# MEMORANDUM REPORT

# FIELD STRATIGRAPHIC INVESTIGATIONS

# NORMAN WELLS - CHICK LAKE AREA,

# NORTHWEST TERRITORIES.

Prepared for

GREAT PLAINS DEVELOPMENT COMPANY OF CANADA LTD.



By

GEOPHOTO SERVICES, LTD.

Calgary, Alberta.

July, 1966.

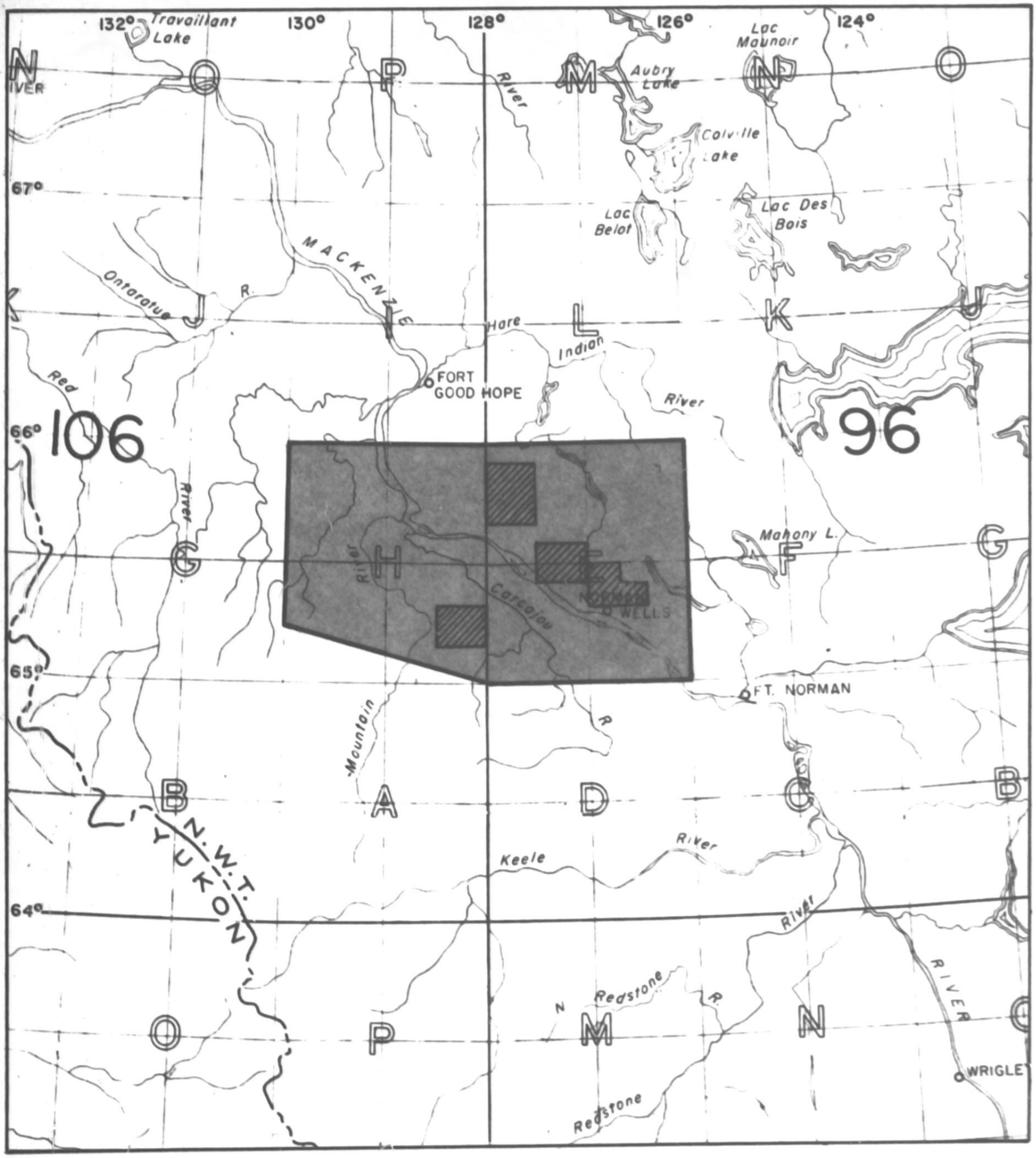


*Figure 1*

# REGIONAL LOCATION MAP

Permit Areas
Norman Wells - Chick Lake Area

Composite Map:- 1 inch = 4 miles

GEOPHOTO SERVICES LTD.

SCALE: 1 INCH = 40 MILES

# INTRODUCTION

This report presents the results of a combined field reconnaissance stratigraphic investigation supplemented by photogrammetric work in the Norman Wells - Chick Lake area of the Northwest Territories.

A. S. Depetris of Geophoto Services, Ltd., and W. Buckley of Great Plains, comprised the field personnel. The field party departed Calgary, by commercial aircraft on June 13, 1966, and arrived at Norman Wells on June 14, 1966. The Mackenzie Mountain Lodge at Norman Wells served as a base of operation. On completion of the field work the field personnel departed Norman Wells on June 28, 1966, and arrived back in Calgary on June 29, 1966.

