

PROJECT NO. 57-6-75-1

MOBIL OIL CANADA LTD.
NORTHERN CANADA AREA
TADENET AREA
TOP PALEOZOIC
CARBONATES
TIME STRUCTURE
Datum 1000' WGS 10000 11/48
Cont. 10' 02048 Date July 1975

057-06-06-086

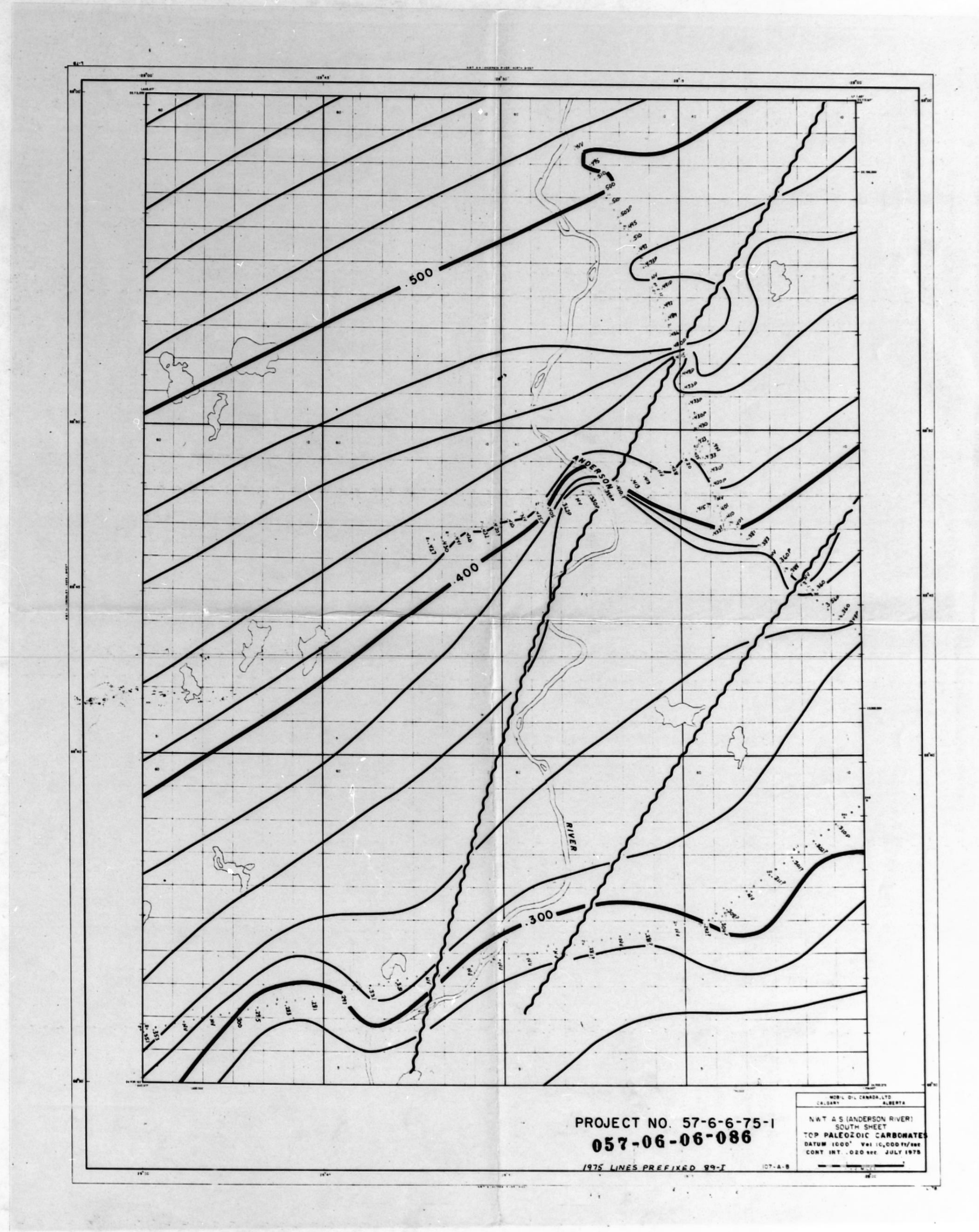
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January 1976



