

REPORT TO
THE GOVERNMENT OF CANADA
PETITOT AREA

Oct

Seismic Survey by
Western Geophysical Company of Canada, Ltd.
for
Hudson's Bay Oil and Gas Company Ltd.

Party F-61

38-6-4-13

1969

38-6-4-13

Report of Reflection Seismograph Survey

PETITOT AREA

Northwest Territories

Permit Numbers 2701, 09, 10.

Project Number 38-6-4-69-1



Surveyed for

HUDSON'S BAY OIL AND GAS COMPANY LIMITED

Calgary, Alberta

Report Submitted to

THE GOVERNMENT OF CANADA

Department of Indian Affairs and Northern Development

Oil and Mineral Division

Northern Economic Development Branch

Report by

G. P. Bates -- Party Chief

Party F-61

WESTERN GEOPHYSICAL COMPANY OF CANADA, LTD.

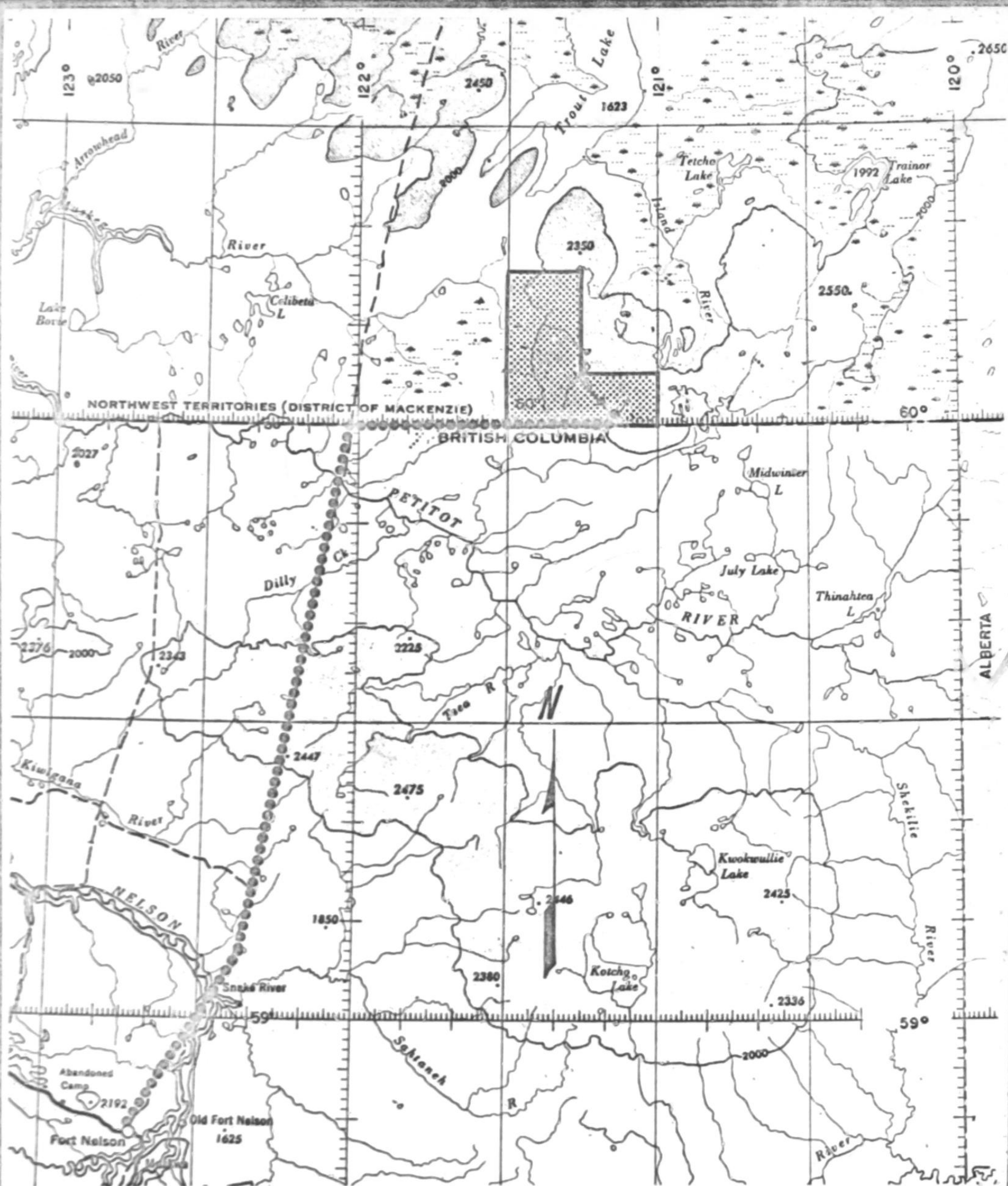
Calgary, Alberta

May, 1969

Western

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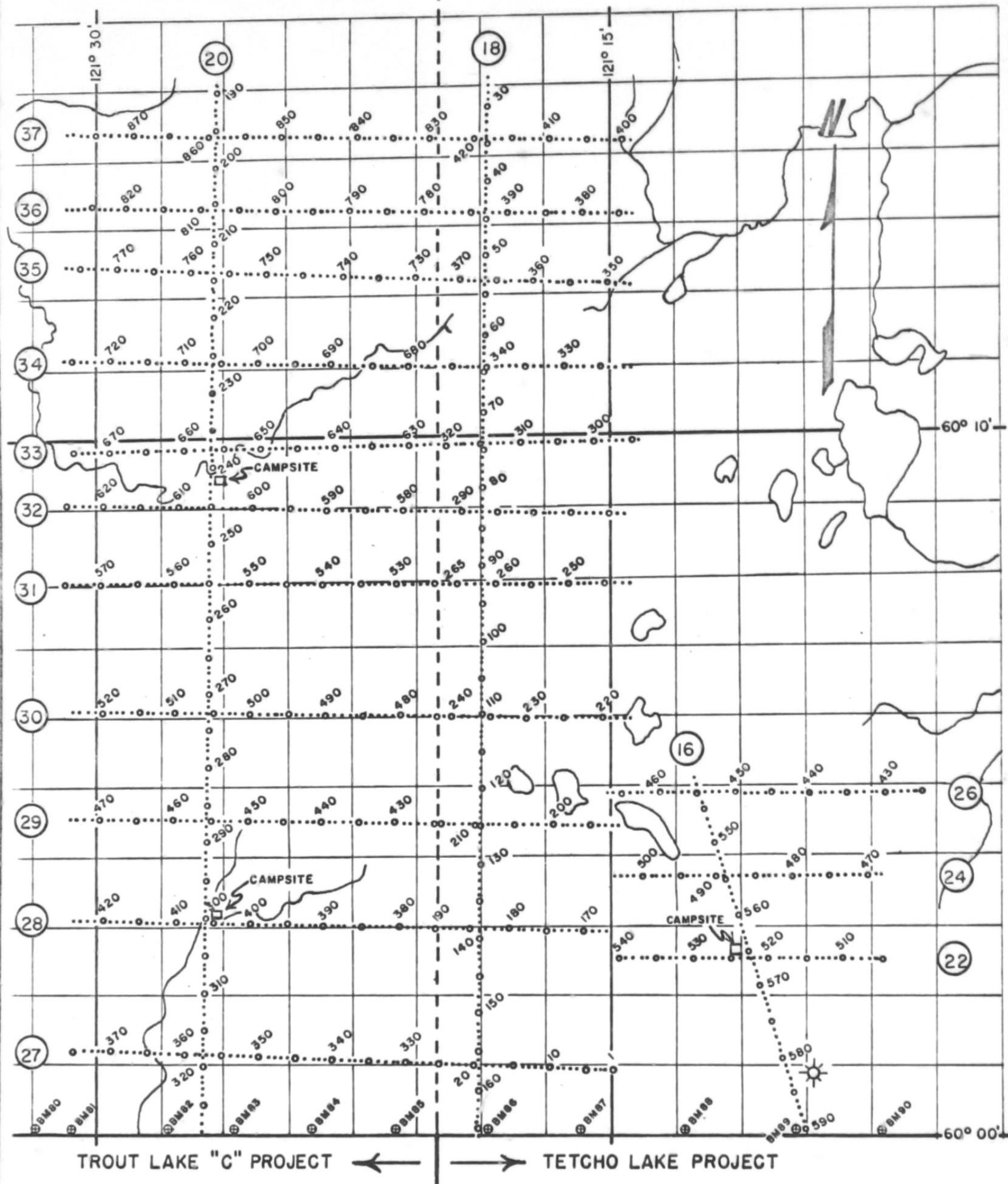
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PETITOT AREA - N.W.T.

