

37-6-5-44

REFLECTION SEISMOGRAPH SURVEY
BLACKWATER LAKE, GREAT BEAR LAKE
NORTHWEST TERRITORIES 1962-63

Shell Oil Company of Canada, Limited
Northern Division Exploration
Edmonton, Alberta.
June 20, 1963

REFLECTION SEISMOGRAPH SURVEY
BLACKWATER LAKE-GREAT BEAR RIVER AND OCHEE RIVER.
NORTHWEST TERRITORIES

1962-63



SHELL OIL COMPANY OF CANADA, LIMITED
Northern Division Exploration
Edmonton, Alberta. June 20, 1963.

BLACKWATER LAKE-GREAT BEAR RIVER AND OCHRE RIVER
NORTHWEST TERRITORIES

Permits #1960-1969 inclusive, #2143-2147 inclusive, #3112-3117 inclusive, #1997-2011 inclusive, #1943-1948 inclusive, N/2 #1949, #1950-1954 inclusive, S/2 #1955, #1956-1959 inclusive, S/2 #3222, #3433-3446 inclusive and #3294-3298 inclusive.

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

Winter Program 1962-63

Location:

The prospect lies in unsettled country east of the Mackenzie River and centered about 90 miles north-northeast of Wrigley, Northwest Territories.

Work was conducted between the latitudes of $63^{\circ}08'$ and $64^{\circ}49'$ North and between longitudes $122^{\circ}15'$ and $124^{\circ}54'$ West.

Dates of Survey:

Seismic recording was conducted between January 11, 1963, and April 13, 1963. The drills were operating between December 30, 1962 and April 10, 1963. Dozing was carried out from December 17, 1962, to April 15, 1963.

Extent of Survey:

Approximate Acreage:	2,500,000
Miles of Traverse:	$396\frac{1}{2}$

Number of Profiles:	834
plus Velocity Profiles:	22
Weathering Shots:	501
Long Refractions:	12
Number of Shotholes:	2486
New Access Road Bulldozed:	35 $\frac{1}{2}$
New Seismic Line Bulldozed:	37 $\frac{1}{2}$

Field Conditions:

Surface Outcrops:

Surface formations consisted of muskeg, and glacial deposits of till, sand, and gravel.

Type of Terrain:

Elevations range from about 400 to 2250 feet above sea level. The Franklin Mountains are immediately to the west of the prospect and the streams within the area drain generally northwest into the Mackenzie River.

Available Roads:

Seismic trails cut during the 1961-62 program were used to a great extent as access roads into the prospect, elsewhere new trails had to be cut by the dozers.

Weather:

Temperatures to a minimum of -53 degrees F. were recorded during the period of survey. The drills lost six days because of blizzard conditions which prevented them from obtaining fuel.

Field Procedure:

Drilling:

a. Formations:

Formations encountered during drilling included sandstone, shale, gravel, sand, clay, muskeg and permafrost. Clay and Boulders were logged in a large portion of the holes drilled.

b. Hole Depth:

Holes were drilled from 10 feet to 60 feet. Shallow holes were drilled where drilling was difficult due to sand, gravel and boulders. The most common hole depth used was 40 feet.

c. Casing:

No casing of holes was required.

d. Drilling Equipment:

Drilling equipment was supplied by subcontractor G. W. Garrity and consisted of three truck mounted Failing CFDI drills equipped for air or water circulation. Drilling of shotholes was invariably done using air circulation. Both rock and finger type bits were used.

e. Drilling Problems:

No drilling problems of any consequences were encountered.

Recording:

a. Procedure:

Seismic recording 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 the closest station

being 220 feet. Six seismometers at intervals of 25 feet per station were used. The number of holes per shotpoint ranged from one to three. Generally, in shale one hole was used per shotpoint; on locations where clay and boulders were encountered three holes at 75 foot intervals were usually drilled per shotpoint.

b. Weathering Spreads:

In a few cases, particularly where shale was near the surface, sufficient first break information was acquired from the split shot normally obtained for reflections. The delay time in this instance could be obtained by the uphole time method. Where the weathered layer was deeper it was necessary to shoot into the spread from shotpoints at either station 1 or 24.

c. Influence of Hole Depth:

Holes were generally loaded to 40 feet. Since the majority of the holes were logged using the general term of clay and boulders, no correlation could be made between reflection quality and any particular formation. Shallow holes, less than 20 feet, usually did not provide sufficient energy.

d. Charges:

For split shots each of the multiple holes was usually loaded with 5 pounds. If a single hole was used a charge of 15 pounds was loaded. On end shots the total charge was usually from 15 to 25 pounds. When shooting velocity profiles, with the shothole removed from the end of the spread, the charge was increased to about 50 pounds.

e. Type Amplifier, Filter Setting, Etc.:

Amplifiers used were of the General Geophysical Company JMH model,

with seismometers (type EVS2) manufactured by Electrotechnical Laboratories.

Unmixed incoming energy from the shot was simultaneously recorded on magnetic tape through an S-I-E. frequency modulated 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.

Occasionally the energy recorded on tape was played back in the field using a S-1-33-180 filter with the application of two-way slow automatic volume control. Some of the field playbacks were recorded in the monitor filter with one-way fast volume control. Records shot for weathering information only were not recorded on tape.

The tape unit was unserviceable from Feb. 13 to Feb. 22.

Traces numbered 1 to 24 on the record were connected to the corresponding stations of the instrument spread. Trace 25 indicated the uphole time and trace 26 showed the shot break and the release of the front end suppression; for a period during the first part of the survey this arrangement was reversed. The uphole seismometer was usually placed five feet from one of the holes. Traces 27 and 28 indicated the constant sensitivity action, and were meant to show energy bypassed from trace 21 with no automatic volume control. Trace 29 indicated a 100 cycle per second timing signal with the frequency derived from a tuning fork.

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

On most split profiles a tap test was recorded on the first shot ahead of the first breaks to ensure that the cables were not reversed.

Surveying:

Surveying was performed using two Wild T1A theodolites, one of these being replaced late in the program by a Wild T16 theodolite. Spreads

were laid out using a calibrated chain. Vertical and horizontal controls were obtained from a system of stations established by a tellurometer survey conducted by the Shell Oil Company of Canada, Limited, and by ties to previous seismic stations established during the 1961-1962 program.

Spreads were laid out using two men, one on each end of the chain, with one using a truck, the other a skidoo.

On the five final maps submitted with this report the locations on the following lines are in error by up to 1000 feet.

Lines 32, 33, 51, 37 and 46.

The errors were not discovered until after the final maps had been completed.

Office Procedure:

Weathering Corrections:

First arrival surface to surface times were plotted on rectilinear paper for each profile shot. Apparently very little V_1 material (assumed to be 3000 feet/second) was present. The lowest refraction velocity (V_2) measured was generally about 6500 feet/second. The next velocity (V_3) recorded varied from 9100 to 13,000 feet/second. In a few cases the V_2 velocity was absent, usually where shale was logged near the surface. Where this occurred the uphole time method of weathering corrections was used. In a considerable number of cases, mostly in the eastern part of the prospect where the Eum horizon was shallow, the next velocity refracted after the V_2 was about 20,000 feet/second, this being indicative of the Eum horizon. In these cases a V_3 of 10,000 feet/second was ruled in the breakover between the V_2 and the 20,000 feet/second velocity. Other

were laid out using a calibrated chain. Vertical and horizontal controls were obtained from a system of stations established by a tellurometer survey conducted by the Shell Oil Company of Canada, Limited, and by ties to previous seismic stations established during the 1961-1962 program.