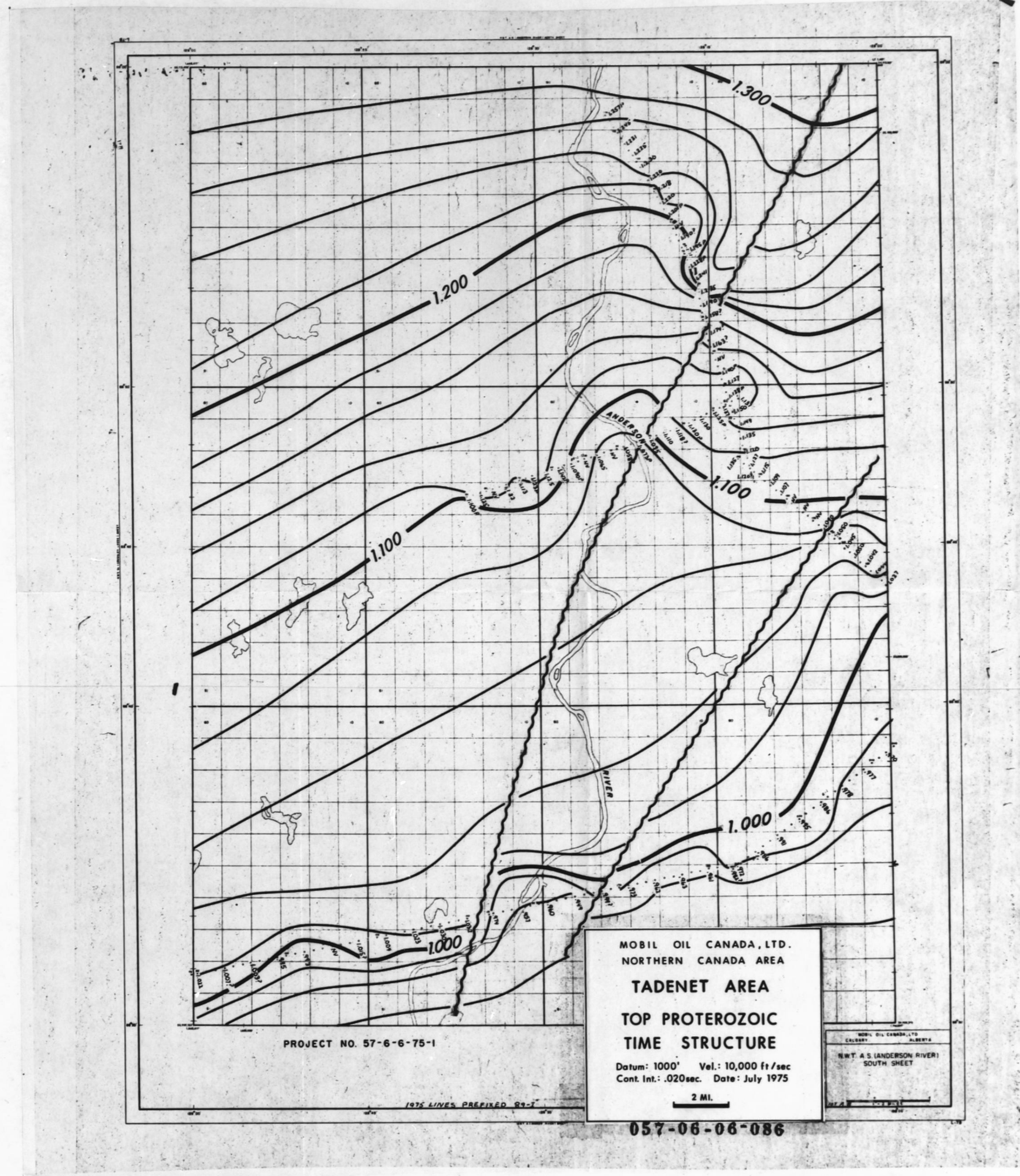
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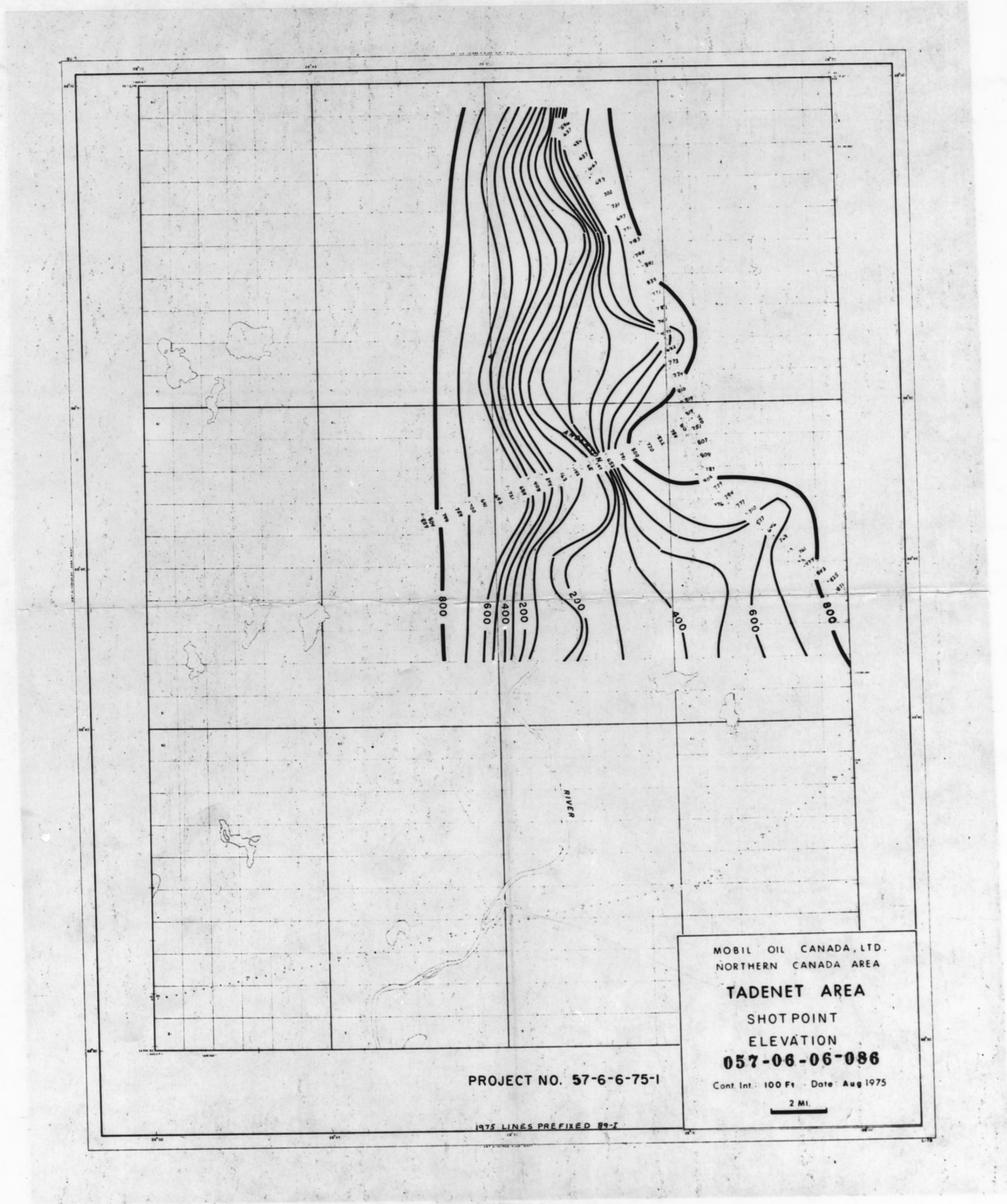
