1134

Negs: 3

1/1

GEOPHYSICAL EXPLORATION SURVEY

Final Report
GREAT BEAR LAKE AREA
Project No. 246-6-5-72-1

ATLANTIC RICHFIELD CANADA LTD.

WESTERN GEOPHYSICAL COMPANY OF CANADA LTD.
DIVISION OF LITTON INDUSTRIES
530 - 71st AVENUE S.E. - P.O. BOX 5250, STATION "A" - CALGARY 9, ALBERTA, CANADA

Geophysical Exploration Survey

Great Bear Lake Area

Project No. 246-6-5-72-1

Permits: 4991, 4992, 4997, 4998, 5246, 5248, 6377

Co-ordinates

Latitude 65°25' to 65°41' Longitude 124°21' to 124°48'
Latitude 65°41' to 65°47' Longitude 123°12' to 123°49'

Permittee

ATLANTIC RICHFIELD CANADA LTD.

Calgary, Alberta

Report by

K. Brillon and R. Mercer

May, 1972

Survey Type - Reflection Seismograph (Dynamite)
Work Period - December 3, 1971 through January 26, 1972

WESTERN GEOPHYSICAL COMPANY OF CANADA, LTD.
Party F-85
Calgary, Alberta

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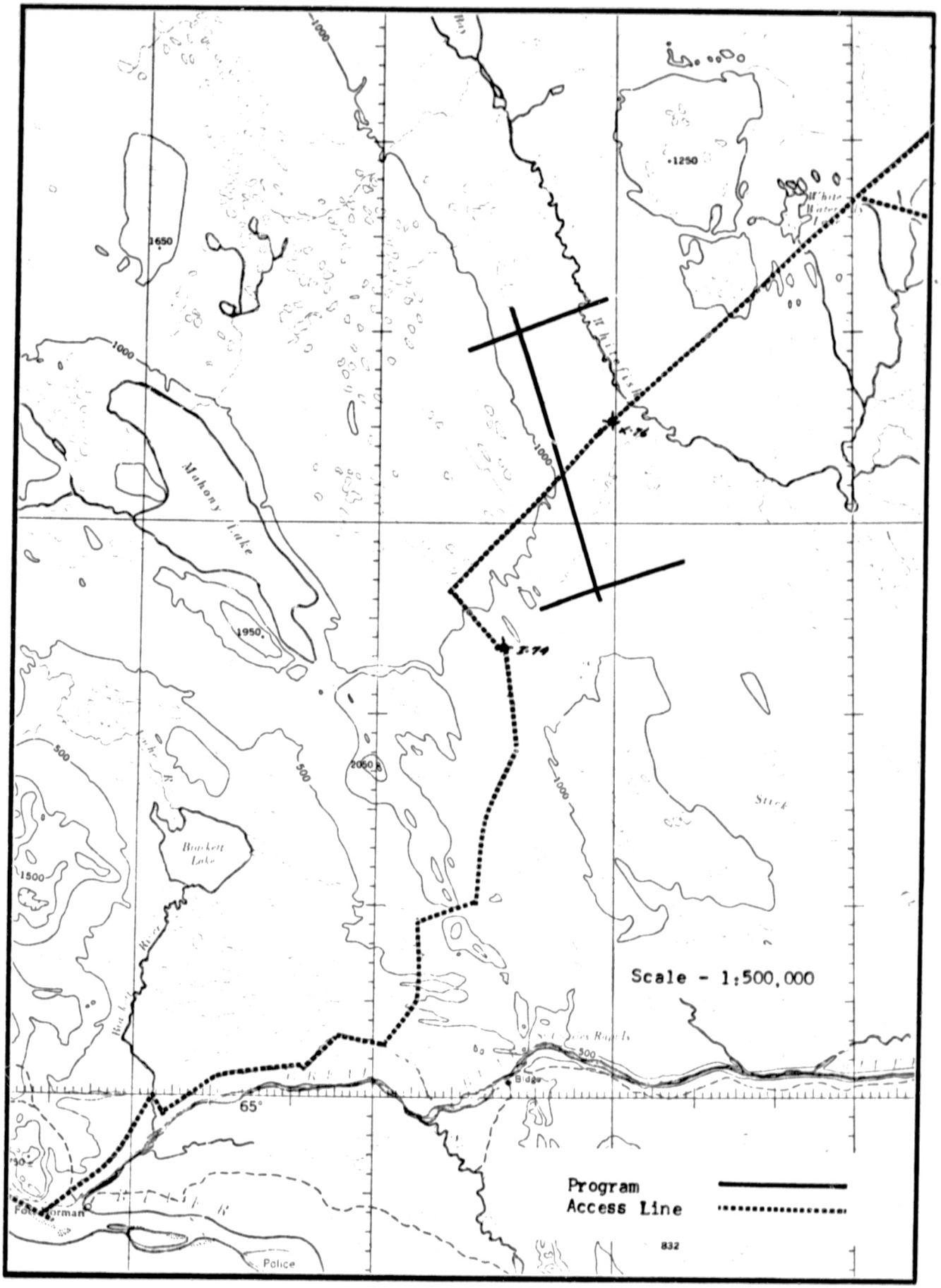
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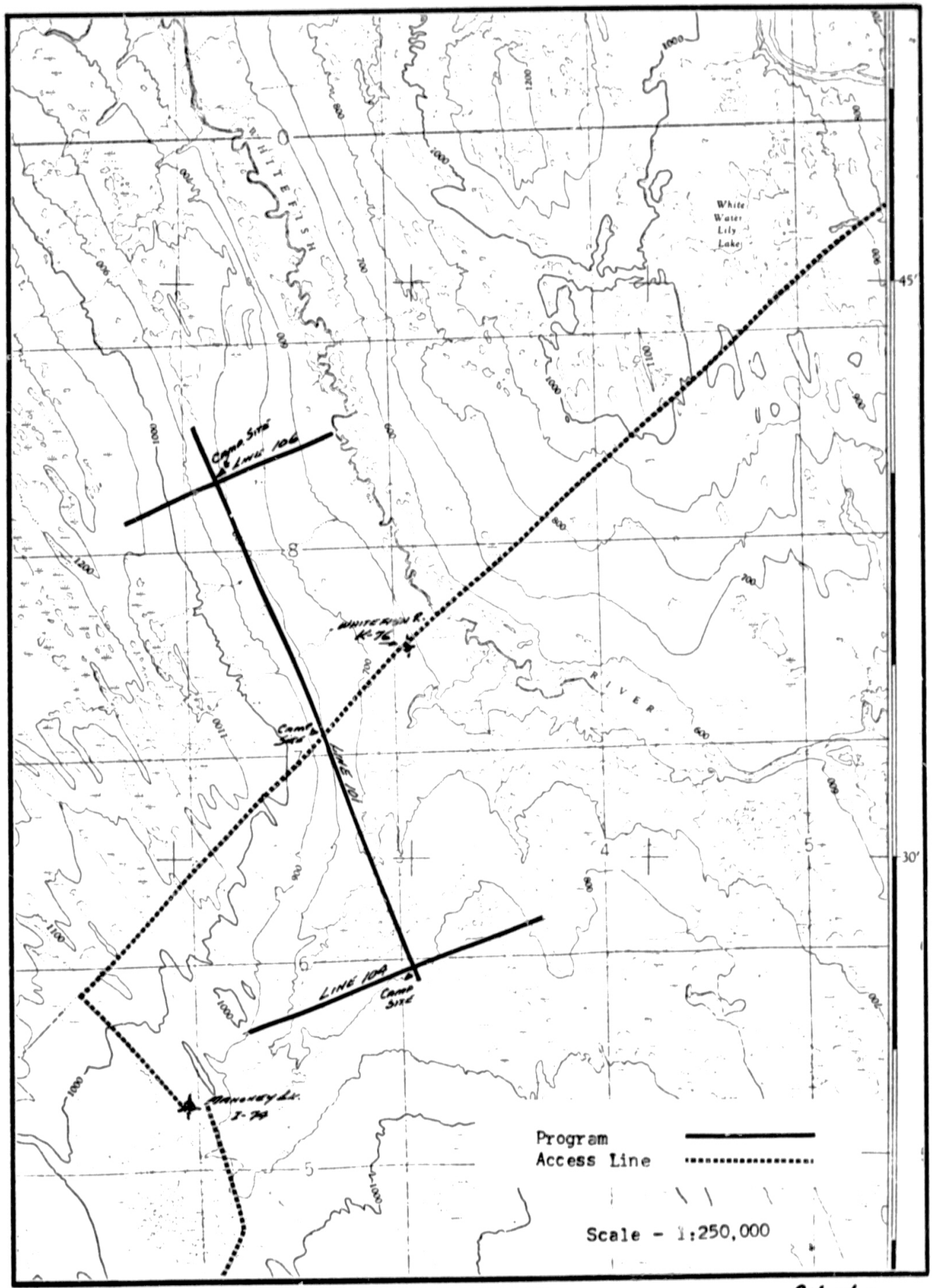
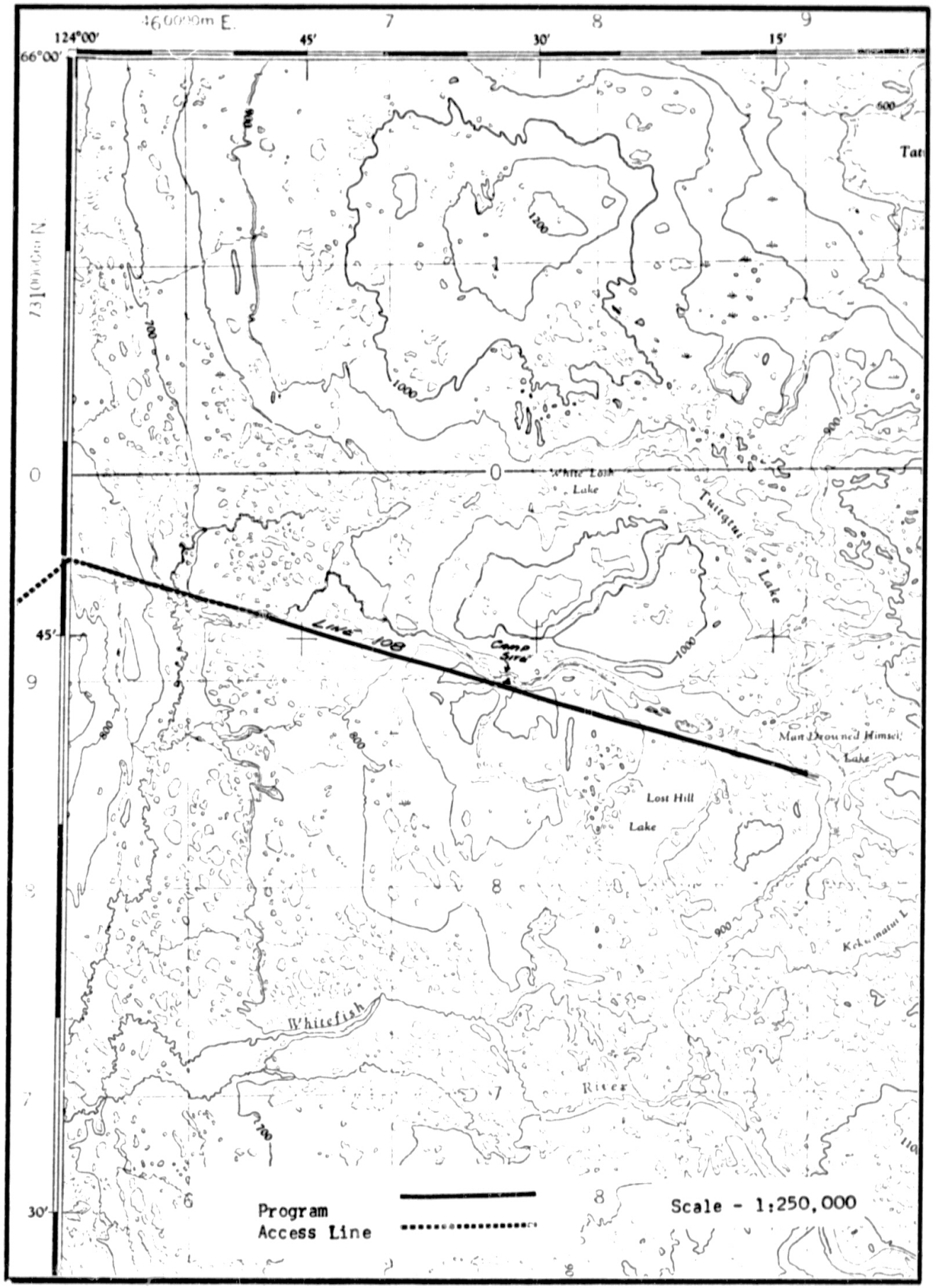
1250
1650
1000
Mahony Lake
1950
1000
500
500
2050
1000
Stark
Brackett Lake
1500
500
Bidge
65°
Scale - 1:500,000
Program
Access Line
832
Police

