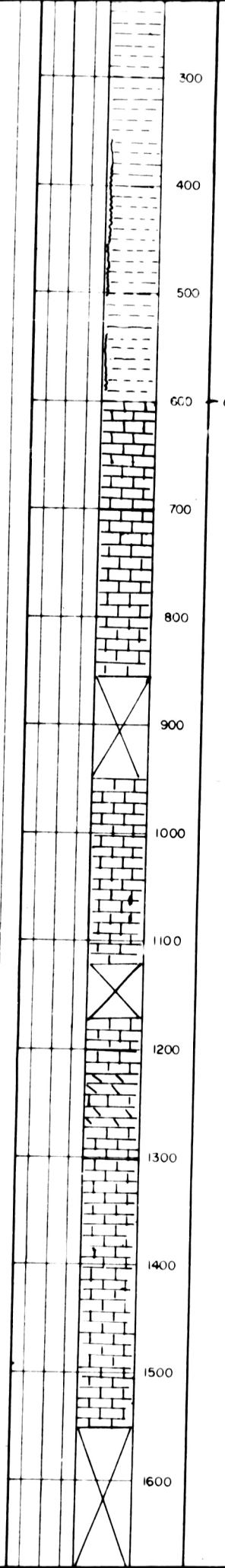
LEGEND

Coal | Salt | Anhydrite | Dolomite | Limestone | Massive Chert | Conglomerate | Sandstone | Siltstone | Shale

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
			Section measured with Jacob's staff and with tape and brunton
			Imperial Formation
		0	siltstone, quartzitic, medium to dark gray, slightly argillaceous
		100	
		140	Canol - Hare Indian Formation
			shale, dark gray, slightly silty
		200	
		300	
			shale, siliceous, dark gray
		400	

1 of



shale, siliceous, dark gray

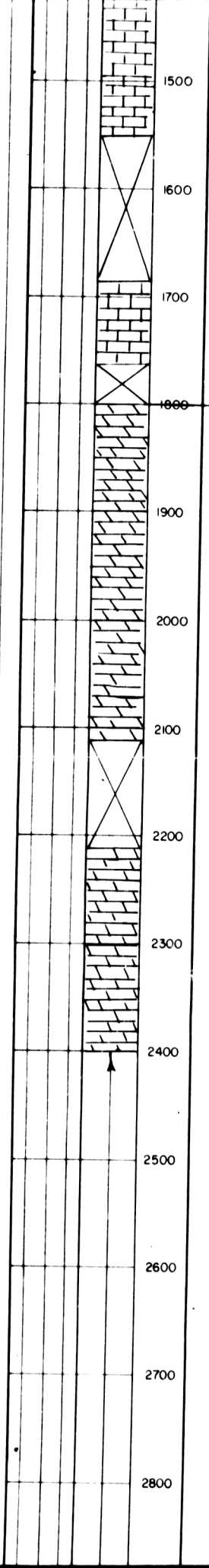
Hume Formation

600' Limestone, micritic to micritic skeletal, dark gray to medium dark gray

950' Bear Rock Formation

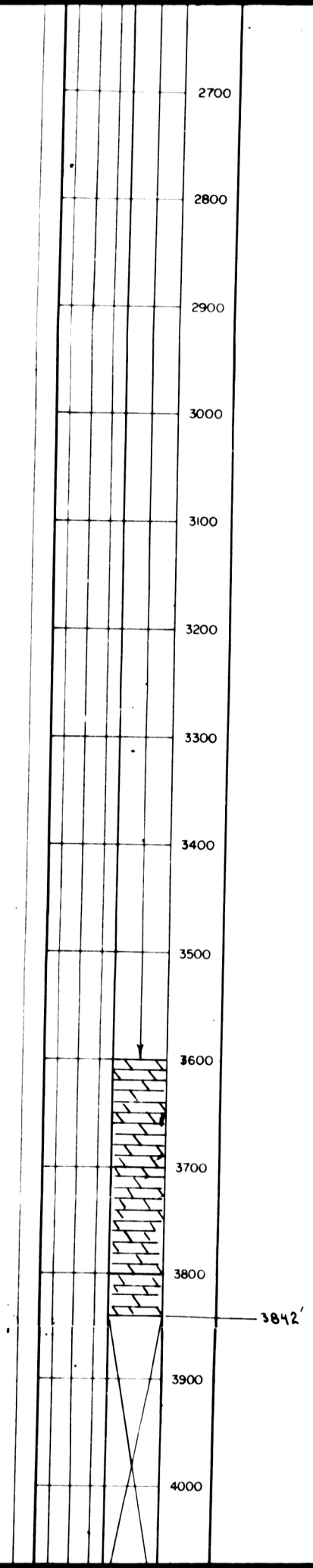
Limestone, micritic skeletal to micritic, dark gray to medium dark gray with limestone breccia between 1170'-1200' and dolomites and dolomitic limestones between 1220-1270'

Limestone breccia, fragments are micrite with a poorly consolidated micritic matrix



Running Group

Dolomite, microcrystalline to fine crystalline, medium to light gray with minor amounts of cryptocrystalline dolomite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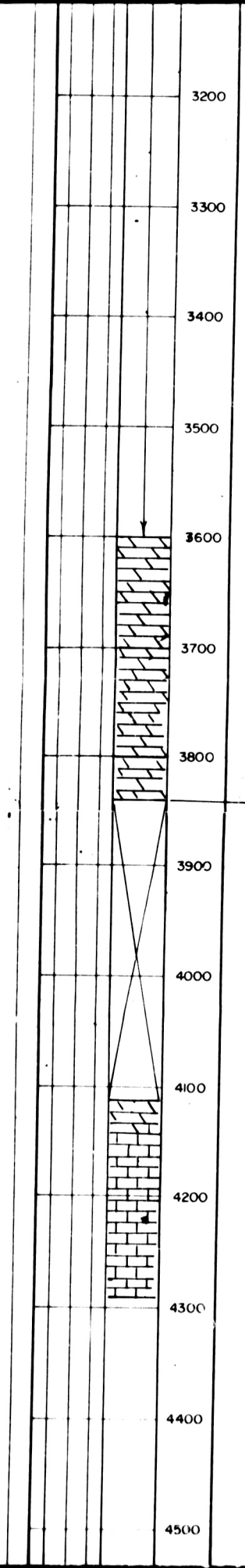