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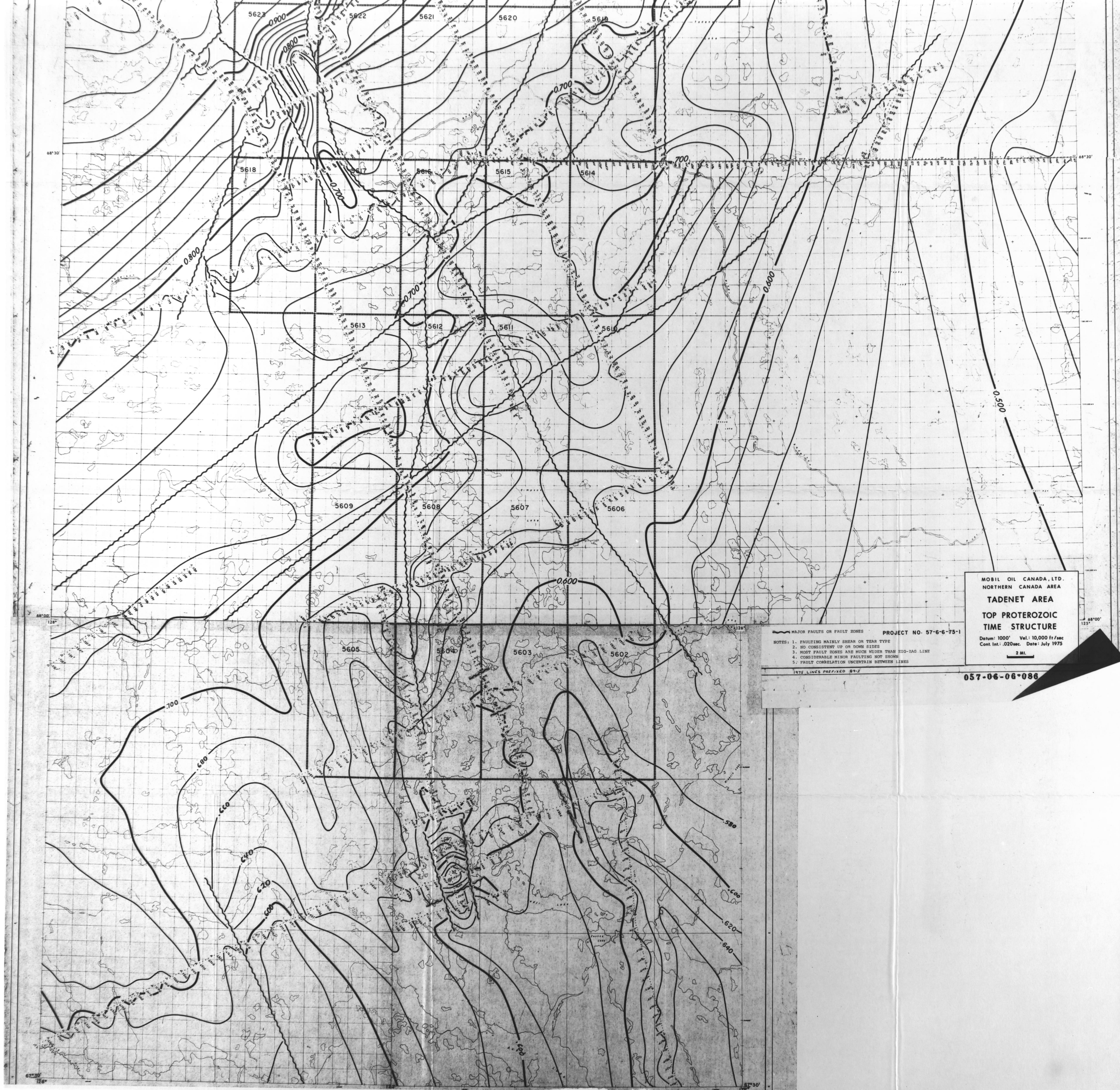
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January 1976