Western


WHITEFISH
White Water Lily Lake
45'
30'
Camp Site & Line 106
WHITE FISH R.
RIVER
Camp Site
LINE 101
LINE 104
Camp Site
Program
Access Line
Scale - 1:250,000

Western


460000m E.
124°00'
45'
30'
15'
66°00'
131°00'00" N.
White Loon Lake
Tuitgut Lake
Line 108
Camp Site
Man Drowned Himself Lake
Lost Hill Lake
Whitefish River
Program Access Line
Scale - 1:250,000

Western

INTRODUCTION

The Great Bear Lake project is located in the Northwest Territories 55 air miles northeast of the town of Norman Wells.

The seismic survey was conducted by Western Geophysical Company of Canada, Ltd., Crew F-85. Operations commenced December 3, 1971 and were completed January 26, 1972.

The program consisted of 40 miles of 400% C.D.P. shooting within the boundaries Latitude 65°25' and 65°41'

Longitude 124°19' and 124°48'

also 18 miles were shot within the boundaries

Latitude 65°41' and 65°47'

Longitude 123°12' and 123°49'

Structure sections were prepared and provided the basis of the interpretation.

The field operation was under the direction of W. Zarusky and E. Lorenowicz.

Supervision was by Mr. K. Brillon for the Atlantic Richfield Canada Ltd. and by Mr. R. Mercer for the Western Geophysical Company of Canada, Ltd.

