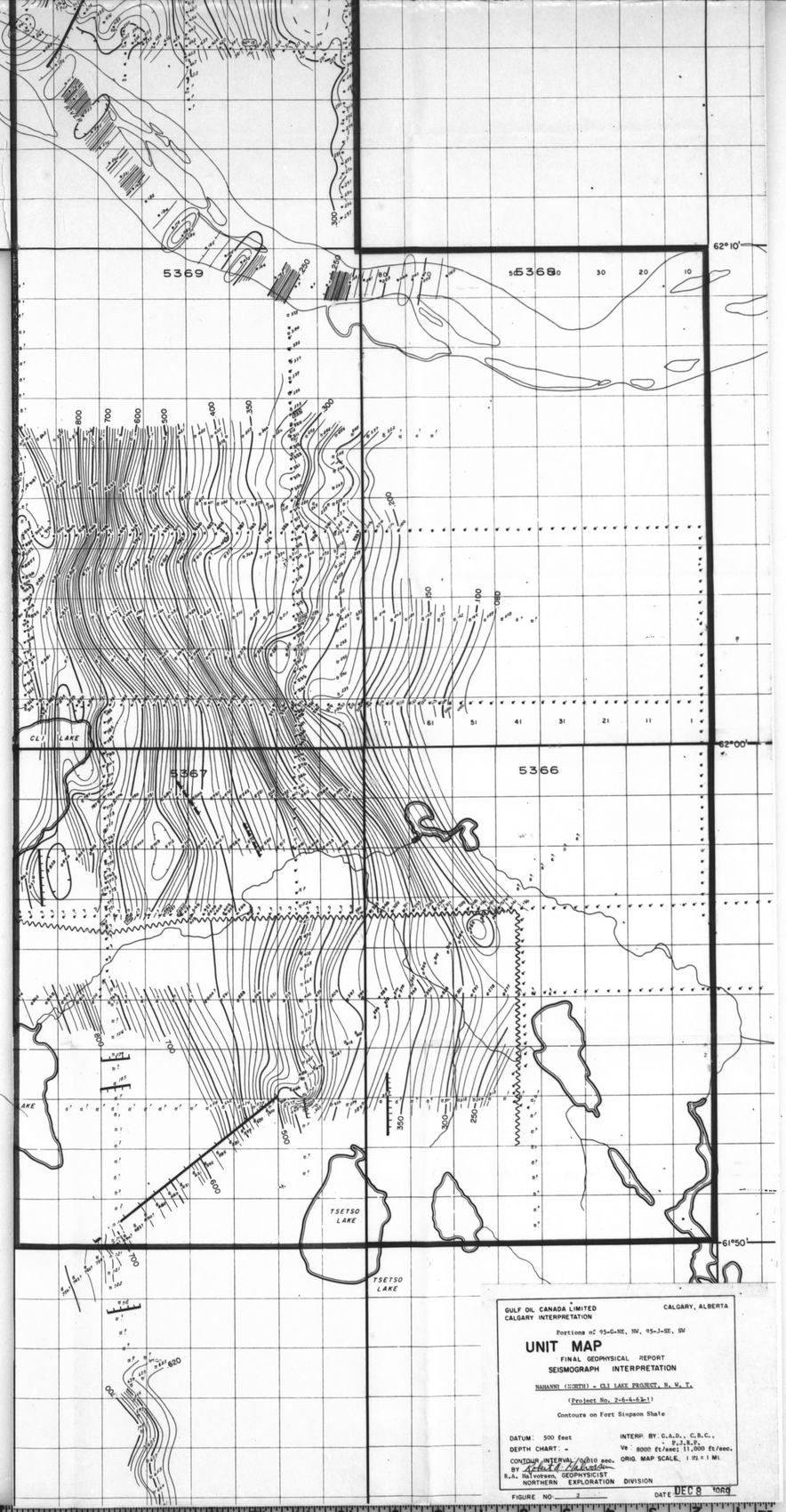


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