The primary objective of the field study, as specified by Great Plains, was to reconnaissance sample, describe and measure representative sections of the Middle Devonian Kee Scarp strata on and in the vicinity of permits held by Great Plains. (See Figure 1). In addition to the stratigraphic program, restricted air reconnaissance on the permits was to be completed to determine terrain conditions affecting accessibility to and mobility on the Great Plains petroleum permits.

Additional photogrammetric work was completed in Calgary, subsequent to the field work, in order to fill in gaps existing in Kee Scarp

data of the western areas.

Thirteen Kee Scarp stratigraphic sections, totalling 832 feet were sampled, measured and described in the field (see Plate 1 and Figure 2). In addition, two sections of the Middle Devonian Hume Formation, totalling 142 feet were also sampled. The field data are presented in detail in columnar log form at a scale of 1 inch equals 10 feet. These columnar sections are included at the back of the report as Plates 2 to 16 inclusive. Fifteen photogrammetrically computed stratigraphic sections were measured in the area lying west of the above mentioned field locations. These 15 photogrammetrically computed sections, totalling 5,432 feet, are detailed on Figure 3.

Section locations and thickness data accumulated from the field and photogrammetric work are also plotted on the composite photogeologic map included at the rear of this report.

Plate 1, at the rear of the report, shows the field and photogrammetric section locations with known Kee Scarp thickness figures color keyed as to their source. Also included are the helicopter reconnaissance routes over the permits.

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

G-3 helicopter support was furnished by Klondike Helicopters on ferry from Whitehorse, Yukon Territory. Excellent support by the Pilot-Engineer, George Kerr, permitted the satisfactory completion of all field objectives.

En route to Norman Wells, the helicopter was commandeered for fire duty by the Forest Service and did not arrive until June 21, 1966. During the period of curtailed mobility, the Kee Scarp type locality at Norman Wells was studied, sampled and described.

Excellent weather prevailed during the field investigation and except for three days of rain prior to the arrival of the helicopter, no time was lost due to poor or marginal flying conditions.

| Section | Sample Code | Formations | | | | | Totals |
|---|---|---|---|---|---|---|---|
| | | Middle Devonian | | | | L. Cret. | |
| | | Hume | Hare Indian | Kee Scarp | Canol | Sans Sault | |
| Mosquito Lake | ML | | | 63 | | | 63 |
| Outcrop Hill | OH | | | 9 | | | 9 |
| Chick Lake | CL | | | 23 | | 40 | 63 |
| Gibson Creek | GC | | | 54 | | | 54 |
| No Lake | NL | 42 | | | | | 42 |
| Moon East | ME | | | 20 | | | 20 |
| Moon South | MS | | | 9 | | | 9 |
| Gap Mountain West | $GM_w$ | | | 86 | | | 86 |
| Gap Mountain | GM | 100 | | | | | 100 |
| Hoodoo Mountain | HM | | | 180 | | | 180 |
| Cleaver Mountain | CM | | | 47 | | | 47 |
| Bosworth Creek | BC | | | 7 | | | 7 |
| Norman Wells | NW | | | 212 | | | 212 |
| Norman Quarry South | $NQ_s$ | | | 36 | 4 | | 40 |
| Shavetail | ST | | 20 | 86 | | | 106 |
| Totals | | 142 | 20 | 832 | 4 | 40 | 1,038 |

FIELD STRATIGRAPHIC SUMMATION

NORMAN WELLS - CHICK LAKE AREA,

NORTHWEST TERRITORIES.

Figure 2

## STRATIGRAPHY

## MIDDLE DEVONIAN

### Hume Formation

The upper part of the Hume Formation was briefly sampled and described at two locations, No Lake (NL) and Gap Mountain (GM). (See Plates 6 and 10). The brief field examination of the Hume strata indicates that the rocks, in this locality, are primarily micritic limestones, slightly argillaceous with very poor porosity characteristics.

### Kee Scarp Formation

The Middle Devonian, which includes the Kee Scarp, has been involved in considerable controversy during the past years. Miscorrelation and misidentification of rock units by early geologists resulted in much confusion regarding the Canol through Hume interval.

This report follows the Middle Devonian divisions proposed by Bassett in his paper "The Devonian Stratigraphy, Central Mackenzie River region, Northwest Territories, Canada". Bassett divided the Middle Devonian into a lower Hume Formation overlain by the Hare Indian shale, a succeeding Kee Scarp limestone series and the overlying Canol Formation. Where the Kee Scarp limestone is absent, the Canol and Hare Indian shales are in direct contact.

The term "Kee Scarp" was first used by Canol personnel to

| SECTION | AREA | LOCATION | THICKNESS |
|---|---|---|---|
| 1 | Lilly Lake | 128°22'W - 65°55'N | 80 |
| 2A | Donnelly River | 128°17'W - 65°51'N | 221 |
| 2B | Donnelly River | 128°21'W - 65°51'N | 260 |
| 3A | West Virginia Hills | 128°37'W - 65°54'N | 220 |
| 3B | West Virginia Hills | 128°42'W - 65°53'N | 528 |
| 4 | Beavertail Mountain | 128°45'W - 65°52'N | 523 |
| 5A | Carcajou Ridge | 128°08'W - 65°38'N | 228 |
| 5B | Carcajou Ridge | 128°14'W - 65°38'N | 318 |
| 6 | East Mountain | 128°44'W - 65°42'N | 554 |
| 7 | Central Imperial Range | 128°37'W - 65°27'N | 353 |
| 8 | North Imperial Range | 128°55'W - 65°28'N | 619 |
| 9A | Powell Creek | 128°46'W - 65°16'N | 273 |
| 9B | Powell Creek | 128°49'W - 65°16'N | 500 |
| 9C | Powell Creek | 128°53'W - 65°17'N | 597 |
| 10 | West Imperial Range | 129°57'W - 65°24'N | 158 |
| 15 Sections | | TOTAL: | 5,432 |

PHOTOGRAMMETRICALLY COMPUTED

STRATIGRAPHIC SECTIONS

NORMAN WELLS - CHICK LAKE AREA,

NORTHWEST TERRITORIES.

