REFLECTION SEISMOGRAPH SURVEY

WRIGLEY - REDSTONE AREA OF NORTHWEST TERRITORIES

1962 HELICOPTER OPERATIONS

Shell Oil Company of Canada, Limited
Northern Division Exploration
Edmonton, Alberta. January 8, 1963

WRIGLEY-REDSTONE AREA, NORTHWEST TERRITORIES

Permits #3223, #3224, E/2 #3225, N/2 #3226, W/2 #3227, E/2 #3228, #3250, #3251.

In compliance with Section 54 (1), (2)b of the Canada Oil and Gas Land Regulations, the following is reported in regard to a geophysical exploration program performed, with the aid of helicopter operations, on the subject permits and surrounding area.

Summer Program 1962

LOCATION:

The prospect lies in unsettled country west of the Mackenzie River and centred about 90 miles north-northwest of Wrigley, N.W.T.

Work was conducted between Latitudes 63°25' North and 64° 48' North and between Longitudes 124°21' West and 126°15' West.

DATE OF SURVEY:

Brush cutting was begun on June 13, 1962, drilling on June 15, and recording on June 26.

Brush cutting was terminated on September 12, 1962, drilling on September 16, and recording on September 19.

The recording crew was shut down between July 28 and August 10 because of lack of a helicopter, and so that drills would establish a lead of holes drilled.

PRODUCTION STATISTICS:

Approximate acreage: 1,050,000.

Miles of Traverse: 181.

Number of Reflection Profiles: 362.

Number of Refraction Profiles: 19.

Number of Holes Drilled: 445.

Number of Holes Attempted but not Completed by Drills: 28.

Number of Miles Cleared: 197.

FIELD CONDITIONS:

Surface Outcrops:

Surface formations generally consisted of thin deposits of glacial till, sand, gravel and muskeg, underlain mostly by strata of the Cretaceous age, except for the north-central area where near surface deposits of the Tertiary age were encountered. Wherever the program lines approached the Mackenzie Mountains, Paleozoic formations were intermittently found near the surface. Throughout most of the area permafrost was encountered at about one foot below surface.

Type of Terrain:

Elevations range from about 180 feet to 2300 feet above sea level. The Mackenzie Mountains are immediately to the west and numerous streams drain generally northeasterly into the Mackenzie River. The terrain is quite rugged in the vicinity of the Mackenzie Mountains.

Available Roads:

There were no roads available into the prospect but this was immaterial since the operation was airborne except along the Mackenzie River where some barge and canoe transportation was utilized.

Weather:

Typical summer weather prevailed throughout the operation. Night temperatures began approaching the freezing point towards the end of the survey.

FIELD PROCEDURE:

Drilling:

a. Formations:

Formations encountered during drilling included muskeg, clay, sand, gravel, shale, sandstone and limestone.

b. Hole Depths:

Hole depths ranged from ten to fifty feet. Average hole depth was about 37 feet.

c. Casing:

No casing of holes was attempted.

d. Drilling Equipment:

Two Mayhew Model 50 portable drills and four Carey Model HHP portable auger drills were brought into the prospect although due to various mechanical breakdowns the number of drills in the field at any one time was usually less than six. One of the Carey drills was redesigned to use a Volkswagon motor.

Gorman-Rupp and Moyne pumps were used for mud circulating. Bits used were finger and rock type. Bit size was usually 3-1/8 inches.

e. Drilling Problems:

Drilling was very difficult in gravel and sandstone, particularly where the latter was shattered. At clay locations, drilling was comparatively easy.

Recording:

a. Procedure:

Seismic surveying was performed using the continuous profile method on a 24 trace recording unit. Shotpoints were located at the centre of 5280 foot instrument spreads consisting of 24 seismometer groups spaced 220 feet

apart with the distance from the shotpoint to closest station being 220 feet. Two seismometers per station were used, initially with a separation of from one to five feet, but after August 25 with a separation of 30 feet. Usually only one hole was drilled per shotpoint. A few shotpoints were drilled using patterns of three holes at whatever distance the drilling crew could separate the holes when moving the drills by hand, usually less than 30 feet.

b. Weathering Spreads:

In most cases sufficient first break information was obtained from the split shot normally obtained for reflections. A few shots were taken with the shotpoint at either station 1 or 24, where the depth of the weathered layer was deep, as on Line 106.

c. Influence of Hole Depth:

Generally holes loaded at 20 feet or less produced very poor to no reflections. At a depth of about 30 feet results could be generally obtained. In some cases near the mountains, as on Lines 104 and 105, no results were obtained in the deeper holes.

d. Charges:

The charge loaded per hole for a reflection record was usually about 15 pounds.

e. Type Amplifier, Filter Setting, Etc.:

Amplifiers used were the General Geophysical Company JMH model, with seismometers manufactured by Electrotechnical Labs.