Spreads were laid out using two men, one on each end of the chain, with one using a truck, the other a skidoo.

On the five final maps submitted with this report the locations on the following lines are in error by up to 1000 feet.

Lines 32, 33, 51, 37 and 46.

The errors were not discovered until after the final maps had been completed.

Office Procedure:

Weathering Corrections:

First arrival surface to surface times were plotted on rectilinear paper for each profile shot. Apparently very little V_1 material (assumed to be 3000 feet/second) was present. The lowest refraction velocity (V_2) measured was generally about 6500 feet/second. The next velocity (V_3) recorded varied from 9100 to 13,000 feet/second. In a few cases the V_2 velocity was absent, usually where shale was logged near the surface. Where this occurred the uphole time method of weathering corrections was used. In a considerable number of cases, mostly in the eastern part of the prospect where the Eume horizon was shallow, the next velocity refracted after the V_2 was about 20,000 feet/second, this being indicative of the Eume horizon. In these cases a V_3 of 10,000 feet/second was ruled in the breakover between the V_2 and the 20,000 feet/second velocity. Other

than the uphole time method, the two layer method was used in determining weathering corrections.

Velocity Data:

A wave front chart, constructed during the 1961-1962 program, was used in point-plotting reflections. Considerable difficulty was encountered in adequately removing the Delta T.

Cross Sections, Maps, Etc.:

Correlations of reflections were established on the best monitor record obtained at each shotpoint. The customary weathering delay time and elevation correction to a datum plane of 1200 feet above sea level were applied to the shotpoint and at each recording station using a correcting velocity of 10,000 feet/second. Almost every monitor was shot with the S-1-33-75 filter which was used as a base with filter correction of zero. Each corrected reflection was then plotted in cross section profile using a wave front chart to remove Delta T. The scale used was 1": .100 seconds two-way time. Best fit lines were drawn through each plotted reflection giving the two-way time at the shotpoint from datum to the particular reflection. The surface elevation and the weathering delay time were indicated near the top of the cross section for each shotpoint.

On a considerable number of shotpoints, particularly in the eastern part, the Hume horizon was apparently shallow and had to be mapped by refraction shooting. Intercept times from the different velocities were measured and the two-way time to the Hume was computed by the three layer method. A correction of plus .010 seconds was used in tying the refraction values to the reflection values for the Hume horizon.

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

G	:	good
F	:	fair
P	:	poor
VP	:	very poor
MC	:	no correlation
NV	:	no value
NR	:	no reflections
NS	:	not shot

Grades were obtained from the specimen record and were based on reflection character, amplitude, and envelope.

Results:

Quality:

Record quality ranged from poor to fair throughout the area.

Maps submitted with the report include:

Topography

Huize (time structure)

Cambrian (time structure)

GRAVITY SURVEY

In conjunction with the seismic survey a reconnaissance gravity survey was carried out along most of the seismic line.

Equipment:

A Warden temperature controlled gravity meter was used to record the gravity data. The operator conducted the survey using a truck during extremely cold weather and a motorized toboggan, a "ski-doo" in the relatively warmer weather.

Processing of the gravity data will begin in July.

Maps submitted:

Only one map showing the locations and elevations of the gravity stations, is submitted with this report. A map showing the corrected gravity values will be submitted in the near future.

Prepared by Northern Division
Exploration - Geophysical Section
under the supervision of B.M. Vailloux,
Manager, Northern Division Exploration,
Shell Oil Company of Canada, Limited.
June 1963.