STATISTICAL DATA

Dates:

Assignment date	November 25, 1971
Commencement of operations.	December 3, 1971
Commencement of recording	December 17, 1971
Completion of recording	January 23, 1972
Completion of operations.	January 26, 1972

Production:

Total days operated	45
Total days recording.	20
Number of days moving	7
*Number of days standby.	6
(*Building access road and ice bridges)	
Number of miles shot.	57.7
Number of locations recorded.	635
Number of locations per day	31.75
Number of shots	638
Powder consumed	6790 pounds
Average charge per location	10.7 pounds
Number of holes drilled	640
Total footage drilled	38,762
Average depth of hole	60.1 feet
Number of holes per day	29

EQUIPMENT

Recording - Unit 323

An RN-110 track vehicle with mounted "dog-house" containing a 24 trace set of Geospace (Model 1590) recording instruments complete with Binary Gain Amplifiers, 72 trace roll-a-long box and radio shooting system.

Cable Trucks - Units 406, 417

RN-110 track vehicles with mounted stake box for carrying cables and seismometers.

Shooting - Unit 459

An RN-110 track vehicle with mounted powder and cap storage boxes, loading pole rack and radio shooting system.

Drills - Units 318, 387

RN-110 track vehicles with mounted Western Model 1200 rotary drills complete with air compressor and mud pump.

Water Trucks - Units 383, 413

RN-110 track vehicles with mounted 700 gallon water tanks, drill pipe racks, powder and cap storage boxes.

Drills - Units 426, 427

FN-160 track vehicles with mounted Western Model 1200 rotary drills complete with air compressor, drill pipe racks, powder and cap storage boxes.

Drill - Unit 322

An RN-110 track vehicle with mounted Gardner Denver Model 3TD Auger Drill complete with drill pipe rack, powder and cap storage boxes.

Survey - Unit 385

An RN-110 track vehicle with mounted stake box for carrying survey supplies.

Supply - Unit 467

An RN-110 track vehicle with mounted stake box, 300 gallon water tank and front end mounted gin poles.

CAMP UNITS

Kitchen-Diner-Sleeper - Unit 395

An RN-110 powered track vehicle with mounted side fold-out van complete with sleeping accommodations for 6 men, dining accommodations for 16 men and cooking facilities.

Utility-Sleeper - Unit 394

An RN-110 powered track vehicle with mounted side fold-out van complete with washbasins, showers, toilets, and sleeping accommodations for 12 men.

Utility-Sleeper - Unit 377

An RN-110 trailer type tracked vehicle with mounted side fold-out van complete with washbasins, showers, toilets, washer-dryer facilities, and sleeping accommodations for 8 men.

Office-Sleeper - Unit 396

An RN-110 trailer type track vehicle with a mounted end fold-out van capable of accommodating 14 men. The office section within the main body contained 2 desks.

Power - Unit 453

An FN-110 trailer type track vehicle with mounted van containing 2 - 35 K.W. Detroit diesel power generating units, storage cupboards and externally mounted racks for storage of camp power cables.

Shop - Unit 2007

An RN-110 track vehicle with mounted van containing work benches, gas and electric welders, air compressor, parts bins, and mechanic's tools.

Powder Magazine - Unit 469

An RN-110 trailer type track vehicle with mounted stake box containing a 4000 pound powder storage magazine and 2 cap storage boxes.

Gas Truck - Unit 477

A Ford 800 diesel powered tandem truck complete with crew cab, three compartment 2000 gallon fuel storage tank, loading and unloading pump and metering system.

Fuel Storage Sloop

Flat Deck on sleighs complete with 4 - 500 gallon fuel storage tanks.

LINE CUTTING AND CLEARING

2 - D7E Caterpillar Tractors complete with hydraulic blades and winch.

1 - D6C Caterpillar Tractor complete with hydraulic blade and winch.

CAMP UNITS

Kitchen-Diner

Trailer unit mounted on sleighs complete with dining arrangements for 6 men and complete cooking facilities.

Sleeper-Washhouse

Trailer unit mounted on sleighs complete with washing facilities and living accommodations for 8 men.

Shop Unit

Trailer Unit mounted on sleighs complete with shop facilities, power plant, gas and electric welders.

Fuel Storage

Flat deck mounted on sleighs complete with 4 - 500 gallon fuel storage boxes.

