PLATE I

IMPERIAL OIL ENTERPRISES LTD.

LOCATION MAP

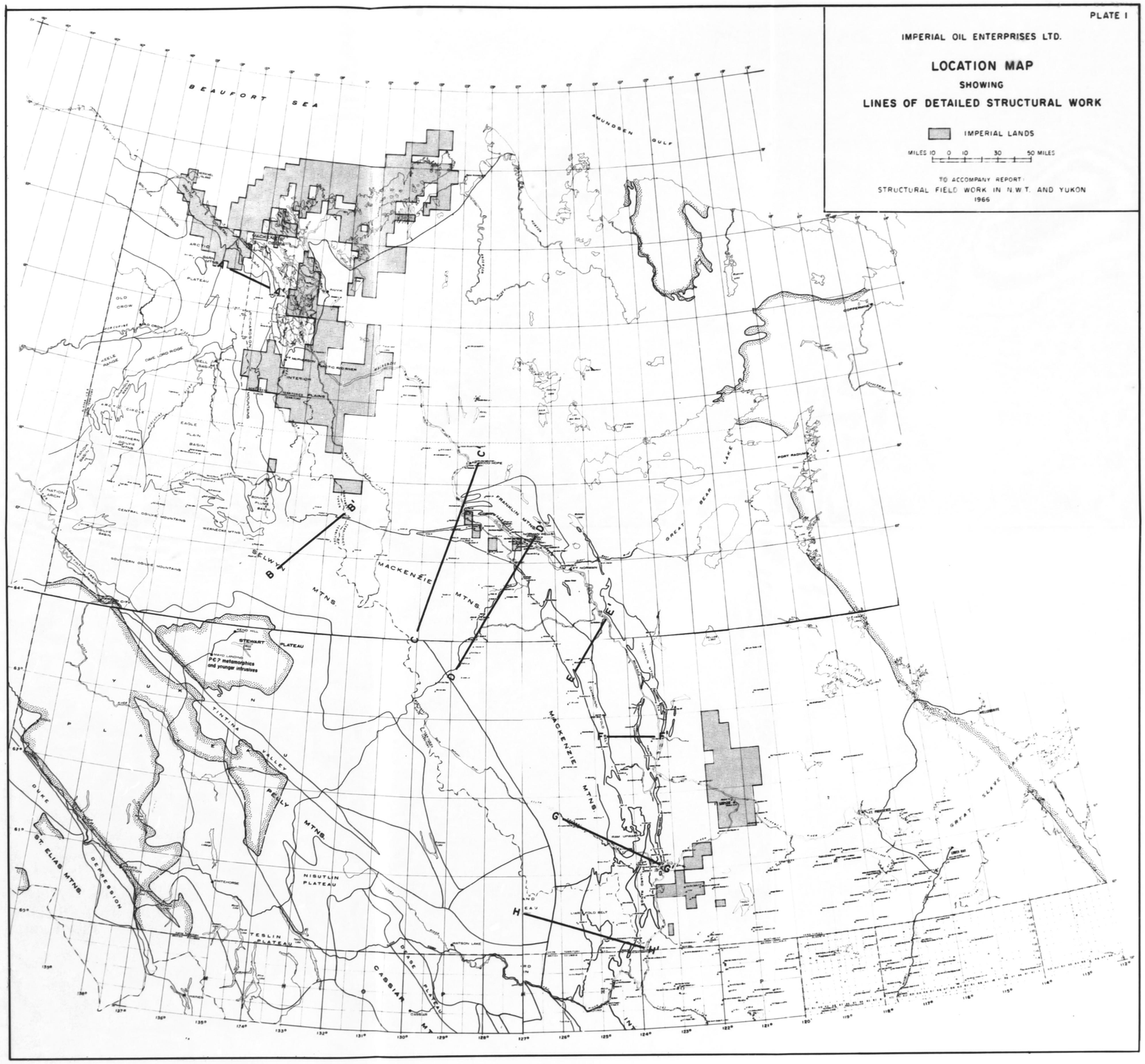
SHOWING

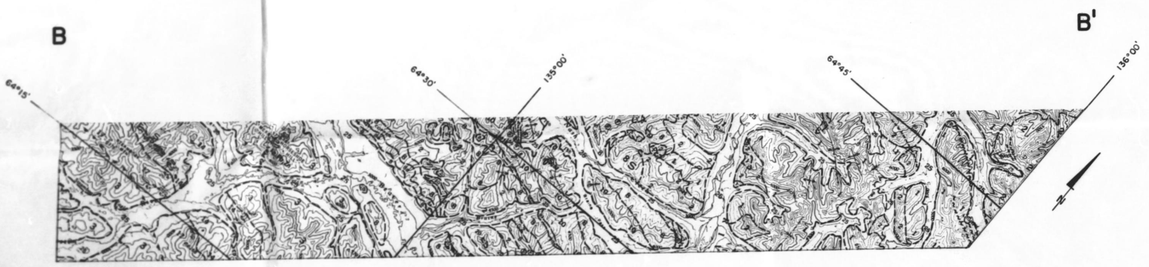
LINES OF DETAILED STRUCTURAL WORK

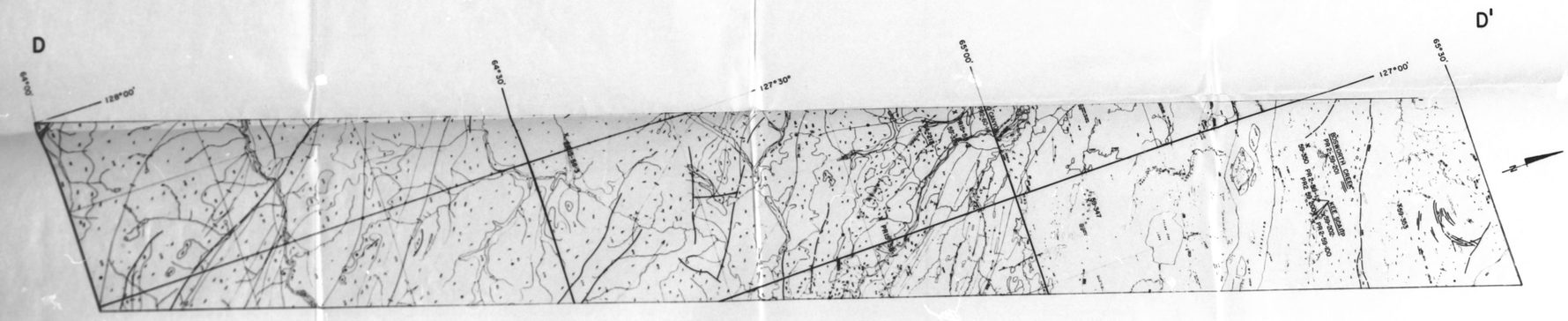
IMPERIAL LANDS

MILES 10 0 10 30 50 MILES

TO ACCOMPANY REPORT:
STRUCTURAL FIELD WORK IN N.W.T. AND YUKON
1966





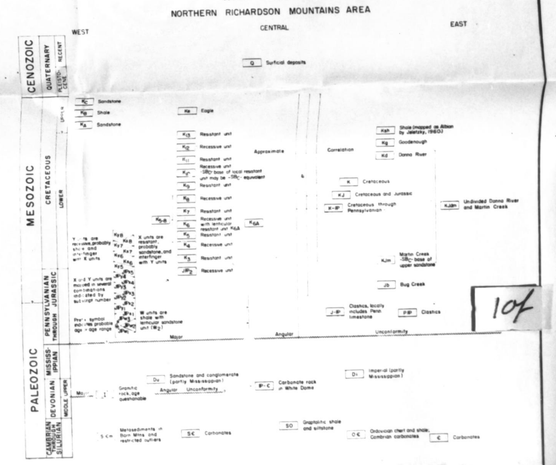


LEGEND

AGE	SYMBOL	FORMATION			
QUATERNARY	Q	Alluvium, glacial drift and landslide deposits	Qal	Alluvium	
QUATERNARY AND/OR TERTIARY	QT	High level pediment gravels			
TERTIARY	Tu	Tertiary shale, sandstone conglomerate and coal			
UPPER CRETACEOUS	Ku	Kotaneelee and younger sediments undivided.(May include Upper Dunvegan strata at base)			
	Kd	Dunvegan	Kfn	Fort Nelson	
	Ks	Sikanni			
LOWER CRETACEOUS	Kl	Lepine	Kb	Buckinghorse group	K Cretaceous undivided
	Ksc	Scatter			
	Kg	Garbutt			
TRIASSIC	Tu -TRI-	Triassic undivided –Stu– Base of upper resistant portion			
PERMIAN PENNSYLVANIAN AND MISSISSIPPIAN	PCm	P — PC Mattson may include Muskwa at base			