MAPS - BLACKWATER LAKE AREA

Devonian-Hume

Northeast
Northwest
South

Near Top of Cambrian

Northeast
Northwest
South

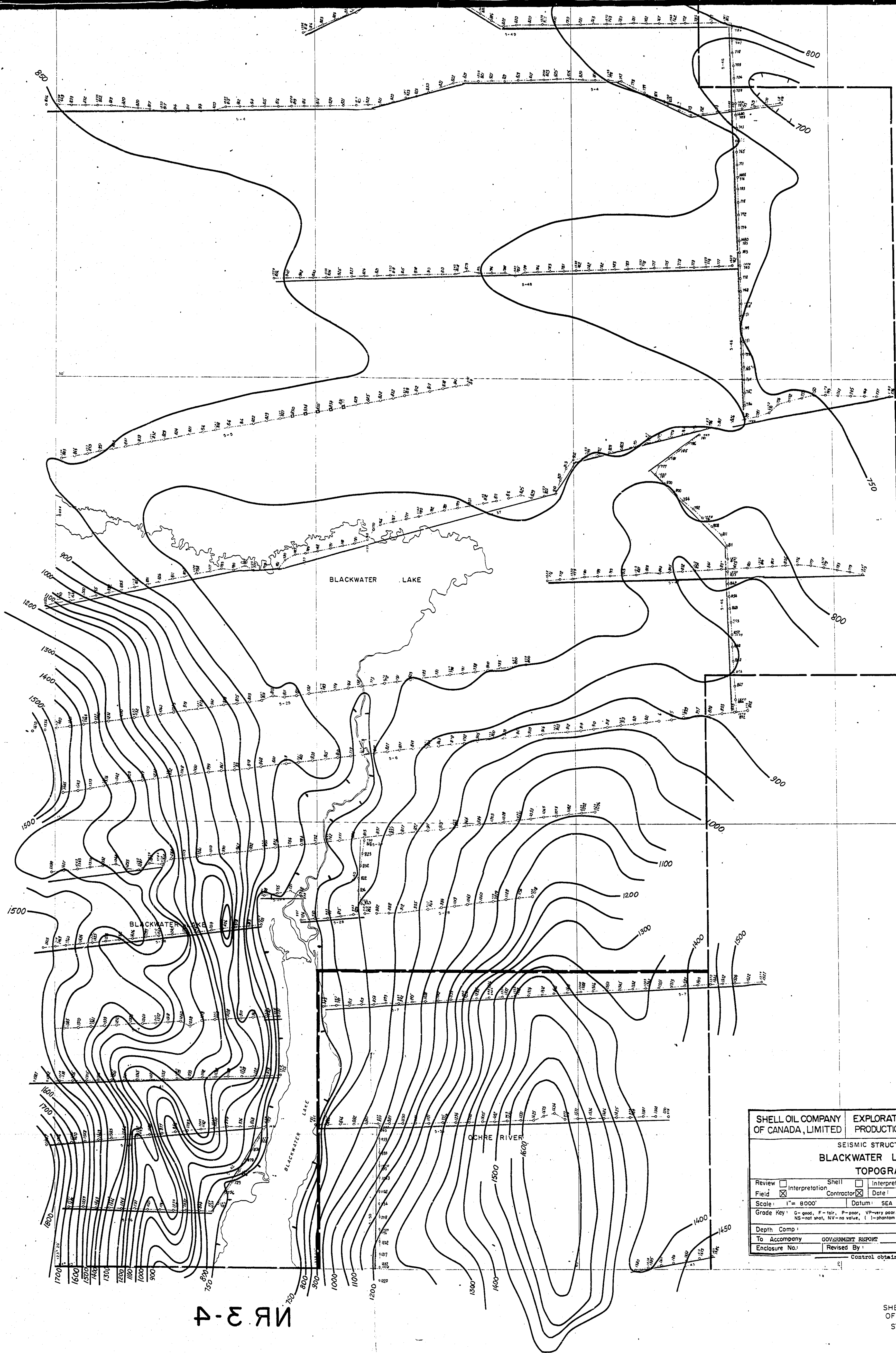
Topography

Northeast
Northwest
South

Topography

showing Gravity control

Northeast
Northwest
South



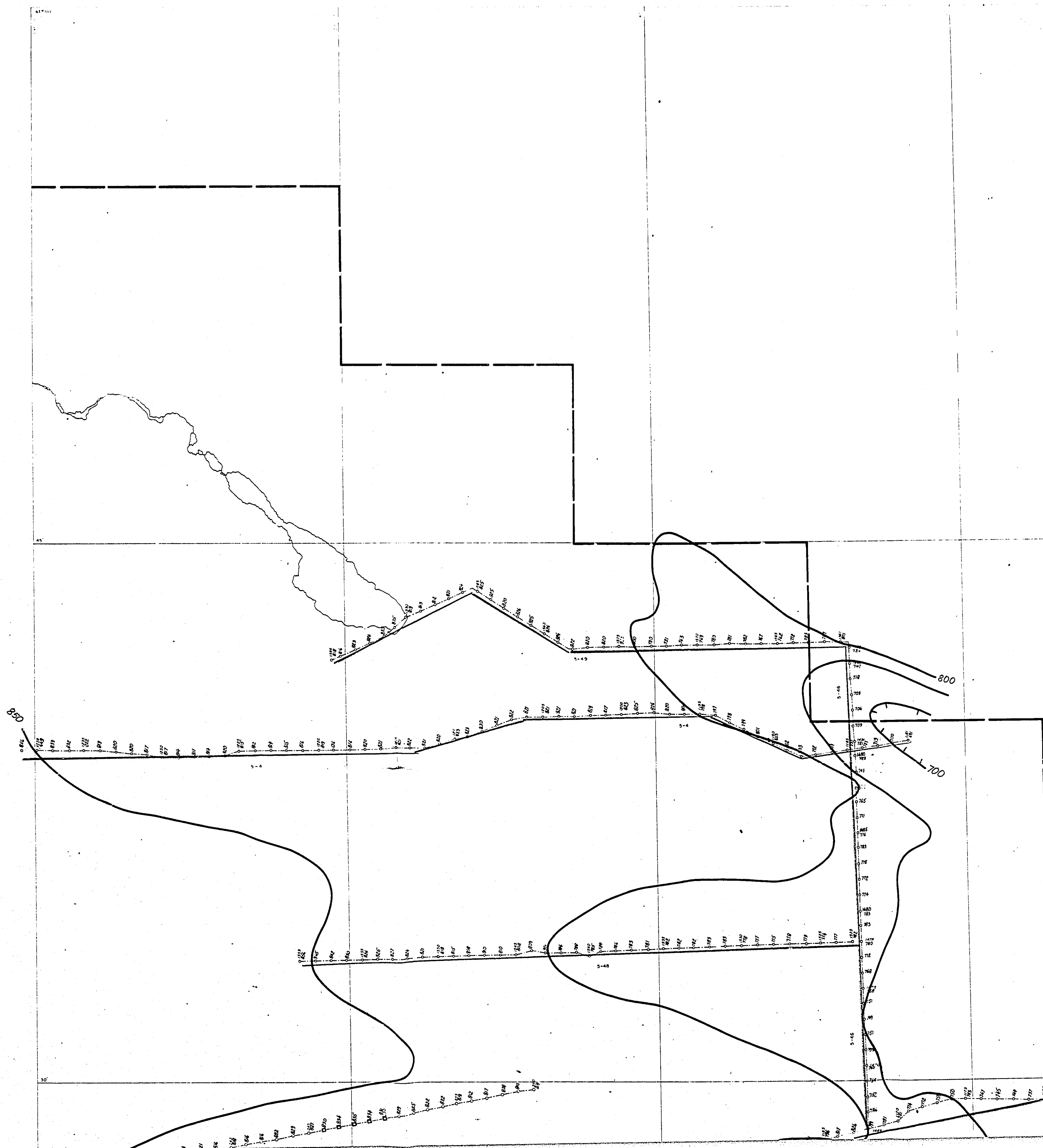
NR 3-4

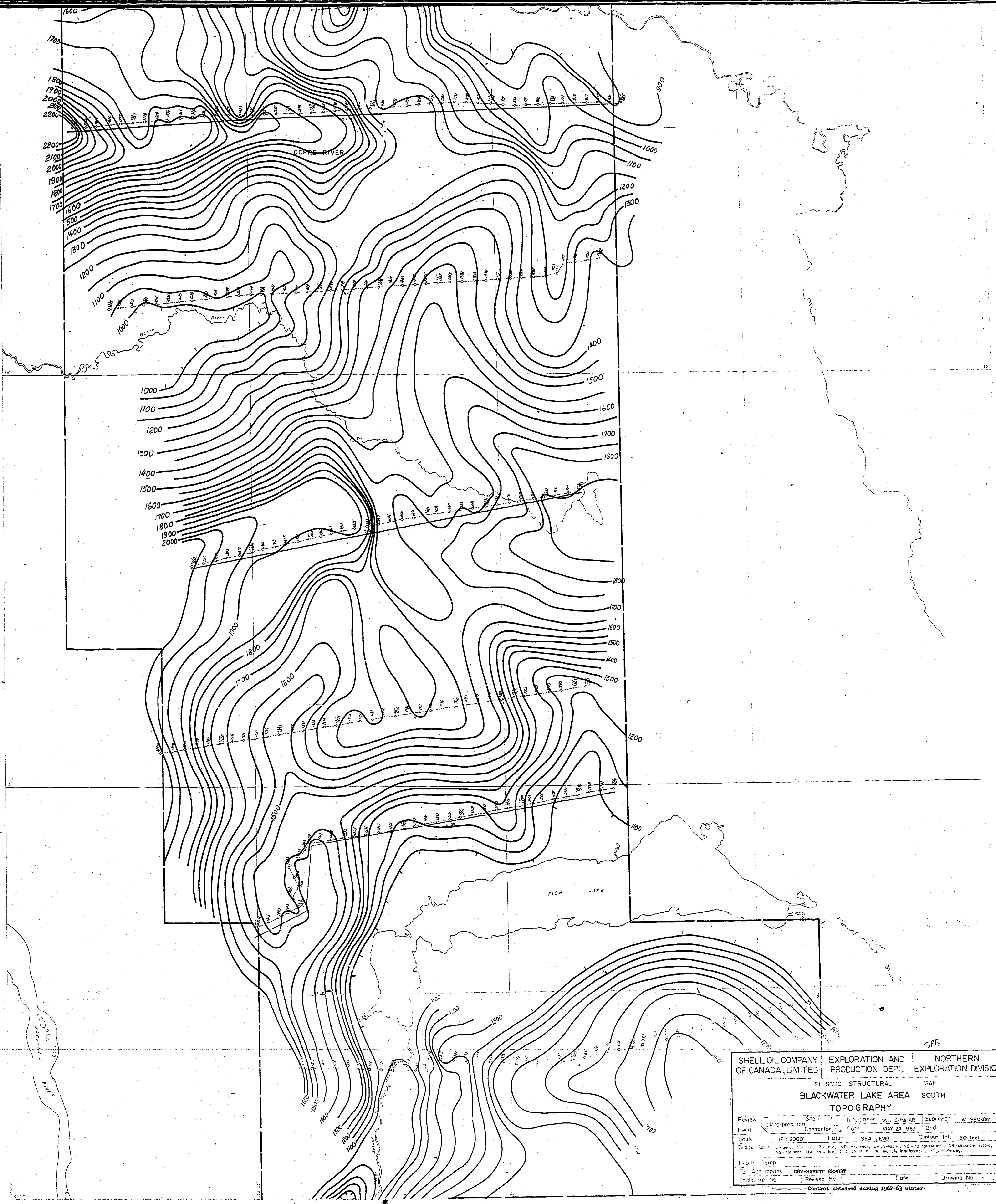
SHELL OIL COMPANY OF CANADA, LIMITED		EXPLORATION AND PRODUCTION DEPT.		NORTHERN EXPLORATION DIVISION	
SEISMIC STRUCTURAL BLACKWATER LAKE AREA				MAP NORTHEAST	
TOPOGRAPHY					
Review	<input type="checkbox"/> Interpretation	Shell	<input type="checkbox"/> Interpreter	W. A. CHMILAR	Supervisor: W. SEMKOW
Field	<input checked="" type="checkbox"/> Interpretation	Contractor	<input checked="" type="checkbox"/> Date	MAY 24, 1963	Grid
Scale: 1" = 8000'		Datum: SEA LEVEL		Contour Int.: 50 feet	
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, I - phantom, m - multiple interference, ~ - phasing.					
Depth Comp:					
To Accompany GOVERNMENT REPORT					
Enclosure No.:		Revised By:		Date	Drawing No. 442
Control obtained during 1962-63 winter.					