Dolomite, micritic, argillaceous

Limestone, micritic with interbedded shale

5 of 5

LOG OF OUTCROP SECTION

STATION NO. PR 1-64-6
Treeless Creek

LOCATION: LSD. SEC. TWP. RGE. W. M.
UNIT ZONE N.T.S.
SEC 436 LAT 68° 90'.. LONG. 135° 30'

Description of location: section measured along small tributary on the east bank of Treeless Creek

ELEVATION MEASURED
METHOD

FORMATIONS

TO ACCOMPANY REPORT

BY:
DATE:

To accompany report
SURFACE GEOLOGICAL RECONNAISSANCE
YUKON - NORTHWEST TERRITORIES
adjacent to
MACKENZIE RIVER

IMPERIAL OIL ENTERPRISES 1964

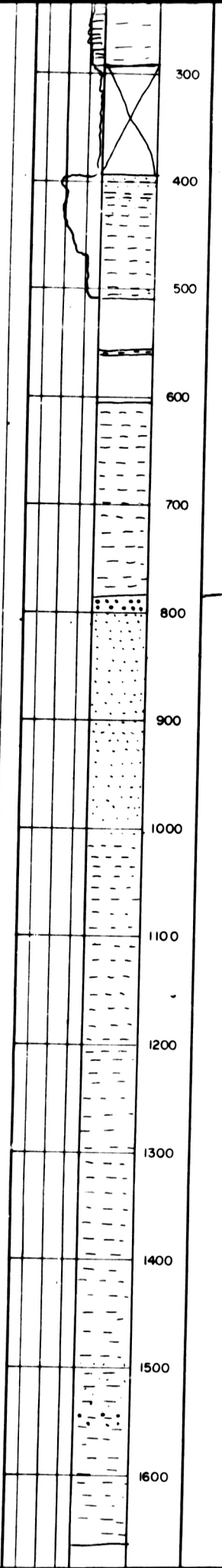
LEGEND

Coal | Salt | Anhydrite | Dolomite | Limestone | Massive Chert | Conglomerate | Sandstone | Siltstone | Shale

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
			Section measured by Pogo stick, tape and brunton
			Lower Cretaceous
			Donna River Formation
		0	shale, silty, medium dark greyish brown,
			with siltstone from 100' to 140'.
		100	
		200	
		300	Covered 290' to 390'
		400	Shale, silty, dark grey brown to medium olive brown

19



Covered 290' to 390'

Shale, silty, dark grey brown to medium olive brown

Shale. dark grey and medium olive brown

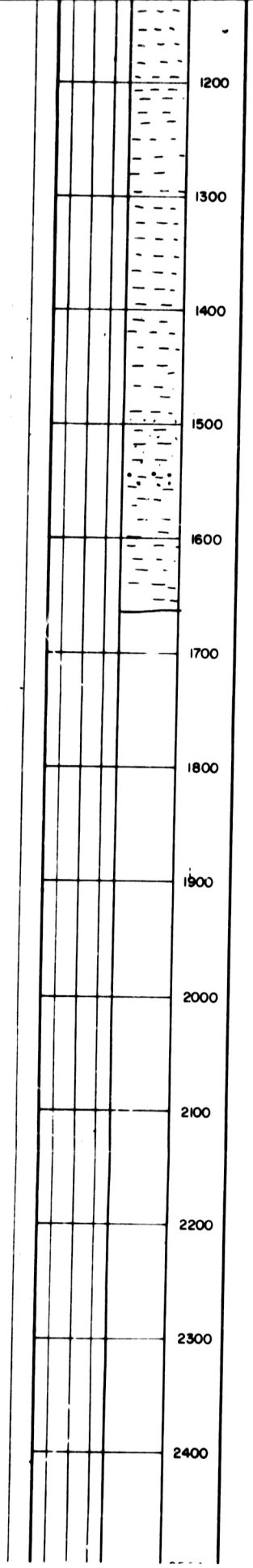
Lower Cretaceous - Jurassic
Martin Creek Formation.
790'
Siltstone, light grey to medium dark grey brown with sandstone from 770'-800', and interbedded with shales and sandstone

Shale medium dark grey to black

Shale. silty medium grey brown with minor siltstone and sandstone interbeds

127

Base of section 1660'



Shale, silty medium gray brown with minor siltstone and sandstone interbeds

Base of section 1660'

LOG OF OUTCROP SECTION

STATION NO. PR 1-64-5
1000 Rapids Creek

LOCATION: LSD.. SEC.. TWP. RGE. W. M.
UNIT ZONE N.T.S.
SEC. 17-D LAT 68°30' LONG. 136°00'

Description of location: Section begins at top of shale exposure on Little Fish River 1.5 miles downstream from Junction of Cache Creek and ends 2 miles upstream from same Junction, on Little Fish River

ELEVATION MEASURED
METHOD

FORMATIONS

TO ACCOMPANY REPORT

To accompany report:
SURFACE GEOLOGICAL RECONNAISSANCE
YUKON-NORTHWEST TERRITORIES
adjacent to
MACKENZIE RIVER

BY:
DATE:

IMPERIAL OIL ENTERPRISES 1964

LEGEND

Coal | Salt | Anhydrite | Dolomite | Limestone | Massive Chert | Conglomerate | Sandstone | Siltstone | Shale