MISSISSIPPIAN	Mm Muskwa	Mr Rundle	MDu –M– Approx. base of Mississippian	Muskwa and Besa River undivided	KDu Cretaceous and Upper Devonian undivided. (Permian and Carboniferous beds absent) gDu- Indicates Cretaceous beds. KDu- Indicates Upper Devonian beds.
MISSISSIPPIAN AND UPPER DEVONIAN	MDubr	MDb Besa River	CJm		
UPPER DEVONIAN			Du	Upper Devonian shale, siltstone and limestone undivided, includes Middle Devonian, Canol and Hare Indian shales. – Ka– Approx. base of Athyris zone. – LT – Approx. top of Leiorhynchus zone. – Ls– Approx. base of Leiorhynchus zone. – IR – Approx. base of Island River limestone. – Su– Approx. top of shale unit – Sba– Approx. base of local hard member of shale unit. – C – Approx. top of Canol	
MIDDLE DEVONIAN	Dh Hume	Dhb Hume and Bear Rock undivided (East)	Dm	Middle Devonian carbonates undivided includes thick pre-Hume carbonate section in west Relationship to Bear Rock not known. – SBa– Approx. base of Hume – B – Base of massive dolomite section (Camsell Range) – SB – Top of shale marker unit – SBa – Base of shale marker unit – SBa – Base of dark laned unit.	DmSO DmS Middle Devonian through Ordovician Carbonates undivided