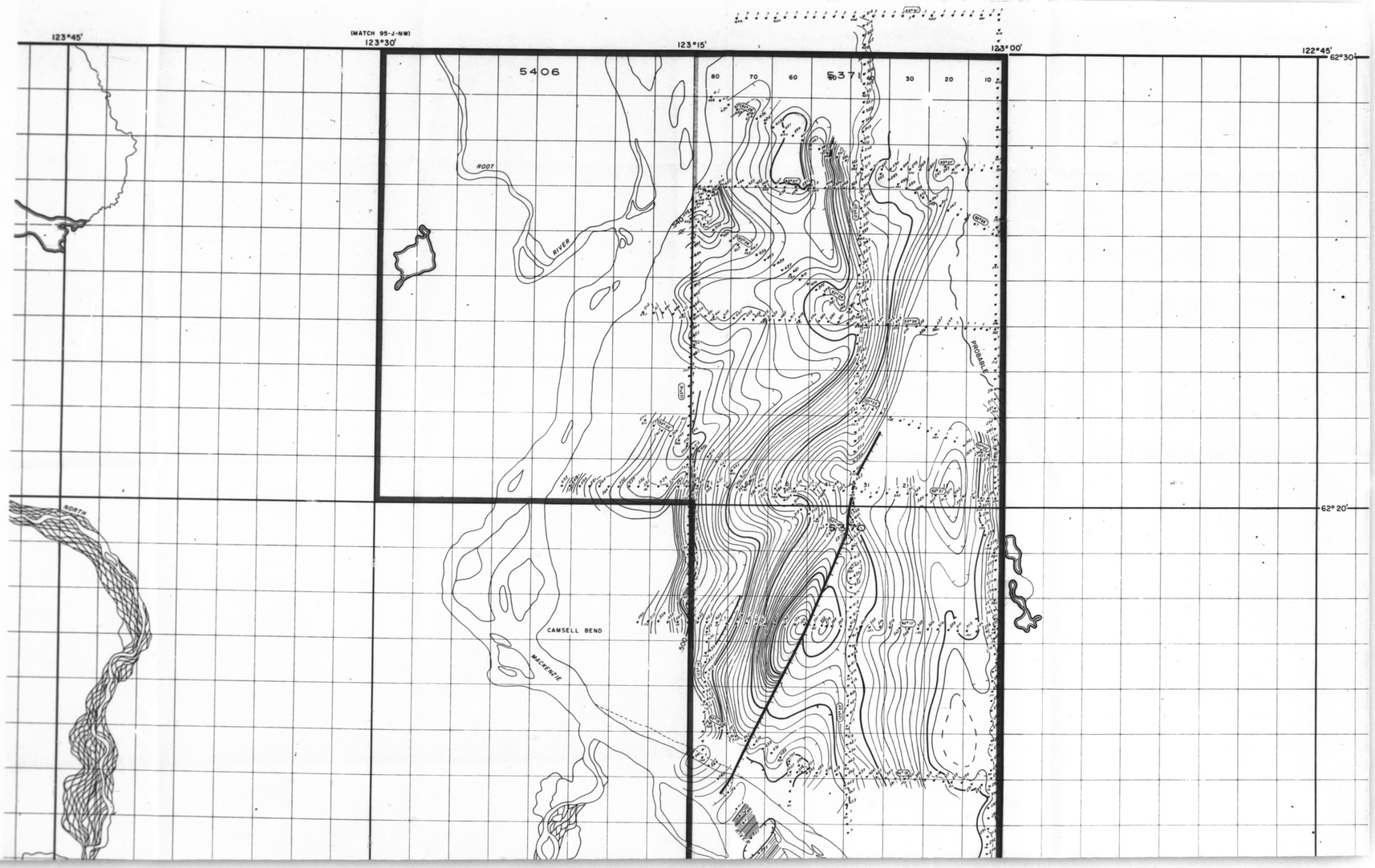
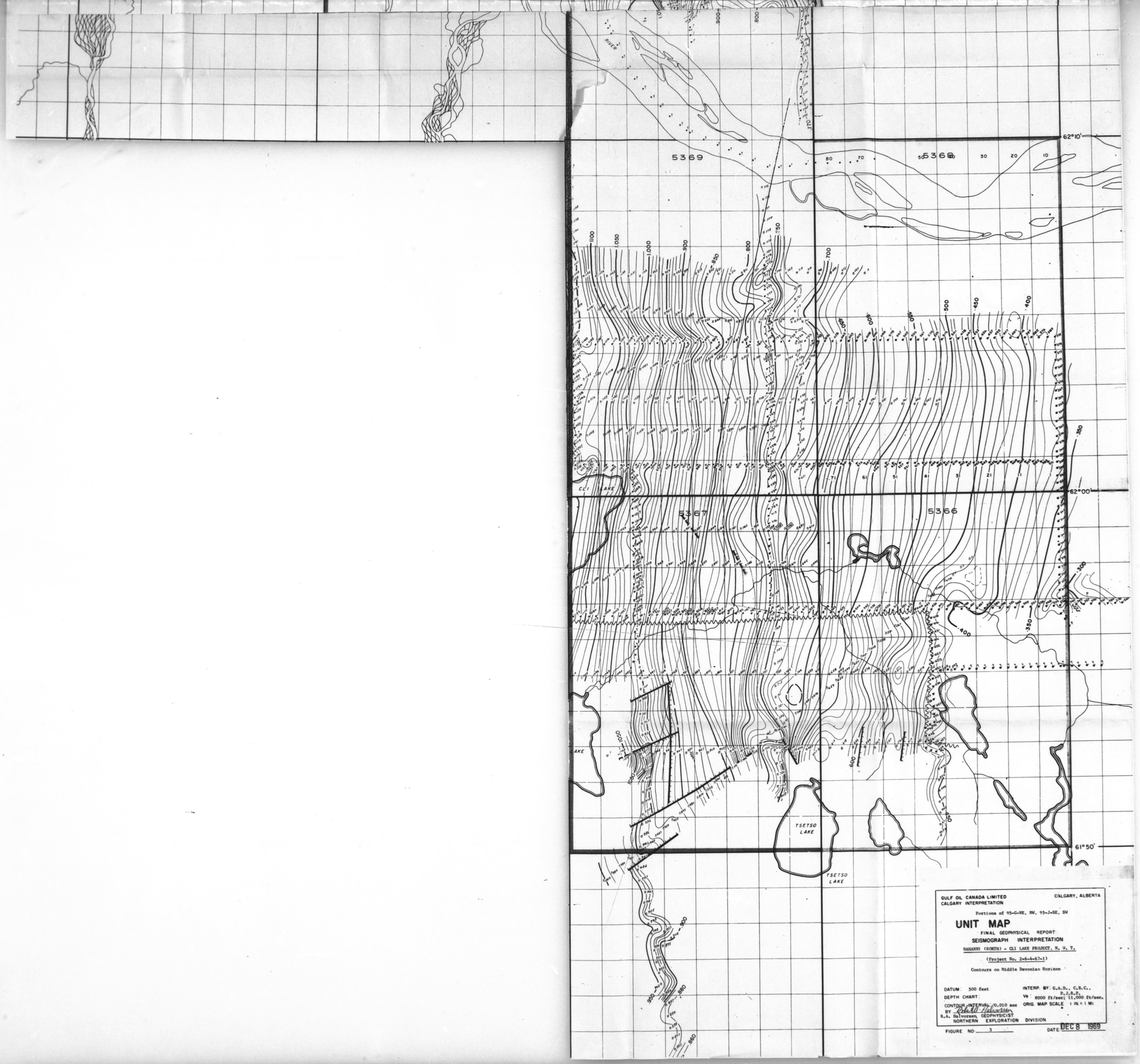