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
			Section measured by Tape and Brunton and Jacob's staff.
			Lower Cretaceous to Jurassic
		0	Siltstone, argillaceous, medium gray, slightly carbonaceous with silty shale and minor quartzoze sandstone
		100	
		200	covered interval 230'-425'
		300	
		400	sandstone, quartzoze, carbonaceous

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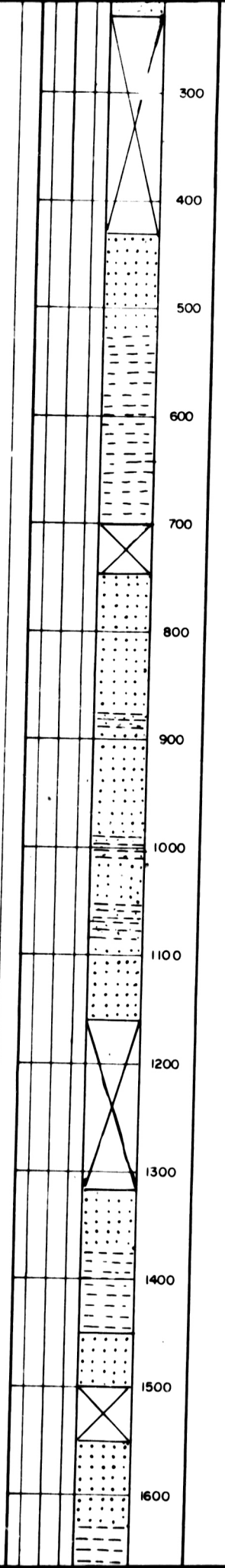


covered interval 230'- 425'

sandstone, quartzose, carbonaceous, very fine to fine grained

shale, dark grey, with minor siltstone

covered interval 700-745'

Sandstone, quartzose, very fine grained with silty shale
dark grey, interbedded

covered interval 1160'- 1315'

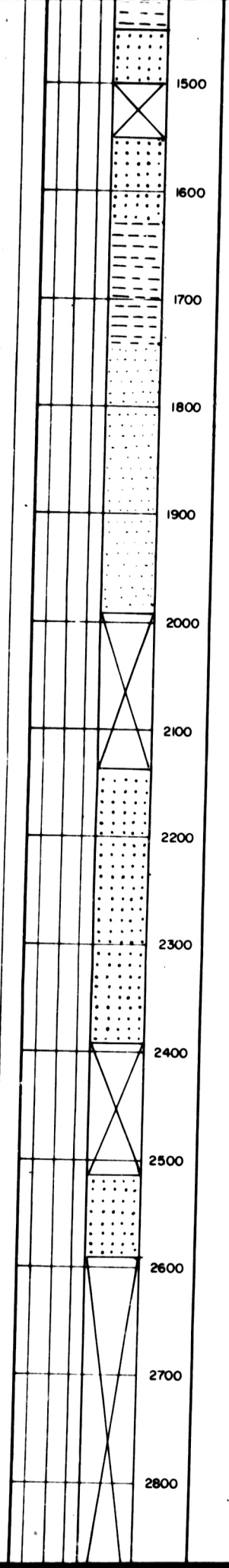
Sandstone, quartzose, very fine grained
with shale, silty, carbonaceous, dark grey.

27

covered interval 1490'-1545'

Sandstone, quartzose, slightly glauconitic, carbonaceous
green gray

Shale, silty, dark gray



covered interval 1490'-1645'

Sandstone, quartzoze, slightly glauconitic, carbonaceous green gray

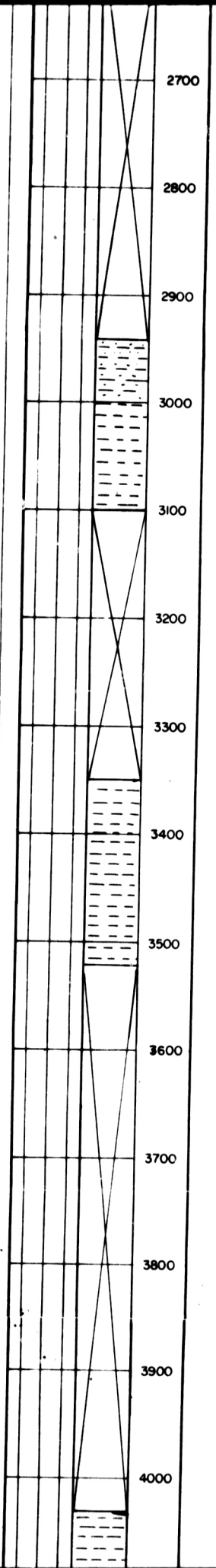
Shale, silty, dark gray

Siltstone - green grey with shale, dark gray, silty

covered interval 1990'-2135'

Sandstone, quartzoze, slightly glauconitic, very fine grained, greenish gray.