SHELL OIL COMPANY
OF CANADA, LIMITED
STRIP MAP NR 3-4
SCALE: 1" = 8000'
NOV. 1962



KFITH AHM
(Great Bear Lake)

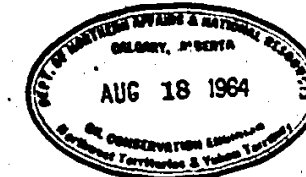


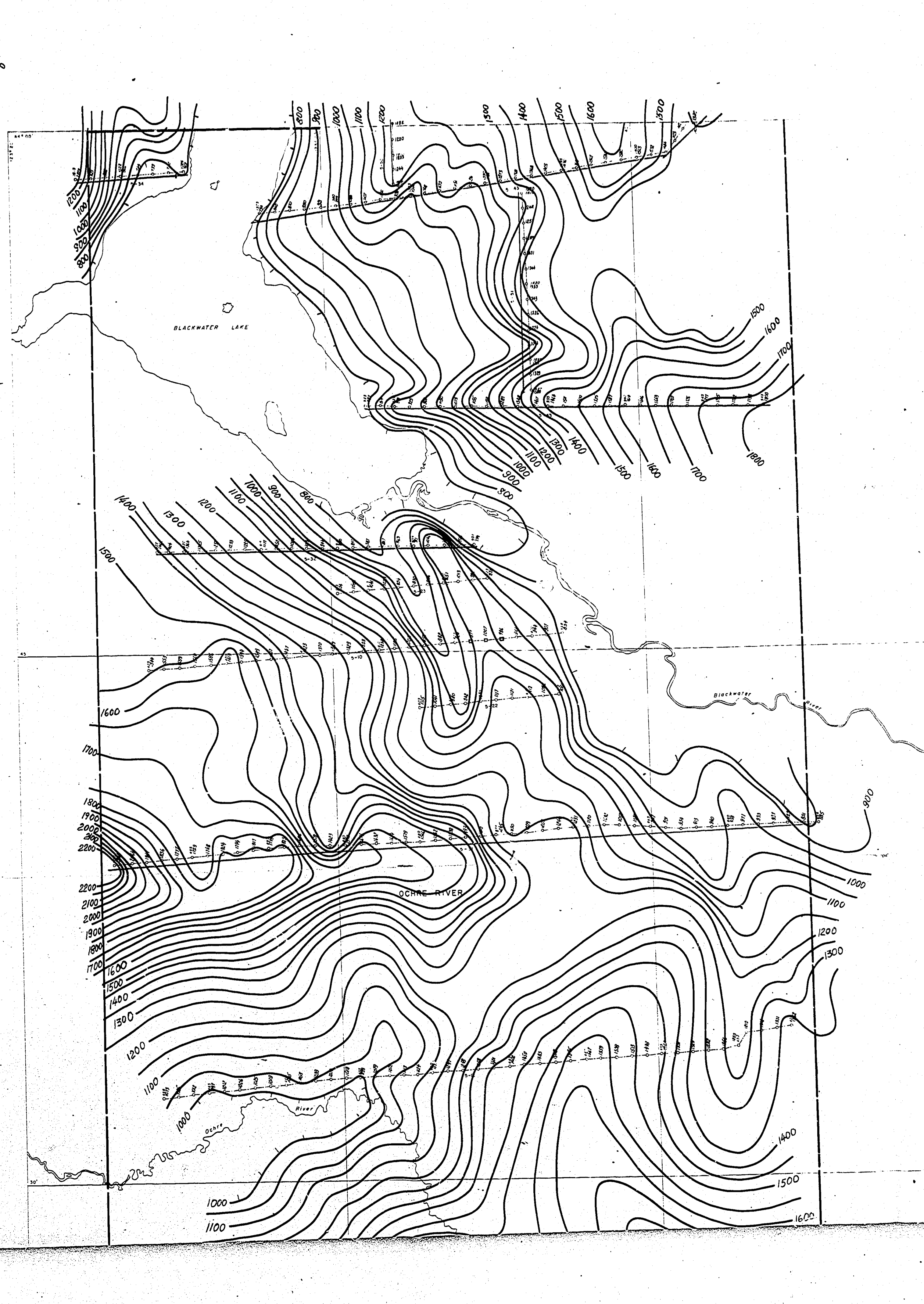


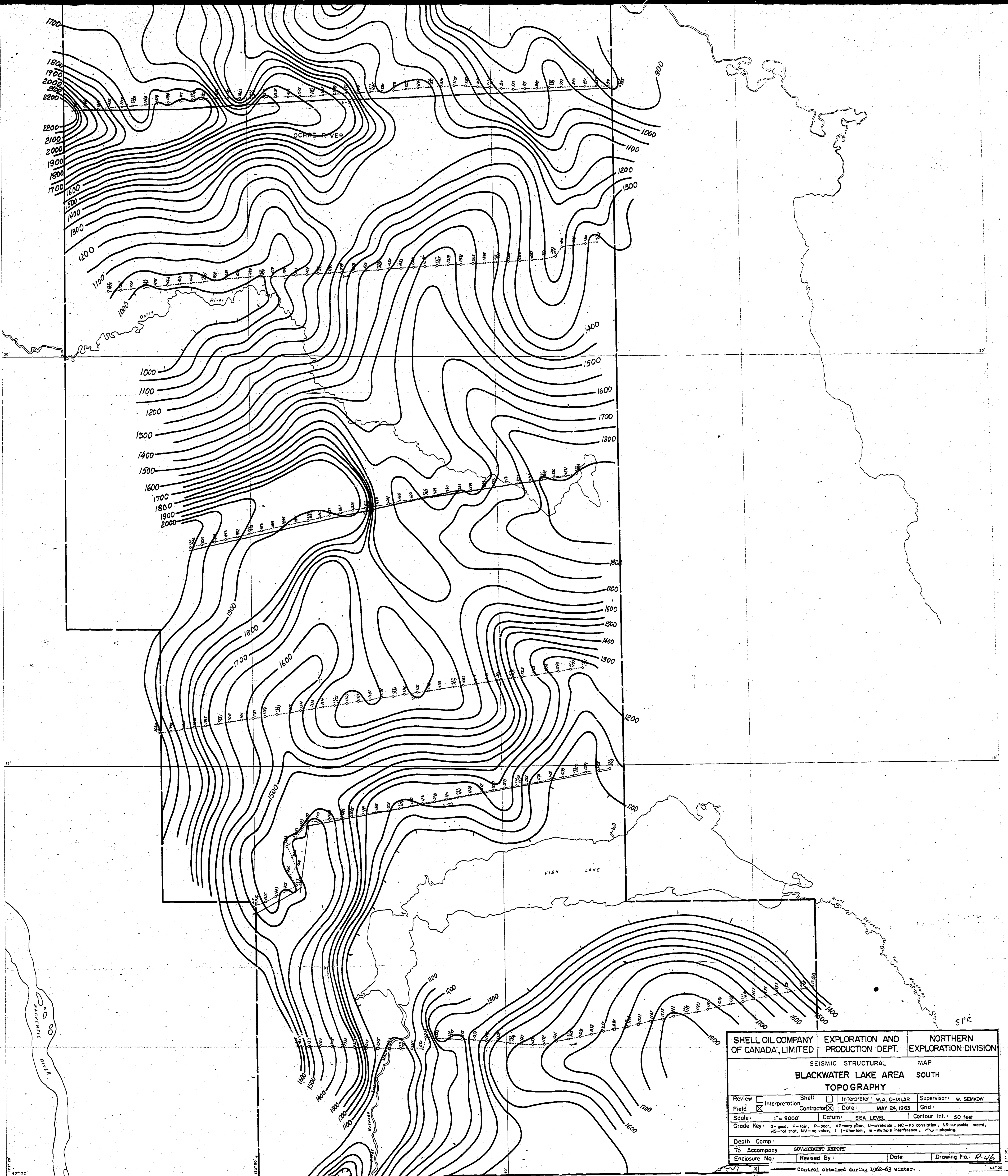
SHELL OIL COMPANY OF CANADA, LIMITED		EXPLORATION AND PRODUCTION DEPT.		NORTHERN EXPLORATION DIVISION	
SEISMIC STRUCTURAL MAP					
BLACKWATER LAKE AREA SOUTH					
TOPOGRAPHY					
Review	Sheil	Interpretation	W. C. M. 49	Supervisory	W. SENKOW
Field	Contractor	Date	MAY 24 1963	Grid	
Scale	1" = 8000'	Contour Int.	50 feet		
Grade Key: G - good, P - poor, V - very poor, U - unusable, NC - no correlation, NR - unusable record, NS - not shown, BV - in view, L - 1 point only, M - multiple interferences, S - shading.					
Drawn	Comp.				
By	Accompany	GOVERNMENT REPORT			
Enclosure No.	Revised By	Date		Drawing No.	
Control obtained during 1962-63 winter.					