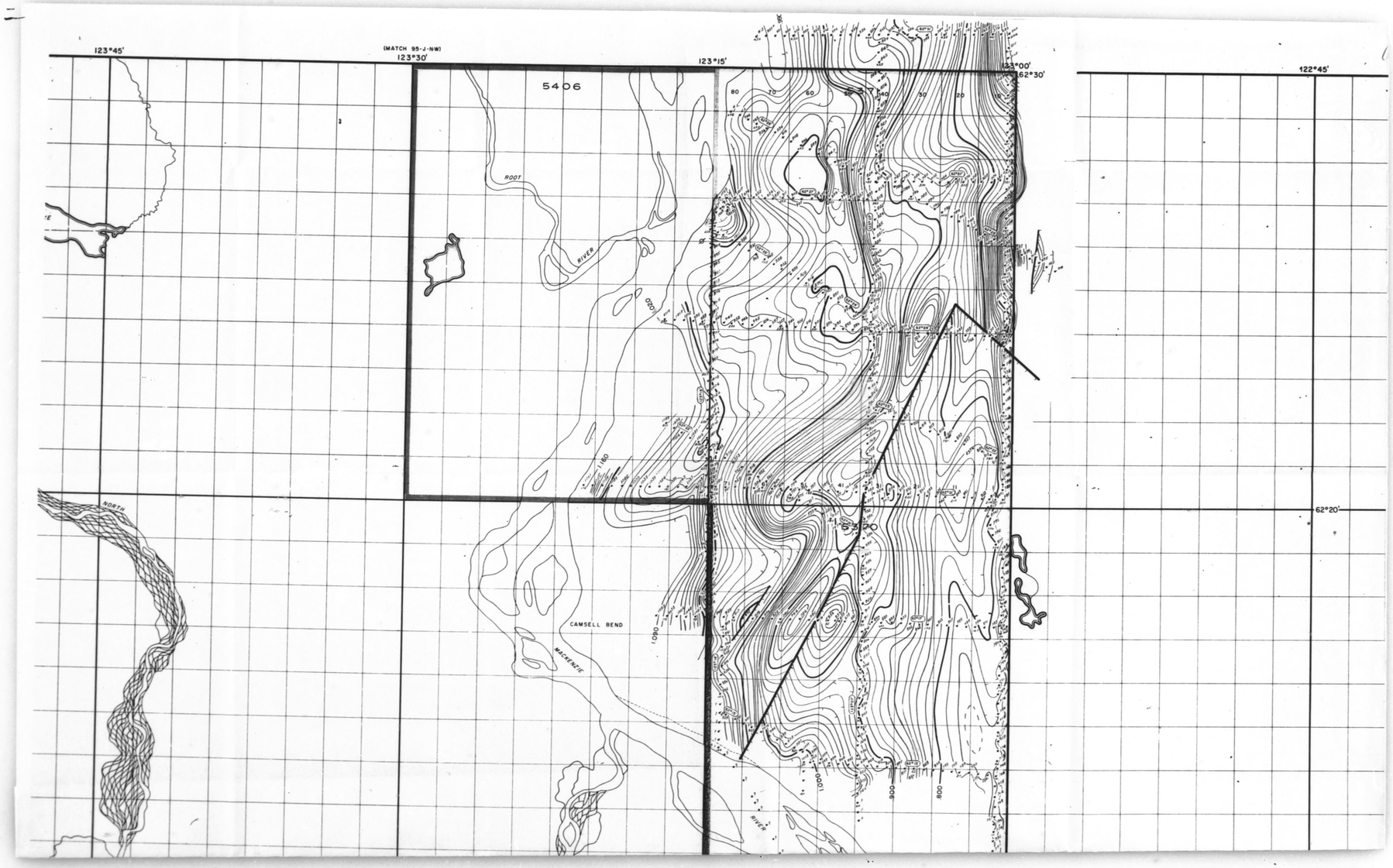
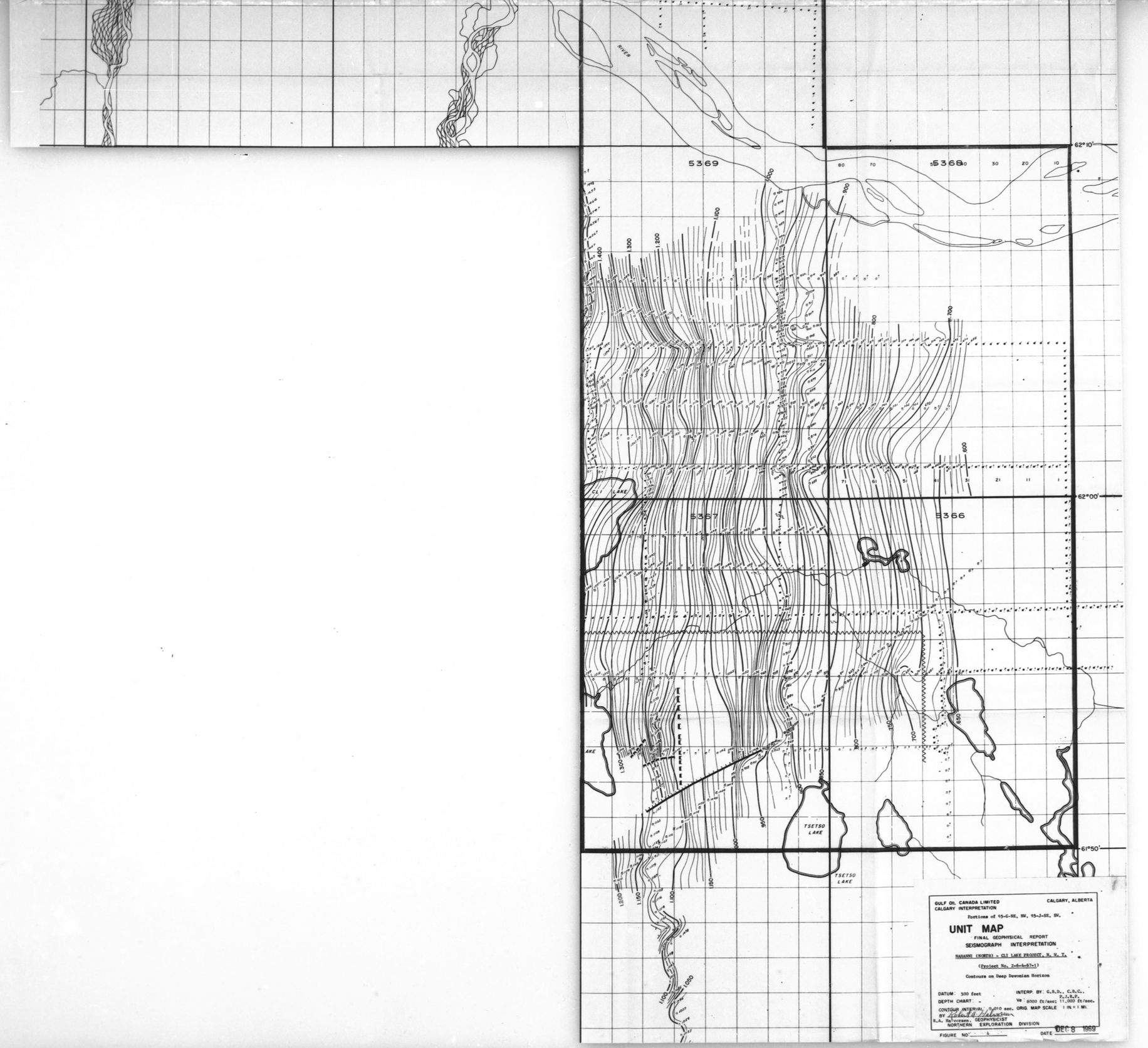