	Dbr Bear Rock				
SILURIAN AND ORDOVICIAN	SOr	Ronning (East) –SBr– Approx base of Mt Kindle member	SO	Silurian and Ordovician carbonates undivided (West) includes thick carbonate section to southeast. Relationship to Ronning not known.	
ORDOVICIAN AND OR CAMBRIAN	O€	Saline River & Mt Cap –SR– Approx. base of Saline River			
CAMBRIAN	€cl	Mt Clark	€	Cambrian undivided	€Pc Mt. Clark and undivided Precambrian
PRECAMBRIAN	Pc	Precambrian shale, siltstone and dolomite undivided			

MAP UNITS

NORTHERN RICHARDSON MOUNTAINS AREA



IMPERIAL OIL ENTERPRISES LTD.
N.W.T. EXPLORATION DISTRICT

GEOLOGICAL STRIP MAPS ALONG LINES OF SECTION

TO ACCOMPANY REPORT:

STRUCTURAL FIELD WORK IN N.W.T. AND YUKON

1966

2 of 2

SCALE: 1 INCH TO 4 MILES

MILES 4 0 4 8 12 MILES

PLATE 2

I N D E X

LIST OF ILLUSTRATIONS

INTRODUCTION

Area Covered

The area of study covered by the 1966 structural field party is shown on a map (Figure 1). The areas of detailed work are reported on a larger scale map (Plate 1 in pocket). The area of study comprises more than 140,000 square miles.