NE 13-14

SHELL OIL COMPANY
OF CANADA, LIMITED
STRIP MAP NE13-14
SCALE 1" = 8000'
NOV 1962

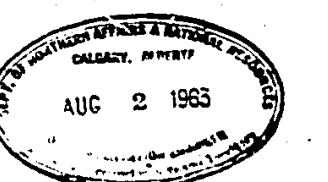


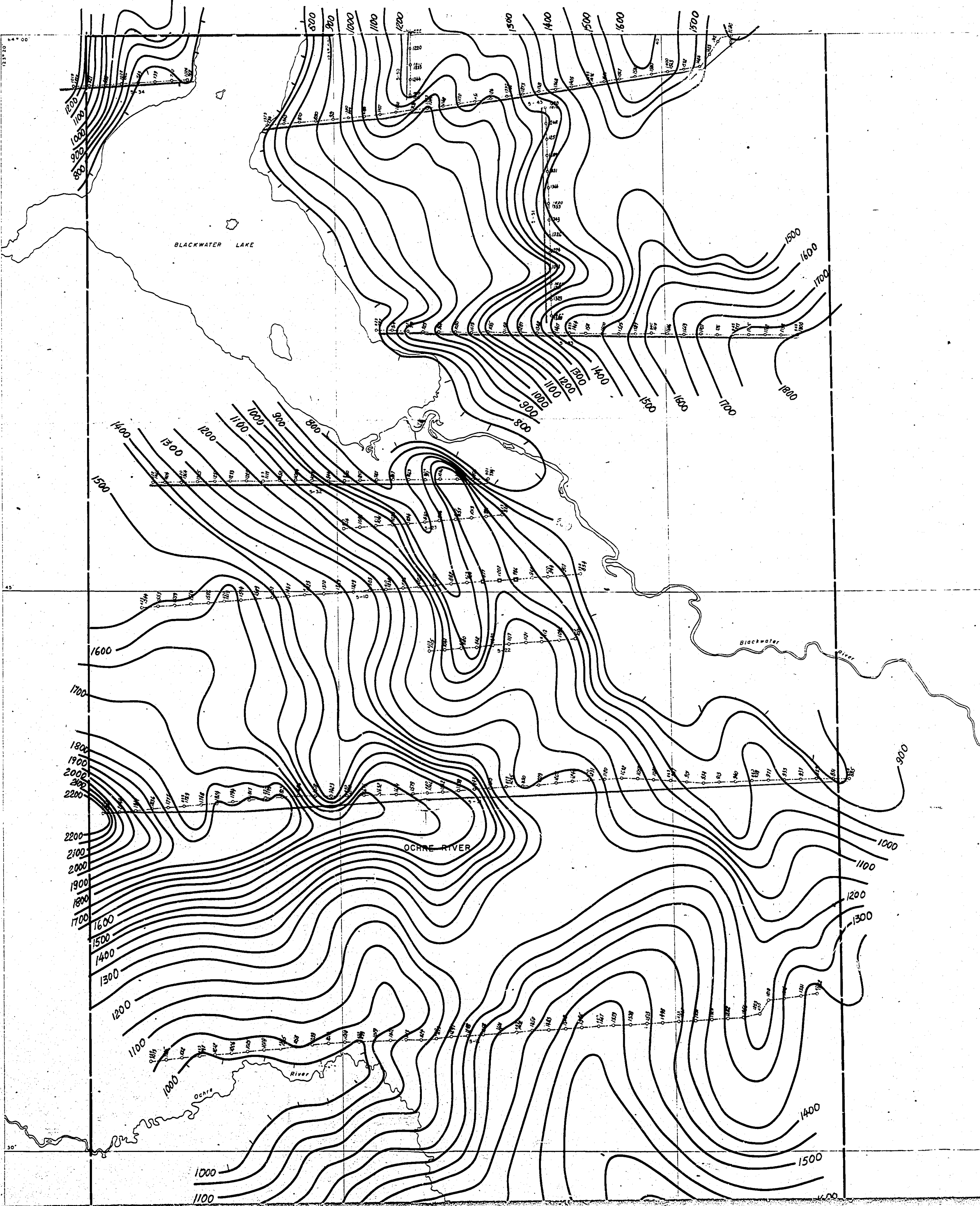


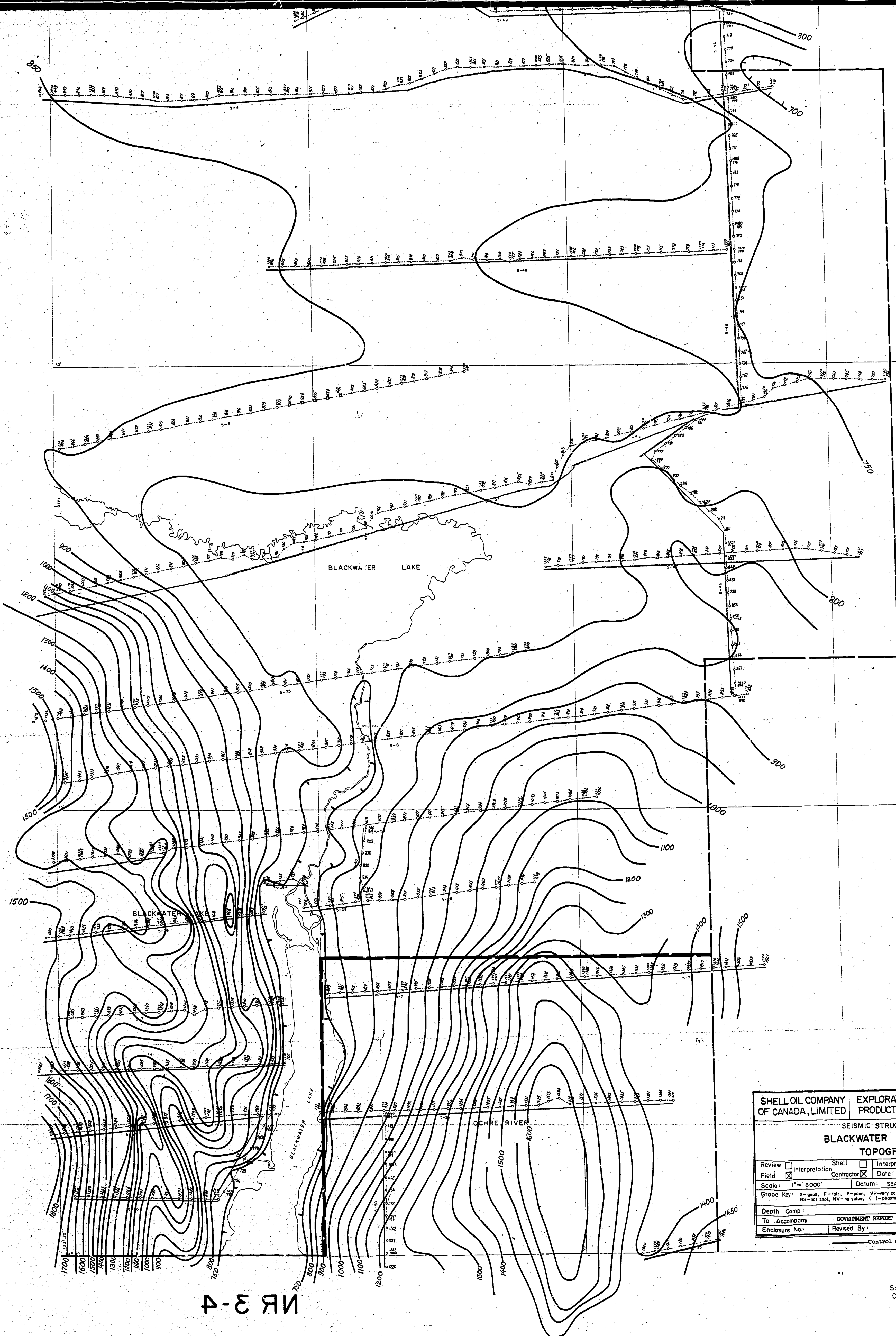


NE 13-14

SHELL OIL COMPANY
OF CANADA, LIMITED
STRIP MAP NE 13-14
SCALE: 1" = 8000'
NOV. 1962



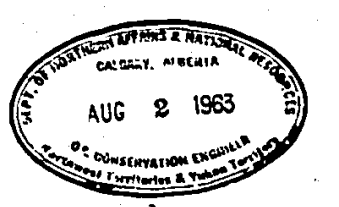


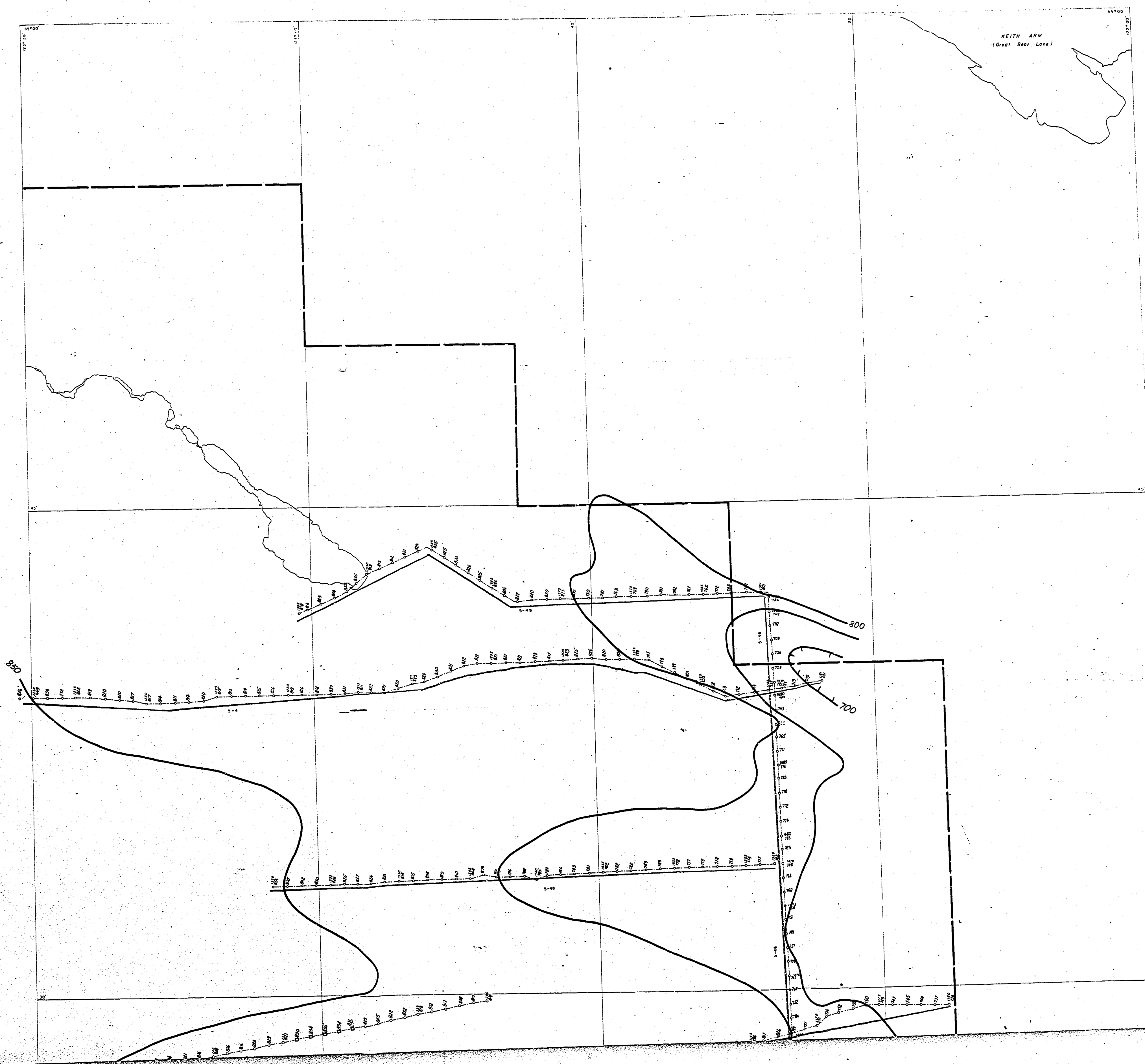


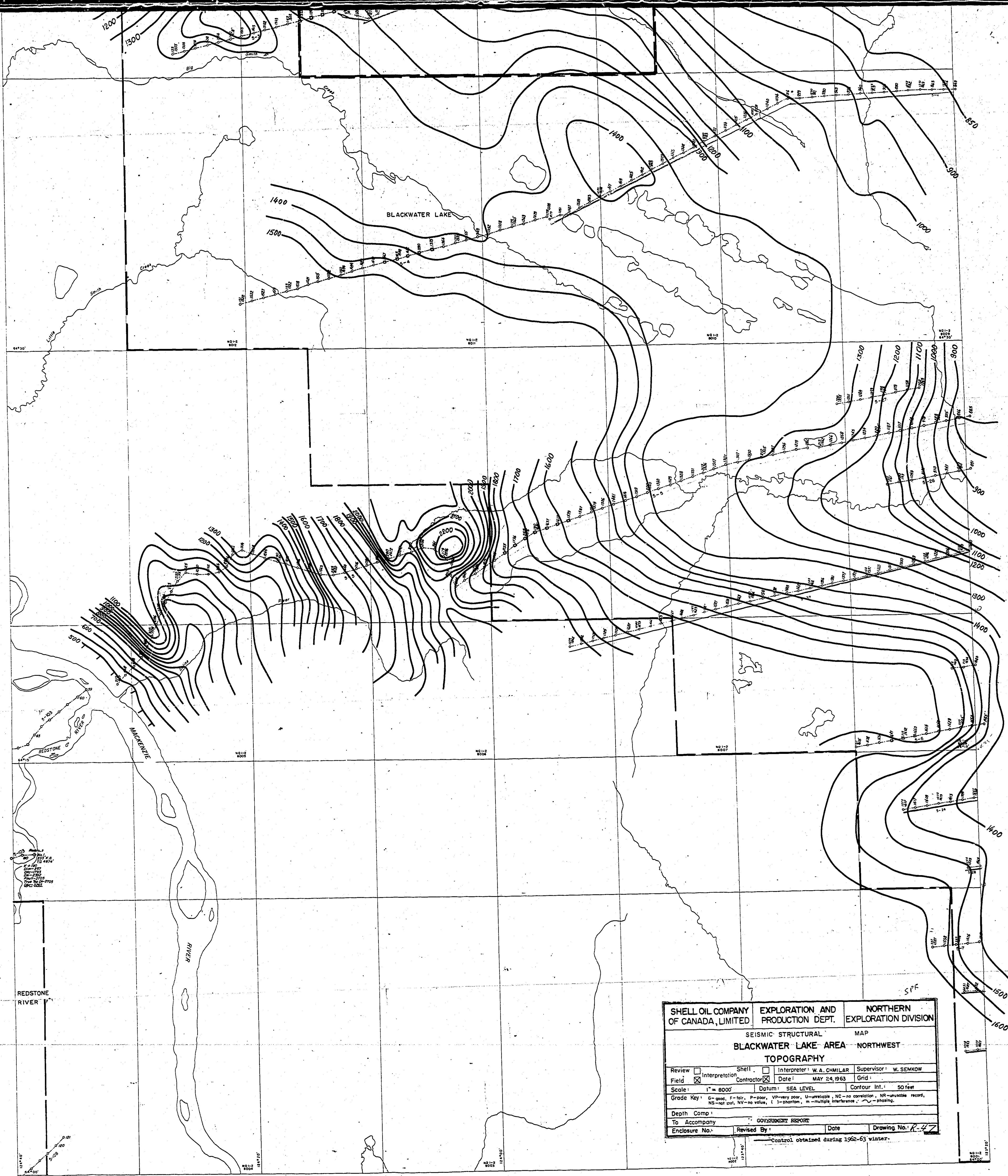
NR 3-4

SHELL OIL COMPANY OF CANADA, LIMITED		EXPLORATION AND PRODUCTION DEPT.		NORTHERN EXPLORATION DIVISION	
SEISMIC-STRUCTURAL MAP					
BLACKWATER LAKE AREA NORTHEAST TOPOGRAPHY					
Review <input type="checkbox"/>	Interpretation <input type="checkbox"/>	Shell <input type="checkbox"/>	Interpreter: W. A. CHMILAR	Supervisor: W. SEMKOW	
Field <input checked="" type="checkbox"/>	Contractor <input checked="" type="checkbox"/>	Date: MAY 24, 1963	Grid:		
Scale: 1" = 8000'	Datum: SEA LEVEL	Contour Int.: 50 feet			
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: GOVERNMENT REPORT					
Enclosure No:	Revised By:	Date:	Drawing No. K-425		
Control obtained during 1962-63 winter.					