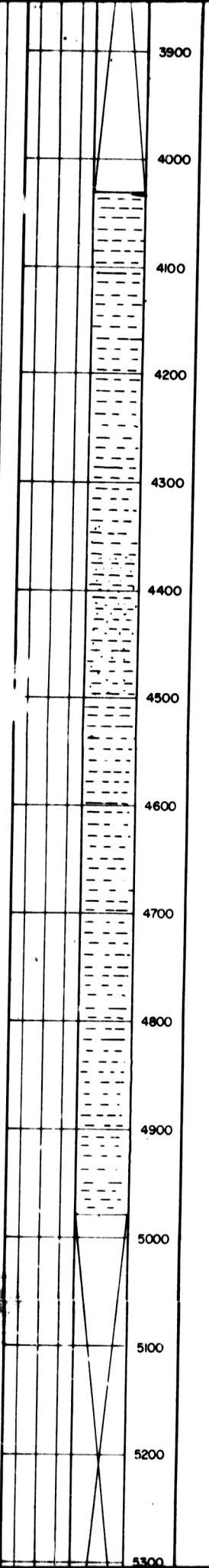
Permian



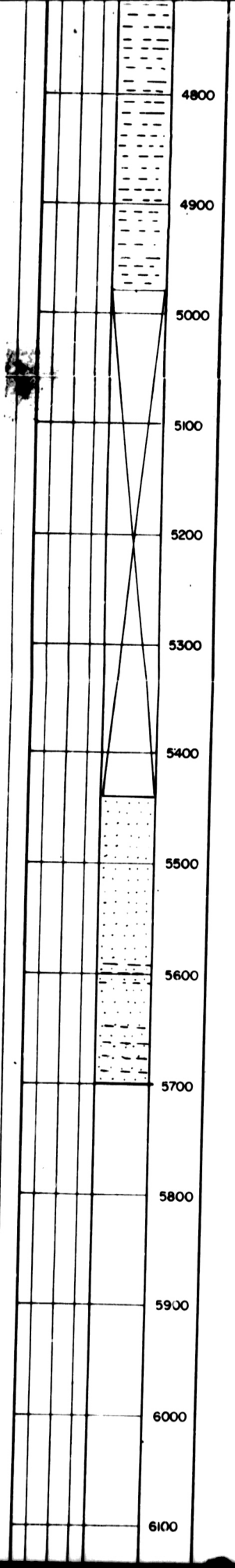
Permian

Shale, silty, dark gray with some siltstone

Shale, dark gray, slightly silty, fe and sulphur stained



covered or inaccessible



covered or inaccessible

siltstone, quartzoze, medium gray to light gray
with silty shale interbeds

LOG OF OUTCROP SECTION

STATION NO. PR1-64-101 Stormy Creek

LOCATION: LSD. SEC. TWP. RGE. W. M.
UNIT N ZONE N.T.S.
SEC. 29 LAT 65°20' LONG. 129°30'

Description of location: measured in canyon along a northeast flowing tributary of the Gayna River approximately six and one half miles west of Gayna River Canyon

ELEVATION MEASURED
METHOD

FORMATIONS

TO ACCOMPANY REPORT

To accompany report
SURFACE GEOLOGICAL RECONNAISSANCE
YUKON-NORTHWEST TERRITORIES
adjacent to
MACKENZIE RIVER

BY:
DATE:

IMPERIAL OIL ENTERPRISES 1964

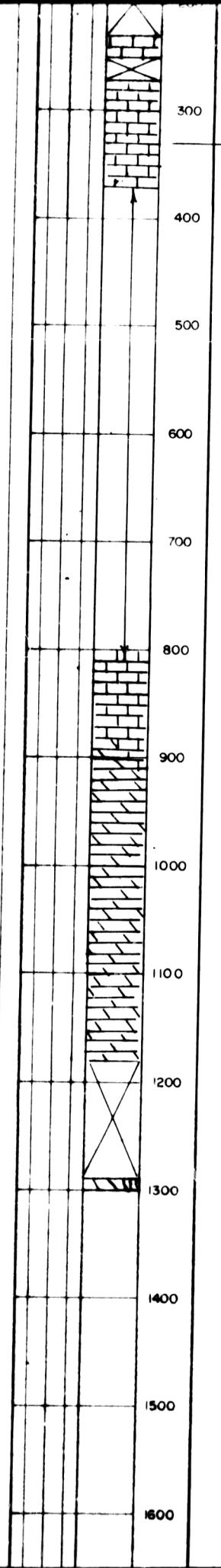
LEGEND

Coal | Salt | Anhydrite | Dolomite | Limestone | Massive Chert | Conglomerate | Sandstone | Siltstone | Shale

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
			Section measured with Pogo Stick, tape and brunton
		0	**Hume formation**
			Limestone, micritic, skeletal, medium dark gray
		100	
		200	
		300	
			Bear Rock Formation
		400	Limestone micritic also often pelletal and lump medium gray to gray buff, , minor shale partings Dolomite and dolomitic is between 800-840

1 of



Bear Rock Formation

Limestone micritic also often pelletal and lump
medium gray to gray buff, , minor shale partings
Dolomite and dolomitic is between 800-840

Dolomite, very fine to micritic grain size, light buff

Ranning Group

Dolomite, siliceous

242

LOG OF OUTCROP SECTION

STATION NO. PR1-64-103
Goodenough Creek

LOCATION: LSD. SEC. TWP. RGE. W. M.
UNIT ZONE N.T.S.
SEC 4-17 LAT 68°09' LONG. 135°30'

Description of location: measured along Goodenough creek and south side of Mount Goodenough

ELEVATION MEASURED
METHOD

FORMATIONS

TO ACCOMPANY REPORT

BY:
DATE:

To accompany report
SURFACE GEOLOGICAL RECONNAISSANCE
YUKON-NORTHWEST TERRITORIES
adjacent to
MACKENZIE RIVER

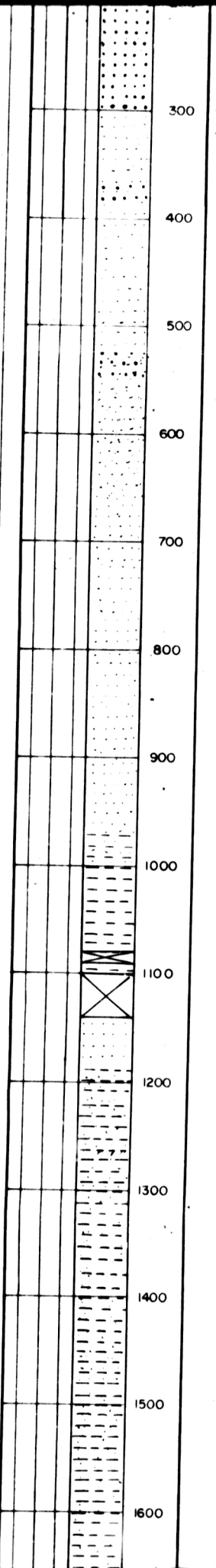
IMPERIAL OIL ENTERPRISES 964

LEGEND

Coal | Salt | Anhydrite | Dolomite | Limestone | Massive Chert | Conglomerate | Sandstone | Siltstone | Shale