Crew Personnel

Party Manager	- W. Zarusky
Party Manager	- E. Lorenowicz
Clerk	- J. Woodhead
Clerk	- J. Jones
Observer	- W. Schawalder
Jr. Observer	- F. Jacob
Shooter	- M. Boyko
Asst. Shooter	- T. Hall
Cable Truck Driver	- A. Murphy
Cable Truck Driver	- N. Greenwood
Recording Helper	- G. Yakeleye
Recording Helper	- R. Horassi
Recording Helper	- W. Horvath
Recording Helper	- J. Green
Surveyor	- G. Gogal
Surveyor	- W. Pajak
Surveyor	- R. Whaley
Rodman	- D. Wray
Rodman	- K. Robertson
Driller	- R. Krisko
Driller	- W. Riley
Driller	- M. Sannerud
Driller	- T. Bennett
Driller	- R. Rohachyshyn
Drill Helper	- B. Cochrane
Drill Helper	- M. Tonita
Drill Helper	- V. Logan
Drill Helper	- G. Perrault
Drill Helper	- J. Knox
Mechanic	- J. Hill
Mechanic Asst.	- M. Vriends
Supplyman	- W. Fairbrother
Cook	- G. Smoke
Cook's Asst.	- D. St. Germain
Gas Truck Driver	- D. Milligan
Gas Truck Driver	- C. Johnson
Dozer Operator	- R. Smith
Dozer Operator	- F. Cloutier
Dozer Operator	- K. Russell
Dozer Operator	- D. Lizotte
Dozer Operator	- K. Ward
Dozer Operator	- T. Smith
Crew Foremen	- S. St. Germain

GENERAL ACCESSIBILITY

Access

The MacKenzie Valley toll road along the north side of the MacKenzie River was the access route from Norman Wells to the Great Bear River. A 30 mile trail was cut to intersect an existing trail from Bennett Field to the Mahoney Lake I-74 well. The remaining 17 miles was existing seismic lines. A northeast - southwest line 5 miles northwest of the I-74 well passed through the middle of the prospect. This line was later extended to the northeast to provide access to a program extension north of Lost Hill Lake.

Topography

The area is gently sloping northeast from the Franklin Mountains. There are no dominant features on the prospect. Small lakes and muskeg hollows dot the area. The tree cover is predominantly spruce of light density and limited growth.

The Whitefish River is the principal drainage channel for the area. Creeks flow northeast into the Whitefish River which flows north into Byland Bay of the Great Bear Lake.

Logistics

The party headquarters was Norman Wells. Crew accommodation was a mobile camp located on the prospect.

The supply point for parts and personnel arriving from Calgary was Norman Wells. Food supplies were purchased in Peace River, trucked to Fort Simpson and flown to Norman Wells.

Transportation for spare parts, food and personnel to the field camp was a Norman Wells based Cessna 185 on skis. The fuel and dynamite storage was in Norman Wells and these supplies were trucked to the field over the access road. A round trip took approximately 65 hours.

The Marconi CH-25 single sideband radio was used for communications between the field camp and Norman Wells. Motrac VHF radios were used for communication between the base camp and the field units. Radio reception from the field camp to Norman Wells was poor. The best reception time was between 6 and 7 o'clock both morning and evening, but interference from the Arctic Island stations during these periods greatly reduced the effectiveness of these periods of reception.

FIELD PROCEDURES

Recording

Geophone group spacing	160 feet
Sub-surface coverage	400%
Shot hole location spacing	480 feet
Seismometer array	in line
Seismometers per group	9
Seismometer spacing	9/200 feet
Dynamite charge	10 pounds
Sample rate	2 milli-seconds
Record length	2 seconds
Format	SEG "A" - EPR

All lines were shot with Trace 1 to the north and east. Each line began and ended with a 24 trace recording; the recorder rolling in and out of the cable. All intersecting lines were extended to give a 400% coverage at the intersection. When surface conditions warranted the skipping of shot holes, a second hole was stacked on the location in front of the skip and the roll-along box shifted in order to maintain the continuity of the sub-surface coverage.

The shot point seismometer was a single geophone placed 10 feet from the shot hole. Three geophone groups were dropped at the hole giving a gap distance to the first effective geophones of 210 feet.

Drilling

Four Rotary drills and one Auger drill were used during the survey but because of the formations encountered, the Auger drill was of limited use.

A single 60 foot hole was drilled at each location.

Typical Hole Log

0-20 Clay and Rocks; 20-30 Gravel; 30-60 Clay and Rocks.

The drill logs show the near surface geology to consist of hard stratified rock layers interspersed with layers of soft clay. The rock formations appear to be a black chert and may exist in ledges rather than in boulder form. Gravel deposits appear at varying depths and in varying thicknesses. Muskeg was encountered on some locations; the depth not exceeding 5 feet.

Survey

The survey instrument used was the transit. The program lines were initiated by turning angles from known locations on lines of known bearings. Shot point location and seismometer group positions were chained using a surveyor's steel road chain. Survey pin flags were used to mark the geophone and drilling locations.

Survey control was based on a former survey which used topographic features for horizontal control. In the current survey control was based on the elevation and horizontal location of shot point 641 as defined in the earlier survey. The bearing of the line at shot point 641 was checked by a sun shot and the physical location with respect to the Whitefish River K-76 well was verified with a survey control line from shot point 641 to the well and bearing checks on existing lines at the well. The shot point location map was plotted using the Territorial Plane Co-ordinate System.

DATA PROCESSING

Data was corrected to a 1,000 foot datum plane at a replacement velocity of 11,000 feet per second.

The velocity-depth function used was from information obtained from the Sinclair Whitefish River K-76 well.