Figure 3

| Section | Sample Code | Formations | | | | | Totals |
|---|---|---|---|---|---|---|---|
| | | Middle Devonian | | | | L. Cret. | |
| | | Hume | Hare Indian | Kee Scarp | Canol | Sans Sault | |
| Mosquito Lake | ML | | | 63 | | | 63 |
| Outcrop Hill | OH | | | 9 | | | 9 |
| Chick Lake | CL | | | 23 | | 40 | 63 |
| Gibson Creek | GC | | | 54 | | | 54 |
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| Moon East | ME | | | 20 | | | 20 |
| Moon South | MS | | | 9 | | | 9 |
| Gap Mountain West | $GM_W$ | | | 86 | | | 86 |
| Gap Mountain | GM | 100 | | | | | 100 |
| Hoodoo Mountain | HM | | | 180 | | | 180 |
| Cleaver Mountain | CM | | | 47 | | | 47 |
| Bosworth Creek | BC | | | 7 | | | 7 |
| Norman Wells | NW | | | 212 | | | 212 |
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Figure 2

## STRATIGRAPHY

## MIDDLE DEVONIAN

### Hume Formation

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PHOTOGRAMMETRICALLY COMPUTED

STRATIGRAPHIC SECTIONS

NORMAN WELLS - CHICK LAKE AREA,

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Figure 3

describe the limestones exposed about four miles east of Norman Wells.

The Kee Scarp Formation is divisible into two units - a lower platform facies and an upper true reef facies.

The lower platform facies, also referred to as the "Brown" Kee Scarp, consists of limestone, generally brown to gray, argillaceous, fine grained to micritic, fossiliferous, with beds ranging from thin to massive. Diagnostic fauna in the platform facies are Stringocephalus burtini Defrance and Rensselandia laevis (Meek).

The upper or true reef of the Kee Scarp consists of a light gray, pure, poorly bedded, reefoid and off-reef bioclastic limestone with abundant branching corals, stromatoporoids and amphiporids.

The Kee Scarp ranges in thickness from 0 to 800 feet with abrupt lateral variations in thickness. In the eastern sections, the Kee Scarp is thin to absent due to truncation and absence of the reefal unit. The maximum reported thickness is approximately 800 feet along the Mackenzie Mountain Front directly south of where the Imperial Anticline is breached by the Mountain River.

In the following paragraphs, the results of the brief field reconnaissance involving the Kee Scarp rocks are detailed. Thirteen Kee Scarp sections, totalling 832 feet, were sampled and described. (See Plates 2 to 16 inclusive, and Figure 2). These sections are located

along a northwest-southeast axis and, with one exception, are all east of the Mackenzie River in or near the petroleum permits held by Great Plains.

The preliminary reconnaissance paleontology, noted on the columnar sections was completed by A. Depetris, and is intended to reflect major faunal representation and not specific paleontologic identification.

In general, all Kee Scarp rocks field examined were primarily of the limestone platform facies. Extensive mantle, muskeg and forested conditions considerably hindered measurement of complete sections. As a rule, neither the upper or lower contacts are exposed, but pronounced changes in topography indicate proximity of the overlying Canol and underlying Hare Indian shales. Consequently, even though the detailed columnar sections do not indicate an enclosing upper or lower contact, field observations indicate that the Kee Scarp thicknesses measured probably represent almost complete sections.

As indicated on the accompanying columnar sections, rocks of the Kee Scarp platform consist mainly of limestone, fossiliferous, micritic to fine grained, argillaceous, brown-gray, with beds ranging from thin to massive. The thicknesses measured are generally less than 100 feet. In two sections examined, Hoodoo Mountain (HM and Norman Wells (NW), rocks in the upper portion indicate reefoid or near

reef facies.

In the Hoodoo Mountain Section, the upper Kee Scarp rocks are abundantly fossiliferous. This thin to massive bedded unit weathers into characteristic light-buff hoodoos.

In the Norman Wells quarry section ($NQ_s$) the extreme lateral lithofacies and thickness variations common to the Kee Scarp strata are evident. In the westerly facing quarry cliff face, the Kee Scarp is grossly divisible into three units:

Upper Thin-bedded Unit

Middle Medium-bedded Unit

Lower Massive-bedded Unit

The Upper Thin-bedded Unit passes laterally and down dip into the overlying, brightly colored Canol shales.