AIR STRIP ———→○
ACCESS ROAD ●●●●●●●●

JAN. 1969



SCALE - 1" = 12,000 FEET.

PETITOT AREA - N.W.T.

JAN. 1969.

2. Permits:

N/A

3. Instruments:

The survey instrument used was a transit.

4. Ties:

The take-off for elevations and traverse of lines in the western part of the area was government bench mark number 83. This bench mark is located on the B. C. -N. W. T. border and is 2,850 feet east of the intersection of Line 20 and the border.

N. Lat.	60°00'03.55"
W. Long.	121°25'55.12"
Elevation	1,814.92 feet

The take-off for elevations and traverse of Lines 16, 22, 24 and 26 was government bench mark number 89. This bench mark is located on the B. C. -Alberta border and is 1,005 feet west of the intersection of Line 16 and the border.

N. Lat.	60°00'03.14"
W. Long.	121°09'40.90"
Elevation	2,102.82 feet

The south end of Line 18 was tied to government bench mark number 84.

INTRODUCTION

The Petitot Area is located in the Northwest Territories approximately 100 miles northeast of Fort Nelson, British Columbia.

The purpose of the survey was to locate reef of the Mid-Devonian age.

The survey was conducted during the period of January 8, 1969 to February 6, 1969, inclusive. Field personnel were stationed in portable camps on the prospect. The interpretive office staff was based at 1023A - 11th Avenue, S.W., Calgary, Alberta. Approximately 43 people, including all contractors, were involved in the field operation, and six people in the interpretive office.

The operation was under the supervision of Mr. L.S. Buckie of Hudson's Bay Oil and Gas Company Limited, and Mr. R.A. Mercer of Western Geophysical Company of Canada, Ltd. The Party Manager was Mr. R. Henningsgard.

Bulldozing operations were contracted by Bruce Rome Construction Ltd. and were under the supervision of Mr. R. Doyle of that company. The camp was catered by Crown Caterers Company Ltd. Other contractors involved in the operation were C.S. Hommy and L. Brick who each supplied one water truck for the drilling operations.

PERSONNEL

BULLDOZING

8	.....	Operators
1	.....	Foreman
1	.....	Cook

DRILLING

5	.....	Drillers
5	.....	Drill Helpers
2	.....	Water Truck Operators

RECORDING

1	.....	Observer
1	.....	Junior Observer
1	.....	Shooter
7	.....	Helpers

SURVEYING

1	.....	Surveyor
1	.....	Rodman
2	.....	Chainmen

CAMP AND CATERING

1	.....	Party Manager
1	.....	Field Computer
1	.....	Supply Driver
1	.....	Mechanic
1	.....	Camp Attendant
1	.....	Cook
1	.....	Bullcook

OPERATIONS

A. GENERAL ACCESSIBILITY

1. Surface Conditions:

The Petitot Area is easily accessible in winter time by means of existing winter roads. Rivers, creeks and muskeg can be crossed when sufficiently frozen. In general, there is surface muskeg in the low lying western portion of the area with scrub pine tree cover. In the higher eastern parts of the area, there are larger jackpine and poplar trees.

2. Topography:

Surface elevations in the area vary from a minimum of approximately +1,700 feet in the western part of the area to a maximum of approximately +2,300 feet in the eastern part of the area. The average rate of change between these two extremes is in the range of approximately 0 to 100 feet per mile.

3. Logistics:

Access to the area was via the Fort Simpson Trail between Fort Nelson, British Columbia and the Northwest Territories border, and then east along the border to the

prospect. Travel time by supply truck along this route was approximately seven hours (see Plate 1 for map of route and Plate 2 for campsite locations).

Approximately three supply trips per week to Fort Nelson were made by truck and the Hudson's Bay aircraft stopped at the airstrip near camp approximately twice each week (see Plate 1 for location of airstrip).

B. SURVEYING

1. Bulldozing:

The bulldozing operations were conducted from a separate self-contained camp. Ten men were employed in this operation.

The camp and equipment consisted of:

- 2 - D-6 Bulldozers
- 2 - D-7 Bulldozers
- 2 - Pick-up Trucks
- 1 - Power Trailer
- 1 - Kitchen Unit
- 1 - Sleeping Unit

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Other ties were:

E. C. I. Line 121-15 Shot-point 75

E. C. I. Line 60-02 Shot-point 87

H. B. O. G. -Pan Am Island River M-41 well

A fly line was run south from the west end of Line 26.

This run was tied to Lines 29, 24, 28 and 22.

All lines which did not form part of a loop were double run.

The survey crew consisted of four men using two pick-up trucks.

C. DRILLING

The drilling crew consisted of 12 men. Equipment consisted of four Auger drills, one conventional drill and water truck, and two extra water trucks. All drills were owned and operated by Western Geophysical Company. The two extra water trucks were sub-contracted.

The single shot-holes were drilled to a depth of 45 feet. Surface muskeg was encountered in approximately one-half of the holes and varied in thickness from zero to approximately 20 feet.