Unmixed incoming energy from the shot was simultaneously recorded on magnetic tape through a General Geophysical Company Geocord recorder, and monitored to produce a conventional paper record. The incoming energy was

filtered through a 1-33-75 filter and automatic volume control applied was one way fast.

At almost every shotpoint the energy recorded on tape was played back to ensure that the tape system was working properly.

Traces number 1 to 24 on the record were connected to the corresponding stations of the instrument spread. Trace 25 indicated the shot break and the release of the front end suppression. Trace 26 indicated the uphole time from the shot level to a seismometer placed on the surface about five feet from the hole. Trace 27 indicated a 100 cycle per second timing signal with the frequency derived from a standard tuning fork.

The monitor record was recorded at a speed of one foot per second.

Surveying:

Surveying was performed using a Wild T1A theodolite, and spreads were laid out using a calibrated chain. Where the program lines were removed from the Mackenzie River horizontal and vertical control was established from either government topographical stations located on mountain tops or from tellurometer stations extended onto the lines by a Shell Oil Company of Canada, survey party.

In running horizontal traverses a discrepancy of about 800 feet was noted between work that originated from the Mackenzie River survey network and work that tied to the government topographical stations.

Various differences in elevations were encountered when work that tied to the Mackenzie River survey network was compared to work that tied to the topographical survey stations and to lake elevations. Indications are that the topographical station and lake elevations could be quite a bit in error.

OFFICE PROCEDURE:

Weathering Corrections:

First arrival surface to surface times were plotted continuously on rectilinear paper for each profile shot. Very little V_1 material (assumed to be 2000 feet per second) was present. The lowest refracted velocity (V_2) measured ranged from about 4400 to 9600 feet per second. The second refracted velocity (V_3) ranged from about 9200 to 13,900 feet per second.

In many cases where shale or sandstone was near the surface the V_2 was not apparent and the uphole time method was used. Elsewhere the two layer method of weathering corrections was used.

In the northern part of the area the spread was not long enough to obtain penetration to the V_3 layer, even when the shotpoints were located at stations 1 or 24.

Velocity Data:

Wave front charts were used to correct for step-out times and events were plotted in time.

Where migration of reflections was necessary, a dip chart using a constant velocity of 11,000 feet per second to the Hume reflection was employed. For migration of deeper events a constant velocity of 20,000 feet per second below the top of the Hume was used.

Cross Sections, Maps, Etc.:

The interpreter in the field established correlations of reflections on the best monitor record obtained at each shotpoint. The customary weathering delay time and elevation correction to a datum of 1000 feet above sea level were applied at the shotpoint and at stations 12 and 13 using a correcting velocity of 10,000 feet per second. Almost every monitor was shot with the

S-1-33-75 filter which was used as a base filter with filter correction of zero.

When the magnetic tapes arrived from the field they were processed as soon as possible. The monitor records usually stayed in the field until the line was shot. The same corrections were applied to the tape as for the monitor except that corrections were computed for all traces. The tapes for each line were then played back to produce a variable area film with step-out corrections also applied. Tapes were generally played back in the General Geophysical Company flat amplifier which reproduced the field monitor, except for slight elimination of high and low frequencies. The variable area film was then printed and the print used for establishing correlations.

A few of the tapes were played back using the JMH amplifier as this unit gave better front end control. A correction of -.010 seconds was necessary to tie values from this work to the monitor.

The datum values of the mapped reflections showed the following grades:

F: fair

P: poor

VP: very poor

NC: no correlation

NV: no value

NR: no reflections

NS: not shot

Grades were based on reflection character, amplitude, and envelope.