The Middle Unit thins laterally to the north and also down dip towards the west. At the north end of the Norman Wells quarry, the Middle Unit, less than 5 feet on the west, thickens perceptively eastward below the Canol shales. In this locality, the base of the Middle Unit is marked by a pronounced fracture which may indicate either a fault or an intraformational unconformity. Strata of the Lower Massive-bedded Unit, below the pronounced fracture zone, appear to truncate against this fracture.

Also at the north end of the quarry, a small reef-like (bioherm)

body within the Middle Unit, is directly overdraped by brilliant colored Canol shales. This 10 by 5 foot reef lies directly above the prominent fracture previously mentioned. This biohermal type reef zone with bituminous stain possesses good to excellent sandy intergranular porosity. The bioherm grades laterally into the Medium-bedded Unit.

The lowermost unit, the Lower Massive, also exhibits the previously mentioned lateral extremes in thickness. In the lower part of the Massive Unit a distinctive four foot, very fine grained, dense, buff colored, poorly fossiliferous member, termed the Barren Unit, (see Plate 15), was used as a Key bed for correlation. This marker bed also thins from approximately 4 feet on the south to 2 feet on the north.

At the south end of the quarry, there is approximately 18 feet of rock lying between the Barren Unit below and the base of the overlying Middle Unit. Northward, at the north end of the quarry, only 5 feet of rock remains between the Barren Zone at the base and the Middle Medium-bedded Unit at the top.

At the northern end of the project area, the Chick Lake (CL) section has approximately 23 feet of Kee Scarp platform limestone directly overlain by very porous, coarse-grained, white-gray, well sorted sandstone with interbedded carbonaceous material. This sandstone unit is interpreted to be Lower Cretaceous in age and to uncon-

formably overlie Middle Devonian Kee Scarp limestone. This interpretation is in turn supported by Canol reports in the Donnelly River area.

Due to the brief time allotted for actual examination of the Kee Scarp rocks and for the pre- and post-field portion of the study, any lithofacies or depositional studies involving the Kee Scarp rocks are beyond the scope of this report. With the aid of 15 photogrammetrically computed stratigraphic sections, published data, subsurface control, and the previously described field measured sections, the following observations regarding the Kee Scarp are apparent:

1. The Kee Scarp strata exhibit pronounced lateral variations in thickness.
2. The formation is thinnest in the northeast where truncation below the sub Cretaceous unconformity and reef absence has considerably reduced the formation thickness.
3. There is an apparent, distinct and direct relationship between the thickness of the Kee Scarp interval and the presence or absence of the reef facies.
4. Where the Kee Scarp thickness is less than 150 to 200 feet, the locality generally indicates that the Kee Scarp limestones are in a platform facies.

5. Where the Kee Scarp thickness is in excess of 150 to 200 feet, reef limestone facies are probably present. Maximum reef growth appears to have centered in the area where the Mountain River breaches the Imperial Range.

## PERMITS

Twelve petroleum permits, held by Great Plains Development Company of Canada Ltd., fall within the project area (see Plate 1). These permits are grouped into four main blocks - northern, central, southern, and western. In the following paragraphs, these individual permit blocks are evaluated relative to petroleum potential. In addition, access to, and mobility on the permits is also briefly discussed relative to any proposed seismic surveys or possible well locations.

### Northern Area

#### Permits 4276, 4277, 4278, and 4279.

The Kee Scarp strata are in platform facies and extremely thin. Middle Devonian Hume rocks, sampled at section No Lake (NL) indicate dense limestone with very poor porosity.

These northern permits are poorly located for potential structural traps. The permits are in a structurally low area straddling the Chick Lake Syncline.

#### Accessibility

The Northern Group of permits is easily accessible in winter by tractor road from Norman Wells in the south to Fort Good Hope

in the north. This winter road cuts through the Gibson Range in the southwestern portion of the permits then parallels the range to the northwest, towards Fort Good Hope.

Summer access is also possible eastward from the Mackenzie River area in the vicinity of the Carcajou Ridge area, then northeastward up the winter tractor road. Summer operations are also possible but the use of special tracked vehicles would be mandatory.

The northern group of permits is located in land of relatively flat morphology with muskeg and lakes common. Timber is moderately well stocked, less than 30 feet in height, and can easily be cleared by bulldozer.

Central Area

Permits 4280, 4281, 4282, and 4283.

The Kee Scarp rocks are thin to absent and restricted to the extreme western part of the permit area. In addition, the Middle Devonian through Ordovician rocks are exposed along upthrown fault blocks. In the eastern part of the permit area, westward homoclinal dipping Silurian through Middle Devonian strata are exposed. This central group of permits also occur in a structurally low area, straddling the Oscar Basin Syncline.

Accessibility

Access to the central group of permits is either by winter

tractor road from Norman Wells, thence by an easterly trending branch road in the vicinity of Cleaver Mountain. An additional access to the Oscar Basin would be by cutting a road up Oscar Creek.

The Oscar Basin area, consists of moderately flat topography, with some northwesterly trending stream incisions creating steep banks. The area is moderately stocked with short trees and road clearing would be no problem.

Southern Area

Permits 4670 and 4671.

These two permits comprise the southernmost block of petroleum permits held by Great Plains.

The Kee Scarp outcrops and is restricted to the extreme southwestern edge of Permit 4670. Northeastward from this point the strata dip homoclinally to the west and become increasingly older towards the northeast.

These southern permits also straddle the southeastward continuation of the Oscar Basin Syncline.