Below the muskeg was clay and rock to the total hole depth.

Occasional patches of surface gravel were encountered, particularly in the extreme western part of the area and also near the creeks.

D. RECORDING

1. Crew and Equipment:

The recording crew consisted of ten men. Recording equipment consisted of one recording truck, two reel trucks and one shooting truck. The recording instruments were Western Geophysical analog type. The model number was FA-40. The seismometers used were type Mark L-2 with a frequency response of 10 cycles per second. They were connected in strings of 10 with two sets of 5 in series-parallel. The recording filter used was FL, with tape A. V. C. The field playback filter was Cep.

2. Procedures:

Sub-surface reflection coverage of 600% was obtained by shooting single shot-holes at intervals of 660 feet. Recordings from 36 seismometer groups were made for each shot taken. The seismometer groups, for each shot, were laid end-to-end in a straight line and the shot-hole was

located between the 18th and 19th groups for each recording. The 10 seismometers of each group were spaced 25 feet apart and the group interval was 220 feet.

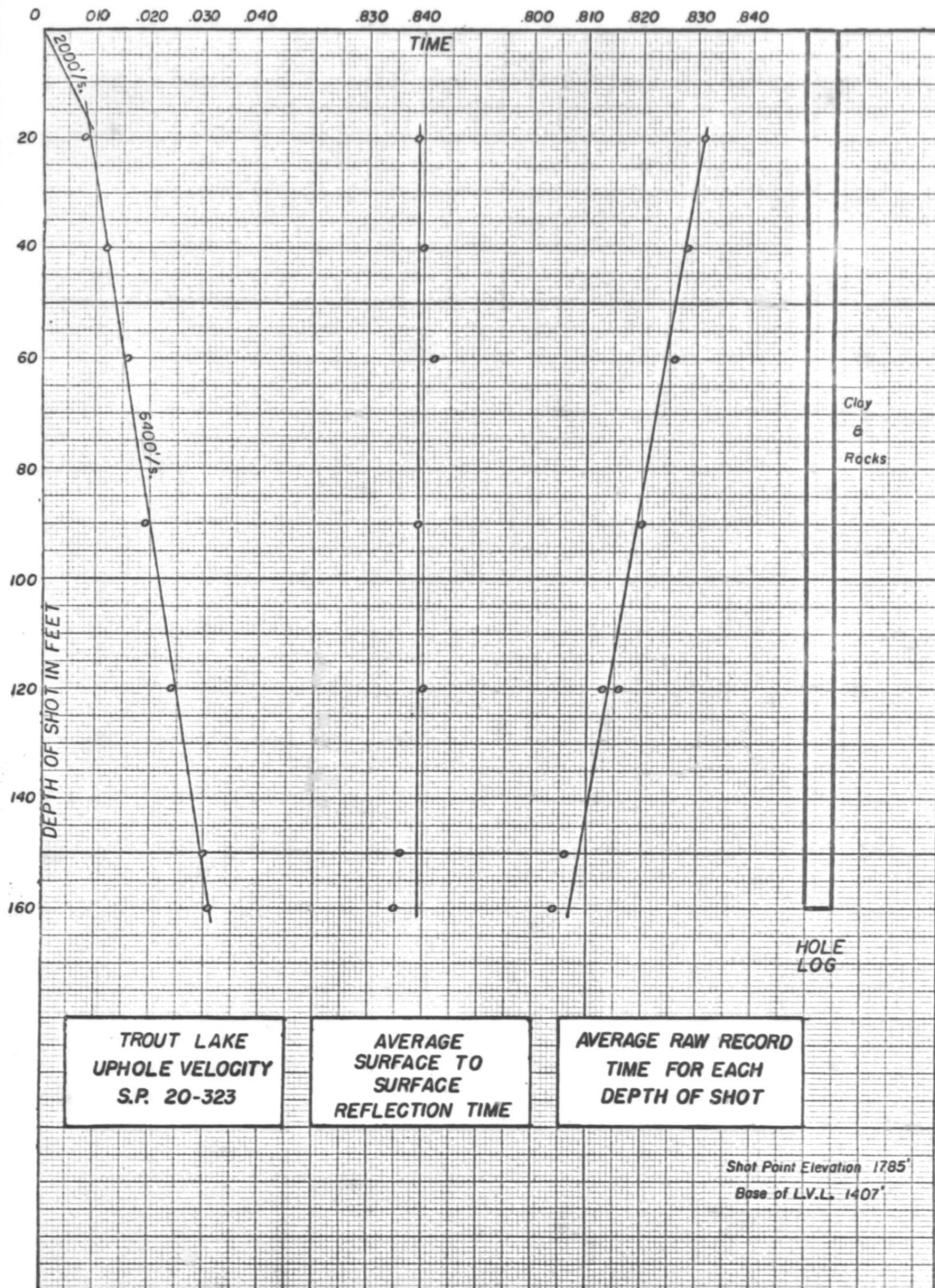
3. Experimentation:

Optimum shooting parameters were known from previous work in the area. However, a deep hole was drilled at shot-point 323 on Line 20. This hole was shot from 160 feet to 20 feet at intervals of approximately 30 feet. For results, see Plate 3. A charge size of 2 1/2 pounds at 40 feet seemed to give reasonable results.

An $X^2 - T^2$ profile was shot on Line 32, from shot-point numbers 583 to 619, inclusive. The Slave Point horizon exhibits considerable relief near the middle of this profile (shot-point 601). The shallow horizons are high at shot-point 601 and dip off in both directions from there. These conditions caused the interpretation of the profile to be difficult and the results to be doubtful.

4. Record Quality:

Record quality in the area was generally fair to good. The occasional gravel patches, which caused record quality to deteriorate, were usually not extensive enough to detract much from the stacked record section.



E. CAMP AND CATERING

The camp equipment consisted of:

- 2 - Pick-up Trucks
- 1 - Fuel Sloop
- 1 - Powder Magazine
- 1 - Power Trailer
- 1 - Kitchen/Utility (combination)
- 1 - Diner
- 3 - Sleeping Trailers

The camp staff consisted of seven men including the catering staff. Catering was by Crown Caterers Company Ltd.

F. OFFICE

1. Computations:

Computations for use on the field record labels, and for input to the digital processing programs involved in creating the stacked record sections, were done on Hudson's Bay Company's digital computer. This computer was an I. B. M. Model 360-30. The input to the Fortran programs used on this computer was data taken from the field records

and survey notes. Also such arbitrarily determined data as the datum plane, replacement velocity, group interval, etc.