123°45'
(MATCH 95-J-NW)
123°30'
123°15'
123°00'
62°30'
122°45'
62°20'
5406
ROOT
RIVER
CAMSELL BEND
MACKENZIE
NORTH
RIVER
1000
1100
1200
900
800

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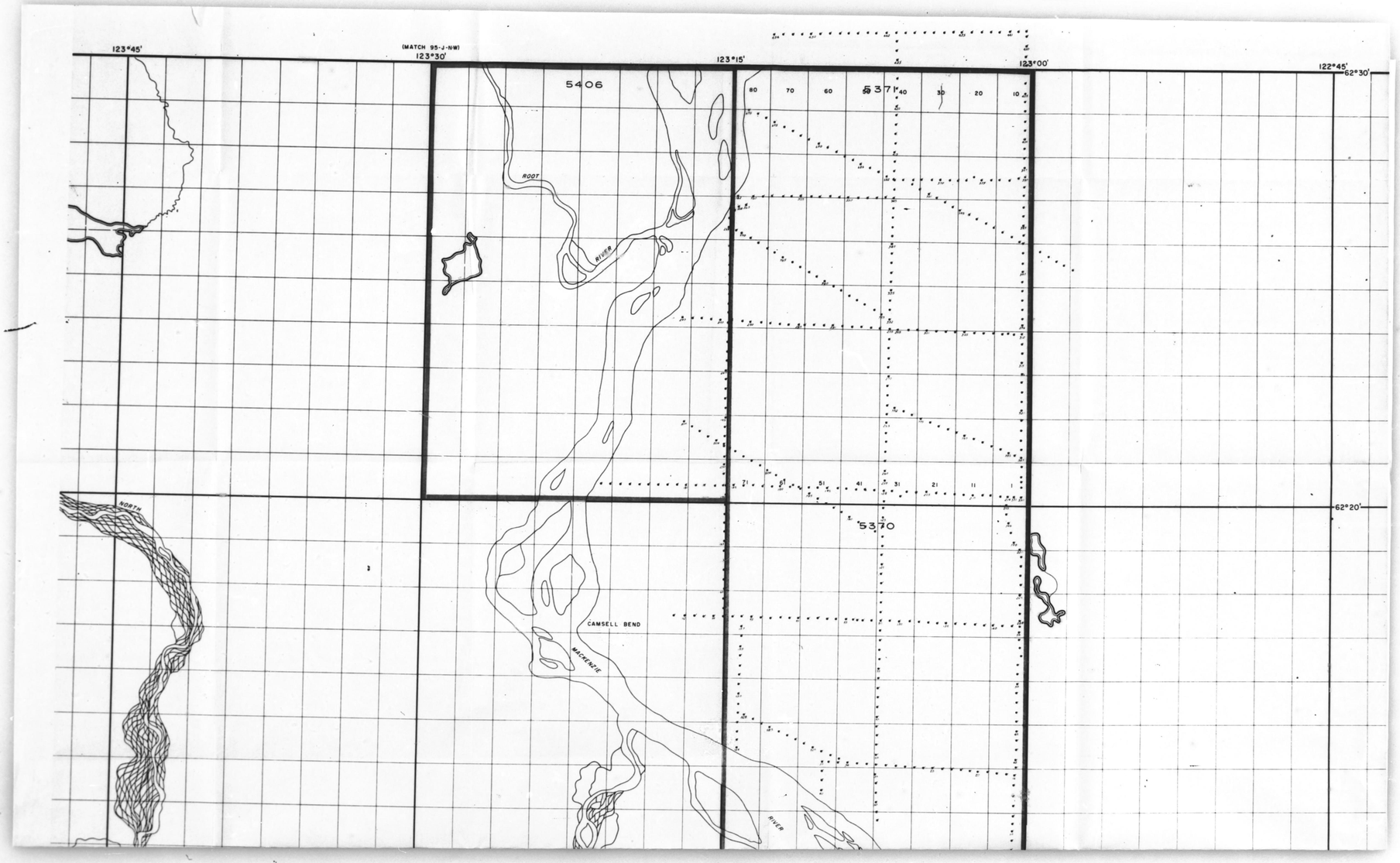