FIGURE 1

INDEX MAP

STRUCTURAL FIELD WORK IN NORTHWEST TERRITORIES AND YUKON 1966

IMPERIAL OIL ENTERPRISES LTD.

▨ — AREA OF WORK

SCALE : 1 INCH TO 64 MILES

152° 148° 144° 140° 136° 132° 128° 124° 120°

BEAUFORT SEA

AMUNDSEN GULF

72°

68°

64°

60°

56°

AKLAVIK

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

136° 132° 128° 124° 120° 116° 112°

Purpose of Study

The study was a continuation of work initiated during the summer of 1965, to determine the general history and style of structural deformation of the whole region.

Weather

Generally good weather was encountered between May 17 and September 1. A few days were lost each month due to snow, rain, low cloud or high winds preventing flying.

Accessibility

Access to the region is difficult. Summer travel is restricted to movements by water or air. Winter travel over land is feasible subject to adequate advance preparations.

Airstrips suitable for use by large wheel-equipped aircraft are located at Fort Simpson, Wrigley, Norman Wells, and Inuvik. Information on the many other special purpose airstrips is listed in the Canada Air Pilot and by the Northwest Territories Aviation Council at Yellowknife.

The region is served by Pacific Western Airlines and Canadian Pacific Airlines on a scheduled basis. Charter aircraft of great variety of size and purpose can be hired at the larger settlements.

The most economical transport is by water. Freight is moved between the highway ending at Hay River to the Arctic coast by barge and tugboat along the Mackenzie River. The designated common carrier is the Northern Transportation Company, with offices at Edmonton, Alberta. Other carrier's equipment may be hired on charter.

Communications

Radio contact with radios monitored by Imperial Oil personnel at Inuvik and Dawson Creek was maintained. The Marconi Company single-side-band, high frequency radio provided excellent service connecting both to these oil-company-staffed radios and to the commercial radio telephone services.

Base Camps

The major portion of the work was done from a floating base camp which was moved as required.

Crew:

The crew consisted of two geologists.

Base Camps:

Except for brief periods when the crew used facilities at Norman Wells and Inuvik, a base camp consisting of trailers mounted on the deck of a barge was used. The camp consisted of a twin diesel tugboat and two 20-foot-by-70-foot barges. One barge carried a cooking and dining trailer, wash trailer plus three sleeping trailers as well as a portable lighting plant, a 1,000-gallon tank of propane and a deepfreeze. The second barge carried aviation gas in 10-gallon kegs, oil, and had a foredeck which was used to land the helicopter.

Aircraft:

Air support required was minimal because the camp was essentially self-sustaining. Fixed-wing aircraft were chartered on an hourly basis as required, from Inuvik or Norman Wells. The work was carried out using a Hiller 12E helicopter on summer-long charter from Okanagan Helicopters Ltd. of Vancouver, B. C. The helicopter was flown approximately 100 hours per month.

Operations

Work was done by flying out from base camp each morning to the areas of interest. The base camp would be met at a prearranged rendezvous each night. Upon occasion the helicopter was carried on the barge to permit moving overnight or during periods of inclement weather.

Previous Investigations

Numerous reports about the geology of the area are available. The most comprehensive of these are those published by the Geological Survey of Canada. Numerous other reports, available from the "open file" have been compiled by oil company and consulting geologists.

ECONOMIC GEOLOGY

The hydrocarbon potential of this great area is as yet unevaluated, but is believed to be of great size. At present only one oilfield has been developed. The field at Norman Wells has produced petroleum product for the rather small local market for more than forty years. More recently, oil and gas have been discovered in the Yukon. Large tracts of land are presently undergoing active exploration.

STRATIGRAPHY

General Remarks

Rocks ranging in age from Precambrian to Tertiary are exposed in the area. The sedimentary section ranges to in excess of 50,000 feet. A brief summary of the stratigraphic framework within which the study was conducted is shown by Figure 2. No sections were measured by the structural party.

