# FIELD STRATIGRAPHIC INVESTIGATIONS

# McCONNELL RANGE, SOUTHERN FRANKLIN MOUNTAINS

# NORTH WEST TERRITORIES

Prepared for

PAN AMERICAN PETROLEUM CORPORATION

CALGARY, ALBERTA

By

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Calgary Alberta

October, 1964

DEPT. OF NORTHERN AFFAIRS & NATIONAL RESOURCES
CALGARY, ALBERTA
FEB 1 1965
OIL CONSERVATION ENGINEER
Northern Territories & Yukon Section

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*Figure 1*

# REGIONAL LOCATION MAP

SCALE: 1 INCH = 155 MILES
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SOUTHERN FRANKLIN MTNS. N.W.T. AREA

# INTRODUCTION

This report presents the results of field stratigraphic investigations in the McConnell Range of the Franklin Mountains, Northwest Territories, conducted for the Pan American Petroleum Corporation by Geophoto Services, Ltd. The field program was of approximately four weeks duration, extending from June 27th, 1964, to July 23rd, 1964, and was under the supervision of A.S. Depetris of Geophoto Services.

The area under discussion encompassed an 11, 653 square mile block bounded on the west by the Mackenzie River, on the north by the Keith Arm of the Great Bear Lake, and on the south by the 63rd parallel; the area is bounded to the east by longitude 121°45'W. The main area of interest within this large block was centered in the western regions within the zone containing the McConnell Range of the Southern Franklin Mountains. Figures 1 and 2 show the project boundary in relation to political boundaries, major streams, and regional structure.

The primary purpose of the field study was to sample in detail the Middle Paleozoic stratigraphic interval in order to supplement Pan American's stratigraphic control in the Southern Franklin Mountains region of the Northwest Territories. The primary objective, as specified by Pan American, was to determine the presence or absence of the Devonian Kee Scarp reef. The secondary objectives

of the stratigraphic project were to determine the economic potential of the Middle Devonian Hume Formation and to better define Bear Rock facies and the relationship of the subjacent formations against the sub-Bear Rock unconformity.

In addition to the stratigraphic program, restricted air and ground geologic reconnaissance was also completed on Pan American Permits 3546 - 3558 south of the Great Bear Lake.

The primary objective, as stated by Pan American in pre-field directives, required modification after extensive field reconnaissance and measurements of initial sections on the ground. Due to a general lack of good outcrop areas coupled with the obvious absence of Kee Scarp reef, the primary objective was re-oriented towards a more complete stratigraphic sampling of the entire interval extending from the Middle Devonian Hume Formation through the Ordovician - Silurian Ronning Group.

In order to obtain optimum results from the restricted time alloted for field operations, a pre-field photogeologic study was conducted by Geophoto. The pre-field study resulted in the preliminary selection of stratigraphic section measurement localities. This pre-field work, when modified by actual field observations, proved invaluable in expediting the field program.

Twenty stratigraphic sections were measured totaling in excess of 22,000 feet. Of this total, the Hume accounted for approximately 4,000 feet, the Bear Rock 6,600 feet, the Mount Kindle 6,700 feet, the Franklin Mountain 2,440 feet and the remainder was alloted to the Precambrian and Upper Devonian sediments (see Figure 4).

The Middle Devonian Hume and the Lower (?) Devonian Bear Rock Formations were sampled at 10-foot intervals. The underlying Ordovician and Silurian Ronning Group was sampled at both 10 and 20-foot intervals. In addition, fossiliferous and very restricted outcrop areas were more densely sampled dependant upon location.

In order to further facilitate the use of the short field time available and to insure completeness of field notes, Geophoto introduced a new field rock description form. This form proved extremely successful in that it systematized note taking, provided a check list of important and often missed stratigraphic detail, and considerably reduced time spent laboriously writing detail. As a result, the uniformity of data recorded by both field parties considerably added to the quality and completeness in presentation of the evaluated material in graphic form.

The data accumulated from the field program are presented in this report and on the accompanying columnar sections and stratigraphic cross-sections.

## TOPOGRAPHY AND ACCESSIBILITY

Plate 1 showing topography, accessibility and section location is a National Topographic Series Map at a scale of 1:250,000. These sections are individually identified by code letters indicating section names.

The primary area of field stratigraphic study was centered around base camp located at an unnamed lake, 64°00' N - 124°11'W, and extended up to 90 miles south and 60 miles north of this point.

The northern terminus of the Camsell Range and central and southern part of the McConnell Range of the Franklin Mountains together form the most prominent topographic feature within the project area. The Franklin Mountains are in turn separated from the Mackenzie Mountains to the west by a broad valley known as the Mackenzie Plain.

The northern part of the Camsell Range is a high east-facing escarpment rising out of the Mackenzie Plain and trending north to northeasterly towards Mount Gaudet, at which point the Range passes into the westerly facing flank of the McConnell Range. The north to northwesterly trending McConnell Range forms a broad dissected plateau with most areas ranging in elevation from 1,000 to 3,500 feet.

The general stratigraphy contributes considerably to the morphology of the area. The central regions are characteristically knobby with restricted pinnacle erosion and a moderate covering of vegetation. The eastern flanks of the McConnell Range are generally more precipitious and considerably less vegetation masks the bedrock. To the west, on the western facing flanks, vegetation cover increases rapidly and in the vicinity of the Mackenzie River considerably muskeg and forest cover completely masks the bedrock.

The McConnell Range is cut by the Ochre, Blackwater, and Great Bear Rivers. Towards the north, north of Mount Clark, faulting coupled with the action of Cordilleran ice sheets has resulted in a relatively broad gap in the McConnell Range escarpment.

The highest peak within the project area is Cap Mountain at 5,100 feet elevation. To the north, Mount Clark rises to 4,798 feet. These two peaks are visible for many miles and provide good landmarks throughout the general area (see Figures C and H).

The Interior Plains area, east of the east facing McConnell Range escarpment is typically a muskeg, poorly drained and lake filled terrain generally lying below 1,000 feet in elevation (see Figures X and Y). South of the Keith Arm of the Great Bear Lake a relatively high topographic area rises to approximately 1,700 feet in elevation. This broad, higher lying area locally provides a well drained terrain surrounded by muskeg (see Figure W).

The Mackenzie River provides the chief transportation route for this region of the Northwest Territories. North of the project area the Great Bear River is also navigable by boat and barge. With the exception of the heavily timbered and muskeg areas typical of the MacKenzie Plain area most of the project area is accessible to helicopters. The higher mountainous regions are generally sparse in tree and vegetation growth, thereby permitting considerable latitude in selection of landing sites for helicopters. To the east, in the Interior Plains region, the presence of extensive muskeg and lake filled areas considerably reduce the mobility of skid-equipped helicopters. In this region float equipped fixed wing aircraft and helicopters are much better suited to the existing terrain (see Figure Y).

An Arctic winter road paralleling the Mackenzie River from Great Slave Lake as far north as Inuvik on the Arctic Coast is shortly scheduled to open. This road follows a new telecommunication right of way. Tentative plans are to keep the road open from mid December through April. Use of the road is subject to toll for moving trucks and equipment.



**FIGURE A**

**Figures A, B and C present an almost complete compass view of the typical rock outcrop and terrain morphology in the project area. Panoramic sequence taken from Table Mountain, 123°29'N - 63°38' N. Bear Rock strata in foreground with remainder of relatively poor distant outcrop area in Bear Rock capped by Hume.**



**FIGURE B**

**Panoramic sequence from Table Mountain. Bear Rock strata in foreground, Ronning Group rocks in the distance.**



**FIGURE C**

**View is from S45E to S45W. Bear Rock in foreground and right center. Ronning Group rocks form ridges in left center. Cap Mountain in distance upheld by Precambrian meta sediments capped by Cambrian Mount Clark sandstones.**

## LOGISTICS AND PERSONNEL

The 1964 field operations were under the direction of A.S. Depetris of Geophoto Services, Ltd. The operating personnel included two geologists, two geologic assistants, helicopter pilot, engineer and cook. Pan American assigned one of their geologists, A.D. Coulombe as a working party head. In addition, H.W. Schwartz and H.J. Stewart of Pan American visited the field camp for a period of three days from July 9th to 11th.

The section measurements and sample collections were done by two stratigraphic parties designated Party "A" and Party "B". These two parties were:

Party "A": A.D. Coulombe, party head, and Tom Shannon, assistant.

Party "B": Larry Swayne, party head, and Wayne Munson, assistant.

One restricted section, the Great Bear (GB) section, was measured by A.S. Depetris and designated Geophoto Party "D" on the sample collection (GD-64-GB).

Helicopter service was contracted from Associated Helicopters of Calgary, Alberta, who provided a Bell G3B-1 helicopter. Associated personnel assigned to the contract included the pilot N.R. Staniland and Bob Heighington, engineer.

The town of Norman Wells was used as a staging area for base camp supplies. Charter service out of Norman Wells, for placement of field gear and personnel, was by Pacific Western Airlines. This charter service utilized both de Havilland Beaver and Otter aircraft in the placement of gear. The staple food supply and the supplemental weekly fresh meat and vegetables were supplied by the Hudson's Bay Company, air freighted to Norman Wells and stored in the Pacific Western food locker. The supplemental food items were then flown to base camp on a weekly basis by de Havilland Beaver aircraft.

The Helicopter fuel supply consisted of approximately 1,400 Imperial gallons of 100/110 aviation gasoline in 140 ten/gallon kegs. This gas was cached at two locations: an unnamed lake east of the McConnell Range located at 64°14'N - 123°14'W, and at base camp located at 124°11'W - 64°00'N.

Communications between base camp and outside points was by Spilsbury and Tindall TRT 300 radio telephone. This four -channel receiver transmitter radio set was equipped to transmit and receive on the following channels:

<u>Pacific Western Airlines</u>

Transmit 5619 Receive 5619

<u>Norman Wells - Department of Transport</u>

Transmit 3317 Receive 4840

**Fort Wrigley**

**Transmit 4270** **Receive 4870**

**G3B-1 Helicopter CF-NTK**

**Transmit 5664** **Receive 5664**

**In general the quality of radio communication was considered to be below normal. This was in part due to poor reception conditions at Norman Wells.**

**After approximately four weeks in the field, the men and equipment were moved back to Norman Wells on July 24, 1964. On July 25th, personnel were returned to both Edmonton and Calgary.**

**During the months of August, September and early October, post-field evaulation, section plotting, and report assembly was done in the Calgary Office of Geophoto. This work was primarily handled by A.S. Depetris, assisted by Larry Swayne under the overall direction of Paul Fuenning.**

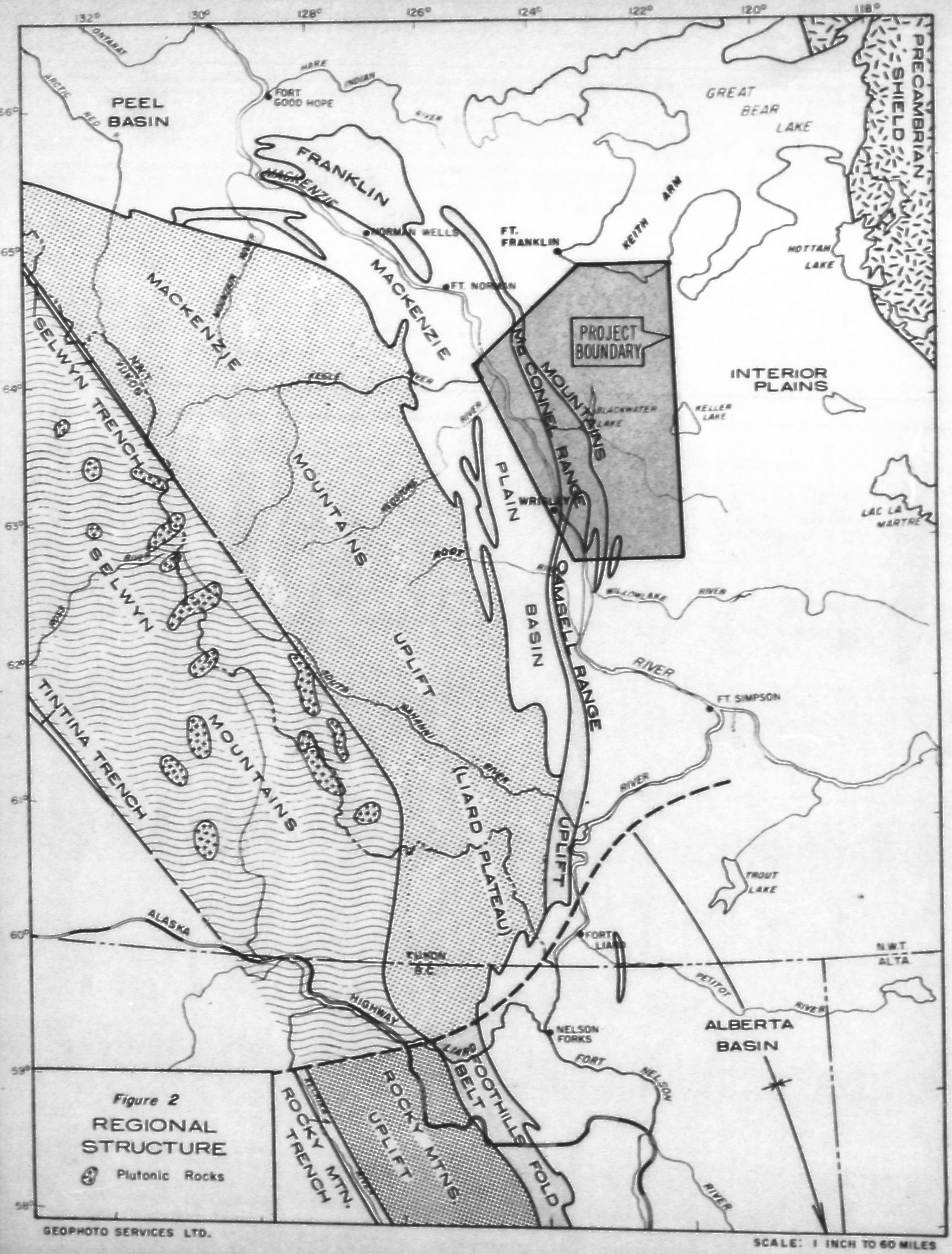



*Figure 2*

REGIONAL STRUCTURE

## REGIONAL GEOLOGY

The eastern edge of the Canadian Cordillera extends northwestwards from the United States border to approximately the 60th parallel, a distance of almost 1,000 miles without any major changes in terrain, geologic structure or trend. At about the 60th parallel, the Rocky Mountain system dies out and is replaced in a right hand en echelon manner by the Mackenzie Mountain system. North of the 60th parallel the eastern margin of the Cordillera swings northwesterly in a broad arc. The project area lies along the eastern edge of the Cordillera and includes a part of the above-described broad arc. Figure 2 shows the project area and its relationship to regional features which are briefly described in the following paragraphs.

### Interior Plains

East of the project area a relatively thin section of Paleozoic strata dips gently southwest away from the Canadian Shield. Regional dip in this area is reported to be less than 25 feet per mile. Rocks present above the Precambrian include about 1,500 feet of Cambrian and Ordovician and about 1,200 feet of Middle Devonian. Variable thickness of Upper Devonian and Cretaceous are present. Little is known of the bedrock geology and structure of large parts of the Interior Plains due to the widespread mantle of glacial debris, vegetation and numerous lakes.

Based on the structural attitude of one outcrop examined in the vicinity of the Keith Arm of the Great Bear Lake, Section GB, it is postulated that structure in this area is similar to the Willow Ridge structure in the southeastern extremities of the project. The Willow Ridge fold exhibits a somewhat discordant northeasterly trend as compared to the north to northwesterly structural trend of the McConnell Range.

Franklin Mountains

The Franklin Mountains, which includes the northern terminus of the Camsell Range and the central and southern parts of the McConnell Range within the project area, consists of a series of arcuate foreland fault blocks separated from the Mackenzie Mountain front by the Mackenzie Plain Basin. Strata ranging from Precambrian to Upper Devonian are exposed in these fault blocks.

The Franklin Mountains merge with the Mackenzie Mountains (see Figure 2) both to the north and south and only occur opposite the great arc of the Mackenzie. The individual ranges of the Franklin Mountains are bounded on one or the other side by high angle reverse faults which dip toward the uplift. These are "upthrust" faults as the term is defined by de Sitter (1956), and may involve basement rock. Martin (1963) believes these faults are splays from a basal shearing plane at the Archeozoic-Proterozoic boundary. The somewhat sinuous

nature of the bounding faults, especially in the southern areas of the project, indicate that the dip of the fault plane varies and is probably warped to some degree.

The major structure of the McConnell Range is that of a major north-northwesterly trending anticline, asymmetric towards the east, and interrupted by a cross-structure in the vicinity of the Ochre River. The overall broad anticlinal structure indicates closure with well pronounced south to southeasterly structural plunge and less well defined north to northwesterly plunge. The flanks of the fold are faulted and relatively broad subsiduary folds are superimposed.

Towards the south the McConnell Range dies out and is replaced by the Camsell Range righthand en echelon. The structure in the northern Camsell Range is in part a west dipping homoclinal succession faulted on the east.

Most of the fault blocks mentioned previously are anticlinal or may represent one flank of a faulted anticline. The faults which bound these blocks or ranges occur on both flanks of the uplift although they are more commonly present on the east flank in which location they indicate the greatest stratigraphic separation.

Mackenzie Plain Basin

The several intermontane structural basins which form the Mackenzie Plain Basin are relatively undeformed in comparison to the

adjoining uplifted areas. The Mackenzie Plain Basin exposes mainly Upper Devonian in the south-central regions within the project area, transgressing upwards in the section towards the north through the Cretaceous and Tertiary. Structure in this zone consists primarily of a belt of relatively gentle folds lying to the west of the main portion of the Franklin Mountains Uplift and to the east of the eastern front of the Mackenzie Mountains. The limits of the Mackenzie Basin are relatively well defined although in a few regions upthrust foreland ranges, such as the Dahadinni Range, disrupts the continuity of the Mackenzie Plains Basin. These semi-isolated foreland ranges are similar to the Franklin Mountain Uplift in structural fabric. The northerly structural plunge of the Mackenzie Plain Basin has already been mentioned.

Mackenzie Mountains

The internal structure of the Mackenzie Mountains exposes a section of folded and faulted Paleozoic rocks. The faults trend parallel to the general structural trend and occur on the flanks of elongate and sinuous anticlines.

Deformation in the Mackenzie Mountains was distributed over a wider area than in the Rocky Mountain system to the south. Consequently, deformation in the Mackenzie is less severe in contrast to the Rocky Mountain system which exhibits marginal deformation of the Cordillera

where limited on the east by the relatively stable and unfractured basement underlying the Alberta Basin.

Information regarding the structure and geologic provinces west of the Mackenzie Mountains is very sparse. The Selwyn Mountains expose Paleozoic rock and are separated rom the Mackenzie Mountains by the Selwyn Trench. The Selwyn Mountains contain large masses of plutonic rock while the Mackenzies do not.

## Tectonic History

The stratigraphic record in the project area gives evidence of periods of tectonic disturbances throughout geologic history. Sufficient data are not available to accurately map the limites of these disturbances, but there is some evidence for charting the times of the major disturbances.

Late Cretaceous and Early Tertiary reflect the last major structural disturbance to occur. Relatively undisturbed non-marine Tertiary strata of Eocene age are found north of the project area. This period corresponds to the widespread Laramide rock and has been termed the Rocky Mountain Orogeny by White (1959).

Early Cretaceous - within the project area the Lower Cretaceous overlies progressively older rock in a northerly direction. This major period of deformation is widely known as the Nevadan Orogeny, and has been termed the Coast Range Orogeny by White (1959).

Late Permian and Early Triassic - south of the project are in northeastern British Columbia the Triassic section transgresses older strata in an easterly direction, but evidence for this unconformity is obscured by the sub-Cretaceous unconformity. White (1959) terms this deformation the Cassiar Orogeny.

Late Pennsylvanian Early Permian - A marked pre-Permian angular unconformity is present in the northeast British Columbia region.

Late Silurian and Early Devonian - the Lower (?) Devonian strata transgresses older strata in the project area from west to east. Baadsgaard et al (1960) postulate a wide-spread "Caledonian" orogenic eposide at about this time.

Early and Middle Ordovician - White (1959) postulates a Middle to Late Ordovician "Cariboo" Orogeny at this time.

Late Precambrian - The Precambrian is separated from the Paleozoic by a pronounced angular unconformity.

| SECTION | SAMPLE CODE | FORMATION | | | | TOTAL |
|---|---|---|---|---|---|---|
| | | HUME | BEAR ROCK | MT. KINDLE | FRANKLIN MT. | |
| 1 River Between Two Mtns. | RM | | 1630' | 820' | | 2450' |
| 2 River Between Two Mtns. N. | RMn | 240' | | | | 240' |
| 3 Bald Mtn. | BM | 300' | 1110' | 900' | | 2310' |
| 4 Mt. Kindle | MK | | | 310' | 720' | 1030' |
| 5 Cap Mtn. (Precambrian) | CM | | | | | 3190' |
| 6 Williams West | WW | 480' | 420' | | | 900' |
| 7 Mt. Gaudet | MG | 435' | 385' | | | 820' |
| 8 Wrigley Permit (U. Dev) | WP | | | | | 140' |
| 9 Wrigley Permit N (U. Dev) | WPn | | | | | 40' |
| 10 Twin Peaks | TP | 270' | 650' | 830' | 790' | 2540' |
| 11 Knob Valley | KV | 280' | | | | 280' |
| 12 Junction Creek | JC | 540' | 20' | | | 560' |
| 13 Amos Creek | AC | 305' | 190' | | | 495' |
| 14 North Amos Creek | NAC | 65' | | | | 65' |
| 15 Dry Creek | DC | 145' | 630' | 1105' | 500' | 2380' |
| 16 Dry Creek North | DCn | 205' | | | | 205' |
| 17 Flower Mountain | FM | 180' | 460' | 1030' | 430' | 2100' |
| 18 Big Smith | BS | 290' | | | | 290' |
| 19 Charles South | CS | 300' | 1115' | 770' | | 2185' |
| 20 Great Bear | GB | | | 80' | | 80' |
| TOTAL | | 4055' | 6610' | 5845' | 2440' | 22300' |

FIELD STRATIGRAPHIC SUMMATION

SOUTHERN FRANKLIN MOUNTAINS, N. W. T.

*Figure 3*

## STRATIGRAPHY

The rocks exposed within the project area range in age from Precambrian to Recent with all of the geological systems represented except the Mississippian, Pennsylvanian, Permian, Triassic and Jurassic.

The following stratigraphic discussion is based primarily on the observations and deductions made as a result of the measurement of 20 sections in the field during late June and July of 1964. The 20 field sections measured, totaling in excess of 22,000 feet (see Figure 3), are presented in detail in columnar log form at a scale of 1 inch equals 100 feet. These columnar sections are included at the back of the report as Plates 3 to 17.

Pre-field instructions from Pan American regarding stratigraphic objectives were listed, in decending order of importance, as:

1. Determine presence or absence of Kee Scarp reef. If absent, initiate a thorough analysis and collection of the laterally equivalent bituminous shales.
2. Economic potential and facies of Hume rocks.
3. Bear Rock facies and boundaries of sub-Bear Rock units.
4. In addition to the above-mentioned primary objectives, stratigraphic and structural reconnaissance evaluation

of Pan American Permits in the Great Bear area was also an integral part of the pre-field plan.

All pre-field objectives, with the exception of the primary were fulfillled. Due to a complete lack of post-Hume outcrop areas, no rocks from this interval, with one minor exception, were sampled or collected. The absence of any recognizeable and typical Kee Scarp land morphology in the area further suggests that the Kee Scarp is not present south of 65°00'N Latitude; equivalent Middle Devonian strata are probably in a shale facies and are included in the undivided, unexposed and nonresistent Upper Devonian series.

In addition to the foregoing, the upper portion of the Ronning Group interval - the Mount Kindle - was sampled in considerably more detail than originally planned due to the very reefoid facies exhibited in portions of that interval. In conjunction with the overall objectives of petroleum evaluation, a section of Precambrian meta sediments was sampled in a 20-foot reconnaissance interval in the Mount Cap area to evaluate the hematite contents of the rock.

The stratigraphic relationships and suggested correlations between individual field measured sections are shown on Plate 2. Also included in the section correlation chart are four principal sections measured by Pan American in previous years.

## Precambrian

Dougals and Norris (1963) recognised a four-fold division of the Proterozoic in the Mount Cap area as follows:

| Formation Name | Thickness | Composition |
|---|---|---|
| Lone Land Formation | 965 feet | Shale, siltstone, mudstone; with a basal section of 220' of fine grained white sandstone. |
| | Angular Unconformity | |
| Map Unit No. 3 | 1510 feet | Interbedded shale, siltstone, and sandstone. |
| Map Unit No. 2 | 1585 feet | Red shale with minor siltstone, and sandstone. |
| Map Unit No. 1 | 1700 feet | Interbedded dolomite, sandstone, siltstone, and shale. |

Relatively small outcrops of Proterozoic strata are mapped and were observed at three localities in the McConnell Range. The three localities are:

1. Cap Mountain,
2. Southeast of Twin Peaks in the central area immediately north of Blackwater Lake, and
3. Mount Clark at the extreme northern margin of the project area.