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
			1 of
			Lower Cretaceous
			Goodenough Formation
		0	Silty sandstone to thick bedded clean sandstone. Outcrop inaccessible, lithology from talus.
		100	
			Sandstone, light gray, lithic, tight, very fine to fine grained with silty sandstone
		200	
			Donna River Formation
		300	300' Siltstone, argillaceous, medium gray to brown gray with thin interbeds of dark gray shale and minor amounts of silty sandstone
		400	



Dana River Formation

300'

Siltstone, argillaceous, medium gray to brown gray with thin interbeds of dark gray shale and minor amounts of silty sandstone

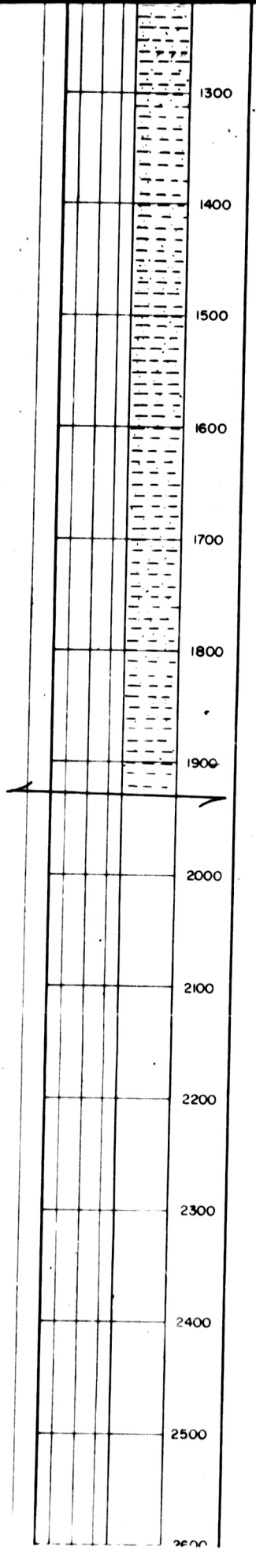
Shale, silty, dark gray, very fossil. Fresh samples are difficult to obtain

Siltstone, argillaceous, as above.

Shale, silty, dark to medium gray, iron stone concretions present

127

concretions present



Base of section faulted - 1930'

LOG OF OUTCROP SECTION

STATION NO. PRI-64-3
Dog Leg Ridge

LOCATION: LSD.. SEC. TWP. RGE. W M.
UNIT ZONE N.T.S
SEC 3-61 LAT 65°30'... LONG. 130°00'

Description of location: North to South trending zigzagging ridge west of Humic River

ELEVATION MEASURED
METHOD

FORMATIONS

TO ACCOMPANY REPORT

BY:
DATE:

To accompany report
SURFACE GEOLOGICAL RECONNAISSANCE
YUKON - NORTHWEST TERRITORIES
adjacent to
MACKENZIE RIVER

IMPERIAL OIL ENTERPRISES 1964

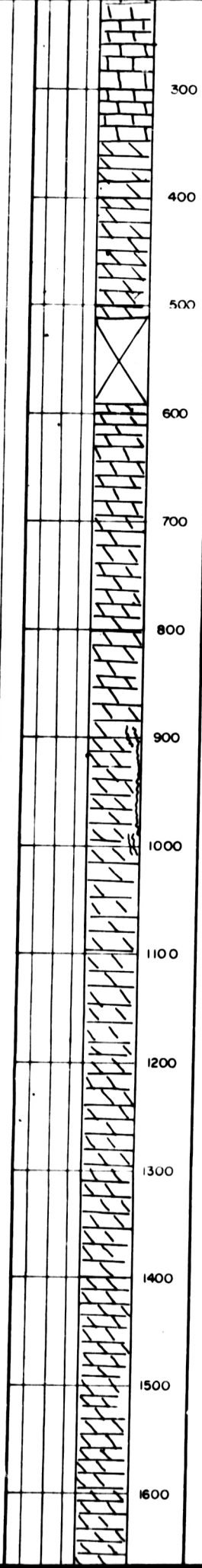
LEGEND

Coal | Salt | Anhydrite | Dolomite | Limestone | Massive Chert | Conglomerate | Sandstone | Siltstone | Shale

IMPERIAL OIL ENTERPRISE LTD. EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
			Middle Devonian Bear Rock Formation
		0	Limestone micritic to Pelletal, medium grey to light brown
		100	
		200	
		300	Limestone, micritic to pelletal, medium gray, with dolomite interbeds
		400	Dolomite, micro crystalline to very fine crystalline, dark grey, with micritic, dolomitic limestone interbeds

1 of



Limestone, micritic to pelletal, medium gray, with dolomite interbeds

Dolomite, micro crystalline to very fine crystalline, dark grey, with micritic, dolomitic limestone interbeds

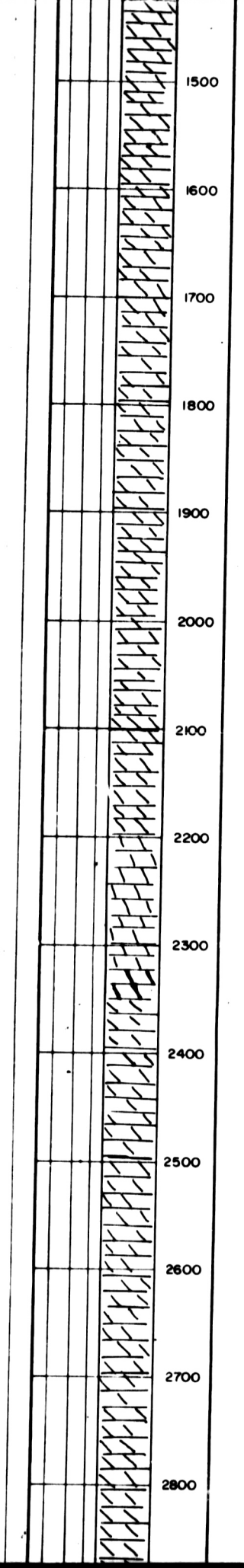
Covered interval 520' - 577'