AGE	LIARD - NAHANNI AREA			NORMAN WELLS - FORT GOOD HOPE AREA			PEEL PLATEAU - RICHARDSON MTNS. - ARCTIC COASTAL PLAIN		
	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 ?	2000'+	Sands, coals, shales, bentonite.
							Goodenough	600'+	Quartzitic sandstone, shales, conglomerate.
JURASSIC							Donna River	1100'±	Dark rubbly shales.
							Martin Creek	850'±	Sandstone and shale.
TRIASSIC		0' to 60'	Micaceous silty shales.				Bug Creek	500'±	Sandstone and shale.
PERMIAN	Prophet	400'	Dark cherts and mudstones.				Unnamed	0' to 4000'	Conglomerate, breccia, sands, shales.
CARBONIFEROUS	Mattson	0' to 5000'	Sandstone, limy, massive becoming shale toward base.	Imperial	0' to 2000'	Sandstone, fine grained, chloritic.	Imperial	0' to 4000'	Shale, sands, siltstones.
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.			
				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.
CAMBRIAN		100'	Quartzite conglomerate and boulder conglomerate.	Saline River	0' to 3000'?	Halite. In outcrop formation is thin, mainly gypsiferous.shale.	Unnamed Shales	?	Shale, dark, siliceous, metamorphosed to argillites in part.
				Mount Cap	0' to 1000'	Dark shale.			
				Mount Clark	0' to 3000'	Sandstone, limestone, dolomite. Orthoquartzite fine to coarse grained.			
PROTEROZOIC	Unnamed	?	Argillites, thinly bedded, platy, green.	Unnamed	?	Reddish weathering sandstones, shales and dolomite. Diorite sills.			

Figure 2

TABLE OF FORMATIONS

To accompany report:

STRUCTURAL FIELD WORK

YUKON AND NORTHWEST TERRITORIES

Imperial Oil Enterprises

Edmonton, Alberta

1966

STRUCTURAL GEOLOGY

General Remarks

This report on the structural geology includes strip maps (Plate 2) to show details in the areas of more intensive study.

The majority of structures may be briefly described as the results of primarily vertical movement. The typical "Mackenzian" broad anticlinal and sharp synclinal features pass into a thrust-faulted region in the core to the west. Many variations and combinations of the two basic types were noted at various localities. This variation of identity is most pronounced at the southern end of the ranges.

Mackenzie Mountains

The typical structures in the Mackenzie Mountains are broad boxy anticlines separated by narrow very sharp synclines along trends parallel with the mountain front. The core of these mountains is characterized by large thrust faults which trend at an acute angle to the front, and involve Proterozoic rocks. These thrusts stem from the intruded and metamorphosed interior region.

The McConnell Range, in front of and slightly removed eastward from the main Mackenzie mountains mass is an abrupt flexure over an ancient fault zone. The rocks show evidence of recurring vertical and strike-slip movements. These movements are recognized as having occurred in post-Cambrian, post-Ordovician-Silurian, and post-Paleocene time.

The Mackenzie Mountains pass fairly abruptly into Rocky-Mountain-type structures south of the Yukon boundary in the vicinity of 59°30' north latitude.

Franklin Mountains

The Franklin Mountains represent a large overthrust plate deformed and notified either by irregularities of the surface over which it slid or by subsequent movements. The plane of motion for the movement creating the Franklin Mountains is believed to have been continued in the thick Cambrian evaporitic sequence.

Richardson Mountains

The present topographic expression of the Richardson Mountains is the result of erosion on a post-Cretaceous arch. At least two episodes of Paleozoic folding can be recognized in the northern Richardsons. The mountains are bounded by long strike-slip fault zones, with a long history of repeated movement, the latest of these movements having occurred in the Laramide. Indications of other major movements along these trends are recognized. These movements are dated as post-Paleozoic, and post- Upper Devonian.