Accessibility

Access to the southernmost group of permits is easily achieved by following the access previously described for the Central group of permits and then trending southeastward parallel to Oscar Creek.

Western Area

Permits 4668 and 4669.

Based on photogrammetric measurements in the vicinity of where Powell Creek intersects the front of the Mackenzie Mountains, the Kee Scarp reef thickens towards the west and thins rapidly eastward towards the permit area. Photogrammetric section 7, northwest of the western permits, indicates that the Kee Scarp is probably reefoid at this locality.

It is possible that reefs may be present in the subsurface of these westernmost permits, but evidence based on Kee Scarp measurements and projected outcrop width in areas surrounding the permits, suggests that the subsurface Middle Devonian reef prospects are not overly favourable.

Permits 4668 and 4669 straddle the Imperial Syncline in the northeasterly one-third of the permit with a small anticlinal feature, Carrot Anticline, immediately to the southwest of the syncline.

Accessibility

Relatively flat topography characterizes the permit area and the only impediment to any ground operations would be the relatively deep stream incision present in the soft sands and shales. Most of the permit area is a consistently flat table land or plateau disected by drainage. The timber, generally less than 30 to 40 feet in height and poorly stocked with considerable open areas, could easily be cleared.

## SUMMARY

This report presents the results of a combined stratigraphic field and photogrammetric investigation of the Middle Devonian Kee Scarp strata in the Norman Wells - Chick Lake area of the Northwest Territories.

Thirteen Kee Scarp stratigraphic sections, totalling 832 feet, were sampled, measured and described in the field. These field sections were supplemented with fifteen photogrammetrically computed stratigraphic sections.

The Kee Scarp is divisible into two units - a lower platform facies and an upper true reef facies. The Kee Scarp ranges in thickness from 0 to 800 feet with abrupt lateral variations in thickness.

The Kee Scarp is thin to absent in the eastern sections. The maximum reported thickness is approximately 800 feet and occurs west of Norman Wells in the Mackenzie Mountains, directly south of where the Imperial Anticline is breached by the Mountain River.

The Norman Wells oil field produces from a coralline lime-stone reef. Closure of the oil saturated section is due to homoclinal up dip shale-out of the reef to the east.

Location of similar reef areas in the subsurface of the pro-ject area and adjoining areas does not appear too favourable.

Access to, and ground mobility on the petroleum permits for any proposed seismic survey or possible well location, are favourable and should be accomplished with minimum effort especially if initiated during winter or early spring.

Respectfully submitted,

GEOPHOTO SERVICES, LTD.

A. S. Depetris

Paul Fuenning

## SELECTED REFERENCES


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SECTION: Mosquito Lake (ML)

LOCATION: 127°35'W - 65°57'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
KEE SCARP PLATFORM

Top of exposed section at summit of cliff. Overlying canol shales not exposed.

LIMESTONE - Bioclastic, micritic, m dr gry, wthrs bf gry, bds avg 4" - 6", sl arg, mod resist, 1/2" sh at base.

34 feet

LIMESTONE - Bioclastic, micritic, bf gry, wthrs bf gry, arg. 6" to mas bds. Mod resist, f-w ind. Lower 6', bds avg 3" - 6". Lenticular.

29 feet

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63 feet

Base of exposed section. Talus covered slope extends to valley.

SECTION: Outcrop Hill (OH)

LOCATION: 127°52'W - 65°53'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
KEE SCARP PLATFORM

Top of exposed section - Top of cliff.

LIMESTONE - Bioclastic, micritic, brn gry, wthrs bf gry, bds avg 6" - 9", sl arg, mod resist, 2% thn 1" sh intrbds. Fossiliferous.

9 feet

Base of exposed section. Large talus slope.

SECTION: Chick Lake (CL)

LOCATION: 128°06'W - 65°45'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

LOWER CRETACEOUS
SANS SAULT

Top of exposed section - Top of ridge.

SANDSTONE - (90%) - crse grnd, sub rndd, wh gry, wthrs bf-wh-gry, w srtd, p ind, 1/2"stringers of carbonaceous material more common below 10'. Scat lenses of pebble cgl. Unit mostly covered - outcrops discontinuous.

SHALE - (10%) - Black, non calc, carbonaceous.

40 feet

Unconformity

MIDDLE DEVONIAN
KEE SCARP PLATFORM

LIMESTONE - Calcisilite, bf gry, wthrs bf gry, arg, bds approx 6", mod resist, upper part limonitic stained and calcite infil fracs. Sh intrbds. Extensive scree and overburden masks rocks. Fossiliferous.

23 feet

63 feet

Base of section concealed. Scree to creek level.

SECTION: Gibson Creek (GC)

LOCATION: 128°08'W - 65°51'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
KEE SCARP PLATFORM

LIMESTONE - Thn bdd. This overlying 20' section sighted on north cliff face. Not sampled.

20 feet

Top of exposed section on south cliff.

LIMESTONE - V f gr, m gry, wthrs bf gry, sl arg, mod resist, mod w ind. Thick bdd at top. Thn bdd at base. Sh intrbds towards base. Fossiliferous.

34 feet

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54 feet

Base of exposed section. Remainder of slope consists of talus.

SECTION: No Lake (NL)

LOCATION: 127°50'W - 65°42'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
HUME

Top of exposed section. Overlying beds mantled and form recessive dip slope.