Dolomites, crystalline with dolomite breccias and cryptocrystalline dolomites and minor massive chert beds

— 730' — Ordovician - Silurian

Ronning Formation

Dolomite, microcrystalline to fine crystalline, trace cryptocrystalline dark grey to light grey, chert occurs as lenses and nodules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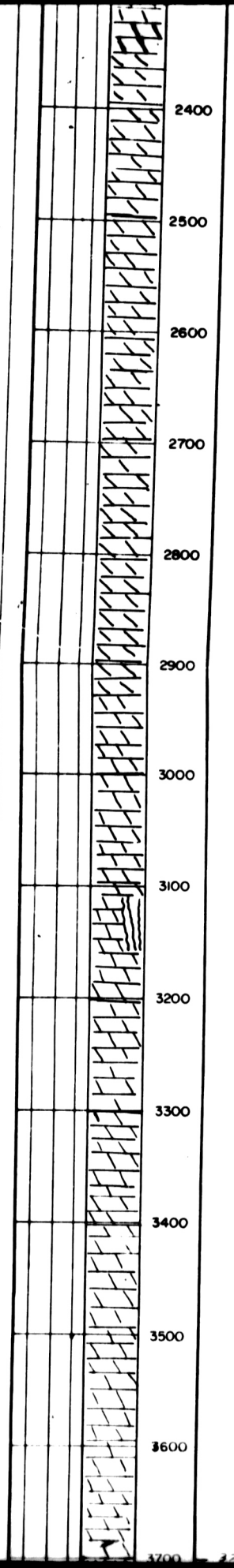


Cambrian - Pre Cambrian

494

LOG OF OUTCROP SECTION

STATION NO. PPY-64-201
CHINKEH CREEK

LOCATION: LSD. SEC. TWP. RGE. W. M.
UNIT ZONE N.T.S
SEC 47J AT 60°40' LONG. 124°00'

Description of location:
In small tributary to Chinkeh Creek.

ELEVATION MEASURED Jacob's staff
METHOD

FORMATIONS

TO ACCOMPANY REPORT

BY:
DATE:

To accompany report:
SURFACE GEOLOGICAL RECONNAISSANCE
YUKON - NORTHWEST TERRITORIES
adjacent to
MACKENZIE RIVER
IMPERIAL OIL ENTERPRISES 1964

LEGEND

Coal | Salt | Anhydrite | Dolomite | Limestone | Massive Chert | Conglomerate | Sandstone | Siltstone | Shale

IMPERIAL OIL. ENTERPRISE LTD EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
		0	0' — Cretaceous shale — shale, soft, dark gray, fissile, silty near base
		100	60' — Basal Cretaceous sands. Sandstone, quartzose, fine to very fine grained, argillaceous, light gray buff thin bedded to flaggy, very silty at 100' to 105'; scattered shaly beds. Below 105' beds massive, sandstone slightly coarser grained, contains carbonaceous material.
		200	135' — Permian Peabot Formation — Interbedded and gradational black siliceous shale and black argillaceous chert, fissile to platy, rubbly, black and buff weathering.
		300	
		400	

LOG OF OUTCROP SECTION

STATION NO. PR1-64-104

Anker Creek

LOCATION: LSD. SEC. TWP. RGE. W M.
UNIT ZONE N.T.S.
SEC 1-20 AT 68°40' N LONG 137°45'

Description of location: Section starts at most westerly outcrop on small south east flowing tributary of Anker creek 10 miles from junction of Anker Creek and the Blow River. Section was measured from that point, along tributary, downstream along Anker Creek to point where the formation is thrust faulted and folded 7.5 miles from junction of Anker Creek and the Blow River.

FORMATIONS

TO ACCOMPANY REPORT

BY:

DATE:

To accompany report:
SURFACE GEOLOGICAL RECONNAISSANCE
YUKON-NORTHWEST TERRITORIES
adjacent to
MACKENZIE RIVER

IMPERIAL OIL ENTERPRISES 1964

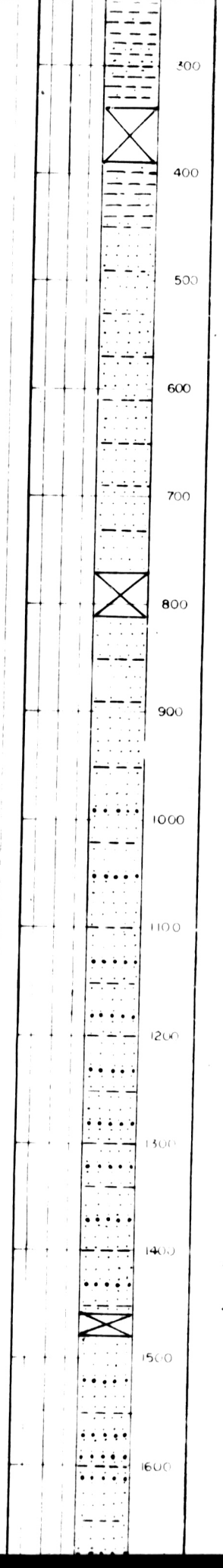
LEGEND

Coal, Anhydrite, Dolomite, Limestone, Massive Chert, Conglomerate, Sandstone, Siltstone, Shale