The datum plane used was +2,000 feet

Weathering velocity was 2,000' /second

LVL velocity was 6,000' to 6,400' /second

LVL thickness was 200 to 700 feet

Sub-LVL velocity was 8,500' to 9,000' /second

Replacement velocity used was 8,000' /second

The method of computing the LVL thickness was by the critical distance from the shot-point to the break-over point as determined from the first breaks on the field record. The following formula was used:

$$\text{Thickness} = 1/2 \sqrt{\frac{V_2 - V_1}{V_2 + V_1}} \times (\text{Critical Distance})$$

Where: V_1 is the LVL velocity
 V_2 is the formation velocity

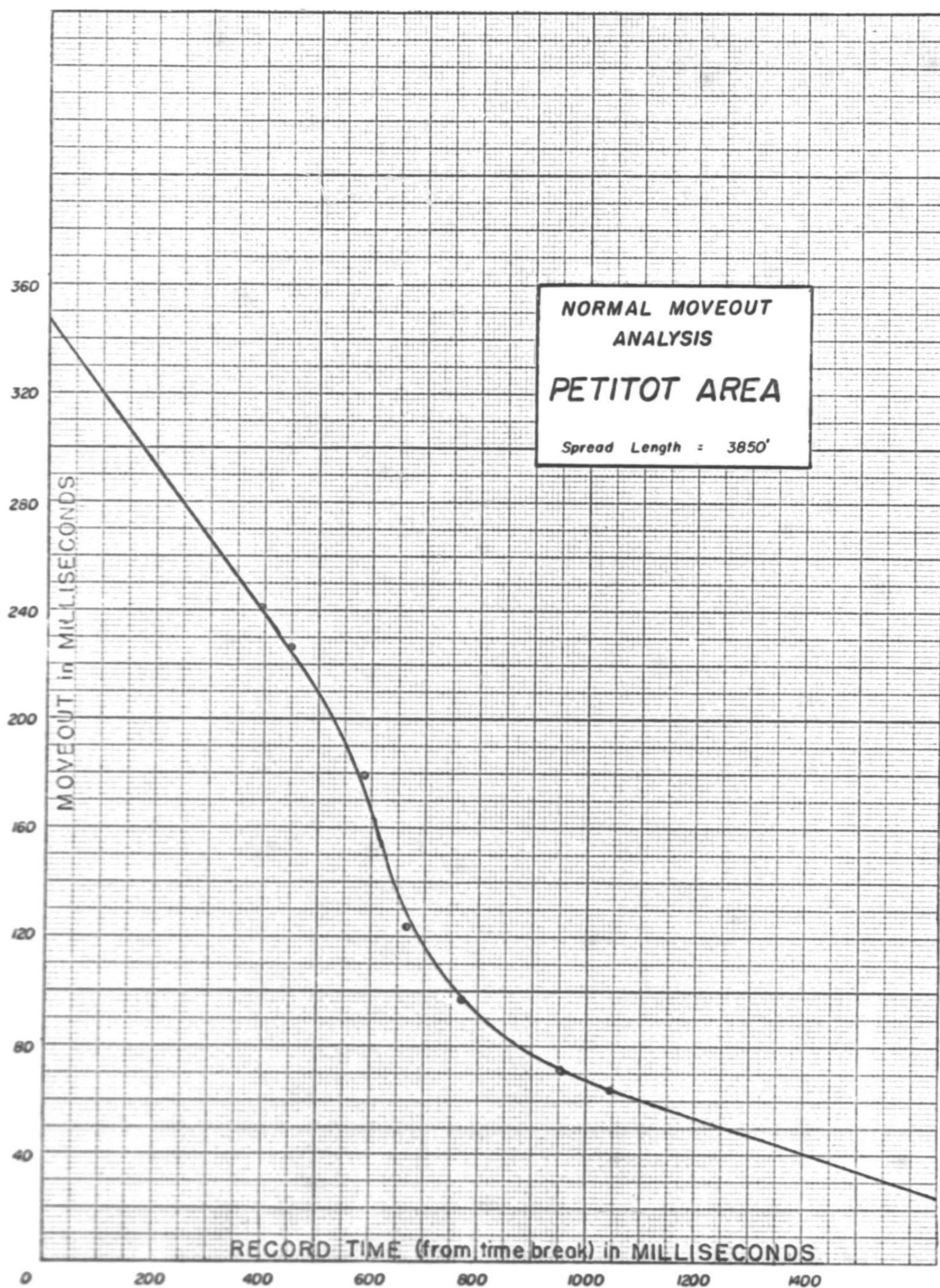
Computations to reduce the raw record times to the datum plane were made using the above information along with first break times and the shot depth. Weathering differences as observed trace to trace on field record reflection data was also used for comparison of results as

determined from the first break and velocity information. If weathering differences disagreed by more than ± 2 milliseconds, then they were adjusted to agree within ± 2 milliseconds. If they disagreed by more than ± 4 milliseconds, a message was printed by the computer and the problem was investigated.

No wells were physically tied in the area. A synthetic seismogram from H. B. O. G. - Pan Am. S. Island River No. M-41 well, which is located near Line 16, was used to correlate reflecting horizons.

2. Processing:

Stacked 600% time structural record sections were made at Western Geophysical Company's Shreveport Data Centre. The analog field tapes were converted to digital tape format and processed on a digital computer. The sample rate was 2 milliseconds. Input data, other than the digital tapes, was prepared in Calgary as described above. The normal moveout curve used was determined empirically from the field records. For a copy of the function submitted, see Plate 4. The following processes were applied to the data:



Normal moveout correction
Static corrections
Common depth point stacking
Mix - 18%
Band pass filter: 18-52.5 (50% points)

The results were plotted on film with a variable area superimposed on wiggle trace.

A copy of the digital stacked tape was sent to Continental Oil Company's Data Centre in Ponka City, Oklahoma, for a deconvolution process.

The quality of the stacked record sections as described above was considered to be generally good.

G. DISCUSSION OF MAPS AND ANOMALIES

Regional strike in the area is approximately north-south.

There is a ridge, or lip, across the northwest corner of the area extending from approximately the middle of Line 37 to the intersection of Lines 20 and 33. Northwest of this lip, all horizons dip steeply to the northwest. South and east of this lip the Mississippian horizon is dipping rather uniformly to the east all the way across the area, while the deeper Jean Marie and Slave Point horizons show

little or no dip in an east-west direction. In other words, there is an overall thinning to the east.

The Slave Point horizon, which is near the zone of interest, exhibits considerable relief. There are very many apparent channels, which could have been washed out by the tides, with many resulting edges or drop-offs. There are also many high anomalies between these channels. Any of these high anomalies could be indicative of reef build-up, particularly when they appear as a lip along the edge of a channel. Referring to the Slave Point time structure map, some anomalies of particular interest would be those indicated by the closed 1,240 contours in the vicinity of the intersections of Lines 18 and 28; also on Line 18 between Line 36 and 37. This 1,240 contour represents the highest elevation of the Slave Point horizon in the area. In the southeast part of the prospect, there is a lip formed along the edge of a drop-off which strikes north-south near the east end of Lines 26, 24 and 22. This edge drops off to the east. Also on Line 16 in the southeast corner of the prospect there is a channel with resulting edges between shot-points 578 and 588. There are some interesting channels near the west end of Line 22.