S. B. LINDSEY
SHELL OIL COMPANY
OF CANADA, LIMITED
STRIP MAP NR 3-4
SCALE: 1" = 8000'
NOV. 1962



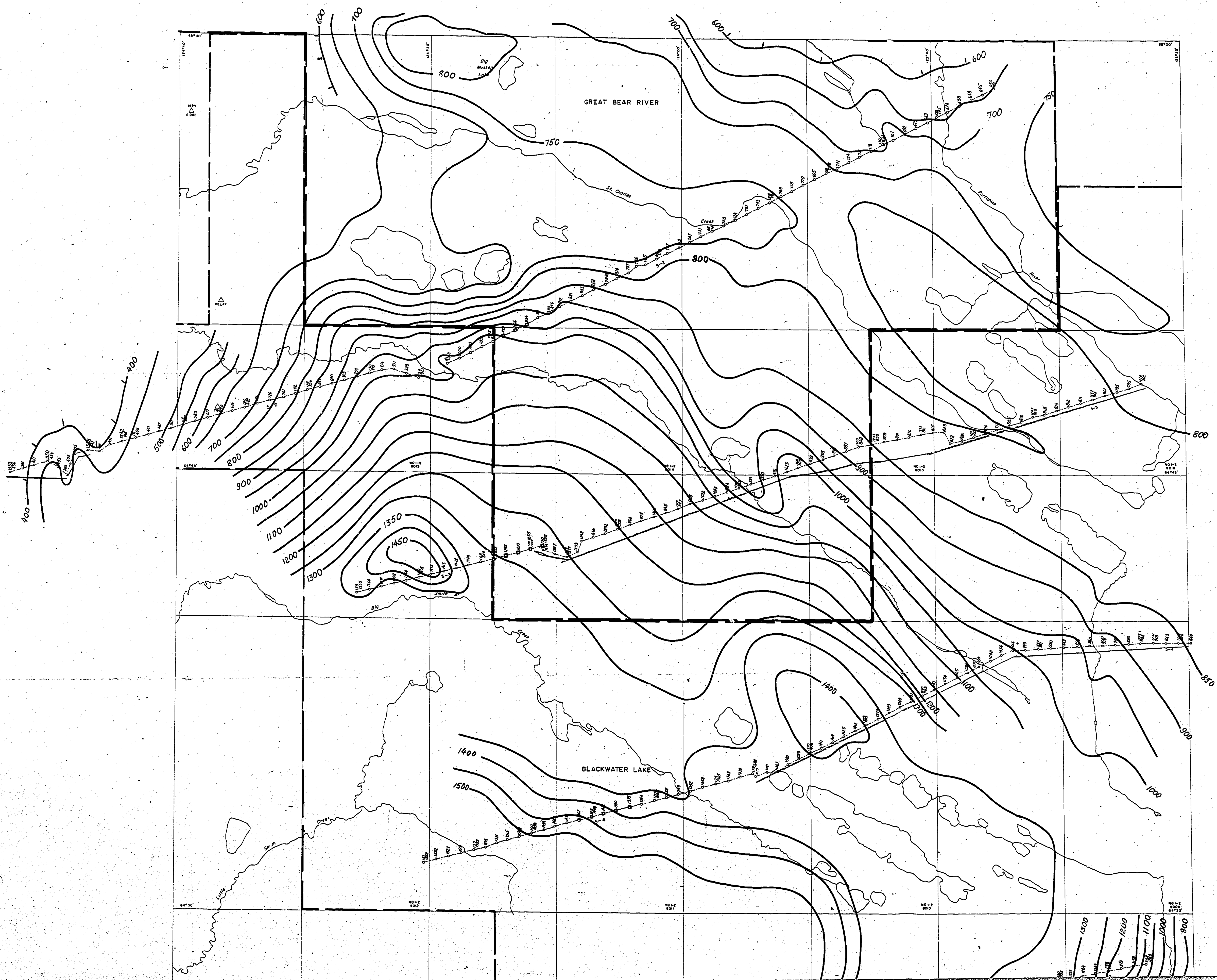


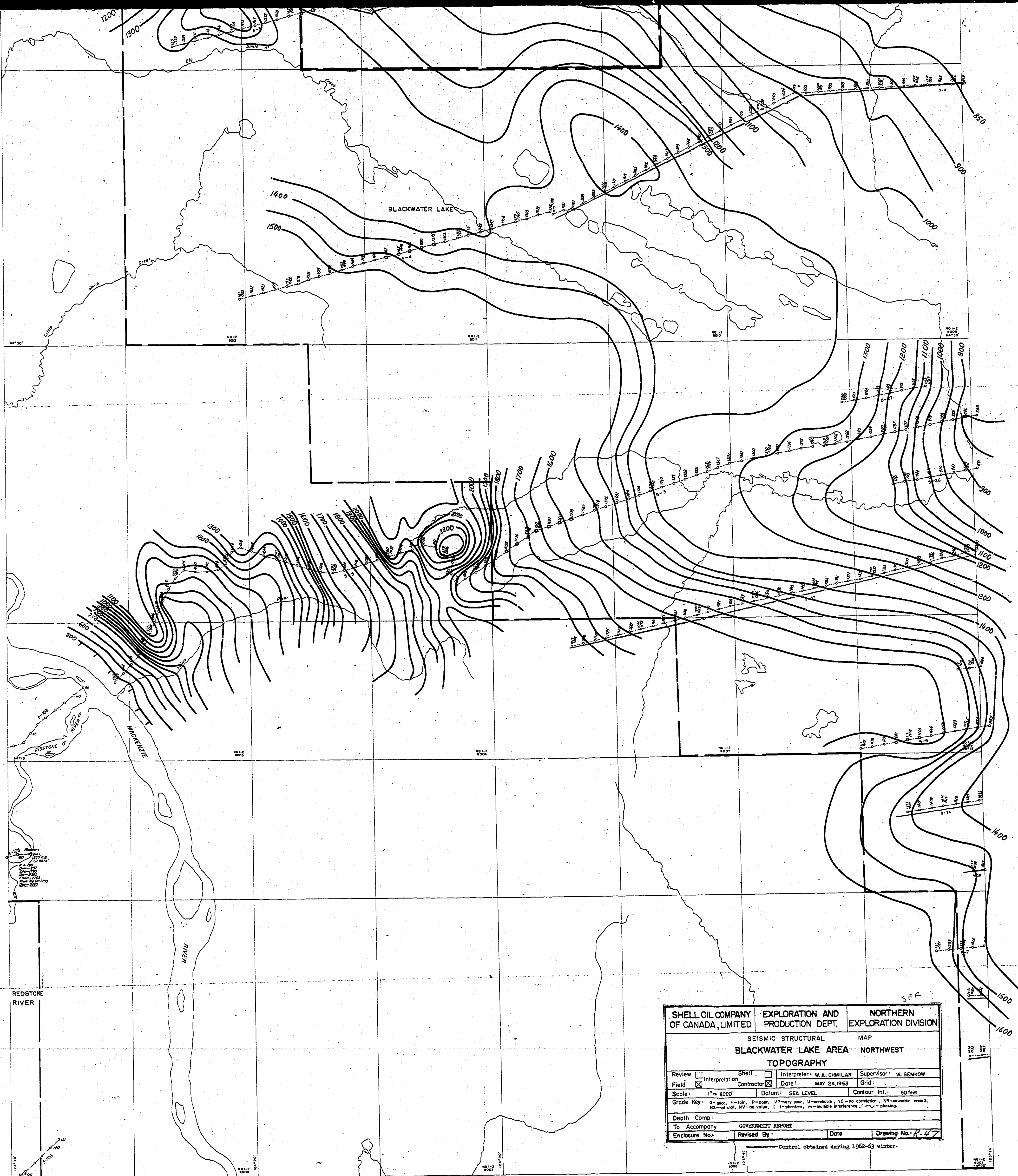


SHELL OIL COMPANY OF CANADA, LIMITED		EXPLORATION AND PRODUCTION DEPT.		NORTHERN EXPLORATION DIVISION	
SEISMIC STRUCTURAL				MAP	
BLACKWATER LAKE AREA				NORTHWEST	
TOPOGRAPHY					
Review <input type="checkbox"/>	Interpretation <input type="checkbox"/>	Shell <input type="checkbox"/>	Interpreter: W.A. CHMILAR	Supervisor: W. SEMKOW	
Field <input checked="" type="checkbox"/>	Contractor <input checked="" type="checkbox"/>	Date: MAY 24, 1963	Grid:		
Scale: 1" = 8000'	Datum: SEA LEVEL	Contour Int.: 50 feet			
Grade Key: G-good, F-fair, P-poor, VP-very poor, U-unreliable, NC-no correlation, NR-unusable record, NS-not spot, NV-no value, (-)-phantom, m-multiple interference, ~-phasing.					
Depth Comp: _____					
To: Company _____					
Enclosure No.: _____					
Revised By: _____ Date: _____ Drawing No.: 1-2					
Control obtained during 1962-63 winter.					

S-1 QN

S. S. MONTGOMERY
SHELL OIL COMPANY
OF CANADA, LIMITED
STRIP MAP NO 1-2
SCALE: 1" = 8000'
JULY 1962





S-1 ON

S. S. CONIGL
 SHELL OIL COMPANY
 OF CANADA, LIMITED
 STRIP MAP NO 1-2
 SCALE: 1" = 8000'
 JULY 1962