In the Cap Mountain area, the sections sampled include the basal 20 feet of the Mount Clark, the Lone Land, Map Unit No. 3, and a portion of Map Unit No. 2. The total stratigraphic interval measured was 3, 190 feet consisting of interbedded siltstone, slate and quartzite

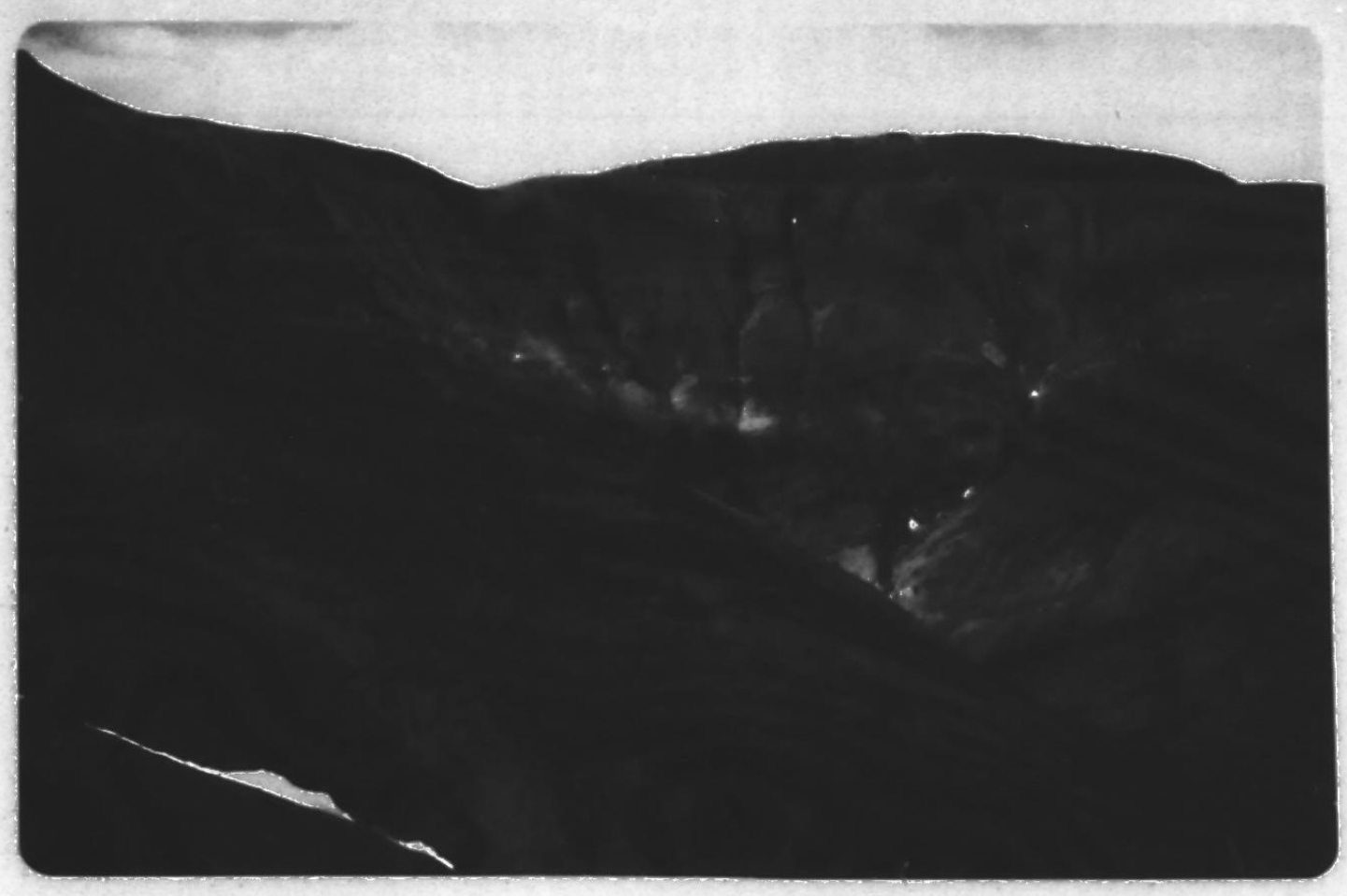


**FIGURE D**

**Cap Mountain (CM) section, 123°13'W, 63°25'N. View is westerly into east facing escarpment of Precambrian shales, siltstones, and sandstones. Minor hematite constituent imparts characteristic red color to rock. Resistant sandstones of the Cambrian Mount Clark Formation form ridge-line at top right.**



**FIGURE E**

**Pronounced pinnacle erosion in Bear Rock strata. View is towards south, vicinity of Blackwater River, 123°32'W, 63°52'N.**

passing upwards into a predominately siltstone and shale sequence below the Mount Clark Formation, These strata are probably part of the Belt series of Western North America. To the north they are probably correlative with the Katherine Group.

Evaluation

The hematite content of the rocks, based on field criteria, did not indicate the interval to be commercial in iron. Subsequent assay by Pan American indicates the rock to be non-commercial and to contain very little iron. When present, the minor hematitic constituent of the rock imparts an overall characteristic red color to the outcrop (see Figure D). The remaining two Precambrian outcrop areas to the north were not sampled but based on helicopter reconnaissance, they do not appear to be of any better grade.

Lower Cambrian

Mount Clark Formation

The Mount Clark Formation crops out in several localities in the Eastern McConnell Range, where it is anticlinally folded and bound to the east by a pronounced fault zone. At Cap Mountain, the Mount Clark Formation consists of 450 feet of sandstone, mainly fine grained, white with purplish red laminae in bands and is massive to thinly and irregularly bedded. Williams (1923) reports Lower Cambrian trilobites from near the upper part of the formation at Mount Clark.



**FIGURE F**

**Location 123°42'W - 64°14'N. Area is approximately two miles northeast of Dry Creek (DC) section. View is from N70W to N25E. Valley in faulted anticlinal core of Cambrian Saline River and Mount Cap sequence. Resistant flanks upheld by Ronning Group strata.**

The Mount Clark is probably correlative with basal Cambrian sandstones reported in some exploratory tests to the southeast of the project and with the basal part of the Macdougal For ation which occurs to the north of the project area.

As previously mentioned in the Proteozoic discussion only the basal 20 feet of the Mount Clark Formation was sampled at Cap Mountain. The sampled interval consists of slightly argillaceous fine to medium grained white sandstone.

## Lower and Middle Cambrian

### Mount Cap Formation

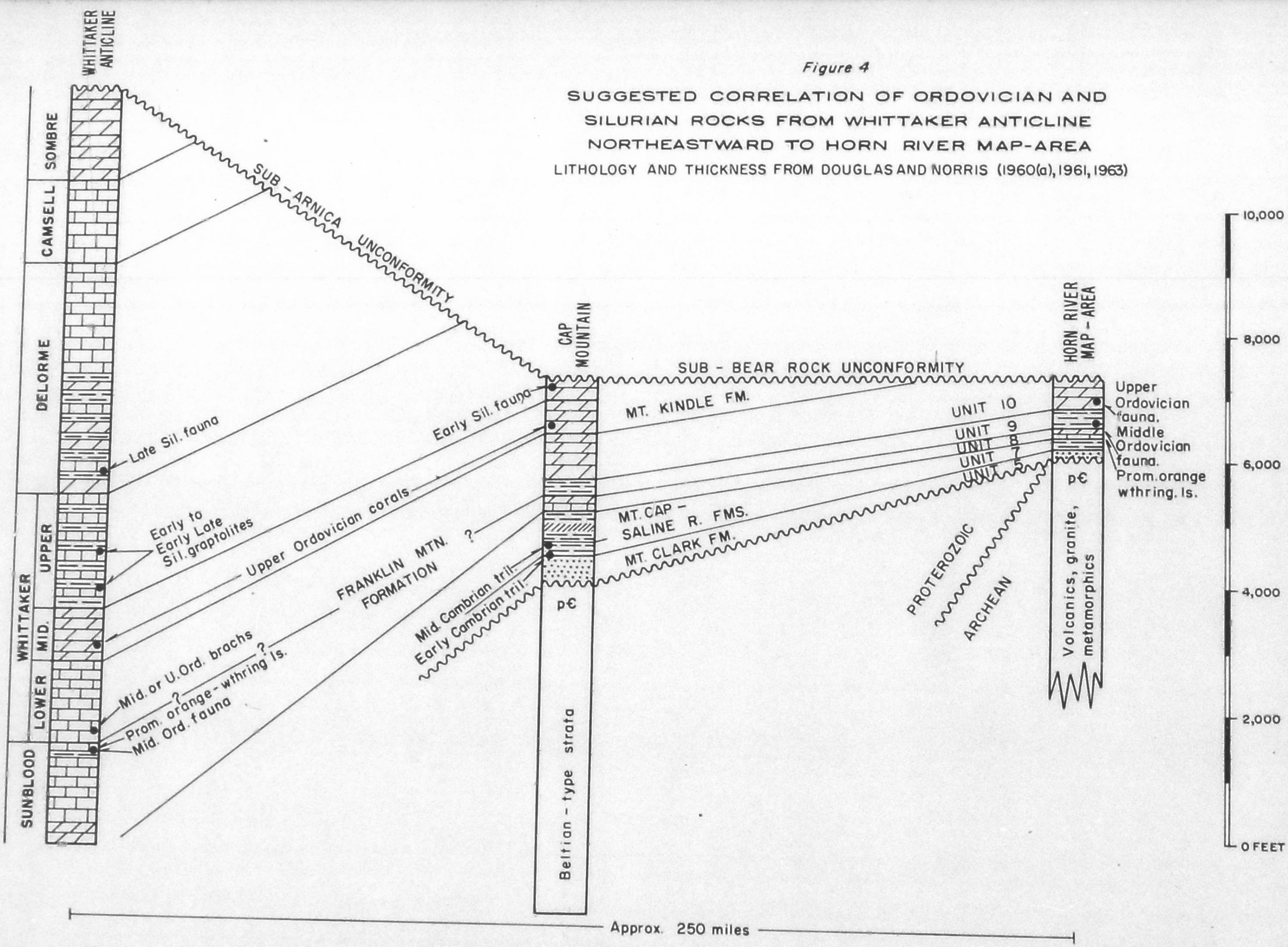
The Cambrian Mount Cap Formation was not sampled nor observed during the field operation. The Mount Cap and the overlying Saline River Formations together form mantled and recessive topography with outcrops being very restricted (see Figures F, G and H).

The Mount Cap Formation is generally restricted to the eastern part of the McConnell Range of the Franklin Mountains system. Douglas and Norris report that only a few feet of Mount Cap shale is exposed at the type locality at Cap Mountain. In this locality, the shales are white, olive green, soft and fissile, and with a light green to light orange red and yellowish orange. The thickness of the formation at this locality is not known but was estimated by Williams (1922) to be about 200 feet. Williams (1922, 1963) assigned the Mount Cap Formation to the Middle Cambrian series on the basis of

*Figure 4*

# SUGGESTED CORRELATION OF ORDOVICIAN AND SILURIAN ROCKS FROM WHITTAKER ANTICLINE NORTHEASTWARD TO HORN RIVER MAP-AREA

LITHOLOGY AND THICKNESS FROM DOUGLAS AND NORRIS (1960(a), 1961, 1963)




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trilobite fauna. Douglas and Norris report early Cambrian trilobites in the basal part of the formation. The contact of the Mount Cap Formation with the underlying Early Cambrian Mount Clark Formation is believed to be conformable. No data are available concerning the contact of the Mount Cap Formation with the overlying Saline River Formation, but the contact is believed to be conformable.

Middle Cambrian

Saline River Formation

The Saline River interval was not sampled in the field but was observed during a helicopter reconnaissance of the type locality on the banks of the Saline River.

The Saline River Formation is poorly exposed in most localities and there are conflicting reports regarding its thickness and lithology. In general, the formation appears to range from 300 to 500 feet thick and consists of variegated gypsiferous shales and evaporites. The contact of the Saline River Formation with the overlying Franklin Mountain Formation is presumed to be a disconformity.

Lower and Middle Ordovician

Franklin Mountain Formation

The name Franklin Mountain Formation was applied by Williams (1922) to approximately 500 feet of calcareous shale and limestone underlying the coral bearing horizon of his Mount Kindle

Formation.

Within the project area, the Franklin Mountain Formation is restricted to a narrow area south of the Saline River and east of the Mackenzie River. Within this zone the Franklin Mountain strata form the lower resistant, linear trending flanks of a faulted anticline (see Figures G and H.) The Franklin Mountain Formation also outcrops in the Mackenzie Mountains to the northwest of the project area.

The type locality of the Franklin Mountain Formation is on the eastern flank of Mount Kindle and was measured by Williams (1922). Douglas and Norris (1963) examined the type locality of the Franklin Mountain Formation and recognized 1, 265 feet of the formation was as follows:

| | |
|---|---|
| 745 feet | Dolomite, fine grained, light grey, thin bedded. |
| 260 feet | Shale, yellowish brown, green and red with minor quartzose sandstone. |
| 260 feet | Shale, yellowish brown, green and red with minor quartzose sandstone. |
| 155 feet | Dolomite, grey, fine grained, thin bedded. |
| 105 feet | Limestone and calcareous shale. |
| 1265 feet | Total Thickness |

Williams (1963) republished a description of his type locality and assigned the Franklin Mountain Formation to the Lower Silurian



**FIGURE G**

**Location is 123°54'W - 64°18'N. View extends from S45E to South from Flower Mountain section (FM). Relatively thin and incomplete Hume section to left overlain by mantled Cretaceous strata. Poorly bedded, brecciated and condensed Bear Rock section forms rounded, white weathering sequence in left center. Underlying well-bedded mountainous sequence of Ronning Group strata flanks and overlies easily eroded Cambrian shales in valley at extreme right.**

Series with a thickness of only approximately 500 feet. As indicated on Figure 4, the Franklin Mountain Formation is believed to be, more or less, a lateral equivalent of the Sunblood Formation reported to the southwest of the project area.

During the field operations the stratigraphic emphasis was primarily directed to the overlying Mount Kindle and the Devonian sequence with the Lower Paleozoic rocks relegated to a reconnaissance sampling. Four partial sections (MK, TP, DC, FM,) of the Franklin Mountain Formation were logged. Of these, the most complete is the Mount Kindle (MK) Section (see Plate 5).

In the Mount Kindle Section, 720 feet of sandy, silty, slightly argillaceous micro-to fine crystalline, thin bedded dolomite comprises the upper part of the Franklin Mountain Formation. This interval compares favorably with the 745 feet reported by Douglas and Norris for the upper portion of the Franklin Mountain Formation.

In the remaining three sections where the rocks of the Franklin Mountain Formation were sampled, the previously mentioned lithology remains essentially the same. In a 40 to 80-foot interval of the Twin Peak (TP) Section, the dolomite is locally oolitic with traces of bitumen filling the poor to fair intercrystalline porosity. In the remainder of the sections, the nature of the intercrystalline porosity generally varies from nil to approximately 6% with the lesser values being predominent.

Strata of the Franklin Mountain Formation are separated from the overlying Mount Kindle Formation primarily on the basis of lithology, bedding, and the presence and absence of fossil material. In general, the Franklin Formation is thinner bedded, more silty, sandy and argillaceous than the overlying Mount Kindle. In addition, the Franklin Mountain is very unfossiliferous, and it is the presence of numerous fossil material in the Mount Kindle that generally permits separation in the field.

The contact of the Franklin Mountain with the underlying Saline River Formation is covered at most localities and there is norpublished description of the contacts (see Figure H). There is no field or photo evidence to suggest an angular discordance between the two formations, but a time hiatus is present. The contact between the Franklin Mountain and overlying Mount Kindle Formation is apparently conformable.

As previously mentioned and as indicated on the individual columnar sections and the correlation of stratigraphic units (Plate 2), the upper contact is positioned at the base of the fossiliferous dolomite.

As indicated on the stratigraphic cross-section (Plate 2), Pan American's East Table Mountaion section indicates the local presence of interbedded anhydrite and dolomite at approximately the 200 to 500-foot interval.

## Evaluation

Strata of the Franklin Mountains sequence generally do not appear to possess favorable porosity characteristics. The overall unit exhibits argillaceous facies with the intercrystalline porosity generally varying between tight to poor. The upper portion of the Franklin Mountain unit appears to exhibit an increase in porosity in the more northern areas, but even in this locality it is still below 5% and average nil to 2%.

## Upper Ordovician and Silurian

### Mount Kindle Formation

The name Mount Kindle was applied by Williams (1922) to approximately 560 feet of grey magnesium limestone, Silurian in age, measured at Mount Kindle, the type locality. Williams (1963) reasserted his belief in the Middle Silurian age of the Mount Kindle Formation.

Douglas and Norris (1963) report a 900-foot composite section in the same general area consisting of a lower 500 to 600-foot massive to thick-bedded medium grey, reefy dolomite, and an upper 300 to 400-foot section of medium bedded, light grey to brownish grey dolomite with siltstones near the top. Douglas and Norris report Late Ordovician fauna in the lower part and Silurian fauna in the upper part.

The Mount Kindle and the underlying Franklin Mountain Formations together comprise the Ronning Group. The name Ronning was applied by Hume (1954) to all beds which had previously been included in the Mount Kindle and Franklin Mountain Formations of Williams along with any other sediments not previously clearly defined.

During the course of the field investigations involving Mount Kindle strata, eight sections totaling 5, 845 feet were sampled and measured (see Figure 3). Of this total, three were complete sections (FM, DC, TP), one was a composite complete section (MK-BM), two were incomplete sections due to the absence of a lower contact, and one (GB) was an isolated outcrop in the Great Bear Lake region.

The currently completed field investigation indicates that the Mount Kindle Formation is divisible into two broad morphological units. The lower unit, Upper Ordovician in age, consists of a light to dark grey to buff, massive to thickly bedded dolomite varying from fine to medium crystalline to coarse skeletal. The lower unit is further characterized by extremely fossiliferous zones and reefoid beds. Towards the north this unit also exhibits a restricted zone of pelletal texture. According to Douglas and Norris the basal beds of the Mount Kindle Formation are reefy and contain large colonial

corals dated as Upper Ordovician (Richmondian). This is in accord with the paleontological dating as supplied by Pan American on fossils submitted.

The upper morphologic unit consists of slightly argillaceous, slightly silty, thin to medium bedded, buff gray to light gray dolomites. These dolomites vary from fine to medium crystalline to micro-granular near the top. According to Norford (Douglas and Norris, 1963), fossils from near the top of the Mount Kindle are of Early Silurian age. Paleontologic dating by Pan American of fossil material submitted indicates an Upper Ordovician age for the Mount Kindle interval. It should be emphasized that fossil collections were restricted to the lower one-third to one-half of the Mount Kindle and it is highly probable that the upper and non-fossiliferous portion is at least partly Silurian in age.

As indicated on the individual columnar sections and on Figure 3, the thickness of the Mount Kindle Formation varied considerably. This is interpreted to be the direct result of truncation below the sub-Bear Rock unconformity. At River Between Two Mountains, approximately 820 feet of Mount Kindle strata are present, with the base not exposed. The basal portion of this section is indicated by Pan American paleontology to be Upper (?) Ordovician in age. Further north, at Bald Mountain (BM), 900 feet of strata were sampled with

the base not exposed. This section is interpreted to be continuous with, and to overlap by approximately 30 feet, the upper part of the Mount Kindle section (MK) lying approximately six miles further north. This total composite section indicates a thickness in excess of 1, 200 feet for the Mount Kindle strata, with a paleontological dated age of Upper Ordovician for the lower portion. The greater part of the Mount Kindle at Bald Mountain may be younger in age (Silurian).

The Mount Kindle section at Mount Kindle is further characterized by the presence of reefoid and very skeletal beds in the lower unit. The lower 300 feet of the Mount Kindle Formation in this section exhibits poor to excellent skeletal, vugular and intercrystalline porosity. About 60 feet above the base of the Mount Kindle Formation, pyrobitumen was observed to line the vugs.

Approximately 25 miles north of the Mount Kindle section, the Pan American East Table Mountain section, measured in 1957, indicates at least 1, 660 feet, and possibly more, for the Mount Kindle thickness. This section not only represents the greatest thickness of Mount Kindle strata within the project area, but also probably contains the youngest units below the sub-Devonian unconformity. The Pan American stratigraphic cross-section indicates the upper 600 feet of this interval to be Silurian in age. The thickness of the Table Mountain section coupled with the presence of Silurian

strata in the upper 600 feet also graphically indicates the magnitude of the sub-Devonian unconformity (see Plate 2).

Further north in the Flower Mountain (FM) and Charles South (CS) sections, the Mount Kindle loses its reefoid characteristics and becomes more silty and argillaceous. The middle to lower part of the Mount Kindle Formation in the north also exhibits pelletel texture and still contains 5 to 10% fossil content, though the inter-crystalline and skeletal porosity is generally poor.

Evaluation

The good to excellent porosity noted in the lower reefoid and very fossiliferous portion of the Mount Kindle Formation indicates that this interval has good petroleum reservoir potential in the sub-surface. Based on the sampling accomplished in the field, porosity appears to vary both vertically and horizontally within the section.

Lower (?) Devonian

Bear Rock Formation

The type section of the Bear Rock Formation is at Bear Mountain near the junction of Great Bear River with the Mackenzie River. Outcrops of the formation are widely distributed within the project area and underlie much of the McConnell Range of the Franklin Mountains. The Bear Rock exhibits a pronounced thinning from south to north (see Plate 2). At River Between Two Mountains, at the extreme southern project boundary, the Bear Rock is 1,630 feet thick. To the north at Flower Mountain, the thickness is reduced to 460 feet.



**FIGURE J**

**View is to south from Bald Mountain (BM) section 63°17'N - 123°12'W. Typical knobby, cavernous and poorly bedded strata of the Bear Rock Formation. Well bedded Hume strata on right mountain flank overlain by mantled and poorly exposed Upper Devonian.**

In general, the Bear Rock Formation is divisible into two morphologic divisions, a lower brecciated limestone sequence with varying amount of limestone and dolomite fragments (see Figure J). The upper unit consists of a thin bedded dolomite and limestone unit (see Figure 0).

The breccia of the Bear Rock Formation varies considerably in structure and composition. The angular fragments of the breccia vary from one inch up to blocks two feet by eight feet, though the general size is less than six inches to micro-brecciated. The matrix is usually less resistant than the fragments and consists of micro to fine crystalline, light to medium gray limestone with secondary calcite. Extensive surface vuggy porosity is characteristic of the formation in most of the outcrop areas. The upper and thin-bedded part of the Bear Rock consists of a medium to light brown gray, very fine to fine crystalline, slightly argillaceous and slightly silty, siliceous, thin-bedded dolomite and limestone unit (see figures J and O).

Erosion of the Bear Rock produces caverns, pinnacles, and typical hoodoo forms (see Figures E and L). Where the breccia is generally less pronounced the topography tends to be more rounded, and in areas where the bedded limestone and dolomite unit is present at the top a recessive and covered interval generally reflects this interval.