IMPERIAL OIL ENTERPRISE LTD EXPLORATION DEPARTMENT PEACE RIVER DIVISION

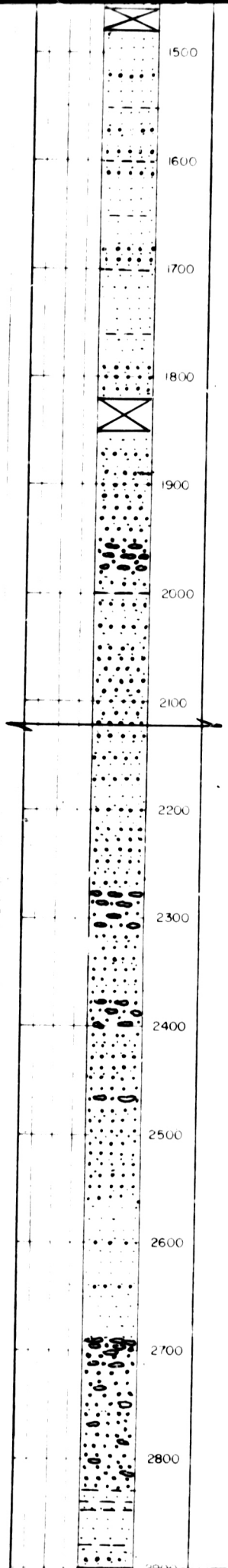
Res.	Lith.	Footage	Description
			Section was measured with Pogo stick, Tape and Brunton.
			Lower Cretaceous - Jurassic.
		0	shale, silty, thin bedded, dark to medium gray, very soft
		100	
		200	
		300	
		400	Siltstone, argillaceous, medium to dark gray, hard,

1 of



Siltstone, argillaceous, medium to dark gray, hard, with very thin partings of shale

Siltstone, Argillaceous, dark gray to medium gray with sandstone, lithic, silty, gray brown proportion of sandstone increases towards the base of interval



Lithic sandstones with argillaceous siltstone as above with some massive conglomerate, chert pebbles, gray brown.

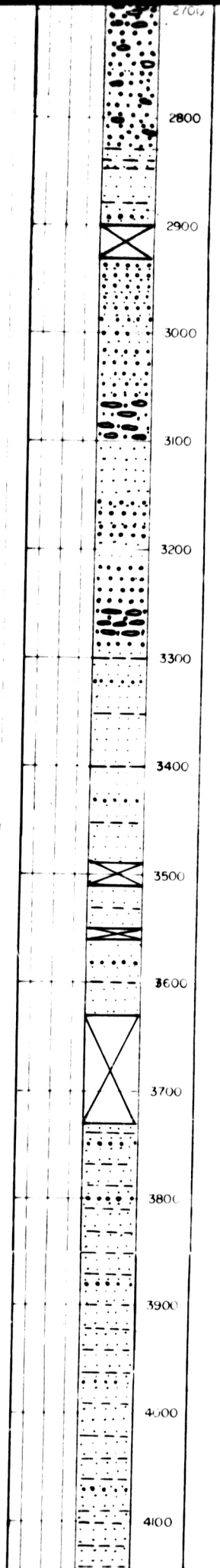
Argillaceous siltstone with lithic sandstone

Interbedded lithic sandstone and argillaceous siltstone with massive conglomerate

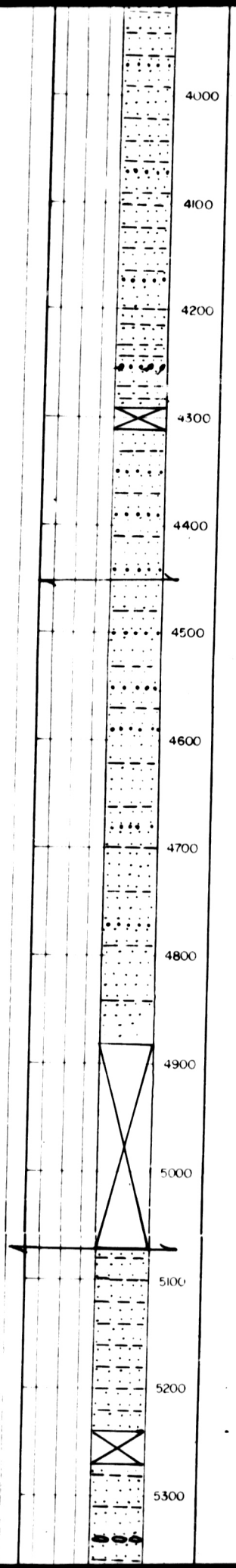
Sandstone, lithic, silty, fine to medium grained

Siltstone, argillaceous, thin to medium bedded

The base of each conglomerate sequence is a disconformity. Conglomerate is chert pebble



Siltstone, argillaceous, with some very fine grained lithic sand, medium to dark gray with sandstone, lithic, silty, argillaceous, very fine to fine grained, light to medium gray, with thin dark shale partings between siltstone and sandstone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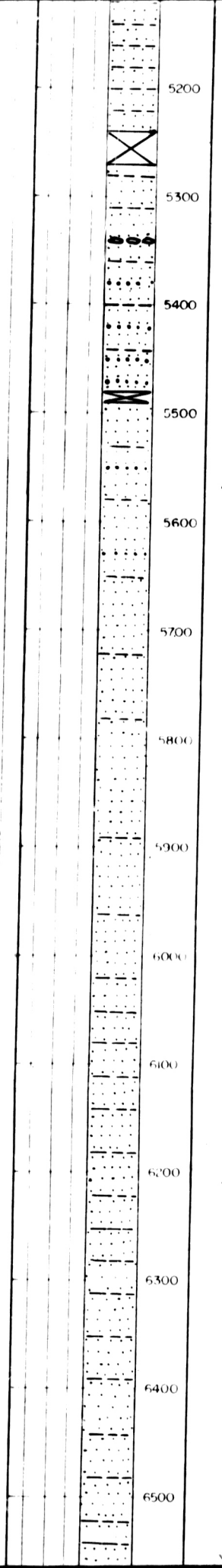
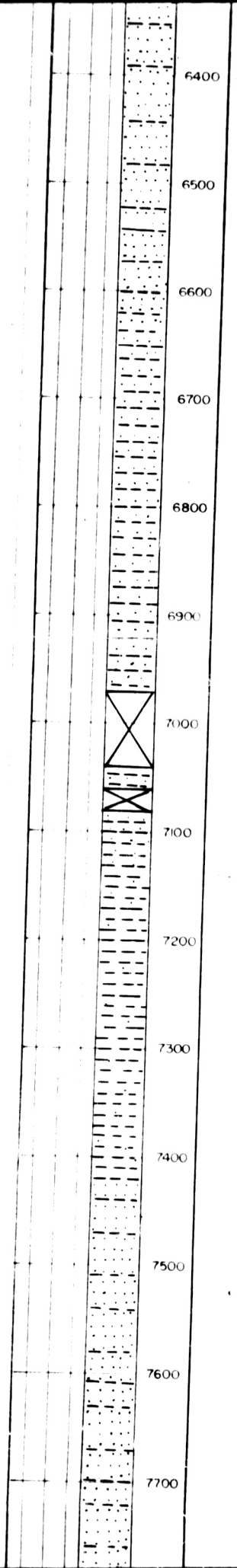