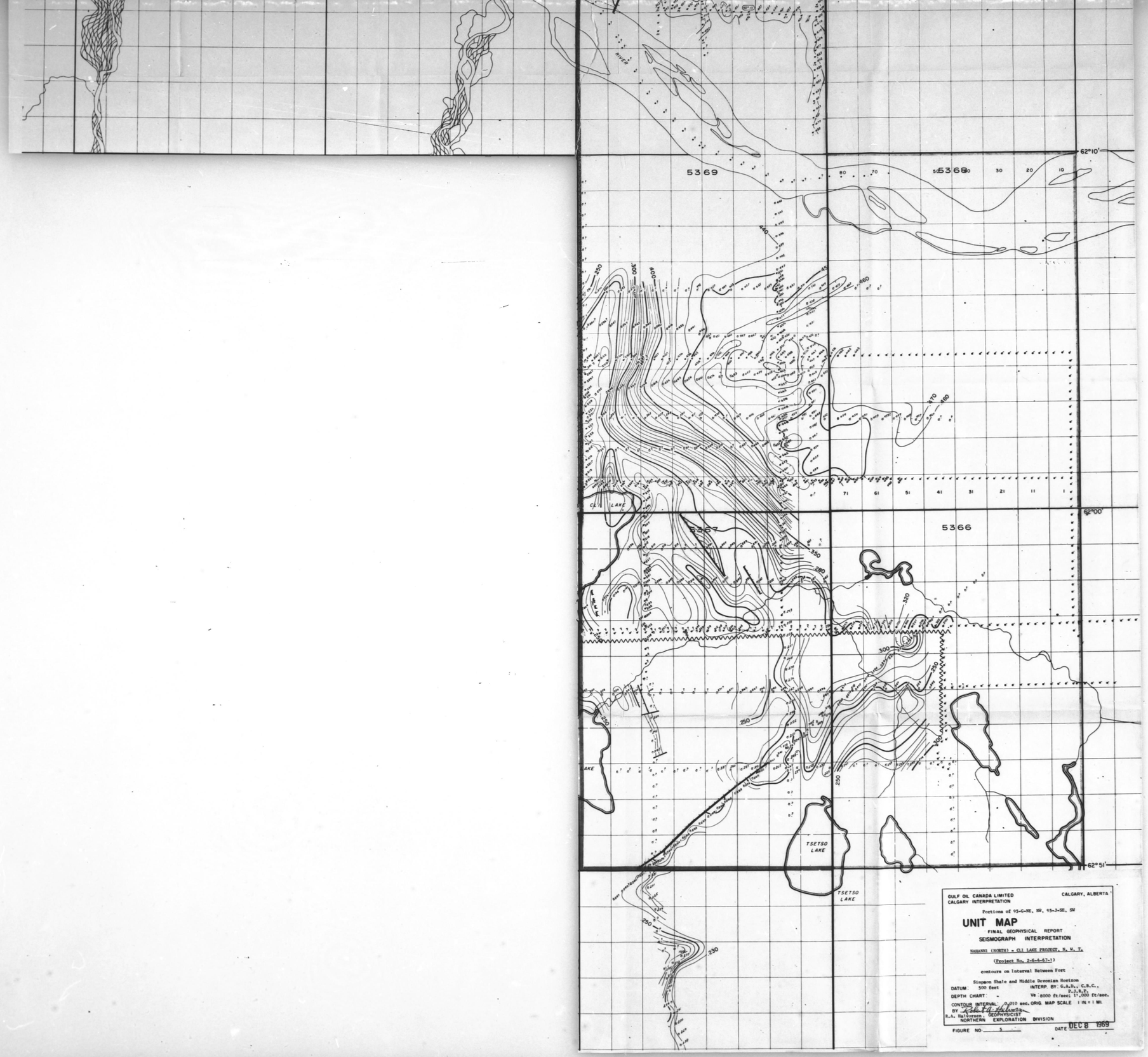


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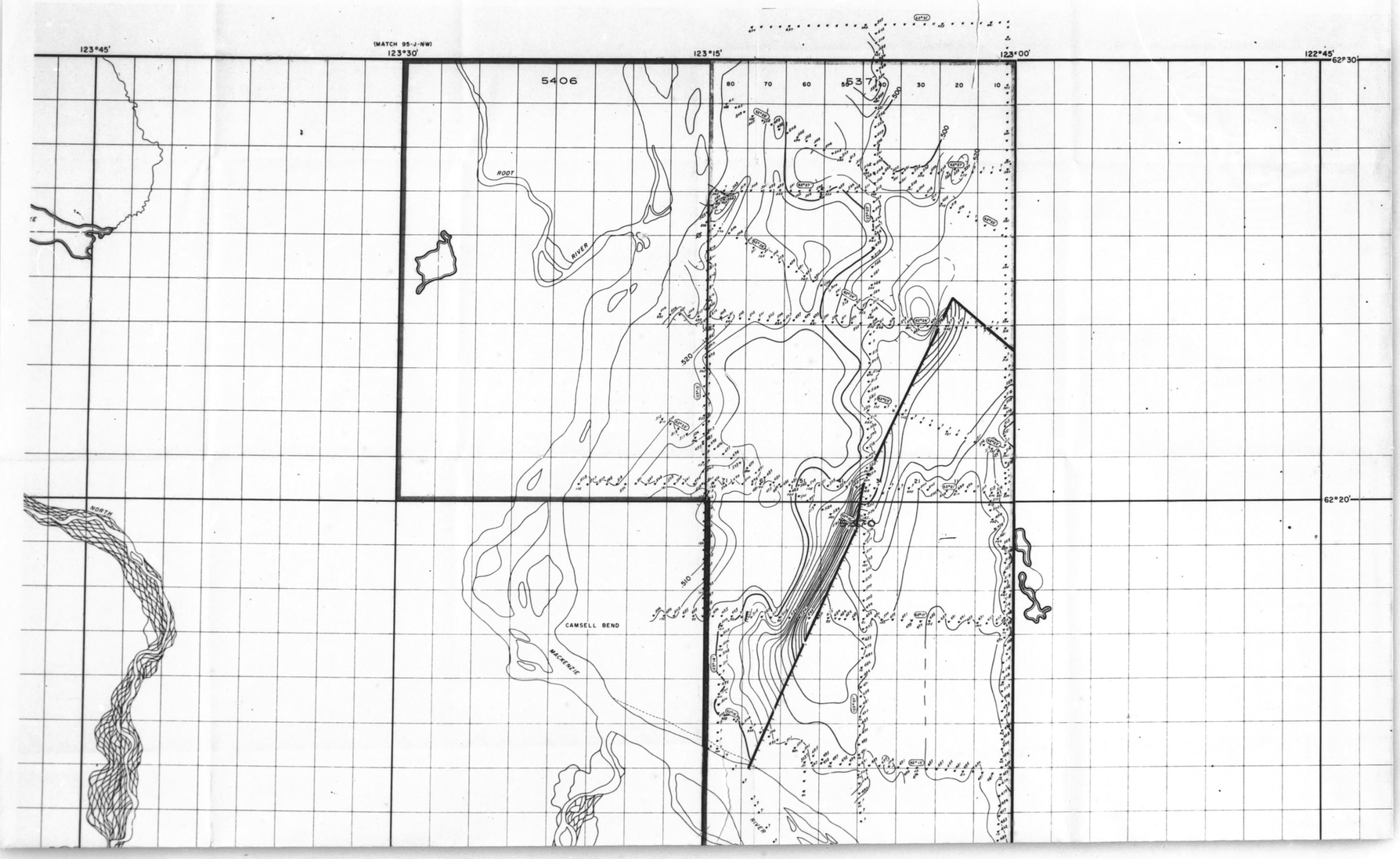