The Normal Moveout (N.M.O.) function was computed from the velocity-depth information and adjusted after the initial playout of the sections to fit the structural conditions existing on the individual lines.

Structural corrections were calculated on an I.B.M. 360-65 computer using the Western Static Program. The input data was obtained from the "first break" times for traces 10 - 15 of each field record. Data from compatible traces was summed and averaged to obtain weathering and elevation corrections to datum plane for each trace.

The presentation was a 400% stacked section to which static and N.M.O. corrections were applied. A band pass filter (10-15-55-60) was applied after stack. Trace muting was a pre-arranged pattern.

INTERPRETATION & CONCLUSIONS

Four maps have been included in this report.

Enclosure 1 - Topographic Map

Enclosure 2 - Cambrian Time Structure

Enclosure 3 - Basal Cretaceous to Cambrian Isochron

Enclosure 4 - Basal Cretaceous - Time Structure Map

The three interpretational maps (Encls. 2, 3 & 4) were produced from the two strong reflections on the seismic sections which seemed continuous and were considered reliable. These reflections were identified from the velocity surveys of the Whitefish River and Lost Hills Lake wells as being generated from the Basal Cretaceous and the Cambrian formations. Problems of correlation from east to west across this large area do exist and these shall be discussed in the write-ups of the individual maps.

Cambrian Time Structure Map

In the western part of the mapped area, the reflection which is generated from the base of the Ronning carbonates and the underlying shale beds, is mapped as Cambrian and can be considered as the top of the Saline River formation, which is Upper Cambrian in age. In the eastern part of the area, the Ronning and the underlying sediments are interbedded and gradational in lithologies and therefore no mappable reflection is generated at this level. A strong deeper

reflection has been mapped on Line 108, mainly to depict the attitude of the beds in this locale. This mapped reflection can be considered as Middle Cambrian in age and is probably the top of the Mount Cap formation.

As the lithologies change from east to west so do the velocities. The average velocity to the Cambrian at the Whitefish River well is 12,750 ft./sec. and at the Lost Hills Lake well to approximately the same point in the section, the average velocity is 10,950 ft./sec.

The map indicates the Cambrian formations conform to a regional pattern, strike NNW/SSE and dip to the WSW. Contrary to regional, the beds thicken to the NE. Minor reversals of dip are indicated near the Franklin Mountains and these folds are probably associated with the forces which produced the mountains. Normal faults are evident in the west, mainly Line 101, and in the east, Line 108 has the fault with the greatest throw.

Basal Cretaceous to Cambrian Isochron Map

This mapped interval indicates a regional thinning of the beds in an easterly direction and abnormal changes of thickness across the major fault (Line 108). The interval velocity varies from 19,800 ft./sec. in the west to 19,200 ft./sec. in the east.

Basal Cretaceous Structure Map

This map has minor correlation problems which are the result of a lithology change at the Cretaceous Devonian contact. In the west the Basal Cretaceous sands lie directly

on the Devonian Carbonates and the resulting contrast of lithologies generates the good reflection which is mapped as Basal Cretaceous. In the east, the Devonian formation has been eroded to a basal shale unit which lies on the Ronning Carbonates. This sand-shale contact does not produce a mappable reflection but, the shale-carbonate (Dev./Sil.) contact 150 feet deeper in the section does, and this reflection has been mapped as Basal Cretaceous in this area.

Again, as in the previous discussion, changes in the age, thickness and lithology of the formations has resulted in changes in velocities across the mapped area. The average velocity to the Cretaceous in the west is 9,800 ft./sec. and in the east 7,600 ft./sec.