EFFICIENCY STATISTICS

AREA: TROUT LAKE

CREW: F-61

RECORDING:

Date work started	January 8, 1969
Date work completed	February 2, 1969
Operating days in area (10 hours)	25.0
Total profiles shot.	1,359
Basement traverse (miles)	86.775
Coverage per operating day (miles).	3.471
Average riding time per operating day	1.5

SHOOTING:

Pounds of dynamite used	2,108.75
Pounds of dynamite per profile	1.55
Total shot-points shot.	685
Number of shots	718

DRILLING:

Total holes drilled.	686
Total footage.	31,073
Average footage per drill (10 hours)	305.4
Average hole depth	45.3

EFFICIENCY STATISTICS

AREA: TETCHO LAKE

CREW: F-61

RECORDING:

Date work started	January 12, 1969
Date work completed	February 6, 1969
Operating days in area (10 hours).	11.125
Total profiles shot.	1,153
Basement traverse (miles)	71.665
Coverage per operating day (miles).	4.51
Average riding time per operating day	1.7

SHOOTING:

Pounds of dynamite used	1,570.25
Pounds of dynamite per profile	1.34
Total shot-points shot.	5.87
Number of shots.	607

DRILLING:

Total holes drilled.	588
Total footage.	26,240
Average footage per drill (10 hours)	361.7
Average hole depth	44.6

The foregoing report is respectfully submitted by:

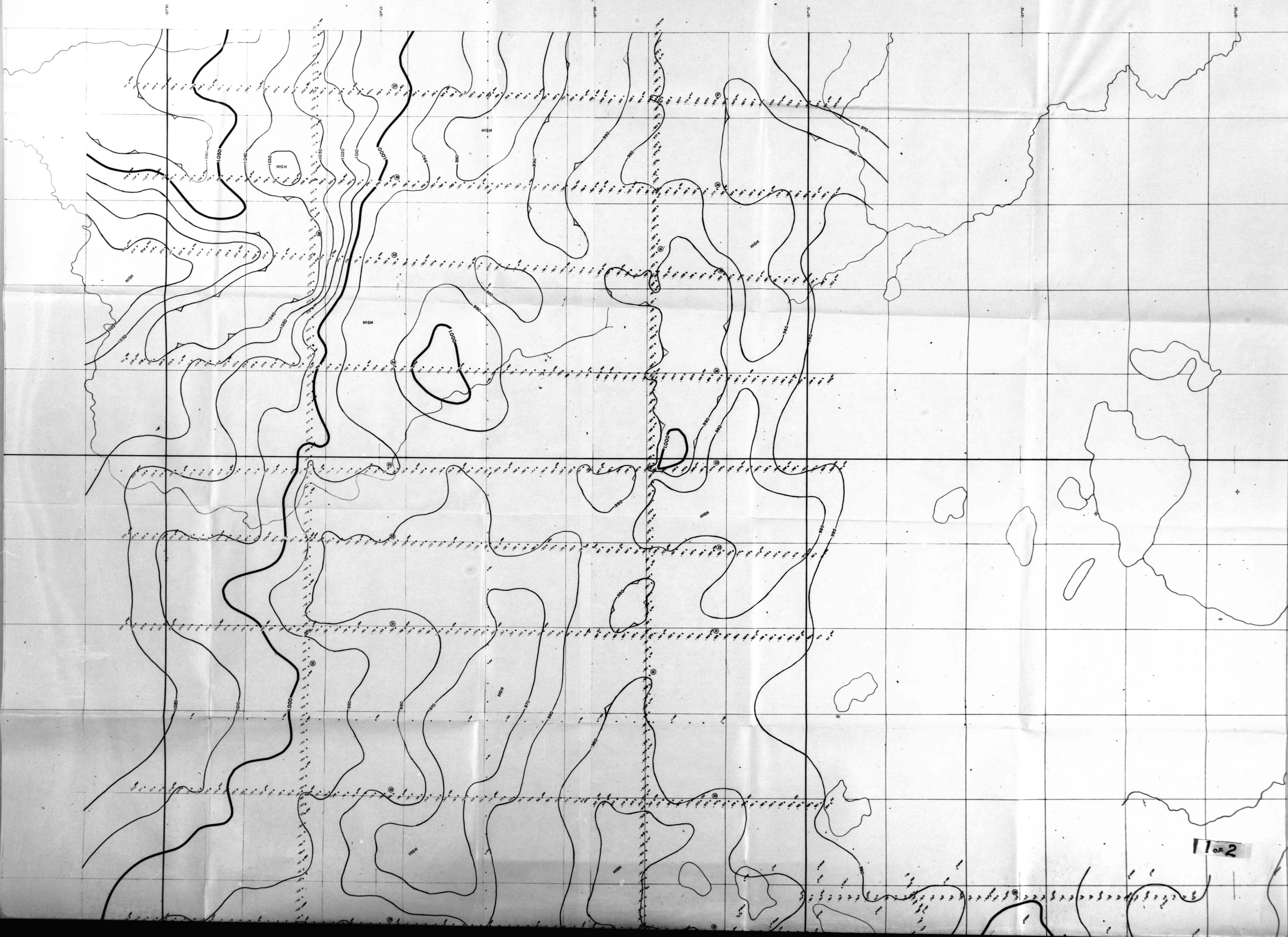
WESTERN GEOPHYSICAL COMPANY
OF CANADA, LTD.