RESULTS:

The following maps are submitted -

(1) Shotpoint location and elevation map

(2) Devonian Imperial time structure

(3) Devonian Hume time structure

(4) Base Cambrian - top Beltian time structure.

GRAVITY:

A reconnaissance gravity survey was conducted in conjunction with a helicopter seismic survey during the summer of 1962 in the Wrigley-Redstone Area. The gravity survey was completed in 16 days in the period from August 27 to September 18, 1962 at a time when the seismic survey was nearing completion and a helicopter could be allocated solely for the gravimeter operator. The survey was conducted between Latitudes 63°05' to 64°48' North and Longitudes 124°00' and 126°15' West.

Gravity readings using a Worden Pioneer gravimeter were made at all shot points cleared for the concurrent seismic program and also on a line in the Wrigley Area where heliports had been cleared in the 1961 helicopter seismic operations. A Bell helicopter, operated by Associated Helicopters Limited, Edmonton, Alberta, was used in transporting the gravimeter and operator to the various stations. A total of 85 helicopter hours were used in the survey to obtain 185 miles of gravity control.

The helicopter transported the operator and gravimeter to a station, off-loaded, circled the station while the operator made his readings, then picked up the operator and meter and progressed to the

next station. Time between readings at consecutive stations at half mile intervals averaged 3 minutes. Gravity readings were usually made at 10 to 13 consecutive stations along a line, then the readings would be repeated at the first, middle and last stations to determine the amount of gravimeter drift. All lines were tied together by looping twice between a specific station on different lines. All loops were made under two hours to obtain good control on the gravimeter drift.

Locations and elevations of the stations were routinely obtained during the concurrent seismic survey with a Wild TIA Theodolite. Vertical and horizontal control was established mainly from the Mackenzie River survey network.

The following is a brief summary of the correction computations:

(1) Drift Corrections

Instrument drift was plotted against time for each loop. Drift corrections were interpolated and applied to the readings at the various stations. Maximum drift was .25 milligals. in 90 minutes while the average drift was approximately .05 milligals per hour.

(2) Latitude Corrections

All stations were corrected to the base Latitude of 64°00' North using a constant correction of .195 milligals per 1000 feet.

(3) Free Air and Bouguer Corrections

A density profile across Shot Point 113, Line 104 with 24 readings taken at 220 foot station intervals indicates that the surface density was approximately 2.2 grams per cubic centimeter. Using this density, a combined Free Air and Bouguer Correction of

0.066 milligals per foot was used to correct all stations to a datum of +1200' at S.L.

(4) Terrain Correction

No attempt was made to compute terrain corrections since the required density of elevation control points was not available.