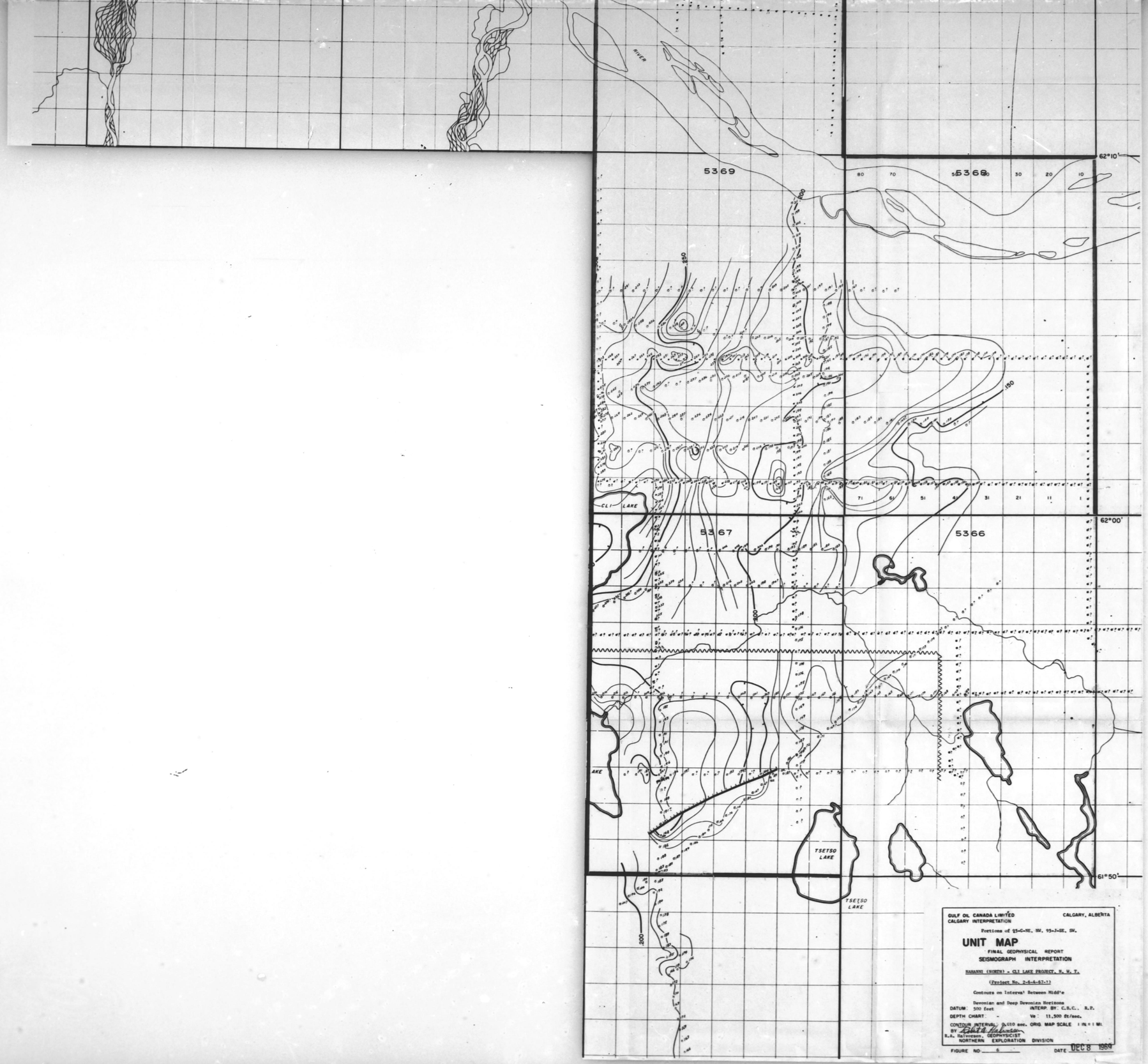

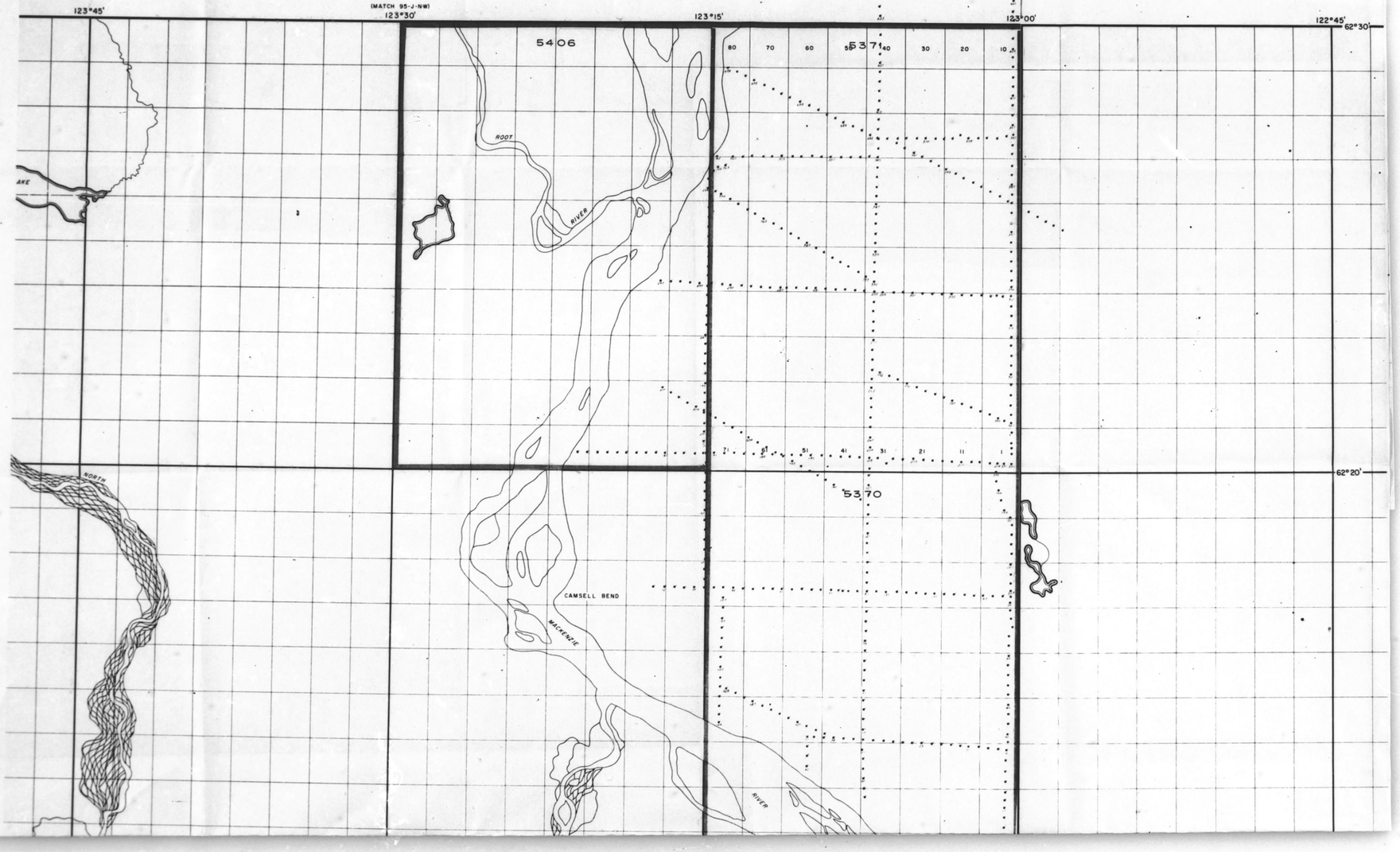


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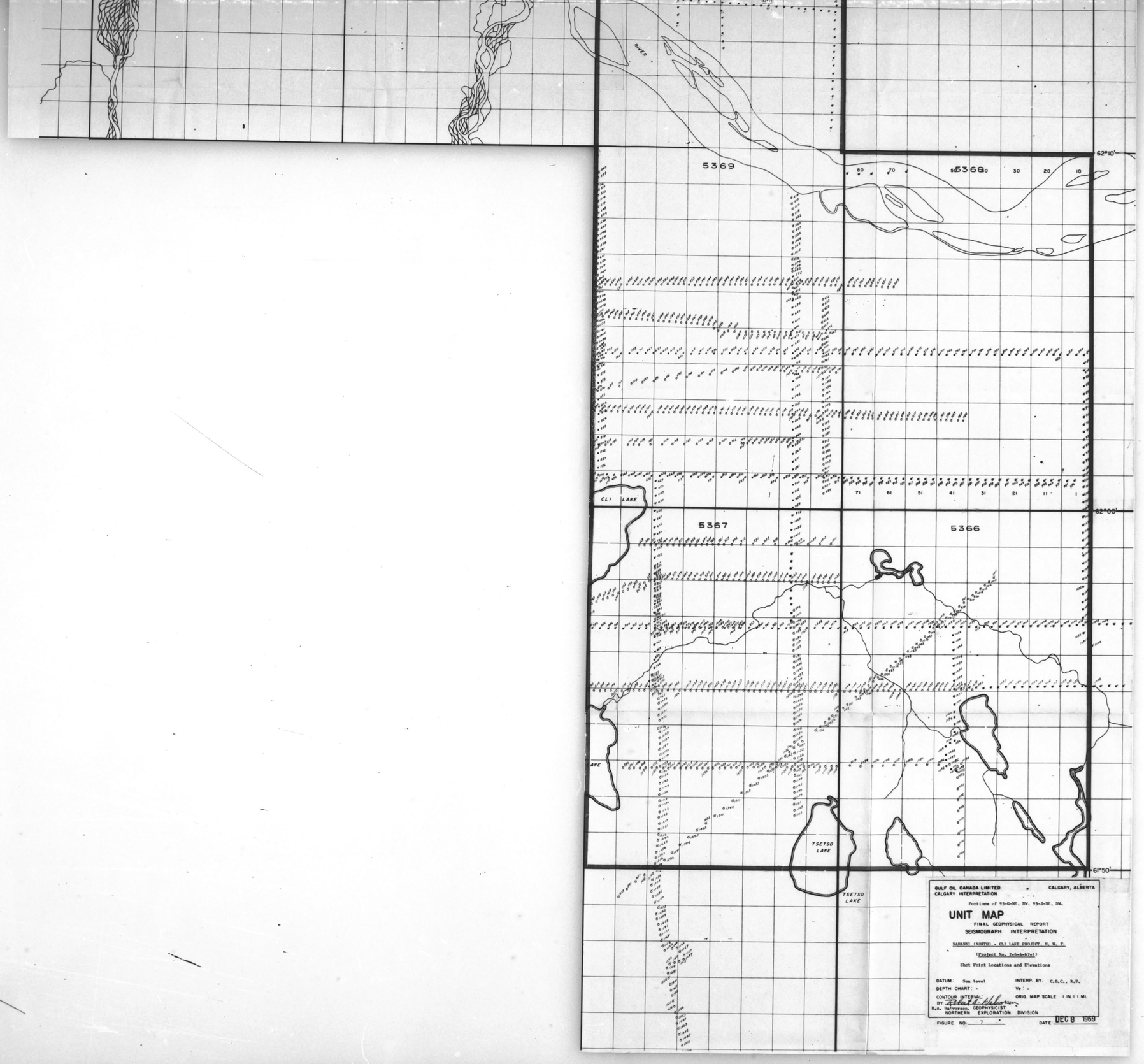