057-06-06-086

Geophysical Exploration Survey

TADENET AREA
Northwest Territories

Project No. - 57-6-6-75-1
Permit No's. - See Enclosures

Co-Ordinates
Latitude 67°48' to 69°13'
Longitude 125°10' to 129°30'

Permittee
Mobil Oil Canada Limited
Calgary, Alberta

Report by
R. Mercer
May, 1975



Survey Type - Reflection Seismograph (Dynamite)

Work Period - December 8, 1974 to April 22, 1975

WESTERN GEOPHYSICAL COMPANY OF CANADA, LTD.

Party MO-89
Calgary, Alberta

Western

Project No. 57-6-6-75-1

Reflection Seismograph Survey
TADENET AREA, N.W.T.

For
MOBIL OIL CANADA LIMITED
Party NO-89 1974-1975

057-06-06-086



057-06-06-086

INTRODUCTION

The Tadenet Area is located in the Northwest Territories approximately 180 miles east of the town of Inuvik.

The survey was a reconnaissance program consisting of 530 miles of new cut line designed to evaluate the area with respect to anomalous conditions which would produce oil and gas bearing structures.

The survey was conducted by the Western Geophysical Company of Canada, Ltd. working on behalf of the Mobil Oil Canada Limited.

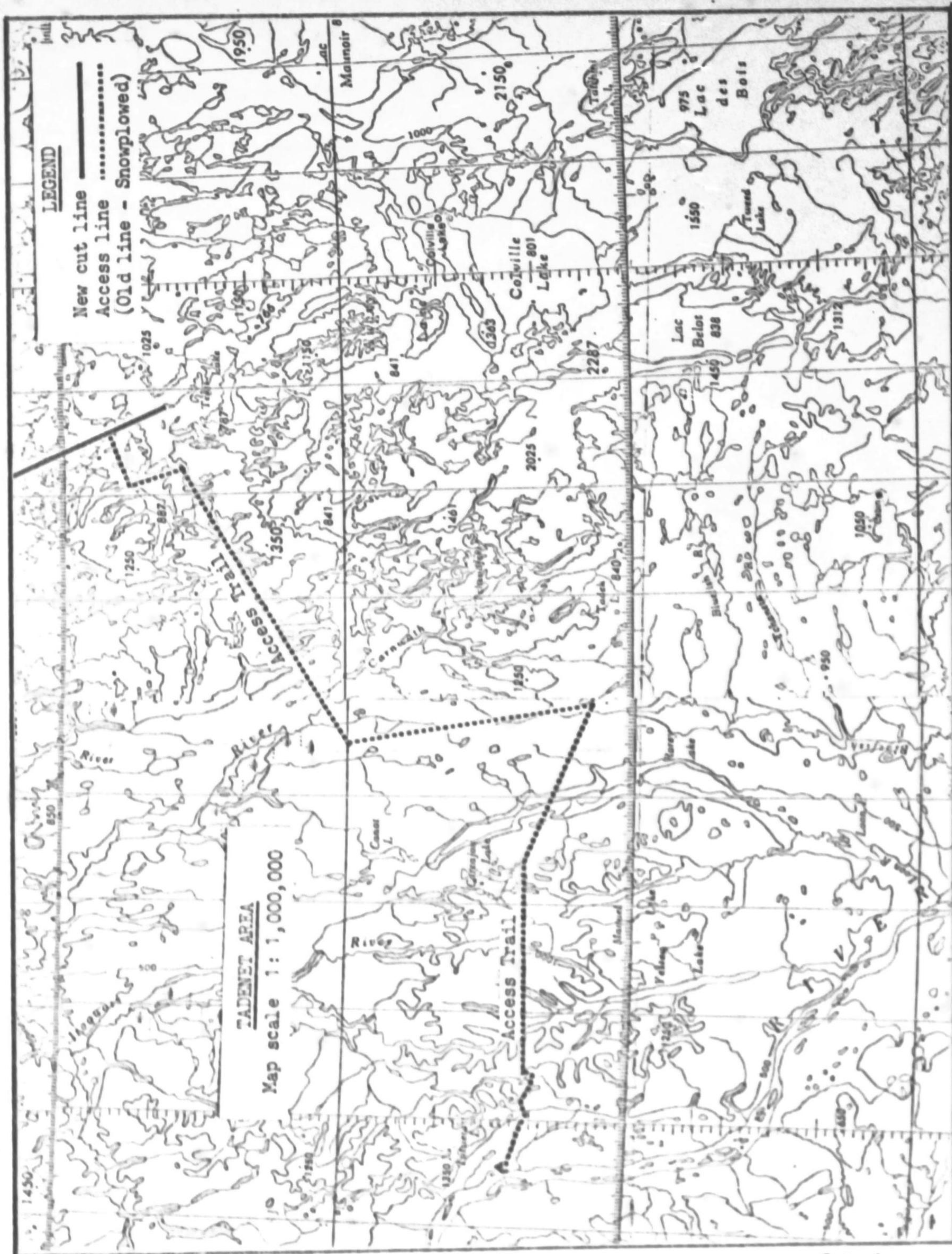
The processing and interpretation of the seismic data was by the staff of the Mobil Oil Canada Limited.

The field operation was under the direction of Mr. W. Quirk.

Supervision was by Mr. E. Kohse and Mr. J. Bunker for Mobil Oil Canada Limited, and by Mr. R. Mercer and Mr. G. Schneider for Western Geophysical Company of Canada, Ltd.

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EQUIPMENT

TECHNICAL

| | | |
|----------------------|-----------------------|---------------------------|
| Amplifiers | Texas Instruments | DFS-III |
| Tape System | Texas Instruments | 508 |
| Oscillograph | Tektronic | 422 |
| Camera | S.I.E. | ECR-10A |
| Remote Firing System | Input-Output | |
| | Encoder | ENC 200 WT |
| | Decoder | DEC 200 |
| Cables | Mark Products Ltd. | 1320 feet |
| | | 6 & 12 outlets per cable |
| | | 220 & 110 group intervals |
| Geophone Strings | Geo Space Canada Ltd. | 10 HZ |
| | | 18 phones /220 feet |

VEHICLES

All vehicles were track mounted. Two experimental half-tracks were tested and are included in the complement of crew vehicles.

| <u>No.</u> | <u>Use</u> | <u>Type</u> | <u>Year</u> |
|------------|--|---------------------------|-------------|
| 1 | Party Manager | F-350 $\frac{1}{2}$ Track | 1974 |
| 1 | Recorder | RN-110 | 1974 |
| 1 | Shooting | FN-75 | 1968 |
| 3 | Cable | FN-60 | 1974 |
| 1 | Survey | RN-75 | 1966 |
| 1 | Survey | F-600 $\frac{1}{2}$ Track | 1974 |
| 1 | Drilling Unit Mayhew Model 1000-Air/Water | Yukon | 1972 |
| 1 | Drilling Unit Mayhew Model 1000-Air/Water | FN-180 | 1967 |
| 1 | Drilling Unit Mayhew Model 1000-Air/Water | FT-800 | 1966 |

PRODUCTION

DRILLING

| | |
|--|--------------|
| Total operating days | 113 |
| Total moving days. | 14 |
| Total weather days | 1 |
| Total drilling days. | 98 |
| Number of holes drilled. | 3888 |
| Average hole depth | 52.9 feet |
| Average holes per day. | 38 |
| Average number drills per day. | 5 |
| Total footage drilled. | 205,585 feet |

VEHICLES

| <u>No.</u> | <u>Use</u> | <u>Type</u> | <u>Year</u> |
|------------|---|-------------|-------------|
| 3 | Drilling Units Mayhew Model 1000 - Air | FN-110 | 1970 |
| 2 | Water Trucks | RN-110 | 1966 |
| 1 | Water Truck | RN-110 | 1964 |

CAMP - DRILLING

| | | | |
|---|--------------------------|----------------|------|
| 1 | Kitchen-Diner | Sleigh mounted | 1974 |
| 1 | Utility | Sleigh mounted | 1974 |
| 1 | Office-Sleeper | Sleigh mounted | 1974 |
| 2 | Sleepers | Sleigh mounted | 1974 |
| 1 | Rec Hall-Sleeper | Sleigh mounted | 1974 |
| 1 | Power-Shop-Storage | Sleigh mounted | 1974 |
| 1 | Fuel Sloop (3500 gallon) | Sleigh mounted | 1974 |
| 1 | Powder Magazine | Sleigh mounted | 1974 |
| 1 | Mobile Shop | RN-110 | 1965 |