LIMESTONE - Lithographic, brn-gry to gry-bl, wthrs bf gry, sl arg, mas bds, v resist, w ind. Cliff former. Some thn styolitic zones. Fracs cmon, secondary vug por due to leaching. Bcms thnr bdd upwards. Less fos than underlying unit.

24 feet

LIMESTONE - Micritic, v f gr, bf gry, wthrs bf gry, arg, thn bdd, bds 2", avg 1". P resist, rubbly. P ind. Fossiliferous.

18 feet

42 feet

Base of exposed section. Large talus slope to creek level.

SECTION: Moon East (ME)

LOCATION: 127°22'W - 65"38'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
KEE SCARP PLATFORM

Top of exposed section. Top of cliff.

| | | |
|---|---|---|
| LIMESTONE - | V f - f gr, brn-gry, wthrs bf gry, arg, bds avg 1' = 2', bcms thn bdd above 16' interval. Pronounced vert joint net at N45°W and S45° W. Outcrop face is v platy and rubbly in upper 4'. Less fossil than below. | 1i feet |
| LIMESTONE - | V f - f gr matrix. Brn-gry, wthrs bf gry, arg, bds not apparent. F resist, f ind. Very fossiliferous. | 9 feet |
| | | 20 feet |

Base of exposed section. Remainder of slope talus covered.

SECTION: Moon South (MS)

LOCATION: 127°22'W - 65°35'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
KEE SCARP PLATFORM

Top of exposed section.

LIMESTONE - Biomicrite, m brn-gry, wthrs lt m gry, arg, thn (?) bdd, mod resist, w ind, pel texture near top. 6 feet

Base of exposed section.

SECTION: Gap Mountain West ($GM_W$)

LOCATION: 127°38'W - 65°33'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
KEE SCARP PLATFORM

Top of exposed section - Top of cliff. Upper contact not exposed. Canol shales underlie mantled and forested valley immediately above cliff.

LIMESTONE - V f xln, gry-brn, wthrs lt tan gry, thn bdd, sl arg, mod resist, f ind, rubbly weathering. Upper 3' thick bdd, forms pronounced flat-irons. Fossiliferous.

34 feet

LIMESTONE - V f gr, gry-brn, wthrs lt tan gry, bds avg 6" - 1'. Sl arg. Fossiliferous.

52 feet

86 feet

Base of exposed section - Base of cliff. Contact with Hare Indian shales not exposed in mantled valley.

SECTION : Gap Mountain (GM)

LOCATION : 127°36'W - 65°33'N
Northwest Territories

METHOD : 5 Foot Jacob Staff
Random Samples

MEASURED BY : W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
HUME

Top of exposed section - Top of flatirons. Contact with overlying Hare Indian shales not exposed.

LIMESTONE - Micritic, gry-brn, wthrs lt-m gry, bds avg 3" - 6" to 30' interval. Mas bds below 30'. Major vert fracs N10°E, minor N60°E. Fossiliferous.

70 feet

Remainder of section visually estimated and described from distance. Unit not sampled.

SAME AS ABOVE - Mod bdd. Forms flatirons - from 90' - 100'.

30 feet

100 feet

Base of section talus covered and probably faulted.

PLATE 10

SECTION: Hoodoo Mountain (HM)

LOCATION: 127°33'W - 65°31'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
KEE SCARP PLATFORM

Top of exposed section - Top of cliff.

LIMESTONE - F gr - mic gran, gry-brn, wthrs bf gry, thn bdd, bds avg 2". F to m resist, m ind. Unit exhibits overall mass appearance and erodes to form Hoodoos. Organic content increases upward. Fossiliferous. 104 feet

LIMESTONE - Vf - f gr, brn to gry-brn, wthrs bf to gry-bf. M to mas bdd, rubbly. Unit forms base of hoodoos eroded in cliff face. Fossiliferous. 21 feet

LIMESTONE - F gr, brn to gry-brn, wthrs bf gry, bds avg 1' - 2' w 3" intrbds. Mod resist, mod ind, sl bit, arg. Unit forms distinctive wavy band on cliff face. 5 feet

LIMESTONE - F - m gr, gry-brn, wthrs gry-bf gry, resist, w ind, mod (?) bdd, rock wthrs platy - prob due to increase in fossil material. Fossiliferous. 17 feet

SECTION: Hoodoo Mountain (HM) - Continued

| | | |
|---|---|---|
| LIMESTONE - | F - m gr, gry-brn, wthrs gry to gry-brn, mas bdd, v resist, w ind, arg. Major fracs N25°W, dip 65°NE. 147' - 152' vug - up to 6", avg 2", some vugs are 2' long by 3" deep and 1 1/2" - 3" wide. At 168' thn arg ls intrbds. Fossiliferous. | 31 feet |
| LIMESTONE - | M gr, lt brn gry, wthrs gry to bf gry, mod resist, mod ind, arg, bds avg 6". | 2 feet |
| | | 180 feet |

Base of exposed section. Talus slope extends to creek level.

SECTION: Cleaver Mountain (CM)

LOCATION: 127°32'W - 65°29'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
KEE SCARP PLATFORM

Top of exposed section. Canol shales not exposed. Proximity of shales indicated by topographic break and recessive morphology.