**FIGURE K**

**Charles South (CS) section, 124°33'W - 64°48'N. View is NNW along McConnell Range. Ronning Group rocks form resistant ridge at left; underlying saddle and westerly facing forested slope are in faulted (?) Bear Rock. Overturned to vertical Hume sequence forms cliff face and scree slopes to right, in turn overlain by undivided Cretaceous.**

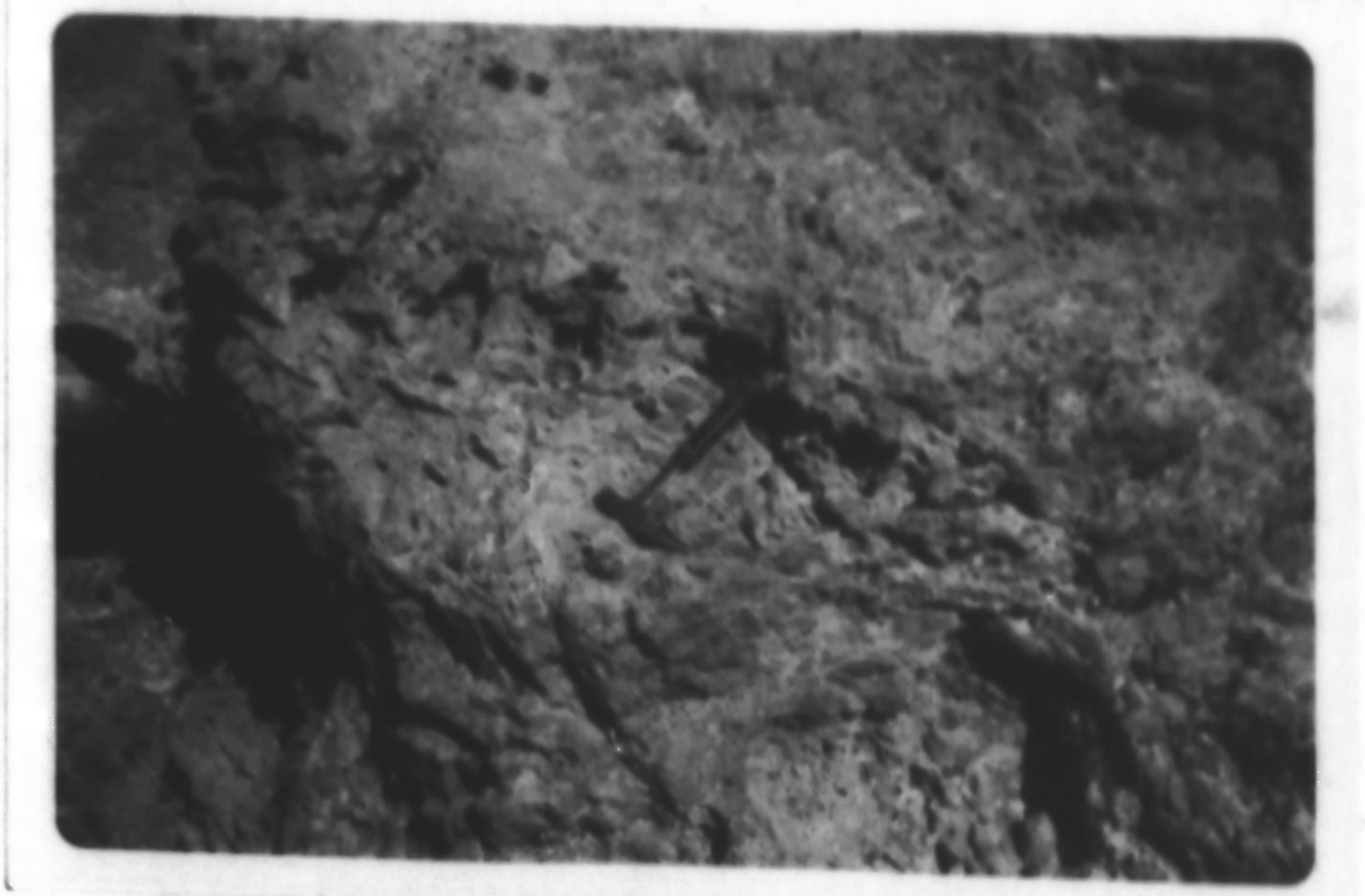


**FIGURE L**

**Charles South (CS) section. Location as in Figure K above. Typical brecciated, cavernous and poorly bedded strata of the Bear Rock Formation.**

The age of the Bear Rock has long been disputed. It reportedly ranges from Upper Silurian (Williams, 1963) to Middle Devonian (Douglas and Norris, 1963). Bassett assigned the formation to the Lower Devonian series and, based on regional photogeologic considerations, this age designation is interpreted to be correct and is used on the accompanying columnar stratigraphic sections and report.

During the course of the field program, ten complete or partial sections of Bear Rock strata were measured totaling 6, 610 feet. Of this total, five sections were relatively complete, thereby affording a good lithologic and thickness cross-section throughout the project area.

The most southerly section measured was that at River Between Two Mountains (RM), where 1, 630 feet of a largely concealed stratigraphic interval was logged (see Plate 3). This anomalous thickness, in part photo calculated, indicates the greatest thickness of Bear Rock measured within the project. Though this composite section is largely concealed and the thickness was partially arrived at photogrammetrically, the thickness of the Bear Rock facies as reported from the F. P. C. Tenneco Root River I-60 well, 20 miles to the southwest, indirectly supports the results. This well recorded approximately 1, 714 feet of Bear Rock (Manatoe) strata. The underlying 2, 282 feet erroneously indicated on the well log as being Bear Rock equivalents are probably Ordovician Silurian Ronning Group strata.



**FIGURE M**

**Looking north from Bald Mountain (BM) section, 123° 12'W - 63° 17' N. Bedded Hume carbonates to left overlying poorly bedded and brecciated Bear Rock. See Figure N below for eastward continuation of section.**

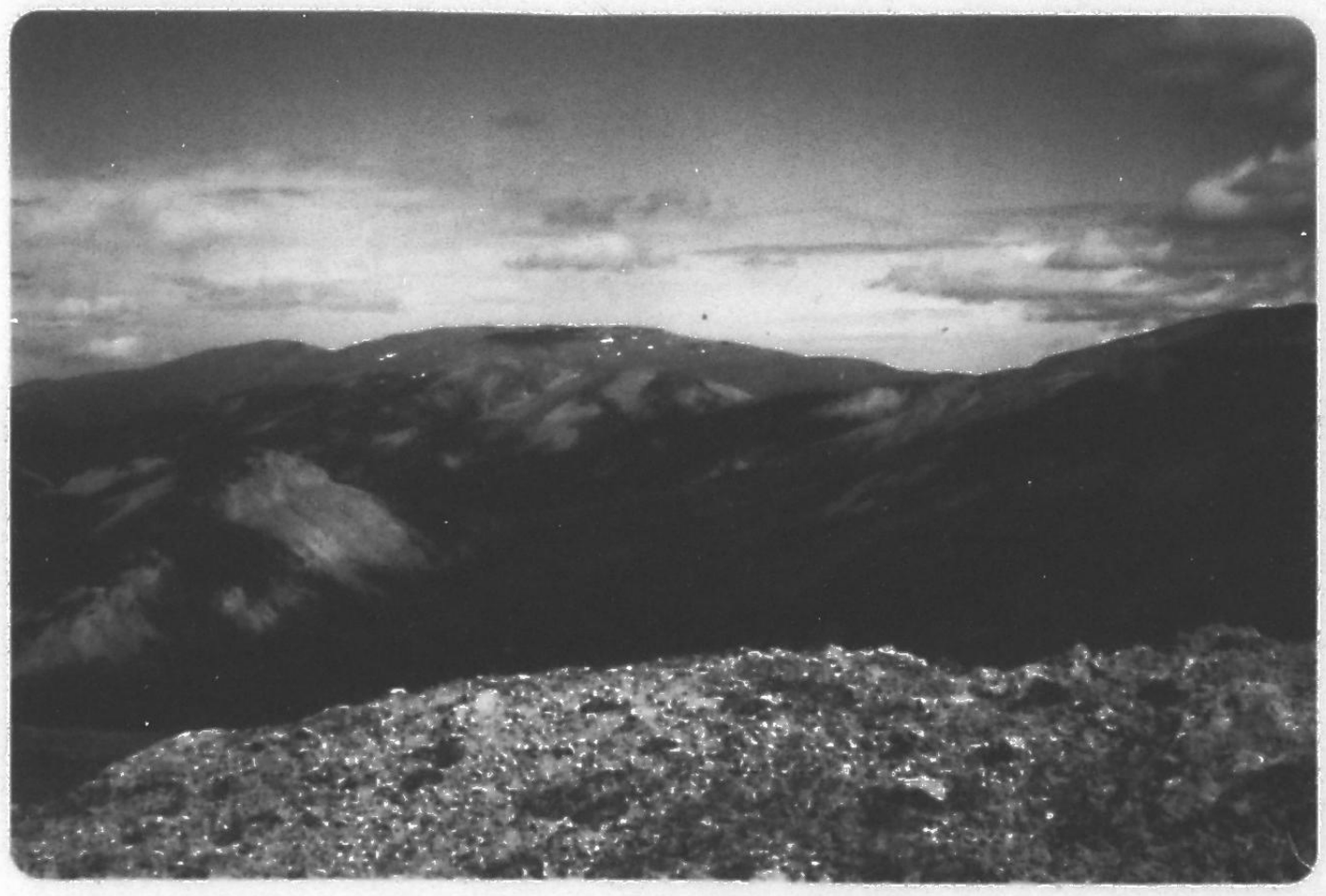


**FIGURE N**

**Looking N10E from Bald Mountain (BM) section 123° 12'W - 63°17'N. Bear Rock Breccias form knob at left center and in foreground. Contact with underlying and well bedded Mt. Kindle carbonates occurs in saddle at left center. See Figure M above for westward continuation of section.**

Approximately 25 miles north of the River Between Two Mountains section, a complete section of Bear Rock strata totaling 1, 110 feet was sampled at Bald Mountain (BM). In this locality the typical morphology of a lower brecciated unit overlain by a thin bedded recessive unit is present and is shown in Figures J, M and O.

In order to better assess and evaluate the east-west facies relationship within the Bear Rock, two incomplete sections were measured to the west of Bald Mountain. These sections are Williams West (WW) and Mount Gaudet (MG). (See Plates 6 and 7). At Williams West the lithology is still essentially identical to the Bald Mountain section in that the lower brecciated unit is overlain by well expressed, recessive thin-bedded dolomite unit (see Figure O).

Further west a Mount Gaudet (MG), an incomplete section of Bear Rock, faulted at the base, is considerably less brecciated with the majority of the limestone being well-bedded in beds up to 18 inches (see Figure P). This interval also reflects a pronounced westerly increase in intercrystalline porosity for the Upper Bear Rock.

As indicated on Plate 7, the sequence of brecciated and bedded dolomites with good porosity is still classified as Bear Rock equivalent, but the interval is considered to reflect Arnica-Manatoe facies. The Arnica-Manatoe Formations are the western stratigraphic equivalents of the eastern Bear Rock Formation.



**FIGURE O**

**East facing cliffs of Williams West (WW) section, 123°24'W - 63°24'N. Bear Rock breccia forms large, cleared, white area at lower right side; bedded Bear Rock dolomites form recessive interval immediately above. Contact between Hume and Bear Rock is located at tonal break at top of recessive interval approximately halfway down slope.**



**FIGURE P**

**View is southeasterly towards Mt. Gaudet (MG) section. Well bedded Hume carbonates on right underlain by Bear Rock; contact is located at base of pronounced topographic break near center of picture.**

As indicated on the stratigraphic correlation chart, Plate 2, the Pan American Wrigley River - Camsell Range stratigraphic section is interpreted to be represented by approximately 1,400 feet of Arnica medium to dark gray, fine to medium crystalline, variably porous and vuggy dolomites unconformably overlying Late Silurian (Delorme) dolomite facies. The succeeding 160 feet of this section, consisting of light to medium gray, porous and medium crystalline grained dolomite is assigned to the Manatoe Formation.

The only other reported presence of Manatoe type facies is from the Imperial Redstone #1 well, located at 64° 12' N - 124°39'W. The line of facies change between the Bear Rock breccia and evaporite unit lying to the east and the porous and bedded dolomites of the Arnica-Manatoe facies to the west appears to lie between the Camsell Range and the Mackenzie River in the south. Northward, the line lies immediately to the west of the Mount Gaudet section as this Bear Rock facies is interpreted to indicate a proximity of the Arnica-Manatoe facies. From this point north, the line probably follows the general Mackenzie River trend towards the northwest and lies somewhere in the vicinity or immediately to the west of the Imperial Redstone #1 well.

North of the Bald Mountain section the Bear Rock interval exhibits progressive thinning. At East Table Mountain a Pan American section, measured in a previous year, indicates that there is approximately

850 feet of Bear Rock strata. Approximately 30 miles further north, at the Twin Peaks (TP) section, this thickness is reduced to 650 feet with the lithology remaining essentially the same. East of the McConnell Range, towards the Interior Plains, the Bear Rock thins considerably and exhibits a very evaporitic facies.

The Flower Mountain (FM) section lying approximately 18 miles north of the Twin Peaks section is the most northerly complete and unfaulted section of Bear Rock strata measured and sampled. At this location, the Bear Rock interval has been reduced approximately 1,000 feet in thickness compared to the most southerly measured section at River Between Two Mountains (RM). (See Plate 2 and Figure 3).

The most northerly sampled Bear Rock interval was at the Charles South (CS) section. This anomalously thick Bear Rock interval, consisting of 1,115 feet, is known to be faulted with major fractures suggesting fault zones at the 1520 to 1640-foot interval.

Pan American's Mount St. Charles section, lying approximately 20 miles to the north, is interpreted to lie below the Bear Rock sequence and to include Cambrian through Ordovician Silurian strata (see Plates 1 and 2). A measured section by Williams (1923), in the Mount Charles area close to the Great Bear River, indicates approximately 530 feet of Bear Rock strata. The upper part consists of thin-bedded, brown weathering dolomite 190 feet thick, underlain by brown, coarse-grained

sandy dolomite, brecciated in part.

As previously mentioned in the Mount Kindle discussion there is considerable truncation of strata below the sub-Bear Rock unconformity. In the Camsell Range section the Arnica (Bear Rock) directly overlies Late Silurian (Delorme) dolomites. Eastward, in the Bald Mountain (BM) area, Douglas and Norris (1963) report the presence of Early Silurian fossils from beds near the Bear Rock contact. As indicated on Figure 5 and Plate 2, the Late Silurian is shown to be progressively truncated eastward against the sub-Devonian unconformity and to be probably missing in the Bald Mountain - East Table Mountain region. Truncation of the sub-Bear Rock units also varies considerably along strike (see Plate 2). In the Pan American Mount St. Charles section 84, approximately 130 feet of banded chert is indicated. This chert interval is interpreted to be truncated towards the south and to be absent in all measured sections in that direction (see Plate 2).

## Evaluation

Wherever observed in the field, the Bear Rock strata exhibits fair to excellent surface porosity. This porosity is primarily due to surface leaching and is interpreted to not persist to any depth in the subsurface.

## Middle Devonian

### Hume (Nahanni) Formation

The term Hume Formation was proposed in 1960 by Bassett for the succession of Middle Devonian Limestone, and, in places shale, which overlies the Bear Rock Formation and underlies the Hare Indian Formation. The type locality of the Hume Formation is where the east branch of the Hume River intersects the front of the Mackenzie Mountains to the north of the project area. South of the project area, the term Nahanni Formation was proposed by Hage (1945) for 450 feet of limestones of Middle Devonian age in the upper part of the south facing cliff at Nahanni Butte. The previously mentioned Hume Formation appears to be a direct lateral and time equivalent of the Nahanni Formation of the Southern Franklin Mountains area.

Douglas and Norris have reported that the Nahanni Formation in the southern areas grades westward into an argillaceous facies for which they proposed the name Headless Formation. Accordingly, the term Hume is interpreted to equate with Nahanni and the Headless.

As previously mentioned in both the introduction and preface to stratigraphy, detailed sampling of the Hume Formation was one of principal objectives of the field program. Accordingly, field emphasis was directed towards the Hume interval and 14 sections of Hume rock, totaling 4,055 feet, were detailed and collected.



FIGURE 6

**Location is 123°12'W - 63° 15'N. View is north towards top of Bald Mountain (BM) section. Bedded Hume carbonates form forested, westerly facing slopes; contact with underlying Bear Rock formation occurs at tonal change at top of large bare area at right center.**



**FIGURE 7**

**River between Two Mountain North (RMN) section, 123°03'W - 62°57'N. Looking southwesterly at bedded Hume carbonates. Contact with underlying Bear Rock at top of scree in left center. Lower Hume fauna in this section suggests lagoonal or shallow water biostromal environment.**

Due to poor outcrops of the Hume sequence within the project area no complete section of Hume was found. Generally, the lower one-third to two-thirds portion of the formation was satisfactorily sampled, but the upper one-third was generally mantled or intermittently exposed. The Junction Creek (JC) section, totaling 540 feet, is probably close to a complete section, though in no section measured was the upper contact with the overlying Middle Devonian shale observed.

Rocks of the Hume formation were field observed to be widely distributed on the low dipping west flank of the McConnell Range. In spite of the wide distribution the rocks are poorly exposed, forested, and complete sections are not existent (see Figures M and Q).

Field descriptions indicate the Hume interval to be a light to dark brown gray, micro to fine crystalline to coarse skeletal, slightly silty and slightly argillaceous limestone. In most sections the limestone unitsis sparsely to very pelletal in the lower two-thirds portion. Upwards the pelletal texture becomes scarce and the limestone becomes more fossiliferous so that the upper portions contain considerably more skeletal material than the lower parts.

In the Franklin Mountains and the more easterly parts of the Mackenzie Mountains the contact between the Hume and the underlying Bear Rock Formation is probably transitional, and is so indicated on the stratigraphic sections. The possibility of a

disconformable relationship should not be overlooked as is suggested by the distinct lithologic differences between the two formations.

The most southerly measured Hume section was at River Between Two Mountains North ($RM_N$), immediately to the south of the project boundary. This composite section consisted of 240 feet of sparsely fossiliferous limestone.

Northward in the Bald Mountain section (BM) 300 feet of Hume strata were logged and sampled. In this section the lithology is still similar to the River Between Two Mountains North section, but the limestone exhibits a pelletal texture indicative of a high energy environment type of deposition.

Immediately to the northwest and west of Bald Mountain two sections were sampled to determine facies variation in the Hume rocks in this direction. These sections, Williams West (WW) and Mount Gaudet (MG) indicate the generally same dense pelletel type limestone but with a slight biogenic increase in the lower middle portion. The Mount Gaudet section of Hume, in the same general structural position and trend with the Pan American Wrigley River - Camsell Range section to the south, was not field observed to exhibit any westerly argillaceous facies. In contrast, the Wrigley River - Camsell Range Hume section is interpreted, after Douglas and Norris, to contain approximately 130 feet of argillaceous Headless strata in the covered interval (see Plate 2).



**FIGURE 8**

**Looking west at the Big Smith (BS) section, 64°40'N - 124°26'W. Interval exposed consists of fossiliferous Hume carbonates with a low westerly dip. Section measured to left of cut on extreme left margin of photo.**

The Junction Creek (JC) section of 540 feet was the largest and most complete section of Hume sampled. The lithology of the Hume in the Junction Creek (JC) section indicates the presence of considerably more coarse skeletal material with traces of pyrobitumen filling the fractures and bedding planes near the base of the section.

Ten miles west of Junction Creek, two faulted and relatively restricted sections involving Hume strata were measured. These sections, Amos Creek (AC) and North Amos Creek (NAC) were photo interpreted to be faulted and to represent a near continuous section. The lower portion of Amos Creek is very sparsely fossiliferous though the lithology is essentially the same as in previously mentioned sections.

In the fifty mile area lying between Amos Creek and Big Smith section to the north the Hume interval is poorly exposed and measurable sections were difficult to find. In addition, south regional plunge also results in Hume strata being truncated in a northerly direction. Two sections (FM-DC), measured along the eastern margin of the McConnell Range, encompassed only the lower portion of the Hume. In this region the limestone is still medium to dark gray, fine crystalline, slightly argillaceous to slightly silty with sparse fossiliferous material.

At Big Smith Creek, the Big Smith (BS) partial section of the Hume proved to be very fossiliferous (see Figure S). Even though the Hume in this area appears to increase in argillaceous content

intercrystalline and interskeletal porosity appears to locally range up to good in the lower part of the section.

The most northerly measured section of Hume strata was the Charles South (CS) section measured approximately twelve miles north of the project boundary, (see Figure K).

**Evaluation**

Strata of the Hume Formation in the area of field study were generally disappointing as regards potential reservoir. In the main, the limestones are dense and tight offering little in the way of primary or even secondary porosity. The Junction Creek (JC) section indicates a small zone of poor to good intercrystalline and skeletal porosity, but this may be due, in part, to surface weathering.

In essence, the Hume does not appear to offer too favorable a prospect throughout most of the immediate project region, but local areas give indications of increasing favorable porosity trends.

**Hare Indian and Kee Scarp**

No Middle Devonian Upper Givetian Kee Scarp reef or platform facies were observed in the area. General land morphology, in fact, indicates that the reef is probably in a nonresistent facies within the project area south of 65°00'N Latitude. Extensive helicopter reconnaissance of the land surface west of the resistant Middle Devonian carbonates forming the western flank of the McConnell Range further



**FIGURE T**

**Mackenzie Plain Area. View is north from 123°43'W - 63°35'N. Mackenzie River in left center. Typical surface morphology exhibited in areas underlain by incompetent Middle and Upper Devonian rocks. Extensive vegetation and Quaternary cover effectively masks most rock outcrops.**

indicate the absence of the Middle Devonian Kee Scarp reef (see Figure T). Extensive mantle in the form of vegetation and Quaternary cover effectively covers all bedrock. One exception is the very isolated and restricted three-foot shale outcrop found 500 feet above and west of the top of the Amos Creek (AC) section. The shale in this locality is medium green-gray, weathers rusty green gray, is thin-bedded, blocky and slightly calcareous. The lithology suggest lower Givetian Hare Indian lithology and the unit is so indicated on Plate II.

The Norman Wells oil field, located north of the project area is on a homoclinal structure on the southwest flanks of the Norman Range. Production is obtained from the Middle Devonian Kee Scarp reefoid limestone at a depth of 1400 to 1700 feet. The porous upper part of the limestone shales out up dip to the east, thereby providing the necessary trap for the accumulation of oil. Within the Norman Wells field the oil saturated part of the reef ranges up to 400 feet thick.

Upper Devonian

Near the close of the field program, two sections of Upper Devonian strata were logged and sampled in the Pan American Permits 3166 and 3167 area.

The lower section, Wrigley Permit (WP) consists of bright green-gray, very fine grained, well sorted sandstone with abundant muscovite. Interbedded with the sandstone is medium gray



**FIGURE U**

**View is north from 63°16'N - 123°50'W. Photo is centered on Pan American Permit 3167 looking northward towards Permitt 3166 in far distance. Upper Devonian (Frasnian) reef forms thin white line in left center distance and also (See Kodachrome below) marks approximate southern boundary of Permit 3166.**



**FIGURE V**

**Wrigley Permit North ($WP_N$) section. Looking north into Upper Devonian (Frasnian) reef. Resistant rim exposes approximately 40 feet of very biogenic and Stromatoporoidal limestone.**

to light green-gray slightly argillaceous siltstone. This interval corresponds to Map Unit 24 of Douglas and Norris (1963).

Eight miles north and overlying Map Unit 24, 40 feet of strongly biogenic and stromatoporoidal limestone was also sampled at Wrigley Permit North ($WP_N$) section, (see Figure V). The limestones in this biostromal type reef, are light gray to tan, microcrystalline to coarsely skeletal, with the skeletal material constituting 70 to 95 per cent of the section. The faunas from this reef are indicated by paleontology to be Upper Devonian Frasnian in age.



**FIGURE W**

**Approximate position is 122° 10'W - 64°40'N. View is north from Permit 3555 towards Permit 3556. Typical muskeg, poorly drained and lake filled terrain of Interior Plains in foreground. In left center background well drained, broad and relatively high topographic area rises to 1700 feet elevation.**



**FIGURE X**

**Approximate position is 121°53'W - 63°48'N. View is north towards Permit 3551. Keller Lake to northeast. Typical muskeg, forested and mantled terrain characteristic of Interior Plains region lying east of the McConnell Range of the Franklin Mountains.**

## PETROLEUM PERMITS

During the pre-field planning stage, meetings with Pan American personnel resulted in an additional field requirement being introduced into the overall stratigraphic program. This requirement was defined as geologic reconnaissance of Permits 3546 to 3558 in the Interior Plains area east of the Franklin Mountains.

### Petroleum Permits 3546 to 3558

A reconnaissance helicopter traverse was made of Petroleum Permits 3546 to 3558 during the early part of July (see Figures W, X, Y and Z). As is evident on the photographs the terrain is poorly drained and consists essentially of muskeg with tree and vegetation cover. Outcrops are not existent and it was only with considerable good fortune that the restricted and isolated 80-foot Upper Ordovician (lower Mount Kindle) section (GB) was found and sampled at Great Bear Lake.

The permit area is probably underlain by relatively thin and undeformed Lower Cretaceous and Upper Devonian strata. Existing structural conditions are unknown but the attitude of the strata field observed at the Great Bear (GB) section suggests similarity with the structural trend as expressed by the Willow Ridge Anticline in the extreme southern part of the project area.



**FIGURE Y**

**Vicinity of 123°00'W - 64°40'N. View is to the south. Typical muskeg terrain with numerous lakes characteristic of Interior Plains region east of the McConnell Range. Pronounced frost polygonal patterns evident in foreground.**



**FIGURE Z**

**Great Bear (GB) section, 64°58'N - 122°23'W. Looking northeasterly along strike of very restricted Ordovician dolomite outcrop exposed on south shore of Keith Arm, Great Bear Lake.**

This anticline trends northeasterly, is in a discordant structural relationship with the overall northerly structural trend expressed in the McConnell Range structures. It is postulated that the identical structural trend persists towards the north and the 37 degree southeasterly dip observed in the Great Bear (GB) section probably reflects the faulted (?) flank of an identical and en echelon fold.

## SUMMARY AND CONCLUSIONS

This report presents the results of a four week field stratigraphic investigation in the McConnell Range of the southern Franklin Mountains, Northwest Territories. The primary purpose of the field study was to sample in detail the Devonian, - Ordovician stratigraphic interval in order to supplement existing Pan American control.

Field results indicate that no Kee Scarp reefs are present and equivalent strata are in a non-resistant shale facies included with the undivided and unexposed Upper Devonian.

The economic potential of the Middle Devonian Hume Formation, better definition of the Bear Rock facies and relationship of the subjacent formation against the sub-Bear Rock unconformity were also determined.

Twenty stratigraphic sections, totaling in excess of 22,000 feet, were measured and sampled during the course of the investigation. The results of this work are presented on fifteen columnar sections and the individual sections are correlated on a stratigraphic cross-section.