CAMP - RECORDING

| | | | |
|---|-----------------------|----------------|------|
| 1 | Kitchen-Diner-Utility | Sleigh mounted | 1974 |
| 1 | Power-Shop-Storage | Sleigh mounted | 1974 |
| 2 | Sleepers | Sleigh mounted | 1974 |
| 1 | Fuel Sloop | Sleigh mounted | 1974 |
| 1 | Incinerator | Sleigh mounted | 1974 |

DOZER CREWSVEHICLES

| | | |
|---|-------------------------|--|
| 4 | D7 Caterpillar Tractors | c/w Hydraulic Blades Winch & Mushroom Shoes |
| 1 | D6C Caterpillar Tractor | c/w Hydraulic Blades Winch & Mushroom Shoes |
| 1 | Safari Bombardier | Foreman's Vehicle |

CONTRACTORS

PRINCIPAL CONTRACTOR

Western Geophysical Company of Canada, Ltd.
530 - 71 Avenue S.E.
Calgary, Alberta

SUB-CONTRACTORS

MacMillan Construction (Peace River) Ltd.
P.O. Box 1680
Peace River, Alberta

Elgin Exploration Co. Ltd.
6229 Centre Street South
Calgary, Alberta

Gateway Aviation Ltd.
Hangar 13, Industrial Airport
Edmonton, Alberta

Peace Air Ltd.
P.O. Box 1357
Peace River, Alberta

CREW COMPOSITION

RECORDING

| | |
|-------------------------|--------|
| 1 - Observer | |
| 1 - Jr. Observer | |
| 1 - Shooter | |
| 1 - Assistant Shooter | |
| 2 - Cable Truck Drivers | |
| 6 - Recording Helpers | 12 Men |

DRILLING

| | |
|----------------------|--------|
| 7 - Drillers | |
| 7 - Drill Helpers | |
| 1 - Driller Mechanic | 15 Men |

SURVEY

| | |
|---------------|-------|
| 2 - Surveyors | |
| 2 - Rodmen | 4 Men |

CATERING

| | |
|---------------------|-------|
| 2 - Cooks | |
| 2 - Assistant Cooks | |
| 1 - Camp Attendant | 5 Men |

ADDITIONAL

| | |
|-----------------------|-------|
| 1 - Party Manager | |
| 1 - Supplyman | |
| 2 - Clerks | |
| 1 - Mechanic | |
| 1 - Mechanic's Helper | |
| 1 - Clean-up Man | 7 Men |

LINE CUTTING & CLEARING

| | |
|------------------------|--------|
| 10 - Machine Operators | |
| 1 - Foreman | |
| 1 - Cook | 12 Men |

| | |
|-----------------|--------|
| Total Personnel | 55 Men |
|-----------------|--------|

DOZER CREWS

CAMP

| <u>No.</u> | <u>Use</u> | <u>Type</u> |
|------------|---------------------------|----------------|
| 1 | Kitchen-Diner-Utility | Sleigh mounted |
| 1 | Sleeper | Sleigh mounted |
| 1 | Shop-Power Unit | Sleigh mounted |
| 1 | Fuel Sloop (2000 gallons) | Sleigh mounted |

FUEL HAUL CAMP

| | | |
|---|---------------------------|----------------|
| 1 | Kitchen-Diner-Sleeper | Sleigh mounted |
| 1 | Shop-Power Unit | Sleigh mounted |
| 1 | Fuel Sloop (2000 gallons) | Sleigh mounted |

Ice building was poor during December and January. The initial freeze was followed by a heavy snowfall which settled the ice surfaces of the lakes producing surface flooding and the building of multiple ice layers. The insulating effect of the deep snow and the various layers of ice hindered the building of a strong and smooth ice layer even though temperatures during December and January were constantly in the -50°F. range.

Because of poor ice and the abnormally low temperatures the use of DC-3 aircraft for fuel haul had to be temporarily abandoned in favor of the lighter turbo-prop Twin Otter aircraft. Fuel costs were doubled because of the disparity in the load carrying capabilities of the two aircraft.

The crew fuel consumption per day was 1000 gallons of diesel fuel and 300 gallons of gasoline. During December and January, all fuel supplies originated in Norman Wells, but an overtaxing of the Norman Wells facilities and an increase in flying distances as the work program progressed northward dictated the use of Inuvik as an alternate source of supply.

Explosives, drill bits and a portion of the gear oils and lubes were obtainable in Norman Wells. Food supplies, vehicle repair parts, etc. were purchased in Calgary.

Personnel were obtained from Calgary, Edmonton, Peace River,

from Calgary to Norman Wells on a twice weekly basis. Cargo and personnel were dispatched from Norman Wells by smaller aircraft.

Field crew airstrips were built on lake ice. During early January, light tracked vehicles packed the lake surface to make airstrips but after January and when ice thickness permitted, a D6C cleared the snow from the ice surface.

The fuel haul cat camp, which was stationed on the field crew airstrip, was the vehicle which housed the aircraft control system and the weather station. Aircraft control consisted of an air to ground radio, a single sideband radio and a non-directional beacon all of which were operated by the resident dozer operator.

The temporary fuel supply at Little Chicago consisted of 30,000 gallons of diesel fuel and 15,000 gallons of gasoline stored in three 15,000 gallon tanks. The supply was expected to last one month, at which time ice thickness would be adequate for the use by fixed wing aircraft.

Fuel consumption exceeded expectations and the supply was depleted shortly after arriving on the prospect. The shortage resulted from an extended use of the Little Chicago staging area while awaiting government approval on a start-up date, and excessive towing power required to move the heavy camp equipment over an access road which lacked the benefits of preliminary snow removal and trail repair.

LOGISTICS

Geophysical equipment, dozers, camps and temporary fuel supplies were assembled during the period September 20 through October 5, 1974 at Little Chicago, a staging area located on the MacKenzie River, 180 miles north of Norman Wells.

The prospect was 135 miles north east of the staging area. The move to the prospect took 10 days (December 9-19). Prior to the Christmas time off period December 22, 1974 through January 6, 1975, fifteen miles of line was cut and two miles of test holes were drilled. Recording commenced with the shooting of the test holes on January 7 and production shooting commenced January 10, 1975. The season's operations were completed on April 21, 1975 and the equipment was stacked at a staging site located on the west bank of Simpson Lake.