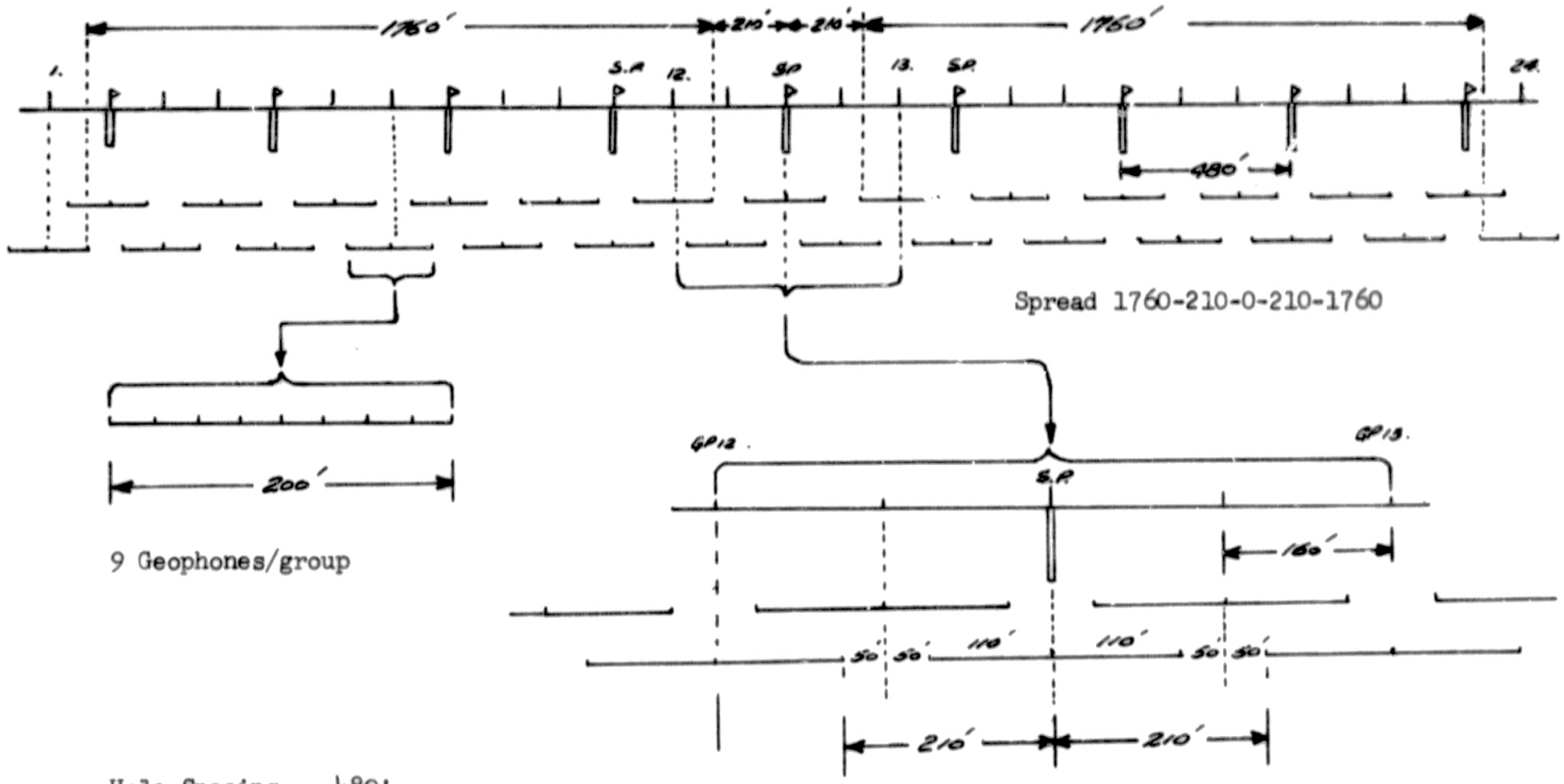
The map indicates the Cretaceous beds strike NNW/SSE and dip WSW. Minor lows and highs are present in the western part of the mapped area and in the east, the large normal fault is the most predominent feature on the map.

CONCLUSIONS

The Cambrian and Cretaceous sediments conform to a regional trend, striking NNW/SSE and dipping WSW. The overall thickness of the Devonian and Ronning group sediments thins to the east while the Cambrian and Sil.-Ord. sediments are thicker to the east. This therefore indicates the rate at which the Devonian sediments were eroded was greater than the deposition of the older Sil.-Ord. sediments.

Faults and folds have been mapped. The faults are more frequently found in the older sediments and the folds are mainly restricted to the immedate area adjacent to the Franklin Mountains.

Spread Layout Diagram



Hole Spacing 480'

Group Interval 160'

Coverage 400%

Western

ENCLOSURE 5

125°30'

125°00'

124°30'

124°00'

65°00'

65°

MANONI LAKE

Campsite

Campsite

Campsite

Campsite

ENCLOSURE 1

GOVERNMENT REPORT MAP

Prepared by

ATLANTIC RICHFIELD CANADA LTD.