In conjunction with the petroleum evaluation, one section of Precambrian meta sediments was sampled in order to evaluate the hematite constituent of this sequence. Subsequent assay by Pan American indicated the iron to be non-commercial.

A prominent angular unconformity at the base of the Bear Rock (Arnica) truncates sub-Devonian rocks in an easterly direction. These conditions provide an ideal environment for the entrapment of hydrocarbons.

The petroleum reservoir potential of restricted stratigraphic units in the southern Franklin Mountains area appears favorable. There is good to excellent porosity in the lower reefoid portion of the Upper Ordovician Mount Kindle strata.

Field results indicate that the Middle Devonian Hume rocks, in the project area, are generally dense with no apparent porosity. One southern section of Hume rocks indicates lagoonal or shallow water biostromal environment suggesting local reefing in this area.

Meager geologic data to the east of the Franklin Mountains, in the Interior Plains region, indicates relatively undisturbed and thin Upper Devonian and Cretaceous sediments at the surface.

Respectfully submitted,

GEOPHOTO SERVICES, LTD.

A.S. Depetris

Paul Fuenning

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oss northeastern British Columbia
thern extension of Franklin
rritories: Geol. Surv., Canada,
pp. 65-87.

t Kindle Formation of the Franklin
trol. Geol., Vol. 11, No. 3.

Plate 3

# PAN AMERICAN PETROLEUM CORP.

SECTIONS – RIVER BETWEEN TWO MOUNTAINS NORTH
LOCATIONS – RIVER BETWEEN TWO MOUNTAINS
PROVINCE – 129° 03' W, 62° 57' N
DATE – 129° 02' W, 62° 55' N
N.W.T.
JULY, 1964

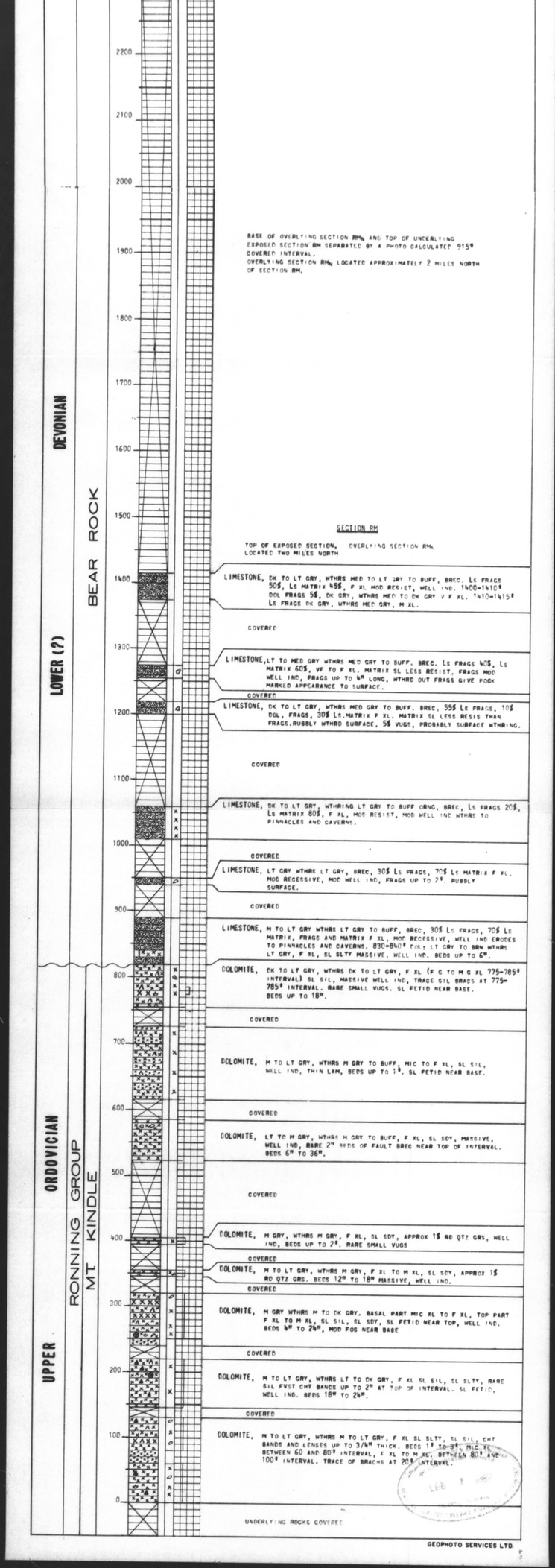
CODES – GRAHAM
SAMPLES – 10FT INTERVALS, BASE TO TOP
MEASURED BY – GEOPHOTO PARTY 8
SY JACOBS STAFF
SCALE – 1" = 100 FT.

60-1-5-46

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| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY % | FIELD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | SECTION RM, |
| | | | | | OVERLYING BEDS NOT EXPOSED |
| MIDDLE DEVONIAN | HUME (NAHANNI) | 200 | | | LIMESTONE, DK GRY, WTHRS, BUFF, V F XL AT BASE GRADING UPWARD TO F XL TO M XL, SL S L, CL SLTY, FOS NEAR BASE, MOD TO V RESIST, WELL INT, SOL FRACS, SIL POS, INCL RARE CRIN AND TRAVE OF SMALL BRACHS |
| | | 100 | | | LIMESTONE, DK ARG WTHRS BUFF, MIC XL TO V F XL, V RESIST, WELL INT, SL SLTY, CALC, FILLED FRACT, RARE SMALL PYR CUBES, BEDS 1/2" TO 3'. |
| | | 0 | | | LIMESTONE, BRN, DK GRY WTHRS LT GRY BRN, MIC XL TO V F XL CRINOID FRACT, SL SLTY, MOD RESIST, WELL INT, MOD FOS NEAR TOP, BEDS 6" TO 2'. |
| | | | | | COVERED |
| | | | | | CONTACT NOT EXPOSED, EST MATRIX 55% COVERED INTERVAL SEPARATES BEDDED HUME STRATA ABOVE FROM RESISTANT OUTCROP OF BEAR ROCK BELOW. |
| | | 2400 | | | LIMESTONE, MED TO LT GRY WTHRS, MED TO LT GRY, F XL, MOD, BREC, LS FRAGS 50%, LS MATRIX 50%, F XL, MOD RESIST, WELL IND, 1400-1410' MOD RESIST, PARTIALLY COVERED, INTERVAL EXAMINED BUT NOT SAMPLED. |
| | | 2300 | | | |
| | | 2200 | | | |
| | | 2100 | | | |
| | | 2000 | | | |
| | | 1900 | | | |
| | | 1800 | | | |
| | | 1700 | | | |
| | | 1600 | | | |
| | | 1500 | | | |
| | | 1400 | | | |
| | | | | | BASE OF OVERLYING SECTION RM, AND TOP OF UNDERLYING EXPOSED SECTION RM SEPARATED BY A PHOTO CALCULATED 915' COVERED INTERVAL. OVERLYING SECTION RM, LOCATED APPROXIMATELY 2 MILES NORTH OF SECTION RM. |
| | | | | | SECTION RM |
| | | | | | TOP OF EXPOSED SECTION, OVERLYING SECTION RM, LOCATED TWO MILES NORTH |
| LOWER (?) DEVONIAN | BEAR ROCK | 1400 | | | LIMESTONE, DK TO LT GRY, WTHRS MED TO LT GRY TO BUFF, BREC, LS FRAGS 50%, LS MATRIX 50%, F XL MOD RESIST, WELL IND, 1400-1410' SOL FRAGS 5%, DK GRY, WTHRS MED TO DK GRY V F XL, 1410-1415' LS FRAGS DK GRY, WTHRS MED GRY, M XL. |
| | | 1300 | | | COVERED |
| | | 1200 | | | LIMESTONE, LT TO MED GRY WTHRS MED GRY TO BUFF, BREC, LS FRAGS 40%, LS MATRIX 60% VF TO F XL, MATRIX SL LESS RESIST, FRAGS MOD WELL IND, FRAGS UP TO 1/4" LONG, WTHRD OUT FRAGS GIVE POOR APPEARANCE TO SURFACE. |
| | | 1100 | | | COVERED |
| | | 1000 | | | LIMESTONE, DK TO LT GRY, WTHRS MED GRY TO BUFF, BREC, 55% LS FRAGS, 10% SOL, FRAGS, 30% LS MATRIX F XL, MATRIX SL LESS RESIS THAN FRAGS, RUBBLY WTHRD SURFACE, 5% VUGS, PROBABLY SURFACE WTHRING. |
| | | 900 | | | COVERED |
| | | 800 | | | LIMESTONE, DK TO LT GRY, WTHRING LT GRY TO BUFF GRNG, BREC, LS FRAGS 20%, LS MATRIX 80% F XL, MOD RESIST, MOD WELL IND, FRAGS UP TO 2". RUBBLY SURFACE, PINNACLES AND CAVERNS. |
| | | 700 | | | COVERED |
| | | | | | LIMESTONE, LT GRY WTHR LT GRY, BREC, 30% LS FRAGS, 70% LS MATRIX F XL. MOD RECESSIVE, MOD WELL IND, FRAGS UP TO 2". RUBBLY SURFACE. |
| | | | | | COVERED |
| | | | | | LIMESTONE, M TO LT GRY WTHRS LT GRY TO BUFF, BREC, 30% LS FRAGS, 70% LS MATRIX, FRAGS AND MATRIX F XL, MOD RECESSIVE, WELL IND, ERODES TO PINNACLES AND CAVERNS, 5% VUGS, PROBABLY SURFACE WTHRING. LT GRY, F XL, SL SLTY MASSIVE, WELL IND, BEDS UP TO 6". |
| | | | | | DOLOMITE, DK TO LT GRY, WTHRS DK TO LT GRY, F XL (F G TO M G XL 775-785' INTERVAL) SL SIL, MASSIVE WELL IND, TRACE SIL BRACS AT 775-785', TRACE CALCITE FILLED VUGS, SL PETRO NEAR BASE. BEDS UP TO 18". |
| | | | | | COVERED |
| | | | | | DOLOMITE, M TO LT GRY, WTHRS M GRY TO BUFF, MIC TO F XL, SL SIL |

KODAK SAFETY FILM




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Plate 4

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | BALD MOUNTAIN | CODE – | CA-64-BM |
| LOCATION – | 63° 17' N, 123° 12' W | SAMPLES – | 10' INTERVAL - BEAR ROCK-HUME ) BASE TO<br>20' INTERVAL - MT. KINDLE ) TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY A<br>5' JACOBS STAFF |
| DATE – | JUNE, 1964 | SCALE – | 1" = 100 FT. |

60-1-5-46

| SYSTEM AND SERIES | FORMATION | FOOTAGE | | POROSITY TYPE | POROSITY Poor Fair Good Exc | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|
| DEVONIAN (?) | BEAR ROCK | 2300 | | | | OVERLYING BEDS NOT EXPOSED |
| | | | | | | LIMESTONE, M TO LT GRY WTHRS LT GRY TO BUFF, BREC, 30$ Ls FRAGS, 70$ Ls MATRIX, FRAGS AND MATRIX F XL, MOD RECESSIVE, WELL IND ERODES TO PINNACLES AND CAVERNS. 830-840' DOL: LT GRY TO BRN WTHRS LT GRY, F XL, SL SLTY MASSIVE, WELL IND, BEDS UP TO 6". |
| ORDOVICIAN | RONNING GROUP MT KINDLE | 800 | | | | DOLOMITE, DK TO LT GRY, WTHRS DK TO LT GRY, F XL (F G TO M G XL 775-785' INTERVAL) SL SIL, MASSIVE WELL IND, TRACE SIL BRACS AT 775-785' INTERVAL. RARE SMALL VUGS. SL FETID NEAR BASE. BEDS UP TO 18". |
| | | | | | | COVERED |
| | | 700 | | | | DOLOMITE, M TO LT GRY, WTHRS M GRY TO BUFF, MIC TO F XL, SL SIL, WELL IND, THIN LAM, BEDS UP TO 1". SL FETID NEAR BASE. |
| | | | | | | COVERED |
| | | 600 | | | | DOLOMITE, LT TO M GRY, WTHRS M GRY TO BUFF, F XL, SL SDY, MASSIVE, WELL IND, RARE 2" BEDS OF FAULT BREC NEAR TOP OF INTERVAL. BEDS 6" TO 36". |
| | | | | | | COVERED |
| | | 500 | | | | DOLOMITE, M GRY, WTHRS M GRY, F XL, SL SDY, APPROX 1$ RD QTZ GRS, WELL IND, BEDS UP TO 2". RARE SMALL VUGS |
| | | 400 | | | | COVERED |
| | | | | | | DOLOMITE, M TO LT GRY, WTHRS M GRY, F XL TO M XL, SL SDY, APPROX 1$ RD QTZ GRS. BEDS 12" TO 18" MASSIVE, WELL IND. |
| | | | | | | COVERED |
| | | 300 | | | | DOLOMITE, M GRY WTHRS M TO DK GRY. BASAL PART MIC XL TO F XL, TOP PART F XL TO M XL, SL SIL, SL SDY, SL FETID NEAR TOP, WELL IND. BEDS 4" TO 24", MOD FOS NEAR BASE |
| | | | | | | COVERED |
| | | 200 | | | | DOLOMITE, M TO LT GRY, WTHRS LT TO DK GRY, F XL SL SIL, SL SLTY, RARE SIL FVST CHT BANDS UP TO 2" AT TOP OF INTERVAL. SL FETID, WELL IND. BEDS 18" TO 24". |
| | | | | | | COVERED |
| | | 100 | | | | DOLOMITE, M TO LT GRY, WTHRS M TO LT GRY, F XL SL SLTY, SL SIL, CHT BANDS AND LENSES UP TO 3/4" THICK. BEDS 1" TO 3". MIC XL BETWEEN 60 AND 80' INTERVAL, F XL TO M XL BETWEEN 80' AND 100' INTERVAL. TRACE OF BRACHS AT 20' INTERVAL. |
| | | 0 | | | | UNDERLYING ROCKS COVERED |

FILM

Plate 4

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | BALD MOUNTAIN | CODE – | GA-64-8M |
| LOCATION – | 63° 17' N, 123° 12' W | SAMPLES – | 10' INTERVAL - BEAR ROCK-HUME ) BASE TO<br>20' INTERVAL - MT. KINDLE ) TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY A<br>5' JACOBS STAFF |
| DATE – | JUNE, 1964 | SCALE – | 1" = 100 FT. |

60-1-5-46

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE (Poor, Fair, Good, Ex.) | FIELD DESCRIPTION |
|---|---|---|---|---|
| | | | | OVERLYING BEDS NOT EXPOSED |
| MIDDLE DEVONIAN | HUME (NAHANNI) | 2300 | | LIMESTONE, M OLV BRN, WTHRS DK M GRY, MIC XL, V SL SLTY, V SL ARG, CALC REPL AXEL MAT., SIL REPL BRYOZ, 10$ SKEL MAT. BEDS 1"-3'. |
| | | | | LIMESTONE, DK BRN GRY, WTHRS LT M GRY, MIC-VF XL, V SL ARG, V SL SLTY, CALC IN FRACS AND MTX. FOS MAT SIL. BEDS 1"-2', 10$ FOS. |
| | | 2200 | | COVERED |
| | | | | LIMESTONE, AS BELOW. |
| | | | | COVERED |
| | | | | LIMESTONE, LT M BRN GRY, WTHRS LT M GRY, MIC XL, ABT PEL AND SKEL(?) MAT. 10$ CALC FILLS FRAC AND MTX. BEDS 6"-2'. |
| | | 2100 | | COVERED |
| | | | | LIMESTONE, LT BRN-WH, WTHRS LT GRY, MIC XL, PEL TEX, SP CALC MTX. BEDS 6"-2'. |
| LOWER (?) DEVONIAN | BEAR ROCK | 2000 | | DOLOMITE, DK BRN GRY, WTHRS DK GRY, MIC-VF XL, V SL ARG, V SL SLTY, BEDS 6"-1', WH CALC FILLS FRACS AND JOINT PLANES, SIL STGRS AT 1980'. |
| | | 1900 | | COVERED. RUBBLE SUGGESTS SAME LITHO AS BELOW. |
| | | | | DOLOMITE, DK BRN GRY, WTHRS M DK GRY, MIC-VF XL, SL ARG, SL CALC. BEDS 2"-2'. |
| | | 1800 | | |
| | | 1700 | | LIMESTONE, LT BF TO M OLV, WTHRS LT-M GRY, MASSIVE, MIC-VF XL, BEDS RUBBLY, V SL ARG, V SL SLTY, FRAGS UP TO 3" CALC, FILLS FRACS AND 1/4"-1" VUGS, SL FETID, TRACE P.P. POR. |
| | | 1600 | | |
| | | 1500 | | COVERED |
| | | | | 1310-1500' LIMESTONE, BF-LT GRY, MIC-F XL, 10$ VUGS, 1/16-1". |
| | | 1400 | | |
| | | 1300 | | 1230-1310' LIMESTONE, LT BF, MIC-VF XL, BRECCIATED WITH 1/8"-1" VUGS, CALC XLS LINE VUGS, V SL SLTY, SL FETID. |
| | | 1200 | | 1110-1230' LIMESTONE, LT BF, MIC-VF XL, INTENSLY FRACTURED, GHOST LINEAMENTS SUGGEST POS SKEL MAT. CALC XLS FILL FRAC. SL FETID. |
| | | 1100 | | 950-1110' LIMESTONE, BF, MIC XL, VERY BRECCIATED. APPROX. 30$ OF UNIT CONTAINS 1/4"-6" VUGS. ABNT SOLN CAVES. GOOD SURFACE POROSITY. |
| | | 1000 | | |
| | | | | LIMESTONE, BUFF, WTHRS LT M GRY, MIC XL, CSE CALC RHMBS AND VUGS, 30$ DOL, ANGULAR FRAGS, 2"-4", BRN GRY, MIC XL. |
| | | | | COVERED |
| | | 900 | B | LIMESTONE, TAN-BUFF, WTHRS LT M GRY, MIC XL, V SL SLTY, SL DOL, FAIR LEACHED, 1/4"-1/2" VUG POR. |
| | | | | COVERED |
| ORDOVICIAN UPPER | RONNING MT. KINDLE GROUP | 800 | | DOLOMITE, LT BUFF GRY, WTHRS SL M GRY, SL SLTY, 5$, SIL, 1/8", STGRS PARALLEL TO BDG. TR PYR. SL FETID. |
| | | | | DOLOMITE, M OLV BRN, WTHRS MTLD M DK GRY, V SL ARG, V SL SLTY, MIC XL, BEDS 2"-4", IRREG THIN SILIC. MASSES PARALLEL TO BDG. |
| | | 700 | | COVERED |
| | | | D | |
| | | | D | DOLOMITE, M OLV GRY-BRN, WTHRS M GRY, MIC XL-V FN XL, V SL ARG, V SL SLTY, 1"-1' BDS. 593-650' INTERVAL REEFOID-LIKE, 10-30$ SKELETEL, SL FETID. |
| | | 600 | D | |
| | | | | COVERED |
| | | | | DOLOMITE, LT-M OLV GRY, WTHRS M GRY-M BRN GRY, V FN-MIC XL, SL SLTY, V SL ARG. 450-500' 6"-8" INTERBEDS OF MIC XL DOL AND V FN XL. FOS DOL. SL CALC FILLING IN FRAC, SL FETID. |
| | | 500 | | |
| | | | | DOLOMITE, WH CRM, WTHRS LT GRY, MIC XL, BEDS 4"-1' SL SLTY, MASSIVE CLIFF FORMER AND LIGHT COLORED. |
| | | 400 | | |
| | | | | COVERED |
| | | | C | |
| | | | C | DOLOMITE, LT GN GRY, WTHRS LT GRY-RSTY GRY, MIC-VF XL, V SL SLTY, SL SNDY AT TOP, V SL CALC IN FRAC. BEDS 6"-2', 1/16"-1/4" VUGS LINED WITH CALC AND DOL RHMBS. VUGGY SURFACE DUE TO LEACHING. |
| | | 300 | C | |
| | | | | COVERED |
| | | | D | |
| | | | D | DOLOMITE, LT GN GRY, WTHRS LT M GRY, MIC-VF XL, SL SLTY, SL CALC. CALC AND DOL RHMBS PARTLY FILL 1/8"-1/2" VUGS. POROSITY PROB DUE SURFACE LEACHING. SL FETID |
| | | 200 | D | |
| | | | | COVERED |
| | | | C | |
| | | | C | DOLOMITE, DK OLV GRY, WTHRS DK GRY, VF XL, SL SLTY, SL SIL. BEDS 2"-1'. FOS 15-30$ OF ROCK. VUGS 1/8-1/4". UNIT 30$ COVERED. |
| | | 100 | C | |
| | | | | COVERED |
| | | | X | DOLOMITE, DK OLV GRY WTHRS MTLD M DK GRY, VF XL, SL SLTY, V SL CALC, IREG BDG 4"-2', 20-40$ SKEL. |
| | | | X | |
| | | | | COVERED |
| | | 0 | D | DOLOMITE, LT GN GRY, WTHRS MTLD LT M GRY, M-VF XL, V SL SLTY, BEDS 6"-1', FEW VUGS TO 1/8". |
| | | | | UNDERLYING OSTEOPOR SPARSE. BASE OF OVERLYING UNIT OVERLAPS APPROX. 30' TOP OF SECTION MK (MT. KINDLE). |

Plate 5

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | MT. KINDLE | CODE – | GA-64-MK |
| LOCATION – | 63°21'N, 123°12'W, 950/SW | SAMPLES – | 20' INTERVALS, BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PART A<br>5' JACOBS STAFF |
| DATE – | JULY, 1964 | SCALE – | 1" = 100' |

60-1-5-46

SYSTEM AND SERIES: UPPER ORDOVICIAN; LOWER AND/OR MIDDLE ORDOVICIAN

FORMATION: RONNING GROUP — MT. KINDLE; FRANKLIN MOUNTAIN

FOOTAGE: 1000, 900, 800, 700, 600, 500, 400, 300, 200, 100, 0

POROSITY: TYPE; Poor, Fair, Good, Ex

## FIELD DESCRIPTION

OVERLYING ROCKS DISCONTINUOUSLY EXPOSED. TOP OF 1030' UNIT OVERLAPS LOWER 30' PART OF BALD MTN (BM) SECTION

DOLOMITE, DK BRN GRY WTHRS SAME, V F XL, SL SLTY, CALC FILLED FRACT, SUC TEXT, SL FETID, M-V RESIST, WELL IND. BEDS 4"-8".

COVERED

DOLOMITE, DK BRN GRY AND WH WTHRS DK BRN AND WH, V F XL-F XL, SKEL, SL SLTY, TR CALC, V FOS, HALYSITES COMP 40$ OF ROCK WHICH CONTRIBUTE UP TO 20$ POR SUC TEXT, ¼" VUGS, M-V RESIST, WELL IND. BEDS 2"-1'.

COVERED

DOLOMITE, MTLD BRN TO WH WTHRS SAME, V F XL, C SKEL, SUBMED GRN, V SL SLTY, V SL CALC, ABDT BLK CHT NOD, 30-50$ SKEL, V RESIST, WELL IND, BEDS 6"-12", ABDT COL CORALS.

SHALE, BLK MOTTLED WH WTHRS DK GRY, PLATEY, ARG, 20$ SKEL, FOS, SL FETID.

DOLOMITE, 20$, DK GRY, MICXL, C SKEL (20$), V ARG, SL FETID. BEDS ¼"-3".

COVERED

DOLOMITE, WH WTHRS LT GRY, M-C XL, REEFOID, PYRBIT LINES VUGS, V SL SLTY.

OVERLYING INTERVAL 770'-1030' MEASURED 1500' SOUTH OF UNDERLYING SECTION

DOLOMITE, LT GRY WTHRS BUFF-LT GRY, VF-M XL, SL SLTY, 2$ SDY VUGS, ½"-½", BEDS 3"-24", SL FETID, WELL IND, REXLD FOSSILS.

DOLOMITE, LT TAN WTHRS BUFF, MICXL-MICGRN, ODD M SS GRN (3$), V SL SLTY, SL FETID, V RESIST, WELL IND. BEDS 1"-4", LAM, IRREG BANDED.

DOLOMITE, LT TO M GRY GN WTHRS LT GRY TO BUFF, MICXL-M XL, SL SLTY, V RESIST, WELL IND. BEDS 2"-8".

605'-680' INTERBEDS OF M AND LT GRY DOLOMITE.

555'-605' LT GRY REDDISH, WTHRS MOT LT BUF-M GRY.

COVERED

DOLOMITE, LT TO DK OLV GRY WTHRS RUSTY BUF TO M BRN GRY, MICXL-VF XL, SL SLTY, F-V RESIST, WELL IND. BEDS 2"-19".

410'-450' SUC TEXT.

395'-410' ½" IREG CHT NOD.

COVERED

OVERLYING INTERVAL 330'-770' MEASURED 3000' SOUTH OF UNDERLYING SECTION

SANDSTONE, LT TAN GRY WTHRS TAN BUFF, VF-F GRN INTBD, VF-M GRN 30-40$ DOL CMT, VF-F GRN UNIT SL ARG, SL SLTY, GRNS 75$ QTZ, WELL SORTED, WELL RND. BEDS 2"-12".