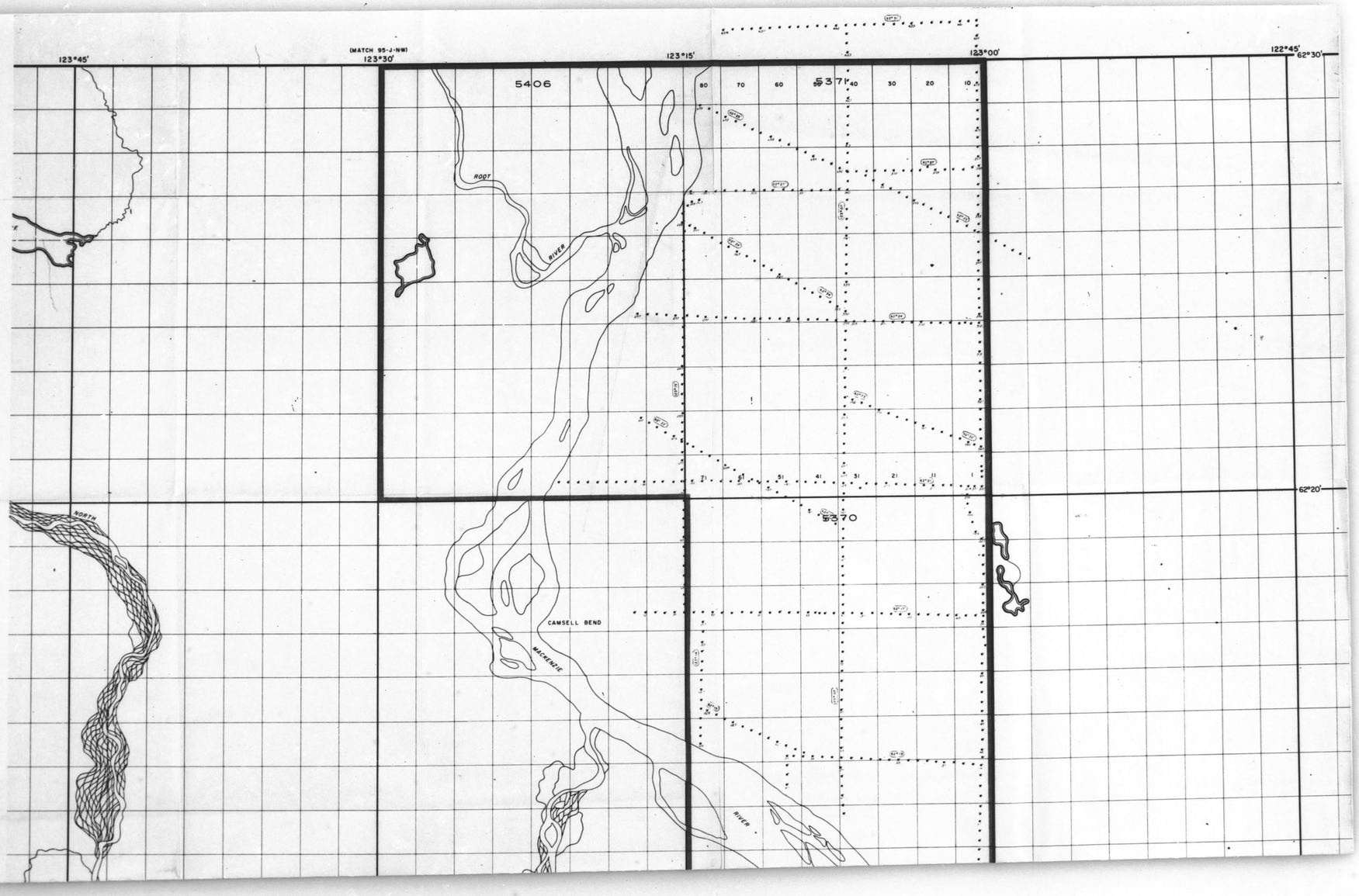

2-6-4-39

# FINAL GEOPHYSICAL REPORT

## Reflection Seismic Survey

## NAHANNI ( NORTH ) - CLI LAKE PROJECT, N. W. T.

(Project No. 2-6-4-67-1)

Report on work performed on
Permits No. 5366 to 5371, inclusive,
Permits No. 5360 and 5406, during the
period November 1, 1967 to May 8, 1968.

Reflection Seismic program shot for
British American Oil Company Ltd.
(Gulf Oil Canada Ltd.)
by
British American Seismic Party No. 2.

R. A. Halvorsen, Geophysicist
Gulf Oil Canada

Date: November 28, 1969

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### A: MAPS

The following maps are included with this report and are located in the attached expanding envelope:

Figure No. 1 - Project Location Map

Figure No. 2 - Composite map - Portions of Unit Map 95-G, J. "Contours on Fort Simpson Shale"

Figure No. 3 - Composite map - Portions of Unit Map 95-G, J. "Contours on Middle Devonian Horizon"

Figure No. 4 - Composite map - Portions of Unit Map 95-G, J. "Contours on Deep Devonian Horizon"

Figure No. 5 - Composite map - Portions of Unit Map 95-G, J. "Contours on Interval Between Fort Simpson Shale and Middle Devonian Horizons"

Figure No. 6 - Composite Map - Portions of Unit Map 95-G, J. "Contours on Interval Between Middle Devonian and Deep Devonian Horizons"

Figure No. 7 - Composite map - Portions of Unit Map 95-G, J. "Shot Point Locations and Elevations"

### B: STATISTICAL DATA

## B: STATISTICAL DATA

1. DATES:

November 1, 1967 - Personnel and equipment assembled at Fort Simpson; began move to Nahanni-Cli Lake project.

November 2, 1967 - First production day

November 11, 1967 - Crew change

December 1, 1967 - Camp move and crew change; no production

December 18, 1967 - Last production day of December, 1967

January 2, 1968 - Crew moving into camp

January 11, 1968 - Crew change

January 25, 1968 - Recorder required repairs; no production

January 31, 1968 - Crew change; vehicle maintenance, no production

February 2, 1968 - No production; temperature -70°F.

February 27, 1968 - No production, wind @ 60 m.p.h.

March 31, 1968 - Crew change, no production

April 9, 1968 - Waiting on cats, no production

May 1, 1968 - Crew change, no production

May 7, 1968 - Last day of production

May 8, 1968 - Crew and equipment moved to Fort Simpson.

2. PRODUCTION:

Performance on the subject permits was carried out during the months of November, December, 1967 and April, May, 1968.

| | |
|---|---|
| Holes drilled | - 1300 |
| Holes shot | - 1330 |
| Mileage | - 130 |
| Total work days | - 67 |
| Production days | - 58 |

| | |
|---|---|
| "No production days" (equipment failure) | - none |
| "No production days" (travel time, camp moves, waiting on cats, weather) | - 9 |
| Average mileage per day based on production days | - 2.2 |

3. EQUIPMENT:

The following tracked equipment was used:
3 drills with air-water capabilities
1 recording unit
1 line laying unit
1 survey unit
2 shooting units

Wheeled equipment:
1 Dodge W-200 (4 wheel drive)
1 Dodge w-300 (4 wheel drive)
1 Transport truck (Used to haul supplies and tracked units where practicable).

Bulldozing equipment:
3 - D7E Caterpillar tractors with snow blades

Camp equipment:
1 Kitchen trailer
1 Dining trailer
1 washroom trailer
1 utility - storeroom trailer
3 eight-man sleeper trailers
1 bolt shed (workshop)
1 power plant trailer (2 generating units)
1 garage (prefabricated)

In addition, the bulldozer contractor provided accommodation and catering for the cat operators and field supervisor.

Instrumentation:

Amplifiers - Gulf Model 65, analog, A. M.

Filters - Open for monitor
38-4 on playback

Percentage mix - (25-50-25)

Tape system - S. I. E. PMR-7 using A. M. format tapes

Cables - Two 1760' land cables
Group spacing 160feet
4 takeouts per trace

Geophones - Gulf Model 59, 30 cycle
4 geophones per group
40 feet geophone spacing

4. PERSONNEL:

British American Employees -

1 Party Chief
1 Geophysicist
1 Party foreman
2 Operators
2 Surveyors
3 Shooters
2 Mechanics
9 Helper grade employees

Catering Staff -

1 Cook
1 Bullcook
1 Camp attendant

Drilling Crew -

3 drillers
3 waterjacks
1 field supervisor

Bulldozer Contractor Crew -

6 Cat operators
1 Field foreman
1 Cook

5. NAVIGATION:

(a) Equipment - K & E Paragon Transit
15 foot Stadia rod

(b) Horizontal control -

The "takeoff point" was S. P. #11, Profile R-123-03 of the Amerada trade data.

Adjustments were made periodically to tie the survey to lakes and creeks throughout the area.

(c) Vertical control -

S. P. #11 - Profile R-123-03 of the Amerada trade data was used as a reference point. Closed loops were run where practicable and hanging lines were double surveyed.

6. CONDITIONS:

Topographic relief and forest cover over the project area is moderate. Muskeg presented no problem since the program was shot under winter conditions.

Travel time within the project area was kept within practical limits by frequent camp moves. Long moves by the tracked equipment were avoided. The transport truck was used to transport the smaller tracked units on long moves when trail conditions permitted.

Regular air deliveries of mail and short supplies were made by a chartered Beaver aircraft. Other light aircraft were used for the transport of personnel.

Radio communications through Fort Nelson, B. C. were unreliable. Northern Mountain Air Service provided a reliable communication link between the field office and the Calgary Operations centre.

Temperatures occassionally dropped to near critical levels. The coldest recorded temperature (-70° F) and the highest winds (60+ m.p.h.) were recorded in February, 1968.

## C: FIELD PROCEDURES

The reflection seismic array was designed to provide 3-fold (300%) Common Depth Point subsurface coverage. The detector lines were laid out in split spread configuration from the Recording Unit. Shot points, located at 960 feet intervals along the cutline, were shot into the setup from end-on, intermediate and centre spread positions.

Shot holes were loaded with 2½ to 5 pounds of dynamite at a 40 foot depth.