LIMESTONE - Gry-brn to gry, wthrs bf gry, mas bdd, v resist, w ind, sl arg. Unit bcms thnr bdd at top. Major fracs strike east - dip 22°N. Bds 6" - 1'. Wh calc in fracs at 42' - 47'. Very fossiliferous.

37 feet

LIMESTONE - Bioclastic, f gr, gry brn, wthrs bf gry, thn bdd, bds avg 1" - 3". F resist, mod ind, arg. Fossiliferous.

10 feet

47 feet

Base of exposed section. Hare Indian shales not exposed - shale proximity indicated by recessive morphology.

SECTION: Bosworth Creek (BC)

LOCATION: 126°52'W - 65°20'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
KEE SCARP PLATFORM

Top of exposed section. Contact between Kee Scarp limestones and canol black, limonitic, non calc platy shales exposed approximately 50' west of Section BC.

LIMESTONE - V f - f gr, brn-gry, wthrs bf gry, bds avg 3", mod resist, f ind. Fossiliferous. 7 feet

Base of exposed section - River level.

PLATE 13

SECTION: Norman Wells (NW)

LOCATION: 126°42'W - 65°18'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
KEE SCARP PLATFORM

Top of exposed section. Slope and beds dip SW at approx same degree. Upper contact with canol shales exposed in Norman Quarry Section ($NQ_S$) approx 3/4 mile SW. See Section $NQ_S$.

| | | |
|---|---|---|
| LIMESTONE - | V f gr, brn-gry, wthrs gry, mas, mod resist, f ind, sl arg, sl slty. At 4' m-thn bdd, fracs common, thn bdd part equiv (?) to +28' interval in Section $NQ_S$. Fossiliferous. | 17 feet |
| LIMESTONE - | M gr, (Calcarenite) coralline, m gr, bf gry, wthrs bf gry, mas bdd, mod resist, f ind. | 15 feet |
| | Covered | 20 feet |
| LIMESTONE - | V f gr, Lithographic. Gry-brn, wthrs bf gry. Bd not apparent. | 10 feet |
| | Covered | 13 feet |
| LIMESTONE - | Vf - f gr, bf gry, wthrs lt gry. Fossiliferous. | 2 feet |
| | Covered | 15 feet |
| LIMESTONE - | V f gr, crypto gr (Calcilutite) brn-gry, wthrs bf gry. Arg, mas bdd, v resist. V hackly on outcrop. Fossiliferous. | 17 feet |

SECTION: Norman Wells (NW) - Continued.

| | | |
|---|---|---|
| LIMESTONE - | Bioclastic, v f gr, brn-gry, wthrs bf gry, mas bds, v resist, w ind, arg, bit, 5% wh calc near base. At 122' v bioclastic. At 139' limonitic, wh calc, recrystal. Fossiliferous. | 30 feet |
| | Covered<br>Probably Ls | 33 feet |
| LIMESTONE - | V f gr, brn-gry, wthrs bf gry, sl arg, mas bdd, v resist, w ind. Fossiliferous. | 40 feet |
| | | * 212 feet |

Base of exposed section. Talus covered slope extends to river valley.

* Apparent thickness. Recalculated to 180±.

SECTION: Norman Quarry South ($NQ_S$)

LOCATION: 126°44'W - 65°18'N .
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
CANOL

Top of exposed section.

SHALE - Fissile, non calc, bl to gry-grn, wthrs red, orange bl. Thickness varies laterally. 4 feet

Pos Disconformity

MIDDLE DEVONIAN
KEE SCARP PLATFORM

LIMESTONE - V f gr, brn-gry, wthrs gry, bds avg 6". (This thn bdd unit prob equiv, in part, to interval top 212 on NW section). 8 feet

LIMESTONE - V f gr, sandy, bf gry, x bdd, jointed, frac, wh calcite. Bcms thnr bdd up section. (Section transferred 100's on K bed from underlying section). 7 feet

LIMESTONE - V f gr, bf gry, wthrs bf gry, arg, sandy, mas bdd. Fossiliferous. 7 feet

K Bed at 26'

LIMESTONE - Coralline, v f gr, 4 feet

SECTION: · Norman Quarry South ($NQ_S$) - Continued.

| | | |
|---|---|---|
| LIMESTONE - | V f gr, (Calsilutite) scat bit filled styolites at base. Sub conc frac, very few fossils, Lateral variation in thick and litho. (Barren Unit). | 4 feet |
| LIMESTONE - | Biosparite, v f gr, bf gry-wh gry, wthrs bf gry, arg, mas bdd, mod resist, w ind, bit, 5% pyrite in scat 1/2" layers. Styolitic. Fossiliferous. | 6 feet |
| | | 40 feet |

Base of exposed section.

SECTION: Shavetail (ST)

LOCATION: 128°17'W - 65°28'N
Northwest Territories

METHOD: 5 Foot Jacob Staff
Random Samples

MEASURED BY: W. Buckley - A. Depetris. (June, 1966).

MIDDLE DEVONIAN
KEE SCARP PLATFORM

Top of exposed section.