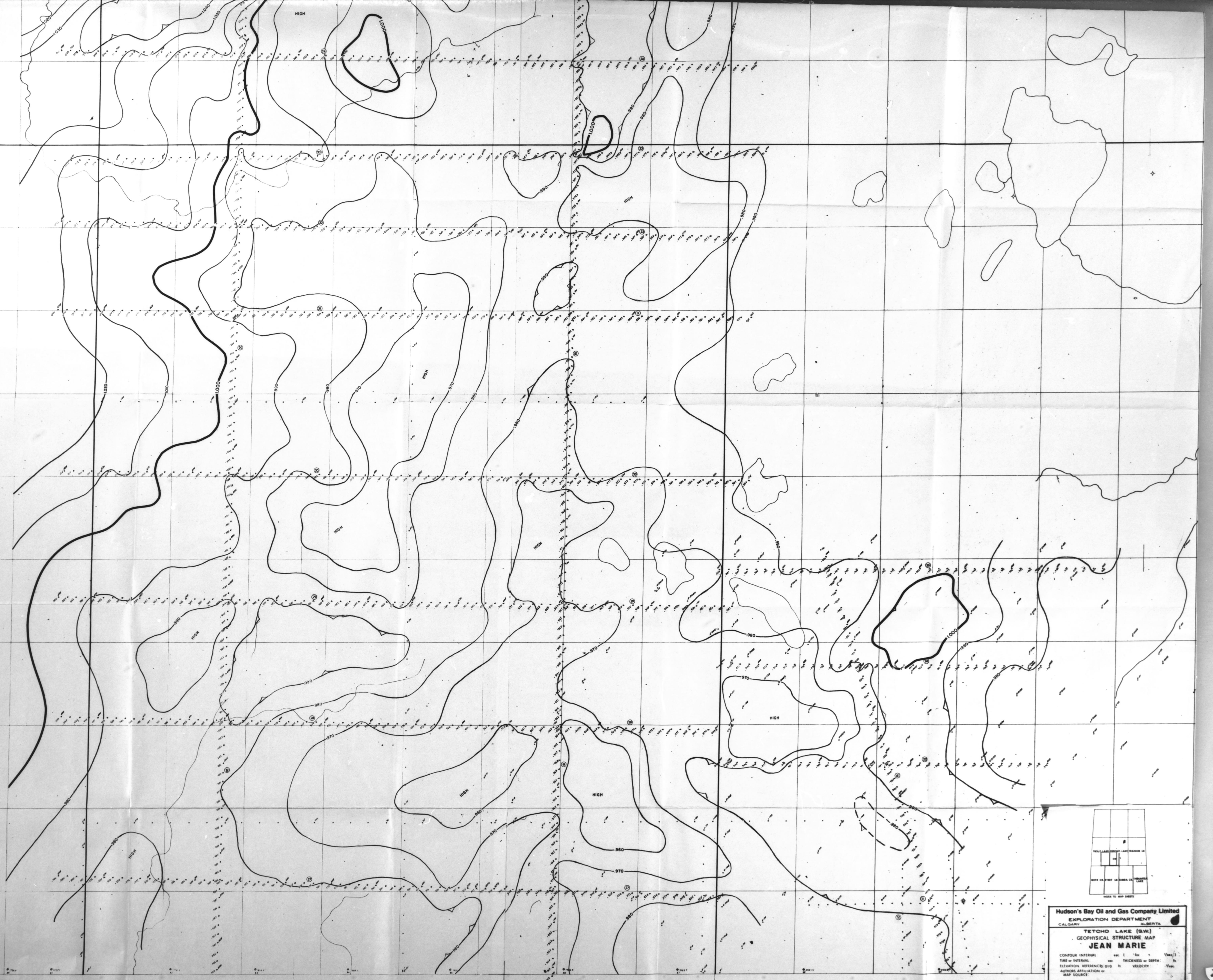
Signed:

G. P. Bates
G. P. Bates - Party Chief

May 30, 1969.
Date

TROUT LAKE (S.E.)

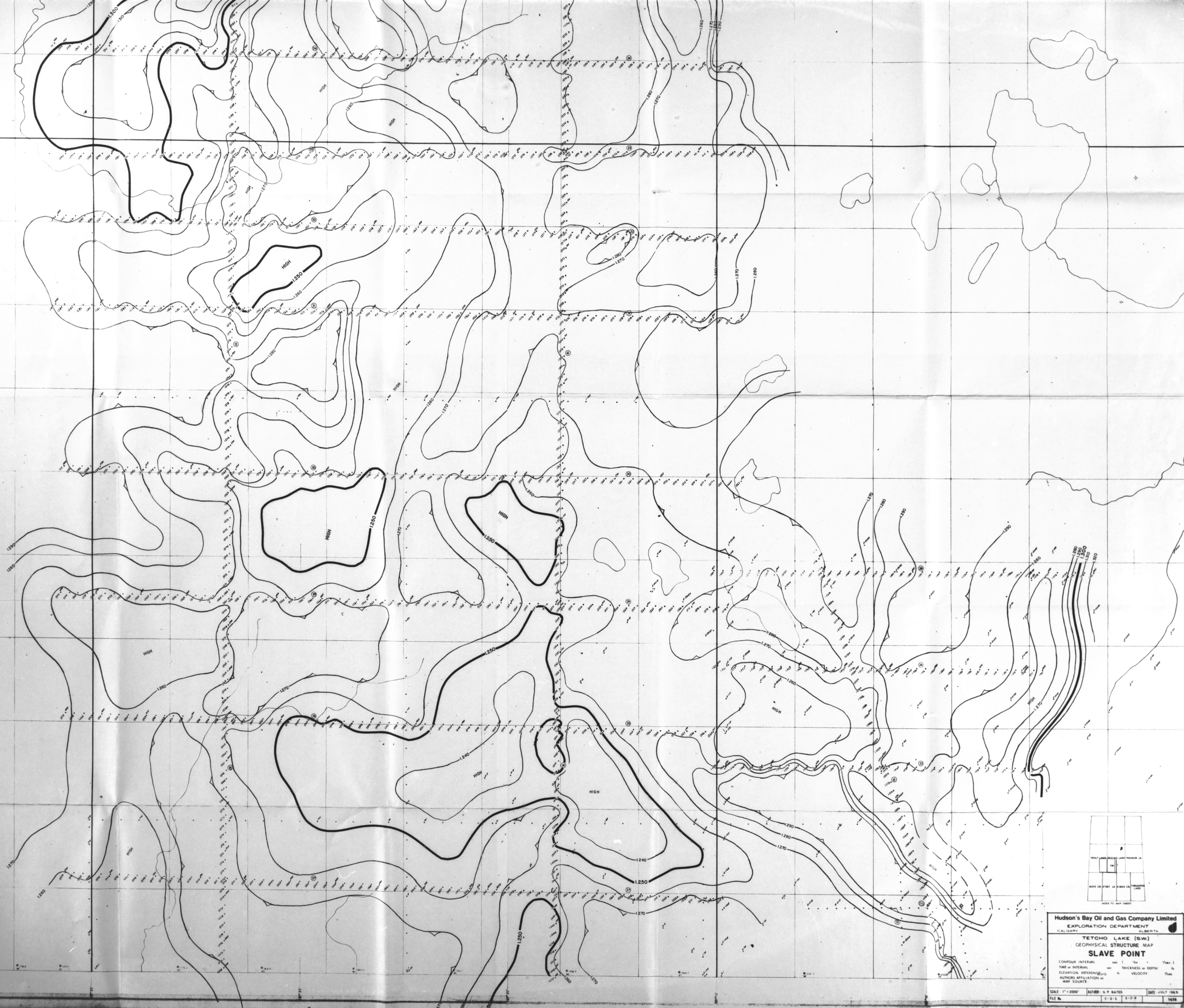




Hudson's Bay Oil and Gas Company Limited
EXPLORATION DEPARTMENT
CALGARY ALBERTA
TETCHOW LAKE (S.W.)
GEOPHYSICAL STRUCTURE MAP
JEAN MARIE
CONTOUR INTERVAL 10' 1" 10' 1"
TIME OF INTERVAL 10' 1" 10' 1"
ELEVATION REFERENCE: D10 1" 10' 1"
AUTHORS AFFILIATION: 1" 10' 1"
MAP SOURCE: 1" 10' 1"
SCALE: 1" = 2000' 1" 10' 1"
DATE: 1" 10' 1"
FILE NO. 1" 10' 1"