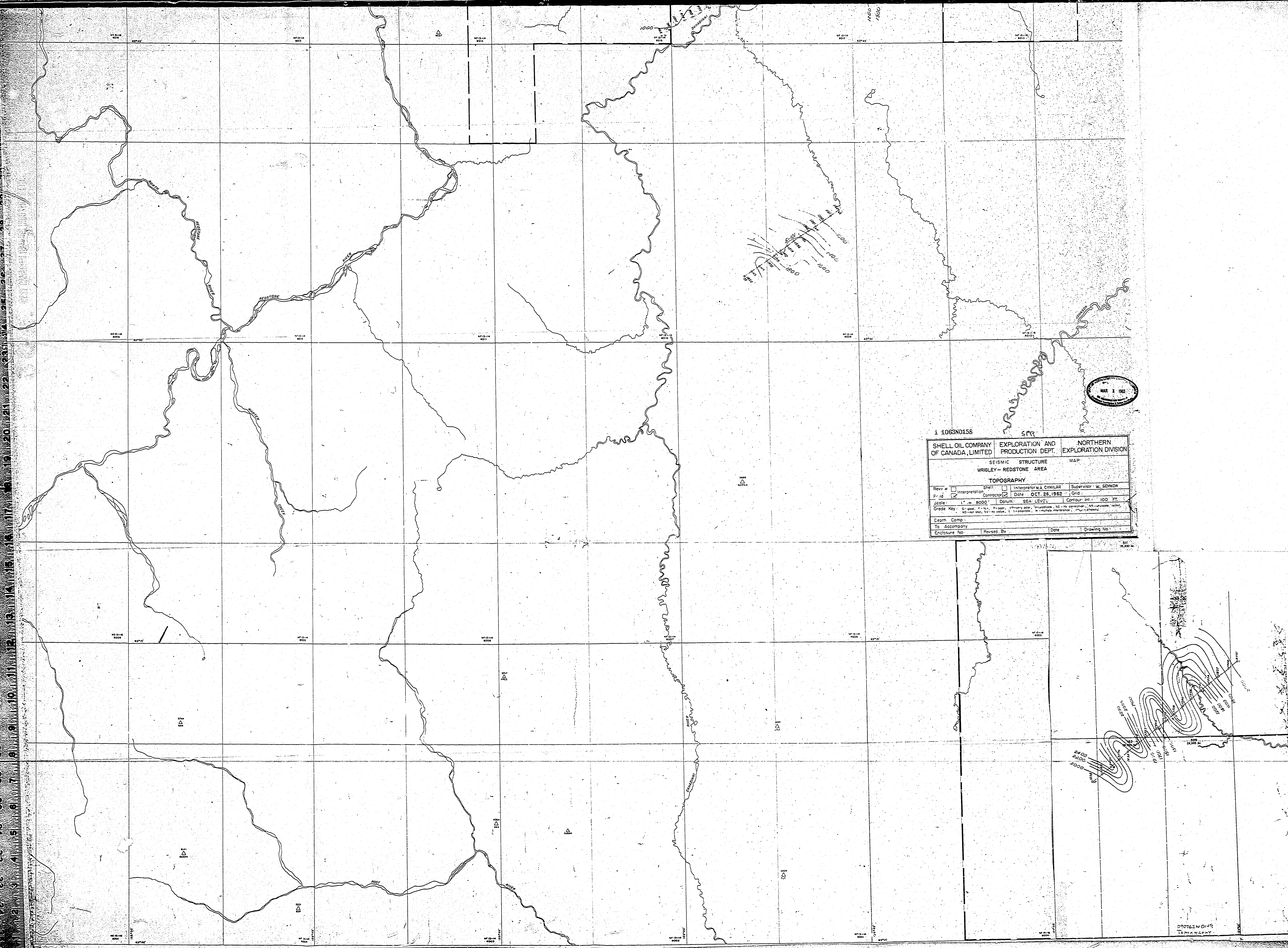
All gravity readings were related to a base value at Shot Point 113, Line 5-2 in the Blackwater Lake Area. To facilitate mapping by making all corrected readings positive, a constant was added to all the Wrigley Redstone readings. These resultant values were posted on the Gravity map and contoured on a 5 milligal contour interval.

A gravity station location and elevation map and a gravity map - corrected for Latitude, Free Air and Bouguer - are submitted with this report.