Staging Area Location - Latitude 68°10'

Longitude 126°40'

A company owned and operated expediting service located in Norman Wells was the supply group for Western's northern operations. The service was on a cost sharing basis with two other Western crews working in the area. The service consisted of two Expeditors, one telex-telephone operator, 3 trucks, one fork lift, 2 trailers, 3 storage buildings, 2 fuel tanks, telex, telephone and communication radios.

A leased Hawker Sidley 748 carried supplies and personnel

CHARGE SIZE, HOLE CONFIGURATION & FILTER TESTS

The test was designed to confirm the validity of the recording parameters used in previous surveys.

The test spread consisted of 2 miles of 48 trace recordings using multiple geophones spaced at intervals of 110 feet. The geophone strings contained 18-10HZ phones per string.

The shot point spacing was 330 feet. Sixty foot pattern holes were drilled at each location spaced 50 feet apart. All holes were preloaded as follows:

Pattern No. 1 $2\frac{1}{2}$ - 5 - $2\frac{1}{2}$ pounds

Pattern No. 2 $2\frac{1}{2}$ - 5 - 10 pounds

Preloads were alternated on successive locations so that a preload pattern was repeated every 660 feet.

The test holes were shot using the following shooting sequence. All recordings were in the 18 - 36 - 124 filter.

Pattern 1 Shot 1 - 1 hole @ 5 pounds

Pattern 1 Shot 2 - 2 holes @ $2\frac{1}{2}$ pounds

Pattern 2 Shot 1 - 1 hole @ $2\frac{1}{2}$ pounds

Pattern 2 Shot 2 - 1 hole @ 5 pounds

Pattern 2 Shot 3 - 1 hole @ 10 pounds

The shooting sequence was continued over the entire length of the line.

In data processing, shots of similar size and configuration were stacked to produce 800% sections each displaying the characteristics of the differing charge sizes and hole configurations.

FIELD PROCEDURES

RECORDING

| | |
|------------------------|-----------------|
| Sample Rate | 2 milli-seconds |
| Record Length | 4 seconds |
| Recording Filter | 18-36-124 |
| Sub-surface Coverage | 800% |
| No. of Groups | 48 |
| Group Interval | 220 feet |
| Geophone Array | In line |
| Seismometers per Group | 18/220 feet |
| Shotpoint Location | 660 feet |
| Holes per Location | 1 |
| Hole Depth | 45 & 60 feet |
| Dynamite Charge | 5 & 15 pounds |

All lines were shot with trace 1 to the north and east.

Each line began and ended with a 24 trace recording.

The cable layout was a 5280 foot balanced spread with shot points located on the group flags. The group at the hole was dropped during shooting thereby producing 110 foot gaps. Lines were extended 4 shot points beyond line intersections in order to have 800% sub-surface coverage at the intersections. The shot point seismometer was placed 10 feet from the shot hole.

All holes were pre-drilled and pre-loaded.

Inconsistencies in Standard Procedures:

Lines 2, 7, 8 & 9 were shot backwards; that is with trace 1 to the west and trace 48 to the east.

Norman Wells, Wrigley, Fort Good Hope, and Aklavik. Northwest Territories residents comprised 35% of the crew.

There was no rotation schedule set up for personnel. Time-off periods were on a self-determination basis subject only to the availability of personnel.

On the first 6 shot point locations a fourth hole was drilled to a depth of 60 feet using a preload of $2\frac{1}{2}$ pounds. These holes were for filter tests.

The following filters were tested.

12 - 18 - 62

12 - 36 - 62

12 - 18 - 124

18 - 18 - 62

18 - 36 - 62

18 - 18 - 124

CONCLUSIONS

After testing it was decided to retain the use of the 18 - 36 - 124 recording filter and to use single holes with a 5 pound preload.

CHARGE SIZE, HOLE CONFIGURATION & FILTER TESTS

The test was designed to confirm the validity of the recording parameters used in previous surveys.

The test spread consisted of 2 miles of 48 trace recordings using multiple geophones spaced at intervals of 110 feet. The geophone strings contained 18-10HZ phones per string.

The shot point spacing was 330 feet. Sixty foot pattern holes were drilled at each location spaced 50 feet apart. All holes were preloaded as follows:

Pattern No. 1 $2\frac{1}{2}$ - 5 - $2\frac{1}{2}$ pounds

Pattern No. 2 $2\frac{1}{2}$ - 5 - 10 pounds

Preloads were alternated on successive locations so that a preload pattern was repeated every 660 feet.

The test holes were shot using the following shooting sequence. All recordings were in the 18 - 36 - 124 filter.

Pattern 1 Shot 1 - 1 hole @ 5 pounds

Pattern 1 Shot 2 - 2 holes @ $2\frac{1}{2}$ pounds

Pattern 2 Shot 1 - 1 hole @ $2\frac{1}{2}$ pounds

Pattern 2 Shot 2 - 1 hole @ 5 pounds

Pattern 2 Shot 3 - 1 hole @ 10 pounds

The shooting sequence was continued over the entire length of the line.

In data processing, shots of similar size and configuration were stacked to produce 800% sections each displaying the characteristics of the differing charge sizes and hole configurations.

SURVEYING

The survey instrument used was the Wild T-16 transit.

Two men comprised a survey party: One surveyor and one rodman. During the months December, 1974 and January, 1975 one survey party was used, but commencing February, 1975 two survey parties were deemed necessary.

Shot point and seismometer group locations were chained using a surveyor's steel road chain. Pin flags marked the seismometer group locations and lath marked the shot point locations.

Program lines were initiated by turning angles from known locations on lines of known bearings. Horizontal control was derived from existing lines, topography and existing trigonometric stations. Elevations were tied to lakes and government bench marks.

NOISE SPREAD TEST

The test was taken to determine the remedial action necessary for the elimination or control of ground roll noise which was prevalent during early shooting.

The test spread was located on line 2, south of line 9. The spread consisted of 5,280 feet of in line coverage using a geophone interval of 20 feet. In addition one 48 trace cross spread was layed out on line 9, 5,280 feet from the shot point.