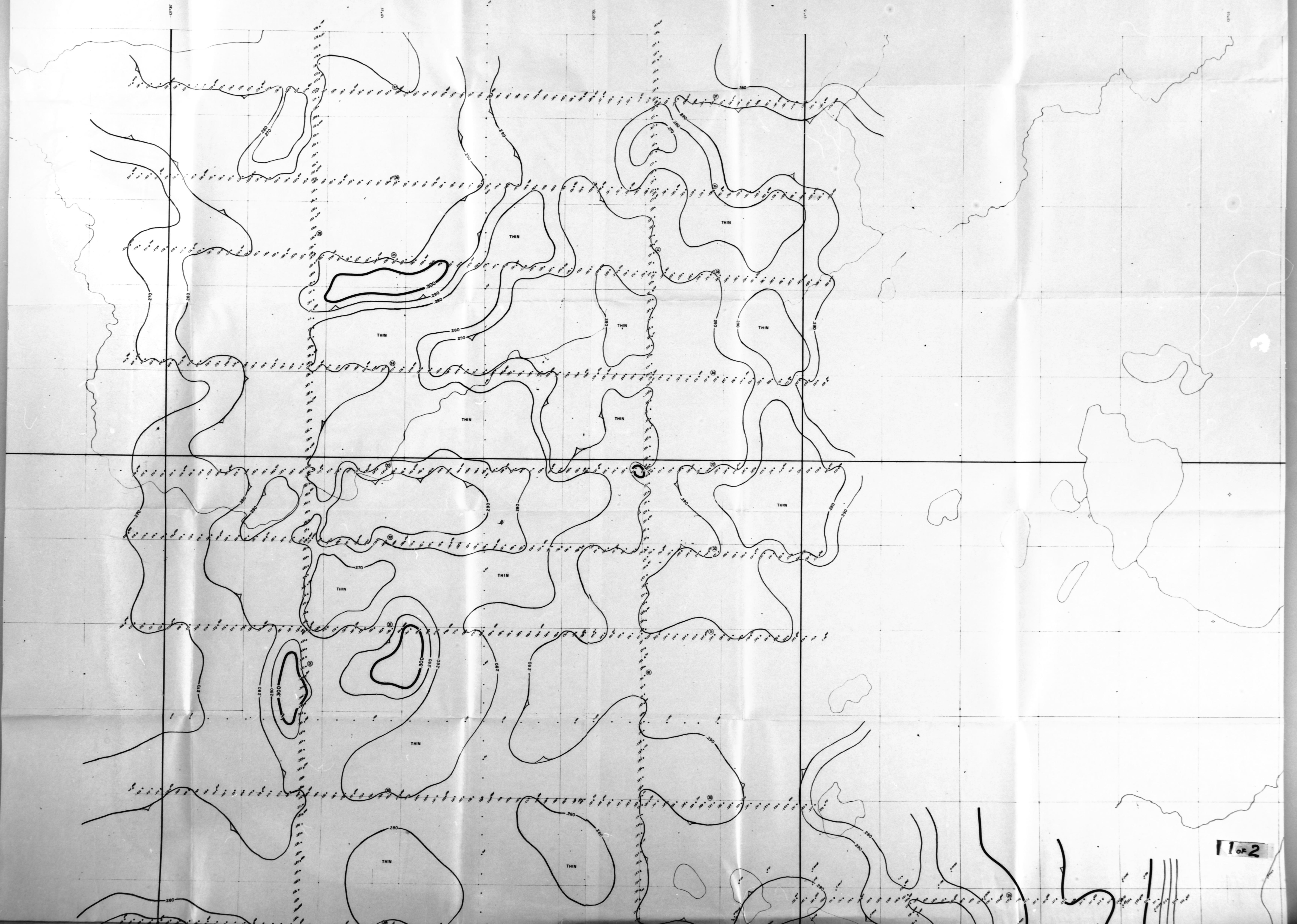
TROUT LAKE (S.E.)





Hudson's Bay Oil and Gas Company Limited
EXPLORATION DEPARTMENT
CALGARY ALBERTA
TETCHO LAKE (SW)
GEOPHYSICAL STRUCTURE MAP
SLAVE POINT
CONTOUR INTERVAL: 10' (100' to 1500')
TIME OF INTERVAL: 10' (100' to 1500')
ELEVATION REFERENCE: 10' (100' to 1500')
AUTHOR: S. P. BATES
MAP SOURCE: 10' (100' to 1500')
SCALE: 1" = 2000'
DATE: JULY 1963
FILE NO. 10' (100' to 1500')

TROUT LAKE (S.E.)