J.J. Hamilton
Division Geophysicist
Northern Division Exploration

February 7, 1963
Edmonton, Alberta

Prepared by Northern Division Geophysical
under the supervision of B.M. Veilleux,
Manager, Northern Division Exploration,
Shell Oil Company of Canada, Limited,
January 1963.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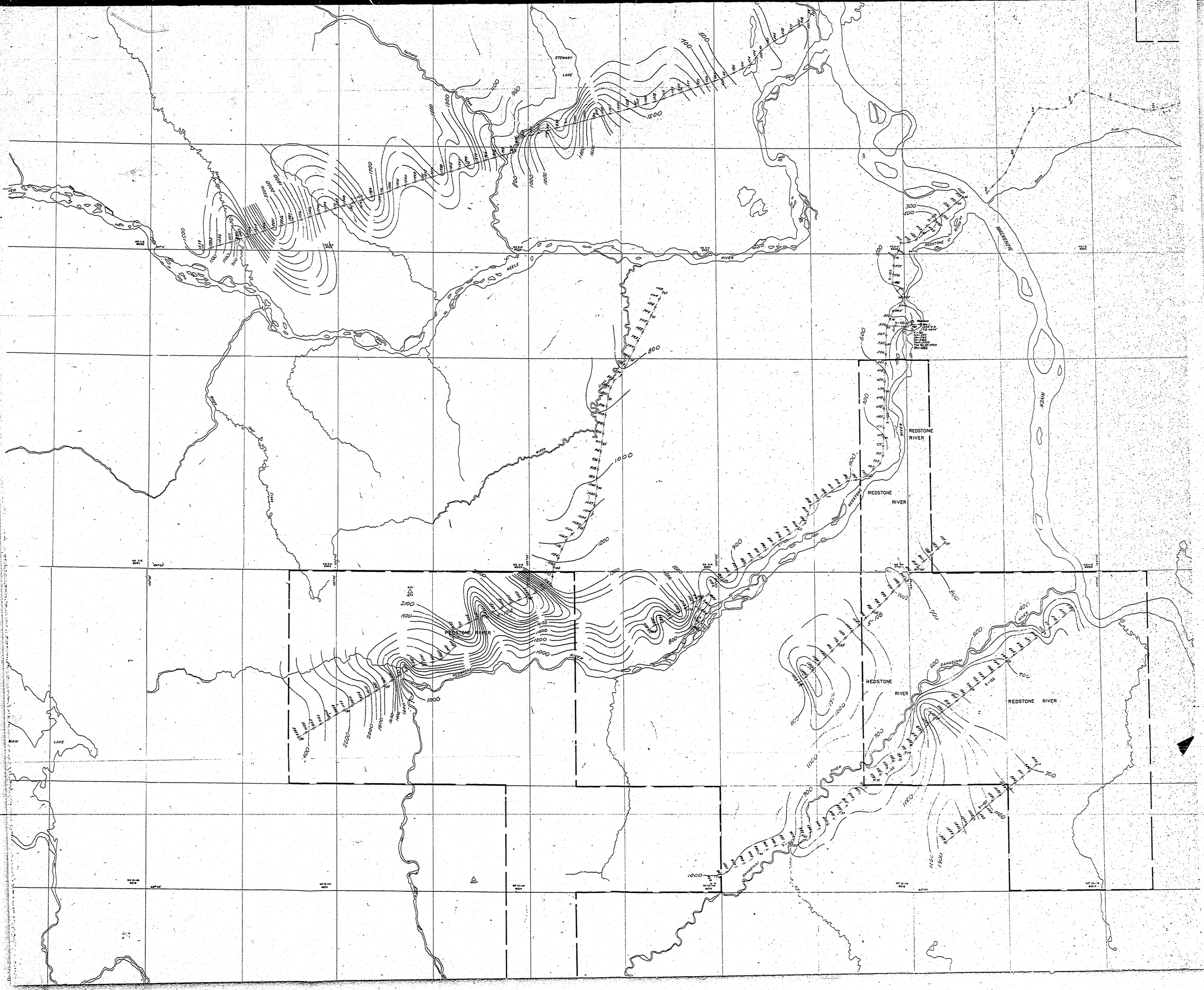
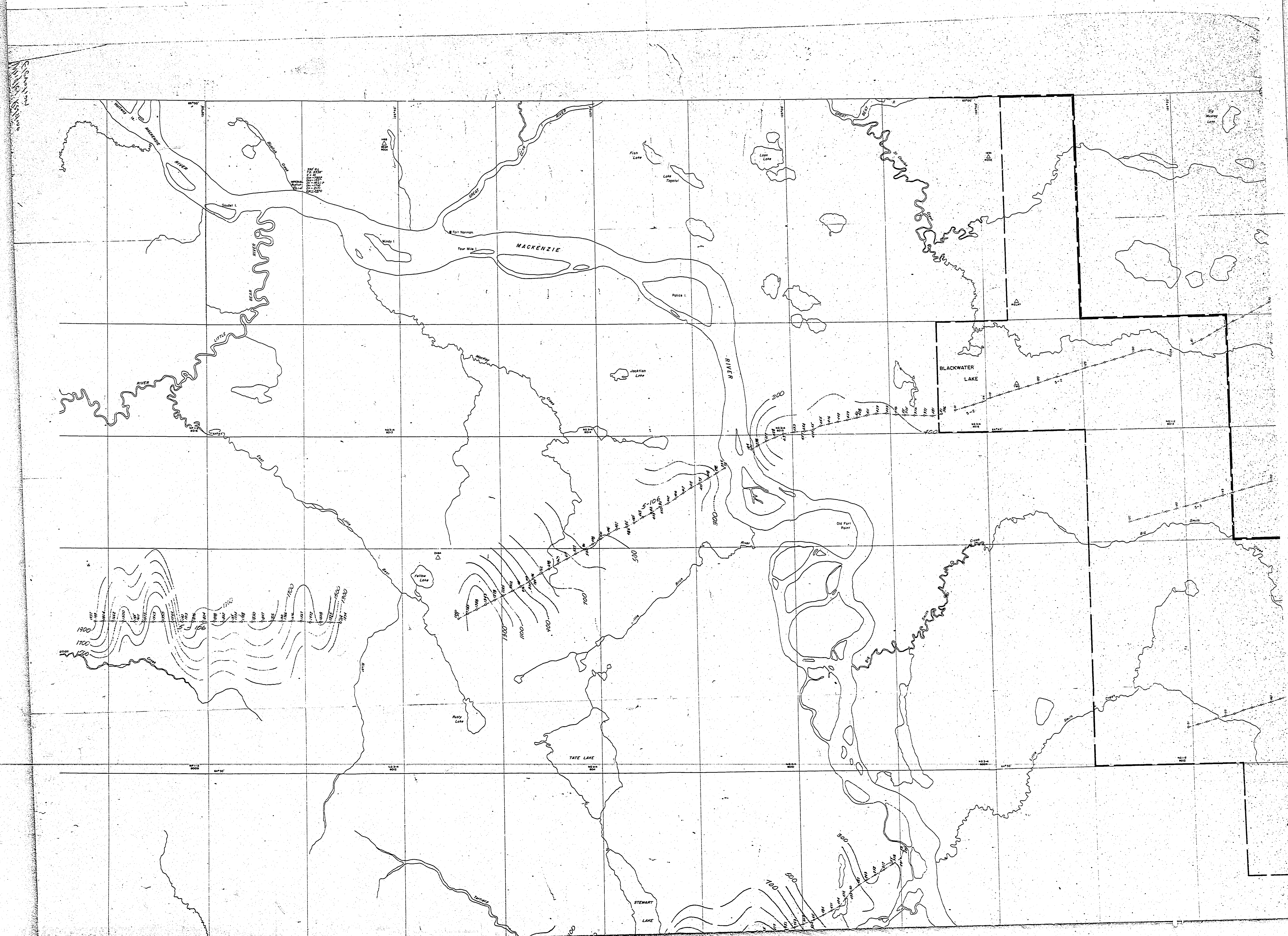
SHELL OIL COMPANY OF CANADA, LIMITED
EXPLORATION AND PRODUCTION DEPT.
NORTHERN EXPLORATION DIVISION
SEISMIC STRUCTURE MAP
WRIGLEY – REDSTONE AREA
TOPOGRAPHY
Review / Field — Interpretation — Shell / Contractor ✓
Interpreter W.A. CHMILAR
Supervisor: W. SEMKOW
Date OCT. 26, 1962
Grid
Scale: 1" = 8000'
Datum: SEA LEVEL
Contour Int.: 100 FT.
Grade Key: G – good, F – fair, P – poor, VP – very poor, U – unreliable, NC – no correlation, NR – unusable record, NS – not shot, NV – no value, ( ) – phantom, m – multiple interference, ~ – phasing
Depth Comp:
To Accompany
Enclosure No.
Revised By
Date
Drawing No.
MAR 1 1963
REDSTONE RIVER
MARTEN CREEK
ROOT RIVER
1000
1100
1200
1800
2000
2200
2400