DOLOMITE, TAN WTHRS DK TAN, MIC XL, SL ARG, SLTY

SANDSTONE, (35$), TAN WTHRS DK TAN, VF-M GRN, V SL ARG, F-V RESIST, WELL IND, BEDS 1"-6", DOL MTX.

DOLOMITE, M TO DK OLV WTHRS M BRN, MIC XL, SL ARG, SL SDY, SL SIL, V RESIST, WELL IND. BEDS 1'-2'.

DOLOMITE, LT GRY WTHRS RUSTY YEL, MICGRN, V SL SLTY, M RESIST, WELL IND, 4' Ss BED AT 195', C GRN, RND.

DOLOMITE, SANDSTONE, MAR-GN GRY WTHRS MAR GN YEL, V RESIST, WELL IND. SANDSTONE F-C GR, 35$ DOL MTX. DOLOMITE F GR, SDY, 35-40$ RND.

DOLOMITE, LT BF TO M BRN GRY, WTHRS DK GRY TO RUSTY YEL, VF XL-MICGRN, SL SLTY, SUC TEXT, V RESIST WELL IND, BEDS 1"-4". 125' 1" CGL, 126' 1"-2" BLKY SH PARTING.

DOLOMITE, LT GRY WTHRS RSTY ORNG, MIC XL-MIC GR, V SLTY BEDS 2"-4". TR PYR.

DOLOMITE, LT OLV-LT OLV GRY WTHRS LT GRY, MIC XL-M GR, V SLTY-SLTY. BEDS 6"-2'. SILT LAMN DISTINCT.

UNDERLYING ROCKS NOT EXAMINED. REMAINDER OF FRANKLIN MTN SECTION DISCONTINUOUSLY EXPOSED AND CONSISTS OF APPROX 500' OF SHALES, SANDSTONES, SILTY DOLOMITES AND LIMESTONES.

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Plate 6

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | WILLIAMS WEST | CODE – | GA-64-WW |
| LOCATION – | 123° 24' W, 63° 24' N; 950/SW | SAMPLES – | 10' INTERVALS BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY A<br>5' JACOBS STAFF |
| DATE – | JULY, 1964 | SCALE – | 1" = 100 FT. |

60-1-5-76

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY Poor Fair Good Ex. | FIELD DESCRIPTION |
|---|---|---|---|---|---|
| MIDDLE DEVONIAN | HUME (NAHANNI) | | | | OVERLYING BEDS NOT EXPOSED |
| | | 900 | | | LIMESTONE, L-M D BRN, WTHRS GRY, MIC XL-C SKEL. V SL ARG, V SL SLTY, BEDS UP TO 3'. |
| | | | | | COVERED |
| | | 800 | | | LIMESTONE, M BRN GRY, WTHRS M DK GR, V SL ARG, V SL SLTY, CRIN. 10-20%, SL FOS ABOVE 800'. BEDS UP TO 1'. |
| | | 700 | | | COVERED |
| | | 600 | | | LIMESTONE, M BRN, WTHRS DK BRN, VF-MIC XL. LOWER 50' RESIST CLIFF FORMER. SL SLTY, V SL ARG. BEDS UP TO 2'. TR PYRBIT AT 580'. PEL. TEXTURE. |
| | | 500 | | | COVERED |
| | | | | | LIMESTONE, M BRN GRY, WTHRS LT M GRY, MIC XL, SL SLTY, V SL DOL MASSIVE, SL FETID, PEL. TEXTURE. |
| | | | X | | LIMESTONE, WH GRY, WTHRS WH GRY, SL SLTY, M-C XL. BEDS 2"-2'. ABNT EUHED CALC XTALS. 30% DOL. |
| LOWER (?) DEVONIAN | BEAR ROCK | 400 | | | DOLOMITE, M BRN GRY, WTHERS DK BRN GRY, V F XL, SL SLTY. BEDS 4"-18". VERY FETID, 20% CALC MTX. TR BREC. |
| | | | | | COVERED |
| | | 300 | | | DOLOMITE, LT M BRN GRY, WTHRS BRN, V FN XL, V SL ARG, SL SLTY, SL SIL. BEDS 2"-8", 20% CALC MTX. SILT LAMINATED. 20% OF UNIT BRECCIATED. |
| | | | | | COVERED |
| | | | X | | DOLOMITE, M BRN GRY, WTHRS BRN GRY, VF-F XL, V SL SLTY. BEDS 4"-8". LAMINATED, 30% CALC MTX. |
| | | 200 | D | | LIMESTONE, LT GRY-WH, MIC XL-VF XL. BREC ¼"-1'. V SL ARG AND SLTY. VUGS 1/8"-2". DOL. VF-F XL, M DK BRN GRY, 20%, SLIGHT FETID ODOR. |
| | | 100 | D | | LIMESTONE, LT M BRN GRY, WTHRS SL M GRY. BREC ¼"-1" BLKS, V SL ARG, SL SLTY. LS MIC XL-CRS XL. DOL. VF XL. MUCH MICRO BRECCIATED. AT +60' DOLOMITE INCREASES TO 40%. |
| | | 0 | | | UNDERLYING ROCKS COVERED |

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Plate 7

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | MT. GAUDET | CODE – | GB-64-MG |
| LOCATION – | 123°36'W, 63°21'N | SAMPLES – | 10' INTERVALS, BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY 8<br>5' JACOBS STAFF |
| DATE – | JULY, 1964 | SCALE – | 1" = 100 FT. |

60-1-5-46

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY Poor Fair Good Ex. | FIELD DESCRIPTION |
|---|---|---|---|---|---|
| MIDDLE DEVONIAN | HUME (NAHANNI) | 800 | | | OVERLYING BEDS NOT EXPOSED. |
| | | | X | | LIMESTONE, DK GRY WTHRS LT GRY, F XL, SL ARG, MOD RESIST, MOD TO WELL IND, SPAR FOS. BEDS 2" TO 16". |
| | | | | | COVERED |
| | | | X | | LIMESTONE, DK GRY WTHRS LT GRY, F XL, SL ARG, MOD RESIST, MOD TO WELL IND, SPAR FOS PEL. BEDS 2" TO 8". |
| | | | | | COVERED |
| | | | X | | LIMESTONE, DK GRY WTHRS LT GRY, F XL, SL ARG, PEL TEXT, MOD RESIST, MOD TO WELL IND. BEDS 2" TO 6". |
| | | | | | COVERED |
| | | 700 | X | | LIMESTONE, DK GRY WTHRS LT GRY TO BUFF, F XL, SL SDY, SL SLTY, PEL TEXT. MOD TO V RESIST, MOD TO WELL IND. 2%-3% FOS. BEDS 2" TO 24". |
| | | | X | | |
| | | 600 | X | | LIMESTONE, DK GRY WTHRS LT TO MED GRY, F XL, MOD ARG, SL SIL PEL TEXT, SL FOS, MOD RECESS, MOD WELL IND. BEDS 6" TO 24". |
| | | | X | | LIMESTONE, DK GRY WTHRS MED TO LT GRY, F XL, SL ARG, SL SIL, MINOR PYR CUBES, MOD FOS, MOD TO V RESIST, MOD TO WELL IND. PEL TEXT. BEDS 2" TO 24". |
| | | 500 | X | | LIMESTONE, DK GRY WTHRS MED TO LT GRY, F XL, SL SLTY, SL SIL, FOS, PEL TEXT, MOD RESIST, WELL IND. 475-515' NUM MINOR CALC FILLED FRACT. BEDS 2" TO 10". |
| | | | X | | LIMESTONE, LT TO DK GRY WTHRS MED GRY TO BUFF, F XL TO VF XL, V RESIST, WELL IND PEL TEXT, MOD FOS. BEDS 2' TO 4'. 385-395' Ls MOD ARG, THINLY (1/16"-1/8") LAM, MOD TO POORLY RESIST, MOD TO WELL IND. MINOR PYR INCL, MOD FRACT WITH CALC FILLING. |
| | | 400 | | | |
| LOWER(2) DEVONIAN | BEAR ROCK (ARNICA-MANATOE) | | | | COVERED |
| | | | X | | LIMESTONE, DK GRY WTHRS MED GRY, F XL, MOD RESIST, WELL IND, SL SLTY FOS, 10% BREC, Ls MATRIX, F XL TO M XL, MED TO LT GRY WTHRS MOTTLED GRY, BUF. Ls FRAGS, F XL MED GRY WTHRS LT GRY. BREC BEDS UP TO 8". |
| | | 300 | | | COVERED |
| | | | | | LIMESTONE, LT TO MED GRY WTHRS LT GRY TO BUFF ORNG, BREC 20% Ls FRAGS, F XL TO M XL, 20% DOL FRAGS, F XL, 60% Ls MATRIX, F XL. MOD RESIST, FAIR TO MOD, WELL IND, NUM SMALL CAVERNS AND PINNACLES. 230'-260' MATRIX MAINLY CALC. FRAGS UP TO 3". |
| | | 200 | X | | LIMESTONE, DK TO LT GRY WTHRING MED GRY TO BUFF, F XL, SL SLTY, MOD TO V RESIST, FAIR TO WELL IND. TRACE OF "Fe" STAIN ON BASAL 10' BEDS 6" TO 18". |
| | | | X | | |
| | | | X | | |
| | | 100 | X | | LIMESTONE, LT GRY BRN WTHRS TO MED GRY BUFF, BASAL 40' F XL TO M XL, MOD FRACT WITH CALC FILLING. 120-140' M XL TO C XL, ALT Ls BANDS (½-2") AND CALC (½") BANDS, MOD FRACT WITH CALC FILLING. |
| | | | X | | LIMESTONE, DK GRY WTHRS DK GRY, C XL, MOD RESIST, FAIR TO POOR IND, ALT BANDS OF CALC AND Ls, 60% Ls, 30% CALC. 10% FAULT BREC. NO DISTINCT BEDDING. |
| | | | X | | LIMESTONE, DK GRY WTHRS DK GRY TO BUFF ORNG, M XL TO C XL, 5% FAULT BREC, NUM CALC FILLED FRACT. MOD RESIST, FAIR TO WELL IND. POORLY BEDDED. |
| | | 0 | | | UNDERLYING ROCKS COVERED |

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Plate 8

# PAN AMERICAN PETROLEUM CORP.

SECTION – TWIN PEAKS
LOCATION – 123°34' W., 64°06' N
PROVINCE – N.W.T.
DATE – JULY, 1964

CODE – CA-64-TP
SAMPLES – 10' INTERVAL - BEAR ROCK-HUME (BASE TO 20' INTERVAL - RONNING GROUP ) TOP
MEASURED BY – GEOPHOTO PARTY A
54 JACOBS STAFF
SCALE – 1" = 100 FEET

60-5-54

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| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | FIELD DESCRIPTION |
|---|---|---|---|---|
| | | | | OVERLYING BEDS NOT EXPOSED |
| MIDDLE DEVONIAN | HUME | 2500 | | LIMESTONE, DK GRY TO BLK WTHRS DK GRY, MICRITIC, CSE SKEL, SL ARG, V SL SLTY, TRILOBITE, FOS, V RESIST, WELL IND, BEDS 6"-12". |
| | | | | COVERED |
| | | 2400 | | LIMESTONE, LT TO M TAN OLV WTHRS LT TO M GRY, MICRIT, PEL, SKEL, SL SLTY, CALC FILLED FRACT, SL FETID, P TO V RESIST, F TO WELL IND, BEDS 3"-1'. |
| | | | | LIMESTONE, M TO DK OLV WTHRS M GRY, MICRIT, CSE SKEL (20-30%), SL SLTY, CALC FILLED FRACT, FOS, SL FETID, V RESIST, WELL IND. BEDS 2"-5". |
| | | | | COVERED |
| | | 2300 | | LIMESTONE, M DK BRN WTHRS DK GRY, MICRIT, PEL, V SL ARG, SL SLTY, CALC FILLED FRACT, V SL FETID, V RESIST, WELL IND. BEDS 1"-12". |
| | | | | COVERED |
| | | | | LIMESTONE, BF TO LT BRN WTHRS M GRY, MICRITIC TO VF FL, ABDT PELL, SKEL (10%), V SL SLTY, SPARRY, CALC MTX, SL FETID, V RESIST, WELL |
| | | | | COVERED |
| LOWER (?) DEVONIAN | BEAR ROCK | 2200 | | LIMESTONE, TAN TO M GRY WTHRS M GRY, MICRI-MBEL, SL SLTY, CALC FILLED FRACT, 20% DOL FRAGS, DK GRY LAM WTHRS DK GRY, V F XL, SL SLTY, P RESIST, F IND, EXPOSURATED. |
| | | 2100 | | LIMESTONE, 70% TAN GRY WTHRS M GRY BREC; MIC-F XL, ABOUT 10% LARGE 1"-2" BLKS LAM, SLTY, 10% LS, M OLV BRN WTHRS M GR GRY, MIC XL. |
| | | 2000 | | LIMESTONE, LT-M BRN GRY-LT GRY WTHRS M GRY, BREC. 20601'-20609' MIC XL, CALC REL, F SL ARG, P RESIST, F IND, FRAGS UP TO 2"x6" 19959'-20601' MIC XL, REALC(?) BREC AND EXPHOLIATED SURFACE |
| | | | | COVERED |
| | | 1900 | | LIMESTONE, LT GRY BF WTHRS M GRY, BREC, MIC XL, SL SLTY, RARE LCMD. 1"-1" VUGS, F RESIST, F IND, CALC FILLED FRAC. |
| | | | | DOLOMITE, DK BRN GRY WTHRS DK BRN, MICRI-VF XL, V SL ARG, SL SLTY, SL FETID, V RESIST, WELL IND, BEDS 3"-6". |
| | | 1800 | | DOLOMITE, M GRY TO M DK BRN GRY WTHRS M GRY TO DK BRN GRY, BREC, 60% DOL FRAGS, MICRI V F XL, SL ARG, CALC CMT, SL FETID, SL SLTY, V RESIST, F IND. NOD LS FRAGS SL SLTY, CALC CMT IN LCMD VUGS. 18753-18760 LARGE FRAGS 8"x12" (50% LS AND 50% CALC DOL). |
| | | | | LIMESTONE, LT GRY WTHRS M GRY, MICRI-VF XL, BREC, SL SLTY, GOBS AND NOD DOL FRAGS, FRAGS 3"-6" NEAR BASE TO 1"-3" TOWARDS TOP, P TO F RESIST, F IND. |
| | | 1700 | | LIMESTONE, TAN TO BF WTHRS LT TO RSTY GRY, MICRI-VF XL, BREC, SL SLTY, PR LCMD VUG POR, FRAGS 80% LS AND 20% DOL, FRAGS UP TO 2"x8", CALC MTX, F RESIST, F IND. |
| | | | | COVERED |
| | | | | LIMESTONE, TAN BF WTHRS M GRY, MICRI-VF XL, BREC, SL SLTY, CALC FILLED FRACT, LCMD 2"-1" VUGS, V RESIST, F IND, LCMD POR. |
| | | | | COVERED |
| | | | | LIMESTONE, LT GRY WTHRS LT TO M GRY, MICRI-VF XL, BREC, SL SLTY, 1/2"-2" LCMD VUGS, FRAGS AVG 1/8"-1", WELL IND, CAVERNOUS. |
| | | 1600 | | COVERED |
| | | 1500 | | |
| | | 1400 | | DOLOMITE, DK BRN GRY TO M OLV GRY WTHRS DK BRN TO MED GRY, MICRI TO VF XL, SL SLTY, FOS, V RESIST, WELL IND, BASAL 10'10"-1460' CALC FILLED FRACT, SL ARG, BEDS 2"-8". |
| | | | | DOLOMITE, TAN-BF WTHRS LT GRY, MIC GRN, SLTY, SL FETID, V RESIST, WELL IND, BEDS 4"-8". |
| | | | | DOLOMITE, M BRN GRY, WTHRS DK BRN GRY, VF XL, SL SLTY, LT GRY CMT, NOD AT BASE, RARE VUGS, SL FETID, V RESIST, WELL IND, SL FOS (GIL), BEDS 6"-12", UNIT VERY LEACHED. |
| | | 1300 | | DOLOMITE, LT GY-M GRY WTHRS LT TO M GRY, MICRI-VF XL, SL SLTY SL FETID, V RESIST, WELL IND. |
| | | | | 1310'-1315' FOS, BEDS 6"-12". |
| | | 1200 | | COVERED |
| | | | | DOLOMITE, DK BRN TO TAN WTHRS LT GRY TO DK BRN, MICRI-VF XL, SL SLTY, PFP, FOS, FETID, V RESIST, WELL IND, UP 10' SUC TEST. |
| | | 1100 | | DOLOMITE, DK BRN WTHRS DK BRN, VF XL, SL SLTY, F-M, SUC TEST, TR. 1/8"-1/4" VUGS, SLTY FETID, ABDT LT GRY CMT AT TOP. |
| | | | | COVERED |
| | | 1000 | | DOLOMITE, M OLV WTHRS LT-M GRY PEL-MICAL AT TOP, V SL SLTY, SL FETID, V RESIST, WELL IND. BEDS 6"-18". |
| | | | | COVERED |
| | | 900 | | DOLOMITE, DK TO M OLV GRY WTHRS M GRY, MICRI-VF XL, SLTY-V SL SLTY, ABDT CMT, NOD 1/8"-2" 9301'-9307' V SL ARG, FOS, V-V RESIST, WELL IND. BEDS 2"-9". |
| | | | | DOLOMITE, DK BRN GRY WTHRS BRN GRY, VF XL-CSE SKEL, V SL ARG, SL SLTY, FOS, SUC TEST, MA TR 1/8"-1/4" VUGS, SL FETID, V RESIST, WELL IND, BEDS 3"-9". |
| | | 800 | | DOLOMITE, DK GRY BLK WTHRS RSTY M GRY, MICRI-VF SKEL (10%), SL ARG, SLTY, SL SLI SUC TEST, 20% CMT NOD, REPL CORALS, SL FETID, V RESIST, WELL IND. |
| | | | | COVERED |
| | | 700 | | DOLOMITE, LT GRY TO M OLV WTHRS M DK BRN TO LT MED GRY, MICAL, REAL SKEL, SL SLTY, 2% 3"-1" WHT CHT NOD. |
| | | | | DOLOMITE, M TO LT GRY WTHRS BF GRY, INTBD MICEL (70%) MICAL-VF XL, SL SLTY, LITHO TEXT, PR RESIST, WELL IND. BEDS 1"-6". UNIT 60-70% COVERED. |
| | | 600 | | DOLOMITE, LT GRY WTHRS BUSTY BF GRY, MICRI-VF XL, REAL SKEL, SL SLTY, LITHO TEXT, PR RESIST, WELL IND. BEDS 1"-3". |
| | | | | DOLOMITE, LT GRY WH WTHRS BSTY LT GRY: 6605'-7007' - T M GN GRY WTHRS BF GRY, MICRI-VF XL, REAL SKEL, SL SLTY, SUCC, TR 1/8"-1/4" VUGS, SL FETID. 6407'-6459' ON CAL VUGS FILLED/BUT STAIN, V RESIST, WELL IND. BEDS 3"-6". |
| | | 500 | | DOLOMITE, LT GRY TO M OLW WTHRS BUSTY BF GRNC; 4674'-5310' MICRI-CAL THIN SL SLTY, LBEG MOD CRACK STRUCTURE ON WTHRD |

UPPER ORDOVICIAN — MT KINDLE GROUP — RONNING

| SYSTEM AND SERIES | FORMATION | POROSITY TYPE | FOOTAGE |
|---|---|---|---|
| MIDDLE DEVONIAN | HUME | Good Poor | 300 200 100 0 |

| SECTION – | KNOB VALLEY | CODE – | G4-66-KV |
|---|---|---|---|
| LOCATION – | 69°07'W. – 129°43'N | SAMPLES – | 10' INTERVALS, BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY A<br>59 JACOBS STAFF |
| DATE – | JULY, 1966 | SCALE – | 1" = 100 FEET |

**60-1-S-46**

## FIELD DESCRIPTION

OVERLYING BEDS NOT EXPOSED.

LIMESTONE, BF TO M BRN WTHRS M GRY, MICRL-C SKEL (20-40%) V SL ARG, V SL SLTY, F-MV RESIST, WELL IND, VERY FOSS WITH ABDT CORAL FRAGS. BEDS 3"-6".

LIMESTONE, BF TO LT BRN WTHRS M GRY, MICRL-C SKEL (20-30%) V SL ARG, V SL SLTY, PETFD, V RESIST, WELL IND. BEDS 3"-6".

LIMESTONE, M BRN WTHRS RUSTY M GRY, MICRL-C SKEL (10%), V SL SLTY, V SL PETFD, F RESIST, WELL IND. TRILOBITE FRAGS.

COVERED

LIMESTONE, BF TO M BRN WTHRS M TO RUSTY GRY, MICRL-C SKEL (20%), SL PETFD, SL SLTY, F-MV RESIST, WELL IND, VERY FOSS WITH ABDT CORAL FRAGS. BEDS 6"-12".

20'6-30'0 MICRL, 40% C SKEL, V SL SLTY, TR SIL REPL FOS.
0'-20'6 MICRL, 10% SKEL, CALC FILLED FRAC.

UNDERLYING ROCKS COVERED

GEOPHOTO SERVICES LTD.

Plate 9

PAN AMERICAN PETROLEUM CORP.

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Plate 9

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | KNOB VALLEY | CODE – | GA-64-KV |
| LOCATION – | 64°01'N - 123°43'W | SAMPLES – | 10' INTERVALS, BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY A<br>5' JACOBS STAFF |
| DATE – | JULY, 1964 | SCALE – | 1" = 100 FEET |

60-1-5-46

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY Poor Fair Good Ex. | FIELD DESCRIPTION |
|---|---|---|---|---|---|
| MIDDLE DEVONIAN | HUME | | | | OVERLYING BEDS NOT EXPOSED. |
| | | 300 | | | LIMESTONE, BF TO M BRN WTHRS M GRY, MICXL, C SKEL (20-40$) V SL ARG, V SL SLTY, CALC FILLED FRACT, V FETID, V RESIST, WELL IND. BEDS 3"-6". |
| | | | | | LIMESTONE, BF TO LT BRN WTHRS M GRY, MICXL, C SKEL (20-30$) V SL ARG, V SL SLTY, FETID, V RESIST, WELL IND. BEDS 3"-6". ABDT CRIN FRAGS. |
| | | 200 | | | LIMESTONE, M BRN WTHRS RUSTY M GRY, MICXL, C SKEL (10$), V SL SLTY, V SL FETID, F RESIST, WELL IND. TRILOBITE FRAGS. BEDS 2'-3'. |
| | | | | | COVERED |
| | | | | | LIMESTONE, BF TO M BRN WTHRS M TO RUSTY GRY, MICXL, C SKEL (20$), SL FETID, SL SLTY, F-V RESIST, WELL IND, VERY FOSS WITH ABDT BRACS AND STROMS. 70'-90' MICXL, 20$ C SKEL, FETID, IREG BEDD 3"-6". |
| | | 100 | | | COVERED |
| | | | | | LIMESTONE, TAN BRN WTHRS LT TO M GRY, MICXL, MOD FOS, SL SLTY, F-V RESIST, WELL IND DECHENELLA FRAGS. BEDS 6"-12". 20'-60' MICXL, 40$ C SKEL, V SL SLTY, TR SIL REPL FOS. 0'-20' MICXL, 10$ SKEL, CALC FILLS FRAC. |
| | | 0 | | | UNDERLYING ROCKS COVERED |

DEPT. OF NORTHERN AFFAIRS & NATIONAL RESOURCES
CALGARY, ALBERTA
FEB 1 1965
OIL CONSERVATION ENGINEER
Northwest Territories & Yukon Territory

Plate 10

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | JUNCTION CREEK | CODE – | GA-64-JC |
| LOCATION – | 64°03'N, 123°49'W | SAMPLES – | 10' INTERVAL, BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY A<br>5' JACOBS STAFF |
| DATE – | JULY, 1964 | SCALE – | 1" = 100 FEET |