LIMESTONE - Litho - v f gr, bf-gry, wthrs brn-gry, thn bdd. Dense. 12 feet

LIMESTONE - Micritic, brn-gry to gry, wthrs lt gry, bdg mas to crude. Sl arg, v resist, w ind. Pronounced lateral facies and thickness change. Fracs N70°E, dip 31°SE. At 23' ls, brn-gry, f-m gr, dense. From 42' - 48' pos reef talus. Very fossiliferous. 36 feet

K Bed. Used to project and correlate interval to base of slope at 48'.

LIMESTONE - Microgran to m gr, brn-gry, thn - mod bdd. Arg, mod resist, w ind. 64' - 65' ls, med gr, brn-gry, mas bdd. 65' - 74' ls, thn, platy, plates avg 3/16", recess, prtly covered. 74' - 86' ls, microgran, lt gry, brn, mod bdd, avg 1'. 38 feet

Base of in place rock.

COVERED - At 116' 25' slump block. (Covered area probably faulted). 55 feet

SECTION: Shavetail (ST) - Continued

| | | |
|---|---|---|
| LIMESTONE - | F - m gr, gry-brn, wthrs lt gry, bds (?) approx 1'. Mod resist, w ind. Fossiliferous. | 15 feet |

MIDDLE DEVONIAN
HARE INDIAN

| | | |
|---|---|---|
| SHALE - | Brn - grn-gry, wthrs brn-gry, platy, calc. Unit mostly covered. | 20 feet |
| | | 176 feet |

Base of exposed section. Remainder of slope mantled and grass covered. Probable fault zone indicated by presence of cold sulphur springs and abdt caliche deposits.

Plate 1

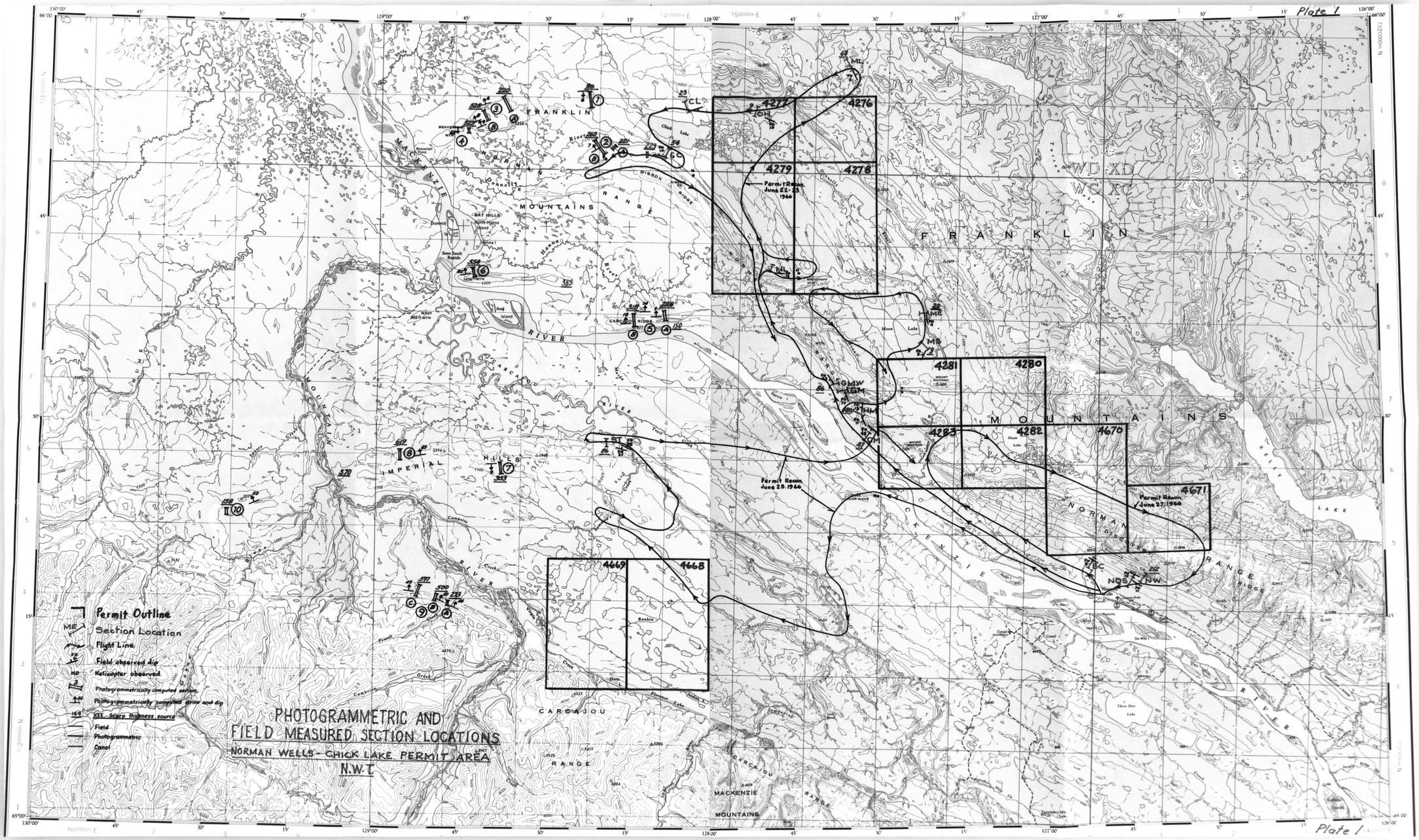


Plate 1