The noise spread was shot with 8HZ single geophones using a 2 group overlap.

Seven shots were taken as follows:

| | | |
|------------|----------------------|--|
| Shot No. 1 | 20 ft. to 960 ft. | 48 traces |
| 2 | 940 ft. to 1880 ft. | 48 traces |
| 3 | 1860 ft. to 2800 ft. | 48 traces |
| 4 | 2780 ft. to 3720 ft. | 48 traces |
| 5 | 3700 ft. to 4640 ft. | 48 traces |
| 6 | 4620 ft. to 5280 ft. | 34 traces |
| 7 | 0 ft. to 940 ft. | 5280 ft. from shot point and perpendicular to line for shots 1 - 6 |

CONCLUSION

The results were inconclusive. There was no ground roll noise in evidence at the test location.

On the first 6 shot point locations a fourth hole was drilled to a depth of 60 feet using a preload of $2\frac{1}{2}$ pounds. These holes were for filter tests.

The following filters were tested.

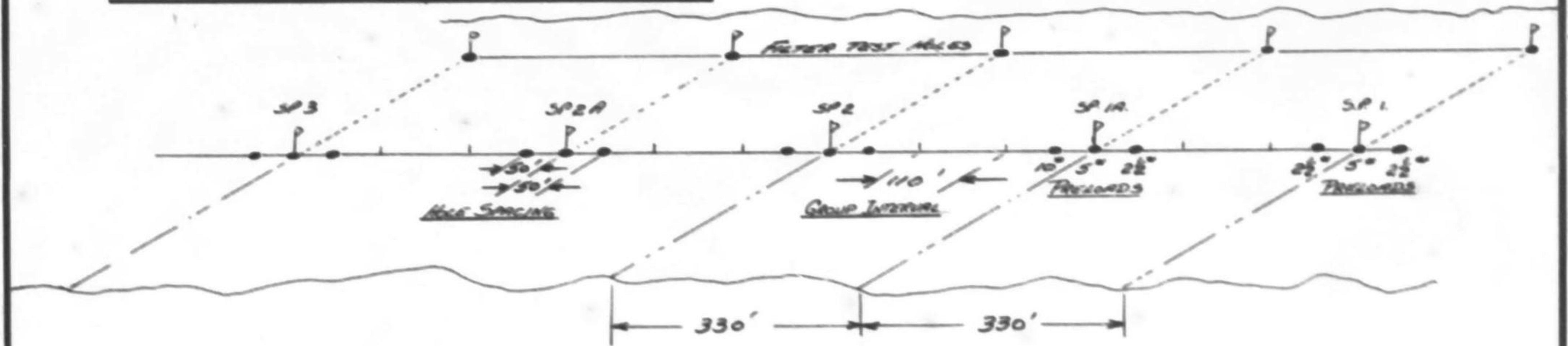
12 - 18 - 62
12 - 36 - 62
12 - 18 - 124
18 - 18 - 62
18 - 36 - 62
18 - 18 - 124

CONCLUSIONS

After testing it was decided to retain the use of the 18 - 36 - 124 recording filter and to use single holes with a 5 pound preload.

TEST PROGRAM LAYOUTS

CHARGE SIZE, HOLE CONFIGURATION & FILTER TEST



NOISE SPREAD TEST



TEST SHOT WITH 2 GROUP OVERLAP

DOZING

All line was new cut and because of poor ice conditions all lakes had to have detours cut. The line was cut to a 30 foot width with the slash windrowed to one side of the trail and compacted by the dozers. Where timber density warranted the slash piles were broken about every 1000 feet. Creek crossings were snow fills which were removed after completion of the shooting.

Five dozers were assigned to the operation. Two D-7's cut and cleared the line; Two D-7's moved camps and did line clean up, windrowed the slash and removed creek crossings; a D-6 built air strips and worked the fuel haul.

DATA PROCESSING & INTERPRETATION

Data reduction, processing, interpretation and mapping was by the staff of Mobil Oil Canada Limited under the direction of Mr. W. Dmitroga.

DRILLING

Seven rotary drills were used during the survey. Four were air drills and three were air-water drills. Single holes were drilled to a depth of 45 feet and preloaded with charges of 10 pounds during the period December through February. During March and April the hole depth was increased to 60 feet and the preload charge to 15 pounds.

The drilling formation was chiefly dry clay. Sandstone was encountered in areas south of the Anderson River and gravel in areas north of the Anderson and Horton Rivers. In some holes the clay was wet but nowhere on the prospect was it considered necessary to use the mud-water capabilities of the drills.

Bit consumption was 0.73 bits per hole at an average cost of \$48.00 per bit.

Drill bits used were the heavy duty inserts, the standard one step insert and the three cone rock-bit, in sizes from 4½" to 5½".

REPORT ON SEISMIC INTERPRETATION

Tadenet Area N.W.T.

Project No. 57-6-6-75-1

INTRODUCTION

This report covers processing and interpretation of seismic reflection data acquired by Mobil Oil Canada Party 89 (Western Geophysical Party F-89) during the period January to April 1975. The field operations aspect of this survey are covered by a separate report prepared by Western Geophysical.

DATA PROCESSING

The processing sequence is shown on the header sheets at the ends of the seismic sections.

Processing was done on a Phoenix system at Mobil Oil Canada's office in Calgary where field reels and final stacked reels are on file.

REPORT ON SEISMIC INTERPRETATION

TADENET AREA N.W.T.