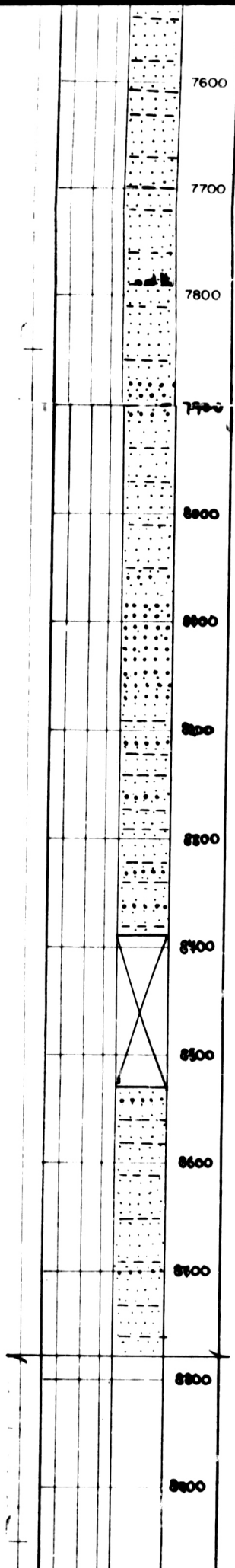
Lithology is 90% argillaceous siltstone with shale and fine grained lithic sandstones



Shale, medium gray, soft with minor beds of argillaceous siltstone and very minor beds of very fine grained lithic sandstone

7 of

Thin bedded argillaceous siltstones as above with shale and very fine to fine grained lithic sandstones as above.



Sandstone, lithic, light gray, fine to medium grained, silica cement.

Thin bdd argillaceous siltstones as above with thin beds of lithic fine grained lithic sandstone and shale. Minor chert pebble conglomerate present

Base of section 8780' Section is faulted off

LOG OF OUTCROP SECTION

STATION NO. PR1-64-4
Martin Creek

LOCATION: LSD. SEC. TWP. RGE. W
UNIT ZONE N.T.S
SEC 23 LAT 68°20' LONG.

Description of location. Section measured on [illegible] sandstone unit which forms high cliffs on [illegible] creek 1.5 miles upstream from Willow Creek.

ELEVATION MEASURED METHOD

FORMATIONS

TO ACCOMPANY REPORT

BY

DATE

To accompany report
SURFACE GEOLOGICAL RECONNAISSANCE
YUKON - NORTHWEST TERRITORIES
adjacent to
MACKENZIE RIVER
IMPERIAL OIL ENTERPRISES 1964

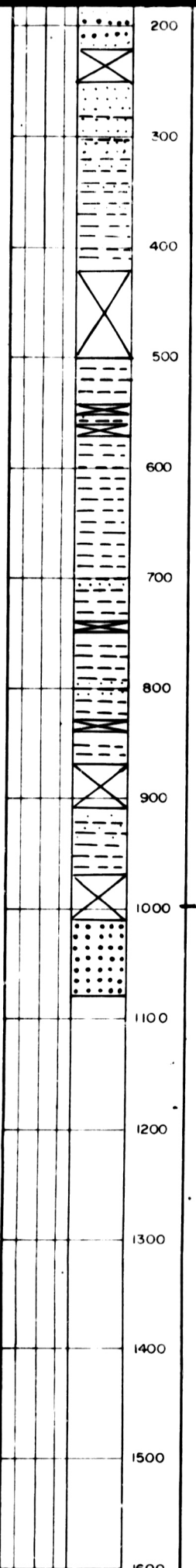
LEGEND

Coal | Salt | Anhydrite | Dolomite | Limestone | Massive Chert | Conglomerate | Sanastone | Siltstone | Shale

IMPERIAL OIL ENTERPRISE LTD EXPLORATION DEPARTMENT PEACE RIVER DIVISION

Res.	Lith.	Footage	Description
			Section measured by Jacob's Staff and tape and brunton
			Lower Cretaceous and Jurassic Martin Creek Formation
		0	Sandstone, quartzose, very fine grained to silt size grains, medium brown, carbonaceous material, silica cement
		100	
		200	
			siltstone, medium gray, with one quartzite bed.
		300	siltstone, argillaceous, dark gray with shale, silty dark gray
		400	shale, dark gray, fissile, siltstone concretions

1 of



Siltstone, medium gray, with one quartzite bed.

Siltstone, argillaceous, dark gray with shale, silty dark gray

Shale, dark gray, fissile, siltstone concretions

Shale, slightly silty, with very thin bedded siltstone at top and bottom of unit, dark gray, fissile

Shale, dark gray, fissile, with 1" interbeds of subfissile silty shale

1010' Jurassic - Bug Creek Formation

Sandstone, quartzose, very fine to fine grained, subangular to round, well sorted, medium brown to buff

242