60-1-5-96

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY Poor Fair Good Ex. | FIELD DESCRIPTION |
|---|---|---|---|---|---|
| DEVONIAN MIDDLE | HUME | | | | OVERLYING ROCKS NOT EXPOSED |
| | | | | | LIMESTONE, DK OLV WTHRS M GRY, MICXL, C SKEL (30-40$), V SL ARG, MOD FOS SL FETID, MOD RESIST, WELL IND. BEDS 1'-5'. |
| | | 500 | | | LIMESTONE, M BRN WTHRS M-DK GRY, MICXL, C SKEL (15$ GRIN), V SL SLTY, MOD FOS, TRIL PYG, SL FETID, V RESIST, WELL IND. BEDS 2'-3'. |
| | | | | | LIMESTONE, LT-M BRN WTHRS LT-DK GRY, MICXL, C SKEL, V SL ARG, V SL SLTY, CALC FOS, TRIL PYG, V RESIST, WELL IND, BEDS 2'-3'. |
| | | | | | COVERED |
| | | | | | LIMESTONE, LT-M BRN WTHRS M-DK GRY, MICXL, SKEL (10$), V SL ARG, V SL SLTY FOS, V RESIST, WELL IND. BEDS 2"-6". |
| | | | | | COVERED |
| | | 400 | | | LIMESTONE, M BRN WTHRS DK GRY, MICXL, 20$ SKEL, V SL ARG, V SL SLTY, FOS, F RESIST, WELL IND, BEDS 4"-8", ABDT STROMS AT 400-405', |
| | | | | | COVERED |
| | | | | | LIMESTONE, M BRN WTHRS DK GRY, MICXL, SKEL, V SL ARG, V SL SLTY, MOD FOS. F-PR RESIST, WELL IND. BEDS 6"-12". |
| | | | | | COVERED |
| | | 300 | | | LIMESTONE, M BRN WTHRS DK BRN GRY, MICXL, C SKEL (60$), V SL ARG, V SL SLTY, PEL, SL FETID, F RESIST, WELL IND. BEDS 6"-8". |
| | | | | | LIMESTONE, M BRN WTHRS M GRY, MICXL, C SKEL, V SL ARG, V SL SLTY, MOD FOS, TRIL PYG, V RESIST, WELL IND. BEDS 6"-24". |
| | | | | | COVERED |
| | | 200 | | | LIMESTONE, M BRN WTHRS DK BRN GRY, MICXL, F-M PEL, V SL ARG, SL SLTY, PEL TEXT, SL FETID, V RESIST, WELL IND, BEDS 2'-3'. |
| | | | | | COVERED |
| | | 100 | | | LIMESTONE, DK TO M BRN WTHRS M GRY TO BRN, MICXL, V SL ARG, V SL SLTY, WELL IND. BEDS 1'-12".<br>125'-140' C SKEL (20$)<br>95' -100' ABDT OOL.<br>70' -125' PEL, C SKEL, SPRY CALC MTX, V SL FETID.<br>55' - 70' BIT FILLED FRAC AND BDD PLANES, 10$ UNIT GRIN, V FETID. |
| | | | | | LIMESTONE, LT TO DK BRN WTHRS DK BRN-M GRY, VF-F XL, V SL SLTY, V RESIST, WELL IND. BEDS 3"-12".<br>43'-55' BEDS 4"-6" LAM PELL(?), SL DOL(?).<br>30'-43' BEDS 3'-5' REXLC, C SKEL. |
| LOWER(?) DEVONIAN | BEAR ROCK | 0 | | | LIMESTONE, LT GRY BRN WTHRS LT TO M GRY, MIC GRN INTBDD MIC XL, SL SLTY, TR BIT, MINOR BREC ON STRIKE, V RESIST, WELL IND. |
| | | | | | UNDERLYING ROCKS COVERED |

DEPT OF NORTHERN AFFAIRS & NATIONAL RESOURCES
CALGARY ALBERTA
FEB 1 1965
Oil Conservation Branch
Northern Territories & Yukon Territory

Plate II

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | NORTH AMOS CREEK<br>AMOS CREEK | CODE – | GA-64-NAC<br>GA-64-AC |
| LOCATION – | 124006'W, 64001'N<br>124006'W, 63059'N | SAMPLES – | GA-6-NAC, 5' INTERVALS, BASE TO TOP<br>GA-6-AC, 10' INTERVALS, BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY A<br>5' JACOBS STAFF |
| DATE – | JULY, 1964. | SCALE – | 1" = 100 FEET |

60-1-5-46

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY Poor Fair Good | FIELD DESCRIPTION |
|---|---|---|---|---|---|
| MIDDLE DEVONIAN | UPPER HUME | 100 | | | **SECTION NAC**<br>SECTION NAC LOCATED 3 MILES NW OF SECTION AC<br>OVERLYING BEDS NOT EXPOSED<br>LIMESTONE, LT-M BRN WTHRS M GRY, MICXL, 20% C SKEL, V SL ARG, V SL SLTY, FOS, V RESIST, WELL IND, BEDS 6"-8", ABDT GASTROPODS. |
| | | 0 | | | LIMESTONE, M BRN WTHRS M GRY, MICXL, V SL ARG, V SL SLTY, CALC FILLED FRACT, FOS, SL FETID, V RESIST, WELL IND, BEDS UP TO 3'.<br>LIMESTONE, M BRN MOT WH WTHRS M GRY, MICXL, C SKEL (10-20%), SL ARG, V SL SLTY, SL FETID, BEDS 6"-1', ABDT GASTROPODS.<br>UNDERLYING ROCKS COVERED. BASE OF SECTION FAULTED. SECTION NAC PROBABLY REPRESENTS IN PART FAULTED AND MISSING UPPER PORTION OF HUME FROM SECTION AC BELOW. |
| | | | | | **SECTION AC**<br>OVERLYING BEDS NOT EXPOSED |
| | HUME | 1500 | | | LIMESTONE, DK OLV WTHRS RSTY GN BLK, VF-F XL, CALC FLD, FRACT, SL SIL, FOS, VERY RESIST, BEDS 6"-8". |
| | | 1400 | | | |
| | | 1300 | | | OVERLYING ISOLATED CARBONATE UNIT OUTCROPS 500' FURTHER WEST THAN UNDERLYING SHALE UNIT. INTERVENING COVERED INTERVAL PROBABLY FAULTED. |
| | | 1200 | | | |
| | HARE INDIAN | 1100 | | | |
| | | 1000 | | | SHALE, M GN GRY WTHRS RUSTY GN GRY, THN BDD, BLKY, SL CALC, SL SIL. |
| | | 900 | | | |
| | | 800 | | | OVERLYING 3' ISOLATED SHALE OUTCROP IS SEPARATED FROM UNDERLYING HUME BY A 500' COVERED AND FAULTED INTERVAL. |
| | | 700 | | | |
| | | 600 | | | |
| | | 500 | | | TOP OF SECTION FAULTED. |
| | HUME | 400 | | | LIMESTONE, M OLV-DK GRY WTHRS RSTY DK GRY TO BUFF, MICXL, 5-10% C SKEL, SL SLTY, SL SIL, V SL ARG, F-V RESIST, WELL IND, BEDS 6"-3'.<br>450'-495' UNIT 40% FAULT BRECCIA, FRAGS 1"-4".<br>COVERED<br>LIMESTONE, M OLV-LT M BRN WTHRS DK OLV TO RSTY ORNG, MICXL, TR SKEL, MOD FOS, V SL ARG, SL SIL, F-PR RESIST, PR-WELL IND, 60% BREC, CALC MTX, FAULT BRECCIA.<br>COVERED |
| | | 300 | | | LIMESTONE, GRY TO DK OLV GN WTHRS TAN-DK GRY, MICXL, PEL, BLEBS, V SL ARG, V SL SLTY, SL SIL, MOD TO V RESIST, WELL IND, BEDS 1"-3', ROCK POWDER AT 350'-360'.<br>LIMESTONE, DK OLV GRY WTHRS M-DK GRY, MICXL-MICGRN, V SL ARG, SL SLTY, 10-15% CALC FILLED FRACT, TR PYR, V RESIST, WELL IND. BEDS 6"-2'.<br>LIMESTONE, OLV GRY WTHRS M-DK GN GRY, MICGRN-MICXL, V RESIST, WELL IND. BEDS 6"-12".<br>240'-250' V SL ARG, SL FETID, 210'-240' SL SLTY, V SL DOLO(?). |
| | | 200 | | | LIMESTONE, LT GN TO M GRY WTHRS RSTY GRY, V F XL, TR SKEL, V SL SLTY, PART BREC AT 190', V RESIST, WELL IND. BEDS 2"-6". |
| LOWER(?) DEVONIAN | BEAR ROCK | 100 | | | LIMESTONE, LT GRY-M GY BRN WTHRS DK GRY-BLK, MICGRN-VF XL, SUBRD KLS, SL SLTY, PART DOL, V RESIST, WELL IND. BEDS 2"-5'.<br>LIMESTONE, M DK TO LT GRY WTHRS DK TO MED GRY, V SL ARG, V SL SLTY, BREC IN PART.<br>120'-150' BDD (80%) MICXL-MICGRN, BREC (20%) MICGRN.<br>70'-120' BDD (40%) MICXL, BREC (60%) MICGRN. |
| | | 0 | | | LIMESTONE, DK BRN WTHRS DK GRY-BLK, MICXL, BREC, V SL ARG, V SL SLTY, FRAGS 4"-3', V RESIST, F-WELL IND.<br>LIMESTONE, LT-DK GRY WTHRS M-DK GRY, MICXL-MICGRN, BREC, V SL ARG, SL SLTY, FRAGS 4"-2", RARE FRAGS UP TO 2'. V RESIST, WELL IND.<br>SECTION CONTINUES IN FOLDED AND FAULTED BEAR ROCK STRATA |

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Plate 12

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | DRY CREEK NORTH<br>DRY CREEK | CODE – | GB-64-DC$_N$<br>GB-64-DC |
| LOCATION – | 123045$^W$ – 64011$^N$<br>123042$^W$ – 64012$^N$ | SAMPLES – | 10$^'$ INTERVALS, BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY 8<br>5$^V$ JACOBS STAFF |
| DATE – | JULY, 1964. | SCALE – | 1$^"$ = 100 FEET |

60-1-5-46

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPES | FIELD DESCRIPTION |
|---|---|---|---|---|
| DEVONIAN MIDDLE | HUME | 200 | | **SECTION DC$_N$**<br>SECTION DC$_N$ MEASURED 2 MILES NORTH OF SECTION DC<br>OVERLYING BEDS NOT EXPOSED. |
| | | | | LIMESTONE, DK GRY WTHRS LT GRY TO BUFF, F XL, SL ARG, SL SLTY, MOD RESIST, WELL IND. BEDS 1$^"$-6$^"$. |
| | | | | LIMESTONE, DK GRY WTHRS LT GRY TO BUFF, F XL, SL ARG, MOD RECES, WELL IND. 150$^'$-160$^'$ SL SLTY, V RESIST. BEDS 2$^"$-18$^"$. |
| | | 100 | | LIMESTONE, DK GRY WTHRS LT GRY TO BUFF, F XL, SL SLTY, PEL. MOD TO V RESIST, WELL IND, SL PETID, MOD FRACT, CALC FILL. BEDS 6$^"$-24$^"$. |
| | | | | LIMESTONE, DK GRY WTHRS LT GRY TO BUFF, V F XL TO F XL, SL SLTY, PEL, V RESIST, WELL IND. BEDS 6$^"$-18$^"$. PARTIALLY COVERED. |
| | | | | COVERED |
| | | 0 | | LIMESTONE, DK GRY WTHRS LT GRY TO BUFF, F XL, SL SLTY, PEL, V RESIST, WELL IND. BEDS 12$^"$-24$^"$. |
| | | | | UNDERLYING ROCKS COVERED. BASE OF OVERLYING SECTION DC$_N$ APPROX EQUIVALENT TO +2235$^'$ (BASE OF HUME) INTERVAL IN UNDERLYING SECTION DC. |
| | | | | **SECTION DC** |
| | | 2400 | | OVERLYING BEDS NOT EXPOSED. |
| | | | | LIMESTONE, DK GRY WTHRS MED TO LT GRY TO BUFF, F XL WITH TOP 15$^'$ F XL TO M XL, SL SLTY, V RESIST, WELL IND, FOS. 2350$^'$-2365$^'$ MOD ARG, PEL, MED TO POOR RESIST. BEDS 1$^"$-16$^"$. |
| | | | | LIMESTONE, DK GRY WTHRS DK TO MED GRY, V F XL TO F XL, MOD ARG THIN LAM, MOD RECES, FAIR TO WELL IND, FORMS SWALE. PARTLY COVERED. |
| | | 2300 | | LIMESTONE, DK TO MED GRY WTHRS DK TO LT GRY TO BUFF, F XL, MOD, PEL, SL FOS, V RESIST, WELL IND, SL SLTY. 2285$^'$-2286$^'$ THIN LAM, MOD ARG. BEDS 2$^"$-12$^"$. 2268$^'$-2285$^'$ SL SDY. |
| | | | | LIMESTONE, DK TO MED GRY WTHRS MED GRY TO BUFF, V F XL TO F XL, PEL, SKEL, SL SIL, MOD TO V RESIST, WELL IND. BEDS 1$^"$-12$^"$. |
| | | | | COVERED |
| DEVONIAN LOWER (?) | BEAR ROCK | 2200 | | LIMESTONE, MED TO LT GRY WTHRS LT GRY, F XL, BREC, MOD RESIST, MOD WELL IND, 40$ FRAGS, ANG TO SUB ANG, 1$^"$-4$^"$, 60$ MATRIX, SL FRI. FORMS HOGBACK. |
| | | 2100 | | LIMESTONE, MED TO LT GRY WTHRS LT GRY, F XL, BREC, MOD RESIST, MOD TO POOR IND, 40$ FRAGS, AND, 1/8$^"$-3$^"$, 60$ MATRIX SL LESS RESIST FRAGS. FORMS SWALE. |
| | | 2000 | | LIMESTONE, MED TO LT GRY WTHRS LT GRY TO BUFF BRN, BREC, F XL, MOD RESIST, FAIR TO WELL IND. 30$ ANG FRAGS, 70$ MATRIX. ERODED IRG CAVERNS. FORMS HOGBACK. |
| | | 1900 | | LIMESTONE, MED TO LT GRY WTHRS MED TO LT GRY, BREC, 40$ FRAGS, F XL TO M XL, 1/8$^"$-4$^"$, LCHD FRAGS FILLED CALC XLS. MOD RESIST, FAIR TO WELL IND, MATRIX 60$, F XL, SL LESS RESIST FRAGS, FAIR TO POOR IND, LCHD FRAGS GIVE POCKMARKED SURF. FORMS SWALE. |
| | | 1800 | | |
| | | 1700 | | LIMESTONE, LT GRY TO BUFF WTHRS LT GRY TO BUFF, BREC, F XL, MOD RESIST, 70$ MATRIX, POOR IND, FRI TEST, SL LESS RESIST THAN FRAGS. FRAGS 30$ ANG 1$^"$-4$^"$. POCKMARKED SURFACE DUE TO LCHD FRAGS. ERODES IRG CAVERNS, FORMS HOGBACK. |
| | | 1600 | | COVERED |
| | | | | DOLOMITE, LT GRY TO BUFF WTHRS LT GRY, F XL, SL ARG, ABNT MINOR FRACT, MOD RESIST, WELL IND. BEDS 2$^"$-3$^"$. |
| | | 1500 | | COVERED |
| | | | | DOLOMITE, LT GRY WTHRS LT GRY, VF XL-F XL, MOD ARG, SL SLTY, MOD RESIST, WELL IND. BEDS 2$^"$-4$^"$. |
| | | 1400 | | COVERED |
| | | | | DOLOMITE, MED TO LT GRY WTHRS MED TO LT GRY, F XL, SL SIL, V RESIST, WELL IND. BEDS 6$^"$-18$^"$. |
| | | 1300 | | 1340$^'$-1350$^'$ V F XL-F XL, MOD ARG WELL IND, MOD RECES. BEDS 1$^"$-2$^"$. |
| | | | | COVERED |
| | | 1200 | | DOLOMITE, MED TO LT GRY WTHRS MED TO LT GRY, F XL, SL SLTY, WELL IND, V RESIST, SL FOS, TOP 60$ MOD SIL. BEDS 2$^"$-12$^"$. |
| | | | | 1150$^'$-1190$^'$ V F XL TO F XL, SL ARG, MOD RECES, PLATY, THN BEDDED. |
| | | 1100 | | 1040$^'$-1070$^'$ SL ARG, MOD RECES, PARTLY COVERED. |
| ORDOVICIAN UPPER | GROUP MT. KINDLE | 1000 | | DOLOMITE, DK TO LT GRY WTHRS DK TO LT GRY, F XL WITH TOP 18$^'$ V F XL TO F XL, SL SIL, V RESIST, WELL IND, SL FOS, SL SLTY. 2$ CHT BANDS UP TO 1$^"$. BEDS 2$^"$-24$^"$. |
| | | 900 | | 820$^'$-860$^'$ SL ARG MOD RECES. BEDS 1$^"$ TO 2$^"$. RECESSIVE, PARTIALLY COVERED. |
| | | 800 | | |
| | | 700 | | DOLOMITE, DK TO LT GRY, WTHRS MED GRY TO BUFF, F XL, MOD TO SL SLTY, MOD TO V SIL, 5$ CHT BANDS AND MOD FOS. BEDS 2$^"$-12$^"$. |
| | | 600 | | 590$^'$-660$^'$ SL PETID. |
| | | | | 520$^'$-580$^'$ MOD TO ABDT PEL, SIL SKEL, SL CALC. |
| | | 500 | | 500$^'$-520$^'$ 1/4$^"$-2$^"$ TN CHT BANDS (5$), RARE SIL FAVOSITIES CORAL. |
| ORDOVICIAN | RONNING | 400 | | DOLOMITE, DK TO MED GRY WTHRS LT GRY TO BUFF, F XL, MOD SIL, SL FOS, V RESIST, WELL IND. BEDS 2$^"$-24$^"$, SMALL VUGS. |
| | | | | 360$^'$-410$^'$ SL ARG, HIGHLY FRACT. |

Plate 13

# PAN AMERICAN PETROLEUM CORP.

SECTION – FLOWER MOUNTAIN
LOCATION – 64°18'N, 129°54'W
PROVINCE – N.W.T.
DATE – JULY, 1964.

CODE –
SAMPLES – 1' & 10' INTERVALS, BASE TO T.
MEASURED BY – GEOPHOTO PARTY 8
S/F JACOB STAFF
SCALE – 1" = 100 FT.

GREEN-FM

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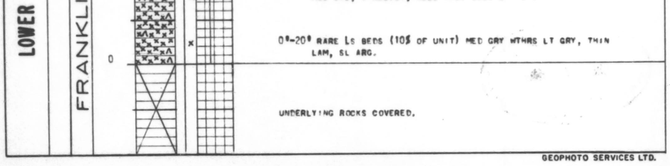
60-1-5-46

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY Poor Fair Good | FIELD DESCRIPTION |
|---|---|---|---|---|---|
| MIDDLE DEVONIAN | HUME | 2100 | | | OVERLYING BEDS NOT EXPOSED |
| | | | | | LIMESTONE, DK GRY, WTHRS MED TO LT GRY, V F XL TO F XL, SL ARG, V RESIST, WELL IND, MOD FRACT WITH MFR STYLOLITES, BEDS 3" TO 12" |
| | | 2000 | | | LIMESTONE, DK TO MED GRY, WTHRS MED TO LT GRY, F XL, SL ARG, SL SILTY, 5% FOS, MOD TO POOR RESIST, FAIR IND, BEDS 2M TO 3M. PARTIALLY COVERED. |
| | | | | | LIMESTONE, DK GRY, WTHRS LT GRY TO BUFF, V F XL TO F XL, 2% SIL FOS, BEDS 6" TO 18" V RESIST, WELL IND, 2% SIL FOS, MOD TO POORLY RESIST, FAIR IND, FORMS MINOR SMALL LEDGES |
| | | | | | LIMESTONE, MED TO LT GRY WTHRS LT GRY TO BUFF, F XL, SL ARG, MOSTLY V RESIST, WELL IND, BEDS 1M TO 2M |

PAN AMERICAN PETROLEUM CORP.

| SYSTEM | SERIES | FORMATION | MEMBER | FOOTAGE | LITHOLOGY | DESCRIPTION |
|---|---|---|---|---|---|---|
| DEVONIAN | LOWER(?) | BEAR ROCK | | 2000 | | LIMESTONE, MED TO LT GRY WTHRS LT GRY TO BUFF BRN, BREC, F FL; MOD RESIST, FAIR TO WELL IND, 30% ANG FRAGS, 70% MATRIX. ERODED IRG CAVERNS, FORMS HOGBACK. |
| | | | | 1900 | | LIMESTONE, MED TO LT GRY WTHRS MED TO LT GRY, BRECC, NOS FRAGS, F XL TO M XL, 1/8"-4", LCHD FRAGS FILLED &/OR ALTERED TO DOL, 30% FRAGS, F XL, SL LESS RESIST THAN FRAGS, 70% MATRIX, FINE TO MED XL, SL LESS RESIST, FAIR TO POOR IND, LCHD FRAGS GIVE POORMARKED SURF. FORMS SHALE. |
| | | | | 1800 | | LIMESTONE, LT GRY TO BUFF WTHRS LT GRY TO BUFF, BREC, F XL, MOD RESIST, 70% MATRIX, POOR IND, PRONOUNCED TEXT, LESS RESIST THAN FRAGS. FRAGS 30% AND 1"-4", PORPHYRIED DUE TO LCHD FRAGS. ERODES IRG CAVERNS, FORMS HOGBACK. |
| | | | | 1700 | | COVERED |
| | | | | 1600 | | DOLOMITE, LT GRY TO BUFF WTHRS LT GRY, F XL, SL ARG, ABNT MINOR FRACT, MOD RESIST, WELL IND, BEDS 2M-3M. |
| | | | | 1500 | | COVERED |
| | | | | 1400 | | DOLOMITE, LT GRY WTHRS LT GRY, VF XL-F XL, MOD ARG, SL SILTY, MOD RESIST, WELL IND, BEDS 2"-4". |
| | | | | 1300 | | COVERED |
| | | | | 1200 | | DOLOMITE, MED TO LT GRY WTHRS MED TO LT GRY, F XL, SL SILTY, WELL IND, BEDS 6"-18". 1340'-1350' V F XL-F XL, MOD ARG WELL IND, MOD RECES. BEDS 1M-2M. |
| | | | | 1100 | | COVERED |
| | | | | 1000 | | DOLOMITE, MED TO LT GRY WTHRS MED TO LT GRY, F XL, SL SILTY, WELL IND, V RESIST, SL FOS, TOP 60' MOD SIL. BEDS 2M-3M. 1150'-1190' V F XL TO F XL, SL ARG, MOD RECES, PLATY, THN BEDDED. |
| | | | | 900 | | 1040'-1070' SL ARG, MOD RECES, PARTLY COVERED. |
| | | | | 800 | | DOLOMITE, DK TO LT GRY WTHRS DK TO LT GRY, F XL WITH TOP 10' V F XL TO F XL, SL SIL, V RESIST, WELL IND, SL FOS, 25 CHT BANDS UP TO 1M. BEDS 2M-3M. |
| | | | | 700 | | 820'-860' SL ARG, MOD RECES. BEDS 1M TO 2M. RECESSIVE, PARTIALLY COVERED. |
| | | | | 600 | | DOLOMITE, DK TO LT GRY, WTHRS MED GRY TO BUFF, F XL, MOD TO SL SILTY, MOD TO V SIL, 5% CHT BANDS AND MOD FOS. BEDS 2M-12M. |
| | | | | 500 | | 500'-660' SL PETID. 520'-580' MOD TO ABDT PEL, SIL SKEL, SL CALC. 500'-520' 3M-2M TH CHT BANDS (5%), RARE SIL FAVOSITIES CORAL. |
| | | | | 400 | | DOLOMITE, DK TO MED GRY, WTHRS LT GRY TO BUFF, F XL, MOD TO SL SILTY, MOD TO V SIL, 5% CHT BANDS, V RESIST, WELL IND, BEDS 2M-12M, SMALL VUGS. |
| | | | | 300 | | 360'-410' SL ARG, HIGHLY FRACT. |
| | | | | 200 | | 290'-360' LT GRY WITH OCC PINK BANDS WTHRS LT GRY TO BUFF, VF TO F XL, MOD SIL, SL SILTY, V RESIST, WELL IND, BEDS 2M-4M. |
| | | | | 100 | | DOLOMITE, MAR TO BRN WTHRS MAR BRN TO BUFF, F XL, SL SDY (3% QTZ GRS), MOD SIL, V RESIST, WELL IND, BEDS 2M-4M. |
| | | | | 0 | | 1140'-1150' DOL, LT GRY WTHRS LT GRY TO BUFF, F XL, MOD SIL, MOD RESIST, WELL IND, RARE INTBD BRN TO PINK DOL, PLATY, LAM. |
| | | | | | | DOLOMITE, DK TO LT GRY, WTHRS TO BUFF TO BRN, MOTTLED, F XL, SL SILTY, MOD SIL, V RESIST, WELL IND, BEDS 2"-12". |
| | | | | | | 0'-20' BARE LS BEDS (10% OF UNIT) MED GRY WTHRS LT GRY, THIN LAM, SL ARG. |
| | | | | | | UNDERLYING ROCKS COVERED. |

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Plate 13

# PAN AMERICAN PETROLEUM CORP.

SECTION – FLOWER MOUNTAIN
LOCATION – 64°18'N, 123°54'W
PROVINCE – N.W.T.
DATE – JULY, 1964.

CODE – GB-64-FM
SAMPLES – 10' INTERVALS, BASE TO T.D.
MEASURED BY – GEOPHOTO PARTY 6
5' JACOB STAFF
SCALE – 1" = 100 FT.