STEWART LAKE
KEELE RIVER
REDSTONE RIVER
MACKENZIE RIVER
DAHADINNI
DESSOMS
WAN LAKE
WEST



WEST CANADIAN GRAVITY SURVEY 1962

NORTH REDSTONE RIVER

REDSTONE RIVER

MARTEN CREEK

ROOT RIVER

DAMOCLES RIVER

JOHNSON

SHELL OIL COMPANY OF CANADA, LIMITED	EXPLORATION AND PRODUCTION DEPT.	NORTHERN EXPLORATION DIVISION	
WRIGLEY REDSTONE AREA N.W.T.			
LOCATIONS & ELEVATIONS OF GRAVITY STATIONS			
Review ☐ Field ☐	Shell ☐ Interpretation ☐ Contractor ☐	Interpreter: Date: Feb. 1963	Supervisor: Grid:
Scale: 1"=8000'	Datum:		Contour Int.:
Grade Key: G-good, F-fair, P-poor, VP-very poor, U-unreliable; NC-no correction; NR-unusable, record; NS-not shot, NV-no value, (..)-uncertain; m-multiple interference; ~~-shielding.			
Depth Comp.:			
To Accompany Gravity report to the Gov't			
Enclosure No.:	Revised By:	Date:	Drawing No.:

SPR

MAR 1 1963

STEWART LAKE

REDSTONE RIVER

MACKENZIE RIVER

KEELE RIVER

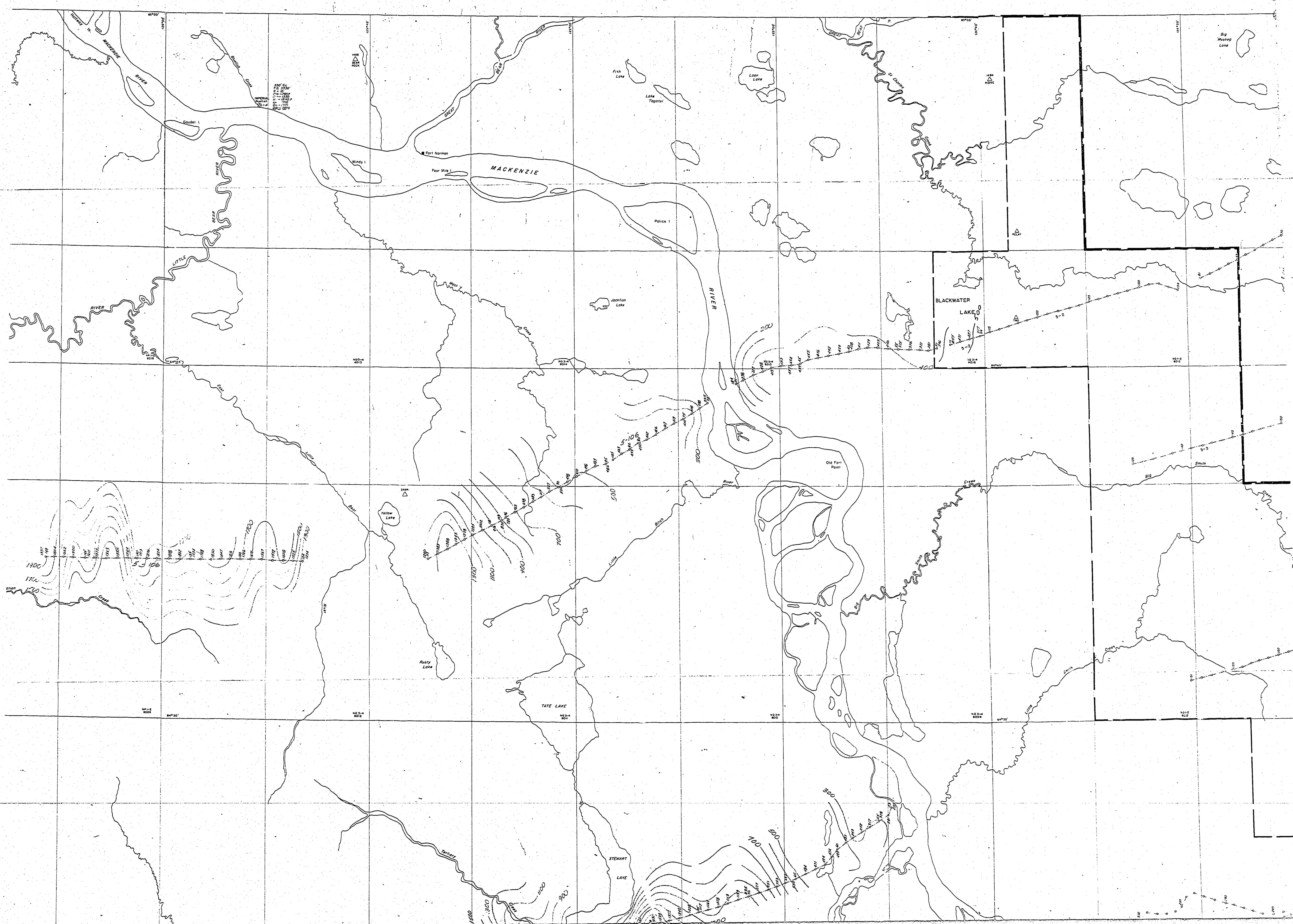
REDSTONE RIVER

REDSTONE RIVER

REDSTONE RIVER

DAHADINNI RIVER

MAIN LAKE



MACKENZIE
RIVER
Goudet I.
Windy I.
Fort Norman
Four Mile I.
MACKENZIE
Police I.
RIVER
Jackfish Lake
Fish Lake
Lake Tagatui
Loon Lake
Big Muskeg Lake
BLACKWATER LAKE
LITTLE
RIVER
Old Fort Point
Yellow Lake
Rusty Lake
TATE LAKE
STEWART LAKE

1 1063N0148

LEGEND
HUME REFLECTION IDENTIFIED BY REFRACTION (APPROXIMATELY 20,000'/se)

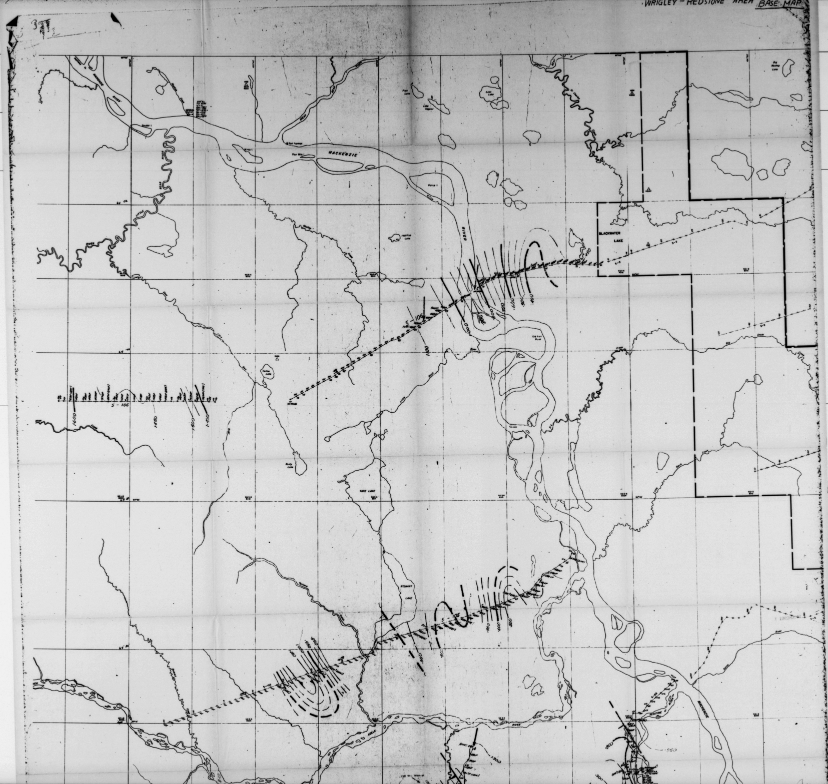
+ MIGRATED DATUM VALUE

Depth values indicated are below ... datum

SHELL OIL COMPANY OF CANADA, LIMITED	EXPLORATION AND PRODUCTION DEPT.	NORTHERN EXPLORATION DIVISION

SEISMIC STRUCTURE MAP
WRIGLEY – REDSTONE AREA
HUME (TOP PALEOZOIC CARBONATES)

Review ☐ Field ☑ Interpretation	Shell ☐ Contractor ☑	Interpreter W.A. CHNILAR	Supervisor W. SENKOW
		Date OCTOBER 26, 1962	Grid
Scale 1" = 8000'		Datum 1000 ASL	Contour Int. .050 se. (275')
Grade Key: G-good, F-fair, P-poor, VP-very poor, U-unreliable, NC-no correlation, NR-unusable record, NS-not shot, NV-no value, ( )-phantom, m-multiple interference, ∿-phasing			
Depth Comp.			
To Accompany			
Enclosure No.	Revised By	Date	Drawing No.



PROJ. NO. 37-6-5-42

LINE NO. MAP

PART NO. 2 OF 2

R.R. 10X