Additional experimental shooting included the following:
(a) Expanded spreads shot at the north end of profiles R-123-03 and the centre of profile R-123-37D.
(b) A noise spread shot at the locations listed in (a).
(c) A weathering hole was shot at the intersection of profiles R-123-03 and T 62-07.

## D: DATA PROCESSING

All processing was done by the British American Oil Co. Ltd., 707 Seventh Avenue, S. W., Calgary, Alberta.

Weathering and elevation corrections were made using refraction information based on first arrival plats. The reflection times were reduced to a 500 foot AMSL datum. Elevation correction velocity was 11,500 ft/sec.

The following parameters are typical of the final record sections:

Presentation - Wiggle trace or optically filtered variable density.

Stack - 3-fold

Structural section

Plot - smoothed electrical

Gain - 16 - 8

AVC - I-1

Filter - $38^4$

Mix - 25-50-25

Plot - Smoothed electrical.

## E: RESULTS AND INTERPRETATION

The program shot by British American Party No. 2 was aligned to evaluate the hinge line area associated with the eastern approaches to the Nahanni Range. Steeply westward dipping beds in conjunction with rapid westward thickening of the Middle Devonian and older rocks is mapped in this area.

The prime prospect appears to be possible Manetoe Reef development of Middle Devonian age. Up to 300 feet of reservoir rock occurs in the Manetoe at outcropping sections and in regional wells. Possible reefing in the underlying Arnica raises the potential reservoir thickness to more than 600 feet. In addition to these prospects, possibilities exist for reefal occurences in the Horn River Shale and Siluro-Ordovician carbonates.

Direct mapping of the Manetoe reef within the Middle Devonian limestones is not possible with the present control. Leads

to the reef prospects are, therefore, related to structures observed on the horizon maps. The Middle Devonian Horizon map is based on an event originating near the top of the Nahanni formation and is believed to be the most diagnostic of Manetoe reef prospects.

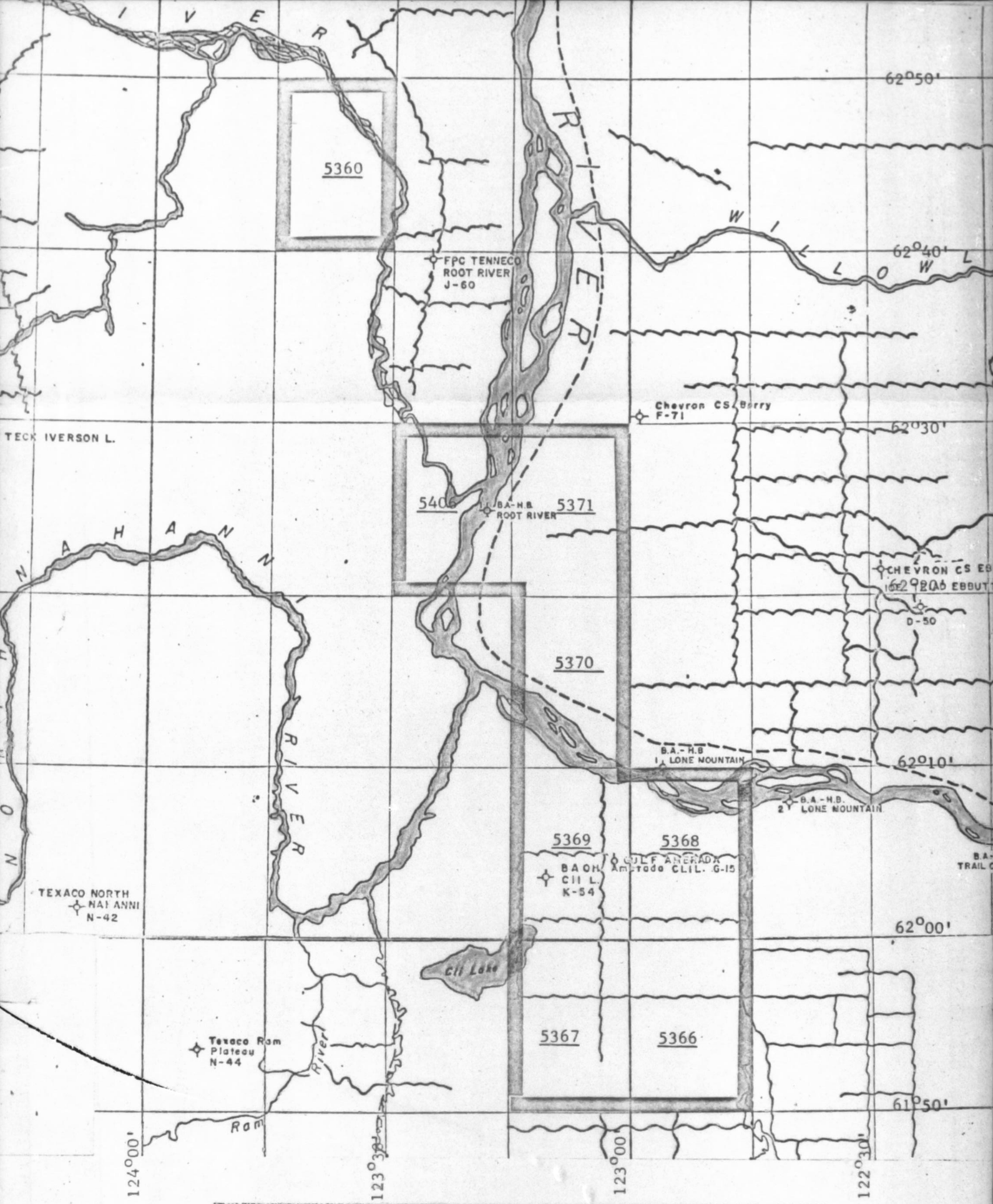
Due to the steep westward dip of the mapped beds a structural variation would not neccessarily appear as a distinct high or low feature on the contoured maps. Rather, the structures could appear as moderate westward nosing or as an area in which a dip gradient somewhat less than regional was followed by a gradient somewhat greater than regional. Two of the potential features mapped in the area south of the Mackenzie River have been evaluated by drilling. The B. A.-Amerada K-54 and B. A.-Amerada G-15 wildcat wells were drilled during the 1968-1969 winter season, without success.

Additional prospects, related to faulting, are mapped across this area. The most attractive of these is centred on sections 48 and 58, Grid Area 60°20' - 123°00'. An anomalous degree of closure contiguous with the fault zone provides an excellent trapping mechanism. Further seismic control is planned across this portion of the project prior to evaluation of local prospects by an exploratory well.

## F: TRADE DATA

The solid dark shot points represent trade data (221 miles) acquired from Amerada Petroleum in the form of record sections. This data was shot by National Geophysical Co. for the Hudson's Bay Oil and Gas Co. Ltd. during the 1962-63, 1963-64 winter seasons. Recordings were made on magnetic tape; 100% coverage was obtained using ¼ mile split spreads. Data quality was variable, being graded from very good to unusable.

The velocity corrections applied by Amerada were based on an 8,000 ft/sec correction velocity. Experimental shooting by B. A. Party No. 2 indicated this velocity to be low. An 11,500 ft/sec. velocity was used in processing the new control and the trade data was reprocessed to tie with the new shooting.




GULF OIL CANADA LIMITED
CALGARY, ALBERTA

NORTHERN DIVISION
EXPLORATION

Final Geophysical Report

NAHANNI (NORTH) - CLI LAKE PROJECT, N. W. T.

Project Location Map

Outline of Project Area

Scale: 1 inch = 8 miles

By: Robert A. Halvorsen
R. A. Halvorsen, Geophysicist
Northern Division Exploration

Date: DEC 8 1969

Figure No. 1