60-1-5-46

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY Poor Fair Good | FIELD DESCRIPTION |
|---|---|---|---|---|---|
| MIDDLE DEVONIAN | HUME | 2100 | | | OVERLYING BEDS NOT EXPOSED |
| | | | | | LIMESTONE, DK GRY, WTHRS MED TO LT GRY, V F XL TO F XL 3% SLT, 3% FOS, V RESIST, WELL IND, MOD FRACT WITH "FE" STAIN. BEDS 3" TO 12". |
| | | | | | LIMESTONE, DK TO MED GRY WTHRS MED TO LT GRY, F XL, SL ARG, SL SLTY, 5% FOS, MOD TO POOR RESIST, FAIR IND, BEDS 2" TO 3". PARTIALLY COVERED. |
| | | 2000 | | | LIMESTONE, DK GRY WTHRS LT GRY TO BUFF, V F XL TO F XL, 2% SLT, PEL TEXT, V RESIST, WELL IND, 2% SIL FOS, BEDS 6" TO 18". |
| | | | | | LIMESTONE, MED TO LT GRY WTHRS LT GRY TO BUFF, F XL, SL ARG, MOD TO POORLY RESIST, FAIR IND, FORMS MINOR SWALE. BEDS 1" TO 2". |
| | | | | | LIMESTONE, MED GRY WTHRS LT GRY, V RESIST, F XL, WELL IND, SL SLTY, PEL TEXT, MOD SIL, 3% SIL FOS. FORMS PROM HOODBACK. BEDS 2" TO 6". |
| LOWER (?) DEVONIAN | BEAR ROCK | 1900 | | | LIMESTONE, MED TO LT GRY WTHRS LT GRY TO BUFF, F XL, BREC 30% Ls FRAGS, 10% DOL FRAGS AND 60% MATRIX. FRAGS MED RESIST AND MOD WELL IND MATRIX MOD RESIST AND POOR TO MOD WELL IND. FRAGS UP TO 2" LEACH OUT TO GIVE ROCK MARKED APPEARANCE. TOP OF UNIT PARTIALLY COVERED. |
| | | 1800 | | | LIMESTONE, DK TO MED GRY WTHRS MED TO LT GRY, F XL, BREC, 35% LS FRAGS AND 5% DOL FRAGS 60% MATRIX, SLIGHTLY LESS RESIST THAN FRAGS. FRAGS UP TO 3". MOD RESIST, MOD WELL IND. |
| | | 1700 | | | |
| | | 1600 | | | LIMESTONE, DK TO MED GRY WTHRS DK TO LT GRY BUFF, F XL BREC 40% FRAGS 60% MATRIX. MASSIVE, MOD RESIST, FAIR TO WELL IND. RUBBLY EROSION SURFACE, FRAGS UP TO 6". ERODES INTO CAVERNS AND QCC PINNACLES. MATRIX SL LESS RESIST THAN FRAGS. |
| | | 1500 | | | 1460-1540' LIMESTONE, LT GRY TO BUFF WTHRS LT GRY TO BUFF, BREC M XL, MOD RESIST. INTERVAL ABOVE 1460' MEASURED 3/4 MILE NORTH OF IMMEDIATELY UNDERLYING SEQUENCE. |
| UPPER ORDOVICIAN | RONNING GROUP MT. KINDLE | 1400 | | | DOLOMITE, MED GRY WTHRS MED TO LT GRY, F XL, SL ARG, SL SLTY, 30% DK GRY WTHRS MED GRY FISS SHALE PARTINGS. MOD RECESSIVE, WELL IND. BEDS 2" TO 6", PARTIALLY COVERED. |
| | | | | | INTERVAL 1300-1460' MEASURED 3/4 MILE FURTHER SOUTH THAN UNDERLYING 1070-1300' SEQUENCE. |
| | | 1300 | | | |
| | | 1200 | | | DOLOMITE, LT TO MED GRY WTHRS LT TO MED GRY, V F XL TO F XL, V SIL, V RESIST, WELL IND, 1190-1300' MOD FRACT WITH CALC FILLING, 1190-1210' BEDS THINLY LAM. BEDS 2" TO 12". |
| | | 1100 | | | INTERVAL 1070-1300' MEASURED 1/4 MILE SOUTH OF UNDERLYING SECTION. |
| | | 1000 | | | DOLOMITE, LT GRY TO BUFF WTHRS LT GRY TO BUFF BRN, F XL, 2% DK GRY WTHRING MED GRY, FISS SH PARTINGS, MOD RESIST, FAIR TO WELL IND, SL ARG, BASAL 40' PARTIALLY COVERED. BEDS 1" TO 6". |
| | | 900 | | | DOLOMITE, DK GRY TO MED GRY WTHRS DK GRY TO LT GRY, F XL TO M XL, MOD TO V RESIST, FAIR TO WELL IND, MOD SIL, 15 TO 35 CHT NOD, 680-690' SL ARG, 630-680' SL FETID ON FRS FRACT. BEDS 2" TO 18". |
| | | 800 | | | |
| | | 700 | | | |
| | | 600 | | | DOLOMITE, MED TO DK GRY WTHRS DK GRY TO LT GRY TO BUFF, F XL, MOD TO V SIL, X5-7% RECRYSTALLIZED FOS, DK GRY CHT NOD IN BASAL PART, BUFF CHT NOD NEAR TOP. MOD TO V RESIST, WELL IND. BEDS 2" TO 18". |
| | | 500 | | | |
| LOWER AND/OR MIDDLE ORDOVICIAN | FRANKLIN MOUNTAIN | 400 | | | COVERED |
| | | | | | DOLOMITE, MED GRY WTHRS MED TO DK GRY, F XL, V RESIST, WELL IND, MOD SIL DK GRY, CHT BNDS UP TO 2". BEDS 6" TO 12". |
| | | | | | COVERED |
| | | 300 | | | DOLOMITE, MED TO LT GRY WTHRS MED GRY TO BUFF, F XL AT BASE GRADING UPWARD TO M XL, SL ARG, MOD SIL, MOD RESIST, MOD WELL IND. BEDS 2"-12". |
| | | | | | COVERED |
| | | 200 | | | DOLOMITE, MOT MED GRY TO PINK WTHRS MED GRY TO BUFF ORNG, F XL TO M XL, MOD TO V SIL, V RESIST, WELL IND. MINOR CHT BNDS, SL SLTY NEAR TOP. BEDS 2" TO 18". |
| | | 100 | | | DOLOMITE, LT GRY TO BUFF WTHRS LT GRY TO BUFF, V F XL TO F XL MOD SIL, MINOR CHT NODULES IN 2' BED 130-132' INTERVAL. MOD TO V RESIST, WELL IND. BEDS 2" TO 12". |
| | | 0 | | | UNDERLYING ROCKS COVERED. |

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Plate 14

# PAN AMERICAN PETROLEUM CORP.

SECTION – BIG SMITH — CODE – GB-64-85

LOCATION – 124° 27' W, 64° 40' N — SAMPLES – 10' INTERVALS, BASE TO TOP

PROVINCE – N.W.T. — MEASURED BY – GEOPHOTO PARTY 8

DATE – JULY, 1964 — SCALE – 1" = 100 FEET — 5th JACOBS STAFF

60-/-S-46

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | FIELD DESCRIPTION |
|---|---|---|---|---|
| MIDDLE DEVONIAN | HUME | 300 | | OVERLYING BEDS NOT EXPOSED |
| | | | | LIMESTONE, DK GRY, WTHRS LT GRY TO BUFF, VF XL TO F XL, 25 FOS, SL SLTY, NUMEROUS MINOR FRACT, MOD RESIST, WELL IND; BEDS 6" TO 2M. |
| | | | | COVERED |
| | | 200 | | LIMESTONE, DK GRY WTHRS LT GRY TO BUFF, V F XL TO F XL, MOD ARG, MOD RESIST, ABT MINOR FRACT, BEDS 12"-18". |
| | | | | COVERED |
| | | | | LIMESTONE, DK GRY WTHRS MED GRY, F XL, MOD ARG, SL SLTY, MOD RESIST, WELL IND; BEDS 2M. |
| | | 100 | | COVERED |
| | | | | LIMESTONE, DK GRY WTHRS MED GRY TO BUFF, V F XL TO F XL, 25 FOS, SL SLTY, MOD RESIST, FAIR TO WELL IND, PARTIALLY COVERED. |
| | | | | COVERED |
| | | | | LIMESTONE, TN GRY TO PINK, BUFF, V F XL TO F XL, 10% FOS, V BRITTLE, MOD RESIST, WELL IND; BEDS 2"-18". |
| | | | | LIMESTONE, DK TO MED GRY WTHRS MED GRY TO BUFF, V F XL, 5-15% FOS, SL SLTY, MOD RESIST, WELL IND; BEDS 2M-6M, 70-80% MICRITY FRACT. |
| | | | | SHALE, DK GRY WTHRS BUFF, FISSILE, CALC, RECESSIVE, 1/4 OF CLIFF. |
| | | | | COVERED |
| | | 0 | | LIMESTONE, DK GRY WTHRS LT GRY TO BUFF, F XL TO M XL, FOS, PEL, CHERTY ALTERNATING THIN BEDS (6"-1M) WITH 1M-2M FOSS, CALC SH LAYERS, 10% FOS, 10M-6M INTERVAL. |
| | | | | UNDERLYING ROCKS COVERED. |

1967

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Plate 14

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | BIG SMITH | CODE – | GB-64-BS |
| LOCATION – | 124° 27' W, 64° 40' N | SAMPLES – | 10' INTERVALS, BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY 8<br>5' JACOBS STAFF |
| DATE – | JULY, 1964 | SCALE – | 1" = 100 FEET |

60-1-5-46

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY Poor Fair Good Ex | FIELD DESCRIPTION |
|---|---|---|---|---|---|
| | | | | | OVERLYING BEDS NOT EXPOSED |
| | | 300 | | | LIMESTONE, DK GRY, WTHRS LT GRY TO BUFF, VF XL TO F XL, 2$ FOS, SL SLTY, NUMEROUS MINOR FRACT, MOD RESIST, WELL IND. BEDS 6" TO 24". |
| | | | | | COVERED |
| | | | | | LIMESTONE, DK GRY WTHRS DK GRY, F XL, MOD ARG, MOD RESIST, WELL IND, ABDT MINOR FRACT, BEDS 12"-18". |
| | | 200 | | | COVERED |
| | | | | | LIMESTONE, DK GRY WTHRS LT GRY TO BUFF, V F XL TO F XL, 2$ FOS, SL SDY MOD RESIST, WELL IND, BEDS 2" |
| | | | | | COVERED |
| | | | X | | LIMESTONE, DK GRY WTHRS MED GRY, F XL, MOD ARG, SL SLTY, MOD RESIST, FAIR TO WELL IND, PARTIALLY COVERED. |
| | | | | | COVERED |
| MIDDLE DEVONIAN | HUME | 100 | X | | LIMESTONE, DK GRY WTHRS BUFF, V F XL TO F XL, 10$ FOS, V RESIST, WELL IND, SL FETID, SL SLTY, SL ARG, PEL. BEDS 2"-18". |
| | | | U | | LIMESTONE, DK TO MED GRY WTHRS MED GRY TO BUFF, V F XL TO F XL 5-15$ FOS, SL SLTY, MOD RESIST, WELL IND. BEDS 2"-8", 70-80$ HIGHLY FRACT. W TH OCC CALC, 60-70$ MOD ARG. INCL TRILOB, BEDS 2"-4". |
| | | | U | | SHALE, DK GRY WTHRS BUFF, FISS, CALC, RECESSIVE .1' DK GRY, FOS, LS BED AT BASE. |
| | | | | | COVERED |
| | | 0 | U | X | LIMESTONE, DK GRY WTHRS LT GRY TO BUFF, F XL TO M XL, FOS, PEL, 0-10' ALTERNATING 1"-2" LS BEDS (60$) WITH 1"-2" FISS, CALC SH (40$), 10$ FOS 10'-18' INTERVAL. |
| | | | | | UNDERLYING ROCKS COVERED. |

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CALGARY, ALBERTA
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OIL CONSERVATION ENGINEER
Northwest Territories & Yukon Territory

Plate 15

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | CHARLES SOUTH | CODE – | GB-64-CS |
| LOCATION – | 124° 33' W, 64° 49' N | SAMPLES – | 10' INTERVALS, BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY 8 5' JACOBS STAFF |
| DATE – | JULY, 1964 | SCALE – | 1" = 100 FEET |

60-1-5-46.

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY Poor Fair Good Ex. | FIELD DESCRIPTION |
|---|---|---|---|---|---|
| MIDDLE DEVONIAN | HUME | 2200 | | | OVERLYING BEDS NOT EXPOSED |
| | | 2100 | | | LIMESTONE, MED GRY WTHRS BUFF, MIC XL TO F XL, SL SLTY, MOD FOS, NUM CALC FILL FRACT, V RESIST, WELL IND. BEDS 4"-5'. |
| | | | | | LIMESTONE, DK GRY WTHRS MED TO LT GRY, V F XL TO F XL, SL SLTY, MOD FOS, RARE PYR NUM CALC FILL FRACT, MOD TO V RESIST, WELL IND. BEDS 2"-4'. |
| | | | | | 2055'-2075' PARTLY COVERED |
| | | 2000 | | | LIMESTONE, DK GRY WTHRS MED GRY, MIC XL TO F XL, SL SLTY, MOD FOS, SKEL IN PART, MOD RESIST, WELL IND. BEDS 2"-4". |
| | | | | | 2005'-2015' F XL TO M XL. PARTLY COVERED |
| | | | X | | 1955'-1965' LT GRY WTHRS BUFF, M XL TO F XL, SL SLTY, MOD FOS, V RESIST, WELL IND. BEDS 2"-4". PARTLY COVERED. |
| | | 1900 | U | | LIMESTONE, MED TO DK GRY WTHRS LT GRY TO BUFF, F XL, SL SLTY, MOD TO V RESIST, WELL IND MOD FOS. BEDS 2"-4". |
| | | | | | 1915'-1955' PARTLY COVERED |
| LOWER (?) DEVONIAN | BEAR ROCK | | | | COVERED |
| | | 1800 | | | LIMESTONE, MED TO LT GRY WTHRNG LT GRY TO BUFF ORNG, F XL, BREC, 70$ MATRIX, 30$ FRAGS UP TO 5", MOD RESIST, FAIR TO WELL IND. ERODES INTO CAVERNS AND PINNACLES. MATRIX SL LESS RESIST THAN FRAGS. RARE CLAY BALL (UP TO 2") FRAGS. |
| | | 1700 | | | |
| | | 1600 | | | LIMESTONE, DK GRY TO BUFF WTHRS DK GRY TO BUFF, F XL, BREC, 40$ FRAGS, 60$ MATRIX, MOD TO POORLY RESIST, FAIR TO WELL IND, FRAGS UP TO 12", SL MORE RESIST THAN MATRIX. |
| | | | | | 1520'-1640' ERODES SMALL CAVERNS AND PINNACLES. LOWD OUT FRAGS POCKMARKED APPEARANCE. MAJOR FRAC INDICATE FAULT ZONE. |
| | | 1500 | | | 1450'-1520' PARTLY COVERED DUE TO SOL COLLAPSE. |
| | | 1400 | | | LIMESTONE, MED GRY TO BUFF WTHRS BUFF ORNG, F XL BREC 40$ ANG FRAGS UP TO 12", 60$ MATRIX SL LESS RESIST. UNIT FAIR TO MOD WELL IND. MAS UNIT ERODES INTO CAVERNS AND PINNACLES. |
| | | 1300 | | | |
| | | 1200 | | | LIMESTONE, LT TO DK GRY WTHRS LT GRY TO BUFF, F XL, BREC, 60$ MATRIX, 40$ FRAGS, MOD RESIST, FAIR TO MOD IND, FRAGS UP TO 12". |
| | | | | | 1250'-1280' CALC SH, DK GRY, FISS, ANG FRAGS UP TO 3". |
| | | | | | 1140'-1250' RARE CLAY BALL FRAGS UP TO 2" DIAM. |
| | | 1100 | | | COVERED |
| | | 1000 | | | |
| | | 900 | | | LIMESTONE, DK TO LT GRY WTHRS LT GRY TO BUFF, F XL, BREC, 60$ LS MATRIX, 30$ LS FRAGS, 10$ DOL FRAGS. MOD RESIST, MOD WELL IND. FRAGS VARY FROM 1/8"-6" LONG. NUM SECONDARY VUGS WITH GROWTH OF CALC XLS. MATRIX SLIGHTLY LESS RESIST THAN FRAGS. LEACHED OUT FRAGS GIVE POCKMARKED EROSIONAL SURFACE. |
| | | 800 | | | |
| | | | | | COVERED |
| UPPER ORDOVICIAN | MT. RONNING GROUP KINDLE | 700 | X | | DOLOMITE, DK GRY TO BUFF WTHRS MED TO DK GRY, F XL, SL SLTY, MOD SIL, V RESIST, WELL IND. BEDS 2"-12". |
| | | | X | | 765'-755' PARTIALLY COVERED. |
| | | | | | COVERED |
| | | 600 | X | | DOLOMITE, MED TO LT GRY WITH OCC PINK TINT, WTHRS MED GRY TO BUFF, V F XL TO F XL, MOD SIL, V RESIST, MOD TO WELL IND. BEDS 2"-12". |
| | | | X | | 655'-675' MOD SILTY. |
| | | | X | | 565'-655' 20$ CHT BANDS AND NOD. |
| | | 500 | X | | DOLOMITE, MED TO LT GRY WTHRS MED GRY TO BUFF, V F XL TO F XL, MOD SIL, V RESIST, WELL IND, 2-5$ CHT BNDS AND NOD. BEDS 2"-18". |
| | | | X | | |
| | | 400 | X | | |
| | | | | | COVERED |
| | | | X | | DOLOMITE, MED GRY TO BRN WTHRS MED GRY, F XL, 5$ CHT BNDS, 1$ FOS, MOD SIL, MOD TO V RESIST, MOD TO WELL IND, HIGHLY FRACT. BEDS 2"-4". |
| | | 300 | X | | |
| | | | | | COVERED |
| | | | X | | DOLOMITE, MED GRY WTHRS LT GRY TO BUFF, F XL, 2$ 3/8" TO 1/2" CHT BNDS, MOD SIL, V RESIST, WELL IND. BEDS 18"-24". |
| | | 200 | X | | |
| | | | | | COVERED |
| | | | X | U | |
| | | 100 | X | | DOLOMITE, DK GRY WTHRS MED TO DK GRY, F XL, 5$-10$ SIL FOS, MOD TO V RESIST, WELL IND SL FETID. |
| | | | X | | 120'-180' SOME MINOR FRACT. BEDS 6"-18". |
| | | 0 | X | | |
| | | | | | UNDERLYING ROCKS COVERED. |

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Plate 16

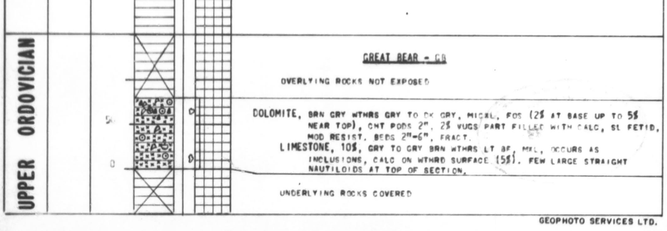
# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTIONS – | WRIGLEY PERMIT NORTH<br>WRIGLEY PERMIT<br>GREAT BEAR | CODE – | GA-64=WP$_N$<br>GA-64=WP<br>GD-64=GB |
| LOCATIONS – | 63°19'N, 123°54'W<br>63°13'N, 123°48'W<br>64°05'N, 122°20'W | SAMPLES – | GA-64=WP$_N$ – 5' INTERVALS, BASE TO TOP<br>GA-64=WP – 10' INTERVALS, BASE TO TOP<br>GD-64=GB – 5' INTERVALS, BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GB – DEPETRIS – 5' JACOBS STAFF<br>WP & WP$_N$ – GEOPHOTO PARTY 4, 5' JACOBS STAFF |
| DATE – | JULY, 1964 | SCALE – | 1" = 100 FEET |

60-1-5-96

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY Poor Fair Good Ex | FIELD DESCRIPTION |
|---|---|---|---|---|---|
| UPPER DEVONIAN | FRASNIAN<br>MAP UNIT 25<br>(DOUGLAS & NORRIS 1963) | | | | **WRIGLEY PERMIT NORTH – WP$_N$** |
| | | 50 | | | TOP OF EXPOSED SECTION |
| | | | | | LIMESTONE, MTLD WH AND TAN WTHRS TAN GRY, MICXL, SKEL (95$) V SL SIL, CLN WTR BIOSTROMAL REEF, V RESIST, WELL IND. |
| | | 0 | | | LIMESTONE, LT GRY TO TAN WTHRS RUSTY GRY, MICXL, C SKEL (70$), SIL IN PT, V FOS, ABDT CALC REPL, MAS REEFOID, V RESIST, WELL IND. |
| | | | | | UNDERLYING ROCKS COVERED |
| UPPER DEVONIAN | MAP UNIT 24<br>(DOUGLAS & NORRIS 1963) | | | | **WRIGLEY PERMIT – WP** |
| | | | | | OVERLYING ROCKS NOT EXPOSED |
| | | 100 | | | SANDSTONE, LT GN GRY WTHRS RUSTY DK GRY, V F GRN, ABDT MUSC, TR CALC CMT, V RESIST, WELL IND. BEDS 1/4"-1/2" INTBD. |
| | | | | | SILTSTONE, 40$, LT GN GRY WTHRS DK GRY, SL ARG, WELL SRT, PR-F RESIST, WELL IND, BEDS 1/8"-1/4". |
| | | 50 | | | SANDSTONE, LT GN GRY WTHRS RUSTY BRN, V F GRN-SILT, SL CALC, WELL SRT MIC, F, ANG, BLK MATERIAL (CHT?) ALONG BEDS AND SURF, PR-MED RESIST, F-WELL IND, BEDS 1/8"-1/2". |
| | | | | | SILTSTONE, M GRY WTHRS RUSTY BRN, MICA, WELL SRT, CALC CMT, CONC, INTBD. |
| | | 0 | | | SANDSTONE, 40$, LT GN GRY WTHRS RUSTY DK GRY, V F GRN, BEDS 1/4"-3/8". |
| | | | | | UNDERLYING ROCKS COVERED |
| UPPER ORDOVICIAN | | | | | **GREAT BEAR – GB** |
| | | | | | OVERLYING ROCKS NOT EXPOSED |
| | | 50 | D | | DOLOMITE, BRN GRY WTHRS GRY TO DK GRY, MICXL, FOS (2$ AT BASE UP TO 5$ NEAR TOP), CHT PODS 2", 2$ VUGS PART FILLED WITH CALC, SL FETID, MOD RESIST, BEDS 2"-6", FRACT. |
| | | 0 | D | | LIMESTONE, 10$, GRY TO GRY BRN WTHRS LT BF, MXL, OCCURS AS INCLUSIONS, CALC ON WTHRD SURFACE (5$). FEW LARGE STRAIGHT NAUTILOIDS AT TOP OF SECTION. |
| | | | | | UNDERLYING ROCKS COVERED |

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Plate 17

# PAN AMERICAN PETROLEUM CORP.

| | | | |
|---|---|---|---|
| SECTION – | CAP MOUNTAIN | CODE – | CA-64-CM |
| LOCATION – | 63°24'N, 123°14'W | SAMPLES – | 20' INTERVALS, BASE TO TOP |
| PROVINCE – | N.W.T. | MEASURED BY – | GEOPHOTO PARTY A 5' JACOBS STAFF |
| DATE – | JULY, 1964 | SCALE – | 1" = 100 FEET |