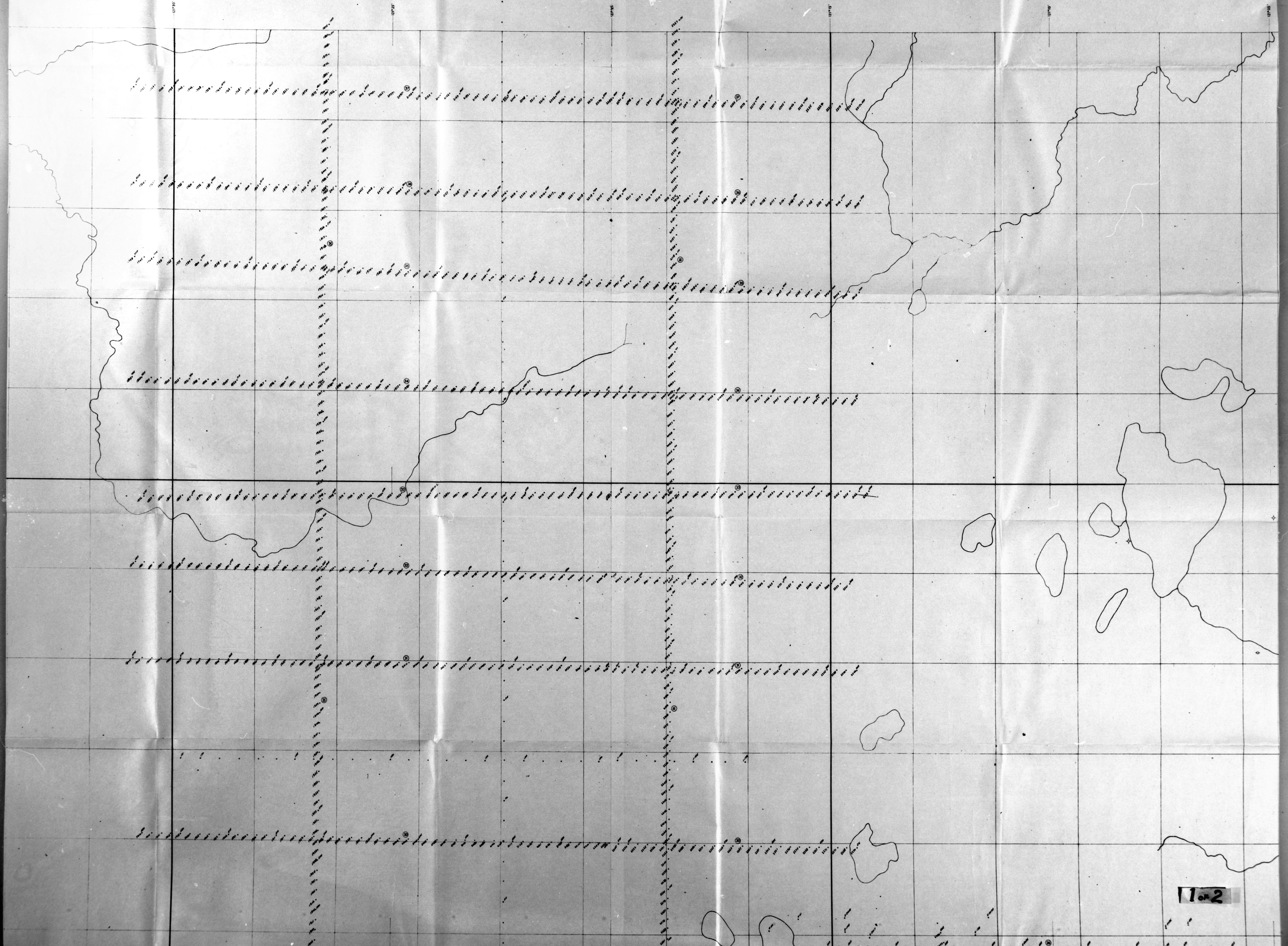
Hudson's Bay Oil and Gas Company Limited
EXPLORATION DEPARTMENT
CALGARY, ALBERTA

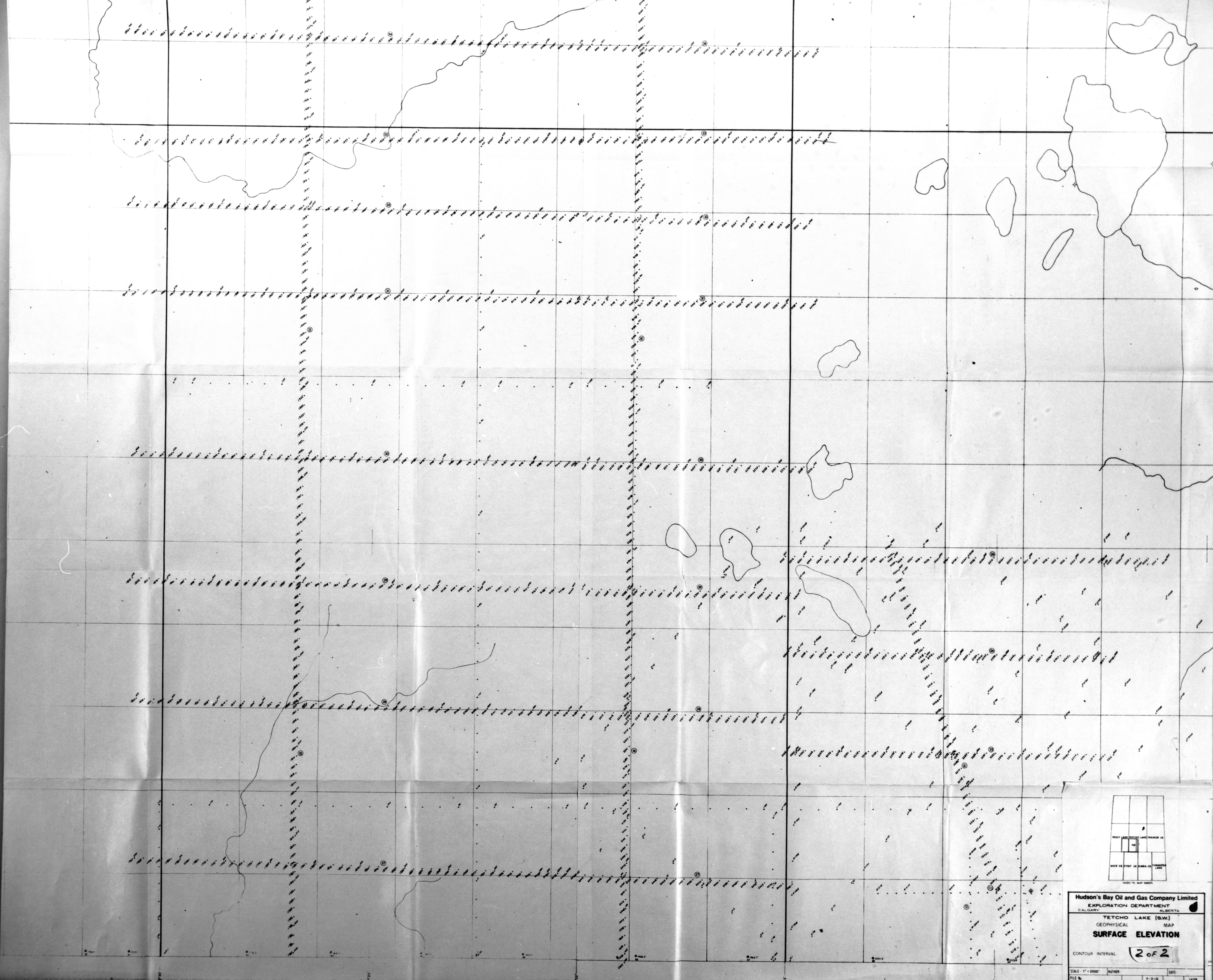
TETCHOW LAKE (SW)
GEOPHYSICAL ISOCHRON MAP
JEAN MARIE-SLAVE POINT

CONTOUR INTERVAL 100
TIME or INTERVAL 100
ELEVATION REFERENCE 100
AUTHOR AFFILIATION OF MAP SOURCE

SCALE 1" = 2000'
AUTHOR G. P. BATES
DATE JULY 1968
FILE # 1438

TROUT LAKE (SE.)





Hudson's Bay Oil and Gas Company Limited
EXPLORATION DEPARTMENT
CALGARY, ALBERTA

TETCHO LAKE (SW)
GEOPHYSICAL
MAP
SURFACE ELEVATION

CONTOUR INTERVAL **2 OF 2**

SCALE: 1" = 2000' AUTHOR: DATE: 1428