Project No. 57-6-6-75-1
Permit No.'s - See Enclosed Maps

Co-ordinates

Lat. $67^{\circ} 48'$ to $69^{\circ} 13' N$
Long. $125^{\circ} 10'$ to $129^{\circ} 30' W$

Permittee

Mobil Oil Canada, Ltd.
Calgary, Alberta

Report By

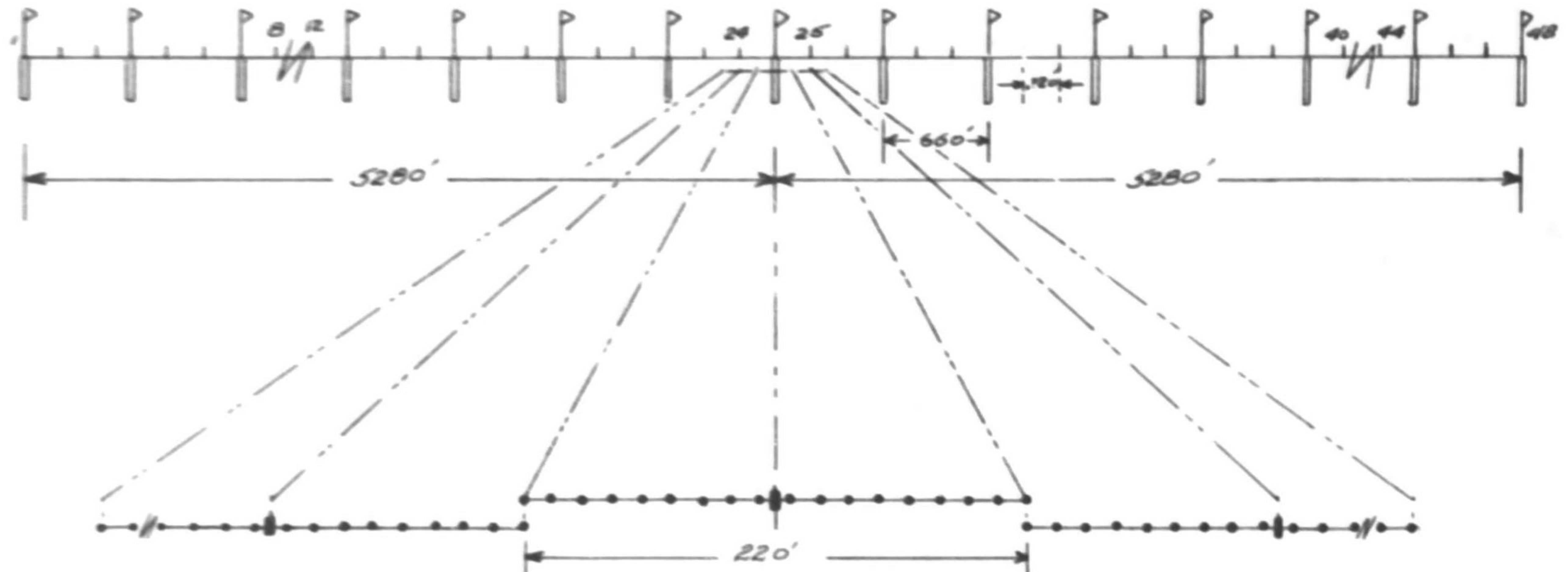
W. Dmitroca
August 1975

Supplement to report on field operations by Western
Geophysical Company of Canada Ltd., Party MO-89,
May 1975.

SPREAD AND CABLE DIAGRAM

North/East

South/West



Spread - 5280-220-0-220-5280
Geophone Group Interval - 220 Feet
Shot Hole Location Interval - 660 Feet
Offset - 220 Feet
Geophone Spacing (In Line) - 18/220 Feet

INTERPRETATION

The most continuous reflection in this area is one identified as Top of Proterozoic. It is the lowermost reflection of a band which is approximately 0.100 sec thick and dips regionally from about 0.6 sec at the south end of the block to 1.1 sec at the north end. This reflection band is postulated to arise from the Cambrian clastic zone which encompasses the Saline River, Mt. Cap and Mt. Clark formations. The top of this reflecting band is the approximate base of the Siluro-Ordovician carbonates of the Ronning group.

There are reflections from the top of the Paleozoic carbonate and Cretaceous over the north half of the area but they are absent over the south half due to regional truncation of the Cretaceous.

The Proterozoic in this area is a very thick interval of layered sediments which show strong structural deformation in the southern half of the block. The structures consist of faulted anticlines and synclines with up to 10,000 feet of relief and very prominent thickening and thinning of various stratigraphic units. It is estimated that there are over 30,000 feet of Proterozoic sediments in this area.

The following time structure and isochron maps, scale 1" = 2 mi., were made for the interpretation of this data.

1. TOP OF PROTEROZOIC -
Time Structure
2. TOP OF PALEOZOIC -
Time Structure
3. BASE OF CARBONATE TO
TOP OF PROTEROZOIC -
Isochron
4. S.P. ELEVATION

These maps are discussed under separate headings below.

TOP OF PROTEROZOIC:

Regional dip on this map is to the northwest and the rate of dip increases from southeast to northwest.

REPORT ON SEISMIC INTERPRETATION

Tadenet Area N.W.T.

Project No. 57-6-6-75-1

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Processing was done on a Phoenix system at Mobil Oil Canada's office in Calgary where field reels and final stacked reels are on file.

This horizon displays a considerable amount of faulting which is interpreted to be mainly shear or tear type. Most of these faults extend into overlying and underlying beds. On the map they are shown by relatively narrow zigzag lines but in reality most are fault zones with widths of up to two or three miles. Many of these faults have surface expressions in the form of chains of narrow elongated lakes. The fault zones produce a marked deterioration in data quality.

The average velocity to this horizon is estimated to be about 18,000 feet per second, but is varied considerably by the amount of Cretaceous overlying the Paleozoic carbonate. It would be higher at the south end and progressively decrease to the north as more Cretaceous is encountered.

One large and several small structures are present on the map. The large structure is on line 89-I-4, SP 270-320 in the vicinity of Sadene Lake. This structure is faulted along the southeast flank, with the down throw to the southeast. Maximum relief is about 0.100 sec or roughly 600 feet.

TOP OF PALEOZOIC

Structures on this horizon generally parallel those of the underlying Top of Proterozoic. This reflection is not present on the seismic sections over the south half of the area. Average velocity to this reflection is estimated to be 7,500 ft./sec.

BASE OF CARBONATES TO TOP PROTEROZOIC:

This interval shows a regional thinning from south to north and local thinning over the large structure in the vicinity of Sadene Lake. The interval velocity is estimated at 16,000 ft./sec.

SURFACE ELEVATION

Surface elevations range from a low of less than 100 feet on line 89-I-13 where it crosses the Anderson River to over 1,000 feet on the southeast and northeast portions of the surveyed area.