60-1-5-96

| SYSTEM AND SERIES | FORMATION | FOOTAGE | POROSITY TYPE | POROSITY Poor | POROSITY Fair | POROSITY Good | FIELD DESCRIPTION |
|---|---|---|---|---|---|---|---|
| CAMBRIAN | MT CLARK | | | | | | REMAINDER OF MT CLARK SECTION CONSISTS OF 430' OF SANDSTONE IDENTICAL TO THE UNDERLYING UNIT |
| | | | | | | | SANDSTONE, WH WTHRS LT GRY, F GR-M GR, SLI ARG, 90% QTZ GR, WELL RND, 10% SIL CMT, F-V RESIST, WELL IND. BEDS 6"-8'. |
| | | | | | | | COVERED |
| | | 3100 | | | | | |
| | | 3000 | | | | | SILTSTONE, LAM BLK AND WH WTHRS DK GRY, F GR-V F GR SILT, SL ARG, SL SDY, 60% QTZ GR, F SRT, TR SIL CMT, F RESIST, WELL IND. BEDS ½"-1". |
| | | 2900 | | | | | SHALE, 40%, BLK, WTHRS BLK, SL CONC, FISS, F RESIST, WELL IND. |
| | | 2800 | | | | | |
| | LONE LAND | 2700 | | | | | COVERED |
| | | | | | | | QUARTZITE, LT GN WH WTHRS REDDISH GRY, V F GR-M GR REXLD, 90% QTZ GR, WELL SRT, WELL RND, REXLD SIL CMT, V RESIST, WELL IND. BEDS 2"-4'. |
| | | 2600 | | | | | SILTSTONE, LT GN LAM WTHRS RSTY GN, VF-C GR SLT, CONC, QTZ GR MSKD, F RESIST, F IND, WTHRS LT GN, AND PBL. |
| | | 2500 | | | | | SLATE, 50%, LT GRN TO MAR WTHRS DK MAR RUSTY GN, 10% SLT, BLKY, PR RESIST, F TO PR IND. |
| | | 2400 | | | | | SANDSTONE, SPKLD, LT TO DK GRY WTHRS LT GRY V F GR-F GR, 75% QTZ GR, F SRT, SUB RND, SIL CMT, V RESIST WELL IND. BEDS 1"-3'. |
| | | | | | | | SLATE, 10%, MAR WTHRS SAME, PR RESIST, F IND, SL SLTY. |
| | | | | | | | SLATE, DK GRY TO BLK, WTHRS RSTY BLK, BLKY, PLTY, P RESIST, WELL IND. |
| | | 2300 | | | | | COVERED |
| | | 2200 | | | | | QUARTZITE, LT GRY WTHRS MED GRY, F GR-C GR, REXL, 85% QTZ GR, WELL SRT, SL ANG-SUB RND, 15% SIL CMT. |
| | | | | | | | 2160' TR CGL, V RESIST, WELL IND. BEDS 6"-36". |
| | | 2100 | | | | | SLATE, 25%, MAR WTHRS DK MAR, 10-30% SILTY, BLKY, F RESIST, WELL IND. BEDS 1/8"-1". |
| | | 2000 | | | | | |
| | | 1900 | | | | | QUARTZITE, LT GRY WTHRS LT TO MED GRY, F GR-C GR XL, 80% QTZ GR, WELL SRT, SUB RND, SIL CMT, V RESIST, WELL IND. BEDS 6"-24". |
| | | | | | | | SILTSTONE, 20%, MAR TO LT GN WTHRS SAME, SL ARG, BLKY, TR SIL CMT, F RESIST, WELL IND. BEDS ½"-2". |
| | | 1800 | | | | | |
| | | 1700 | | | | | SILTSTONE-SLATE, MAR TO LT GRY WTHRS DK RSTY GN, TR PYR, BLKY, HEM CMT, F RESIST, WELL IND. BEDS ½"-1". |
| | | 1600 | | | | | QUARTZITE, 30%, MAR TO LT GRY WTHRS SAME, V F GR-M GR, V SL ARG, SL SLTY, 80% QTZ GR, WELL SRT, WELL RND, SIL CMT, V RESIST, WELL IND. BEDS 6"-36". |
| | | 1500 | | | | | SLATE, 40%, MAR TO LT GN WTHRS MAR TO DK GN, SL SLTY, PYR ALONG BDG, PLATEY AND BLKY, FINE RESIST, WELL IND. |
| | | 1400 | | | | | SILTSTONE, MAR TO LT GN WTHRS DK MAR-RUSTY GN, SLT GR SZ, SL ARG, 40% INTBD, F GR, SS, TR SIL CMT, ABOUT 80% QTZ GR, WELL SRT, SUB RND, HEM CMT, V RESIST, WELL IND. BEDS 6"-24". |
| | | 1300 | | | | | SLATE, LT TO DK GN WTHRS RSTY GN-BLK, SL ARG, 30% SLT, ABDT PYR. PR RESIST, WELL IND. BEDS ½"-3". |
| | | 1200 | | | | | SILTSTONE, LT TO DK GN WTHRS RSTY GN, V F GR-C GR SLT, 20-30% ARG, 10% SDY, SL SIL, QTZ GR MSKD, FR SRT, SUB RND, HEM CMT, V RESIST, WELL IND. BEDS 2"-36". |
| PRECAMBRIAN | | 1100 | | | | | |

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| SYSTEM AND SERIES | FORMATION | |
|---|---|---|
| LOWER AND/OR MIDDLE ORDOVICIAN | FRANKLIN MOUNTAIN | |
| RONNING GROUP | MT. KINDLE | |
| UPPER ORDOVICIAN | | |
| LOWER (?) DEVONIAN | BEAR ROCK | |
| MIDDLE DEVONIAN | HUME | |

DATE –

PAN

SECTION –
LOCATION –
PROVINCE –
DATE –

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KODAK SAFETY ▲ FILM ■+

15666A

15666A

15666A

MAP UNITS 2 AND 3 (DOUGLAS & NORRIS 1963)

PRECAMBRIAN

LONE

2500 2400 2300 2200 2100 2000 1900 1800 1700 1600 1500 1400 1300 1200 1100 1000 900 800 700 600 500 400 300 200 100 0

SLATE, MSKD, F RESIST, F IND, WTHRS LT GN, RND PBL.

SLATE, 50% LT GRN TO MAR WTHRS DK MAR RUSTY GN, 10% SLT, BLKY, PR RESIST, F TO PR IND.

SANDSTONE, 60%LO, LT TO DK GRY WTHRS LT GRY V F GR-F GR, 75% QTZ GR, F SRT, SUB RND, SIL CMT, V RESIST WELL IND. BEDS 1'-3'.
SLATE, 10%, MAR WTHRS SAME, PR RESIST, F IND, SL SLTY.

SLATE, DK GRY TO BLK, WTHRS RSTY BLK, BLKY, PLTY, P RESIST, WELL IND.

COVERED

QUARTZITE, LT GRY WTHRS MED GRY, F GR-C GR, RNDL, 85% QTZ GR, WELL SRT, SL ANG-SUB RND, 15% SIL CMT.
21609 TR CGL, V RESIST, WELL IND. BEDS 6"-36".
SLATE, 25% MAR WTHRS DK MAR, 10-30% SILTY, BLKY, F RESIST, WELL IND. BEDS 1/8"-1".

QUARTZITE, LT GRY WTHRS LT TO MED GRY, F GR-C GR XL, 80% QTZ GR, WELL SRT, SUB RND, SIL CMT, V RESIST, WELL IND. BEDS 6"-24".
SILTSTONE, 20%, MAR TO LT GN WTHRS SAME, SL ARG, BLKY, TR SIL CMT, F RESIST, WELL IND. BEDS 1"-2".

SILTSTONE-SLATE, MAR TO LT GRY WTHRS DK RSTY GN, TR PYR, BLKY, HCM CMT, F RESIST, WELL IND. BEDS 1"-1".
QUARTZITE, 30%, MAR TO LT GRY WTHRS SAME, V F GR-M GR, V SL ARG, SL SILTY, 80% QTZ GR, WELL SRT, WELL RND, SIL CMT, V RESIST, WELL IND. BEDS 6"-36".

SLATE, NOS, MAR TO LT GN WTHRS MAR TO DK GN, SL SLTY, PYR ALONG BDG, PLATEY AND BLKY, FINE RESIST, WELL IND.

SILTSTONE, MAR TO LT GN WTHRS DK MAR-RUSTY GN, SLT GR SZ, SL ARG, MSKD, WELL SRT, SUB RND, SIL CMT, ABOUT 80% QTZ GR, WELL SRT, SUB RND, HEM CMT, V RESIST, WELL IND. BEDS 6"-24".

SLATE, LT TO DK GN WTHRS RSTY GN-BLK, SL ARG, 30% SLT, ABDT PYR. PR RESIST, WELL IND. BEDS 2"-8".

SILTSTONE, LT TO DK GN WTHRS RSTY GN, V F GR-C GR SLT, 20-30% ARG, 10% SDY, SL SIL, QTZ GR MSKD, FR SRT, SUB RND, HEM CMT, V RESIST, WELL IND. BEDS 2"-36".

SLATE, DK MAR WTHRS MAR, SLT GR SZ, 20% SILT, HEM CMT, F RESIST, F IND. BEDS PLTY.

SILTSTONE, 30%, DK MAR WTHRS MAR, SLT GR SZ, SL ARG, SL SIL, QTZ GR MSKD, WELL SRT, HEM CMT, 15% VUGS CALC FILLED, V RESIST, WELL IND. BEDS 2"-12".

SILTSTONE, DK MAR WTHRS DK MAR, SLT GR SZ, SL ARG, SL SIL, QTZ GR MSKD, WELL SRT, HEM CMT, 15 VUGS CALC FILLED, V RESIST, WELL IND.

SLATE, 15%, LT GN WTHRS LT GN YEL, SL ARG, VUGS CALC FILLED, SL SIL, QTZ GRS MSKD, WELL SRT, SIL CMT, V RESIST, WELL IND. BEDS 1"-3".

SLATE, LT GN WTHRS ORNG GN, M SLT, SL SDY, QTZ GR, WELL SRT, SIL CMT, F-MD, V RESIST, WELL IND. BEDS 3"-6".

SILTSTONE, MAR WTHRS MAR, V F GR-C SLST, SL ARG, F SRT, HEM CMT, V RESIST, WELL IND. BEDS 2"-6".
SANDSTONE, 40%, MAR WTHRS MAR, V F GR, SL SLTY, SL SIL, WELL SRT, WELL RND, HEM CMT, V RESIST, WELL IND. BEDS 6"-12".

SLATE, MAR WTHRS MAR, ARG, 20-40% SLT, SL DY, LITHO, FR-P SRT, HEM CMT, FR-P RESIST, WELL IND, PLTY.
SILTSTONE, 50%, MAR WTHRS MAR, SLT-V F GR SS, SL ARG, 10-50% SDY, SL SIL, CRMN, F SRT, HEM CMT, F RESIST, WELL IND. BEDS 2"-12".

SILTSTONE, MAR WTHRS MAR, V F GR, SL ARG, SDY IN PART, QTZ GRS MSKD, FAIR SRT, HEM CMT, FR-P RESIST, FR IND. BEDS 2"-4".
QUARTZITE, 30%, MAR WTHRS MAR, V F GR-F GR, SL SIL, QTZ GRS MSKD, F-WELL SRT, WELL RND, HEM CMT, V RESIST, WELL IND. BEDS 4"-12".

SILTSTONE, MAR WTHRS MAR, F GR-C GR, QTZ GRS MSKD, F SRT, 15-20% HEM CMT, F-PR RESIST, F IND. BEDS 4"-8".
QUARTZITE, 15%, MAR WTHRS MAR, V F GR-F GR, SL SLTY, SL SIL, QTZ GRS MSKD, F-WELL SRT, WELL RND, 20-25% HEM CMT, V RESIST, WELL IND. BEDS 6"-24".

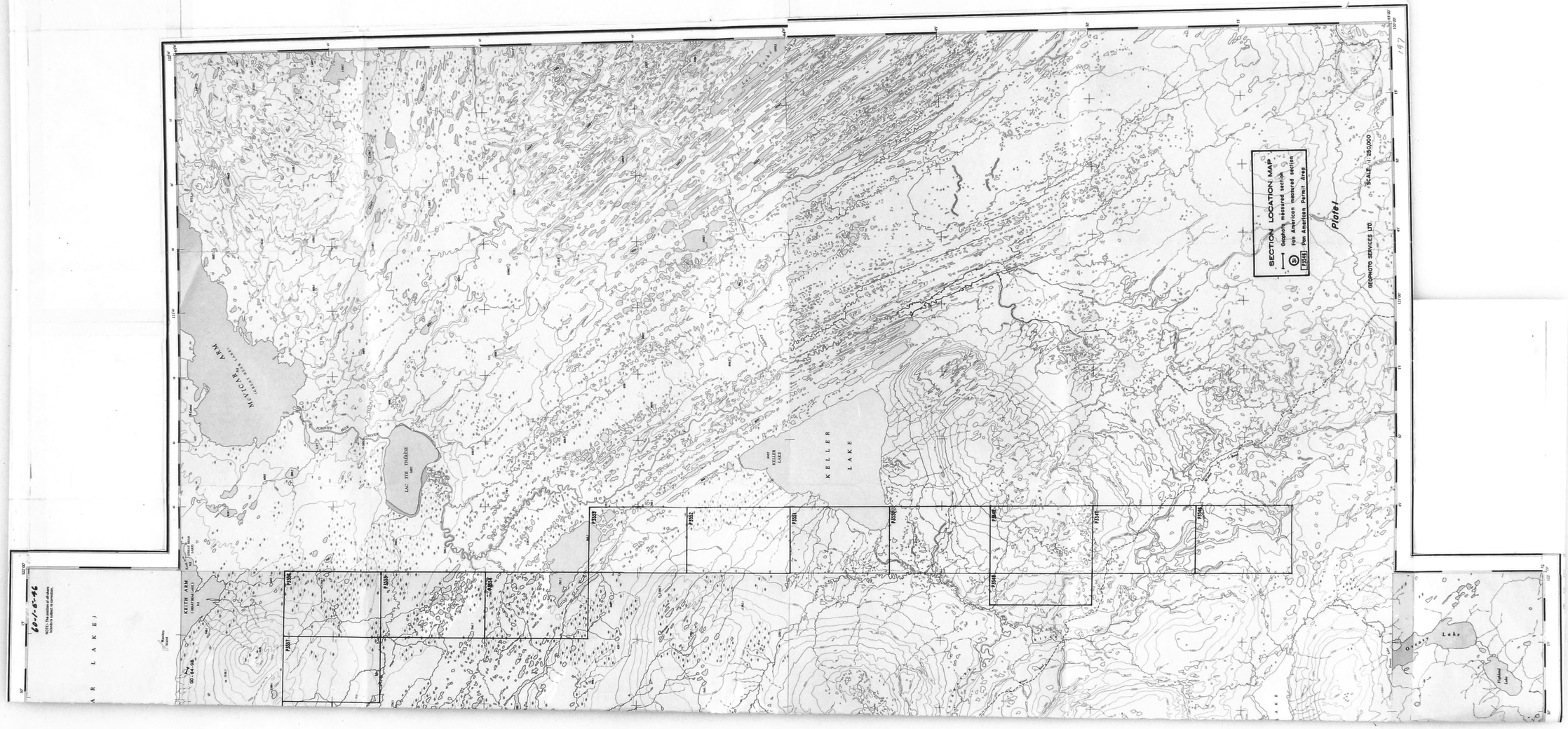
QUARTZITE, 70%, MAR WTHRS MAR, VF-C GR, PR SRT, WELL RND, HEM CMT, ABDT 3% FELDS, ABDT 20% CHERT PBLS, ABDT RIPPLE MARKS ABOVE CGL.
SILTSTONE, MAR WTHRS MAR V SL CALC, SL SIL, F-PR SRT, WELL RND, HEM CMT, V RESIST, WELL IND. MUD CRACKS ¼"-1" RADIAL WORM BURROWS BED SLAB.
SILTSTONE, MAR WTHRS MAR, V SL CALC, SL SIL, QTZ GRS, MSKD, F RESIST, F IND, 20% HEM CMT. BEDS 3"-20".
QUARTZITE, 10%, MAR, V F GR, SL SLTY, SL SIL, V RESIST, WELL IND. 25% HEM CMT. BEDS 2"-6".

SILTSTONE, MAR WTHRS LT RED, GRNG WH TO V F GR (10%) V SL ARG, SDY, F RESIST, F IND, TR CALC CMT, SL SIL, HEM CMT, MUD CRACK STRUC. BEDS 1/8"-1/4".

UNDERLYING INTERVAL COMPRISING REMAINDER OF UNIT 2 AND ALL OF UNIT 1, IS WELL EXPOSED AND CONSISTS OF APPROXIMATELY 2500 FEET OF RED AND GREEN SHALES, SILTSTONES, SANDSTONES AND DOLOMITES.

GEOPHOTO SERVICES LTD.


(GREAT BEAR LAKE)
KEITH ARM
(GREAT BEAR LAKE)
BLACKWATER LAKE
BLACKWATER
LAKE
FRANKLIN MOUNTAINS
McCONNELL RANGE
MOUNTAINS
MACKENZIE
RANGES
MACKENZIE MOUNTAINS
BLACKBONE RANGES
RIVER
PLAIN
Fort Franklin
Lake
Halkett
Lake
LAC
TRAIL
RIVER
CANYON
CREEK
MOUNTAIN
RANGE
MOUNT
Mt
Creek
Canyon
Trail
River
Plain
Ranges
Mountains
Lake
Range
Mount
Mountain


SECTION LOCATION MAP
Geophoto measured section
Esso American measured section
Pan American Permit Area
P3565
Pan American Permit
SCALE 1: 250,000
GEOPHOTO SERVICES LTD.
McILICA R. ARM
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P3563
P3564
P3565
P3566
P3567
P3568
P3569
NOTE: The position of all shore features is subject to correction.

30x

MT. ST. CHARLES (PAN. AM. 84)

CHARLES SOUTH (CS)

BIG SMITH (BS)

FLOWER MOUNTAIN (FM)

DRY CREEK NORTH (DCN)

DRY CREEK (DC)

NORTH AMOS CREEK (NAC)

AMOS CREEK (AC)

JUNCTION CREEK (JC)

TWIN PEAKS (TP)

KNOB VALLEY (KV)

BLACKWATER LAKE (PAN. AM. 57)

DATUM

UPPER ORDOVICIAN

MT. KINDLE

LOWER & OR MID. ORDOVICIAN

FRANKLIN MTN.

CAMBRIAN

MID. DEV.

L. HUME

DEVONIAN

LOWER (?)

BEAR ROCK

Faulted Section at Dtr

L. FR. DEVONIAN

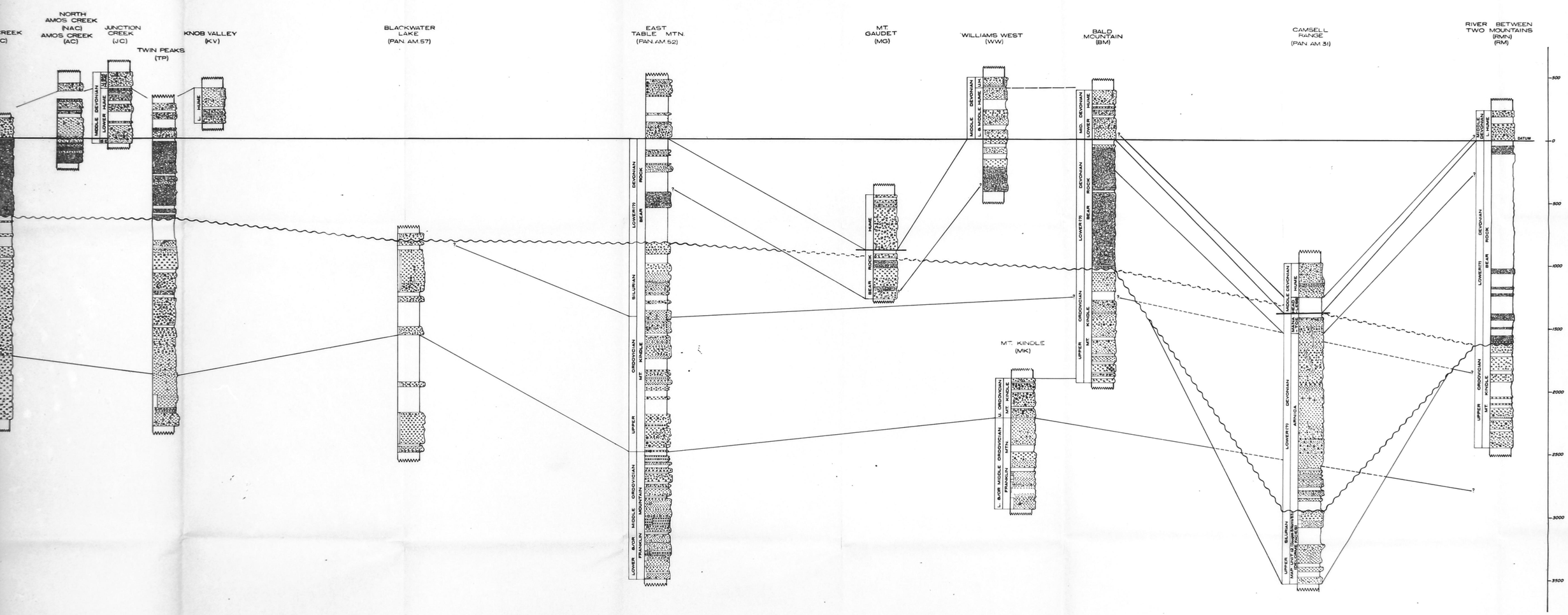
MIDDLE DEVONIAN

LOWER DEVONIAN

HUME

30x

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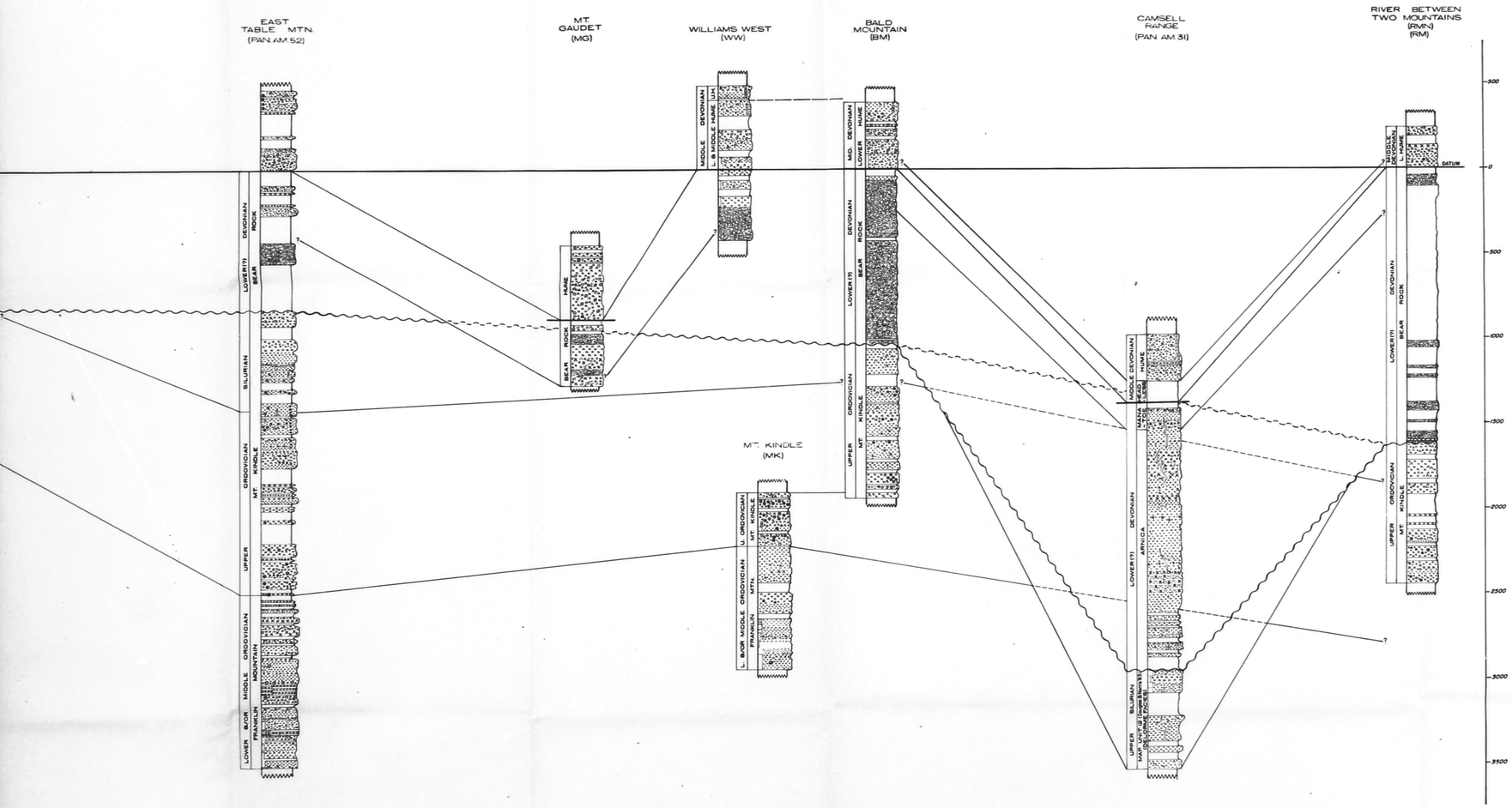

NORTH AMOS CREEK (NAC)
AMOS CREEK (AC)
JUNCTION CREEK (JC)
TWIN PEAKS (TP)
KNOB VALLEY (KV)
BLACKWATER LAKE (PAN AM 57)
EAST TABLE MTN. (PAN AM 52)
MT. GAUDET (MG)
WILLIAMS WEST (WW)
BALD MOUNTAIN (BM)
CAMSELL RANGE (PAN AM 31)
RIVER BETWEEN TWO MOUNTAINS (RMN) (RM)
MT. KINDLE (MK)
DATUM
0
500
1000
1500
2000
2500
3000
3500


30x
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197

60-1-5-96

FEB 1 1965




# STRATIGRAPHIC CROSS SECTION SOUTHERN FRANKLIN MOUNTAINS NORTHWEST TERRITORIES

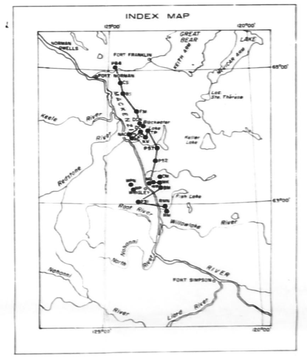
*Horizontal Scale – 1 inch=2 miles*
*Vertical Scale – 1 inch=250 feet*

DATUM – Base of Hume

PREPARED FOR
PAN AMERICAN PETROLEUM CORP.
OCTOBER 1964

***Plate 2***

INDEX MAP




30x
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