Northern Exploration District

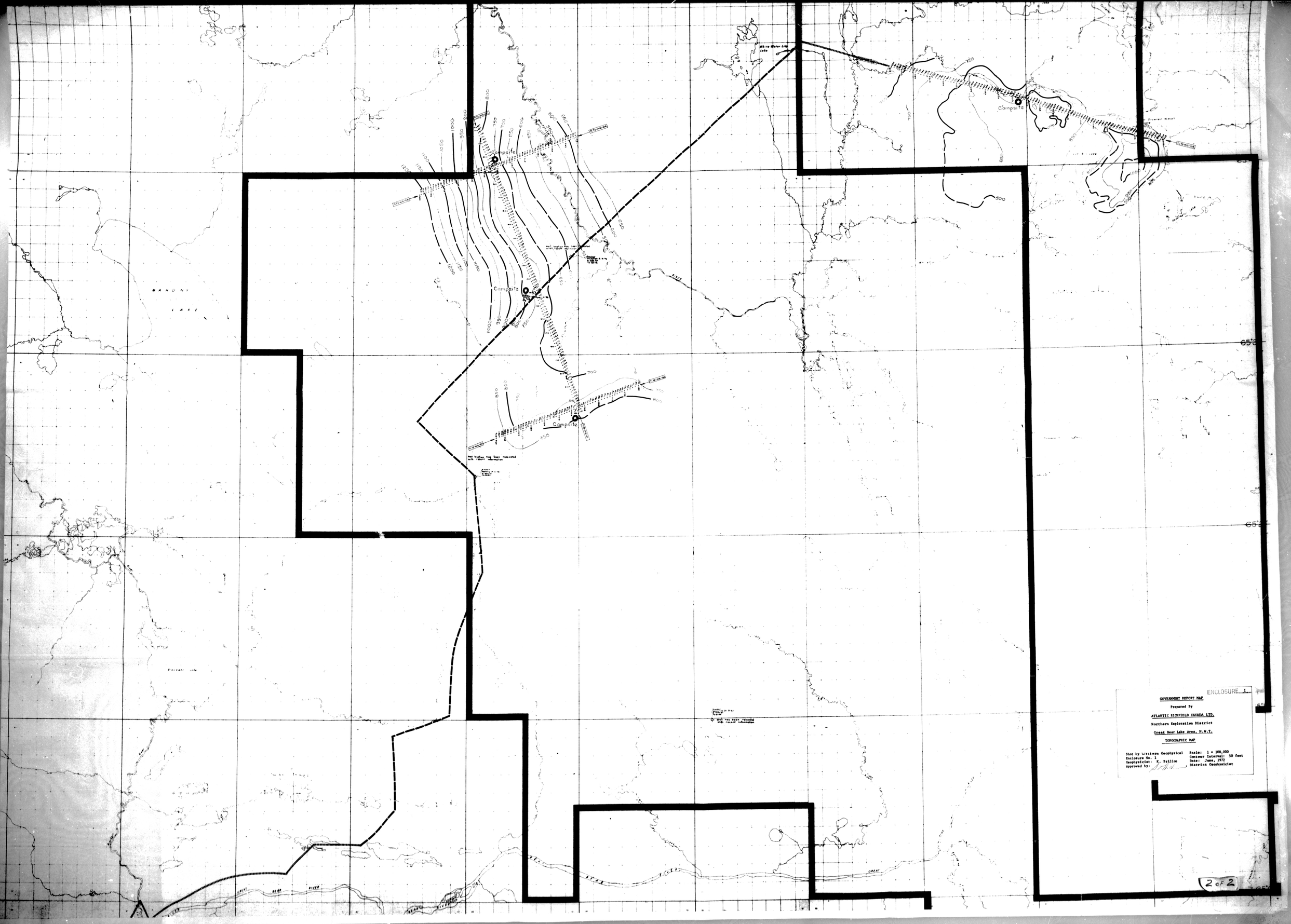
Great Bear Lake Area, N.W.T.

TOPOGRAPHIC MAP

Shot by Western Geophysical
Enclosure No. 1
Geophysicist: K. Brillon
Approved by: , District Geophysicist

Scale: 1 = 100,000
Contour Interval: 50 feet
Date: June, 1972

11 OF 2



ENCLOSURE 1

GOVERNMENT REPORT MAP

Prepared By

ATLANTIC RICHFIELD CANADA LTD.

Northern Exploration District

Great Bear Lake Area, N.W.T.

TOPOGRAPHIC MAP

Shot by Western Geophysical
Enclosure No. 1
Geophysicist: K. Brillon
Approved by: _____, District Geophysicist

Scale: 1 = 100,000
Contour Interval: 50 feet
Date: June, 1972

2 OF 2


125°30'
125°00'
124°30'
Campsite
Campsite
Campsite
Campsite
High
Low
High
ENCLOSURE 2
GOVERNMENT REPORT MAP
Prepared By
ATLANTIC RICHFIELD CANADA LTD.
Northern Exploration District
GREAT BEAR LAKE AREA, N.W.T.
CAMBRIAN TIME STRUCTURE MAP
Datum: 1,000' a.s.l.
V_C = 10,000 feet/sec.
V_A = 13,000 feet/sec. (west)
V_A = 11,400 feet/sec. (east)
Shot by Western Geophysical Ltd.
Geophysicist: K. Brillon
Approved by: , District Geophysicist
Scale: 1 = 100,000
0.010 sec. = 62 feet
Contour Interval: 0.020 sec.
Enclosure No. 2
Date: June, 1972
1 OF 2

MANONI LAKE

GREAT BEAR RIVER

GREAT BEAR RIVER

GREAT BEAR RIVER

Campsite

Campsite

Campsite

Campsite

High

Low

High

White Water Lake

65°

GOVERNMENT REPORT MAP ENCLOSURE 2

Prepared by

ATLANTIC RICHFIELD CANADA LTD.

Northern Exploration District

GREAT BEAR LAKE AREA, N.W.T.

CAMBRIAN TIME STRUCTURE MAP

Datum: 1,000' a.s.l.
V_C = 10,000 feet/sec.
V_A = 13,000 feet/sec. (west)
V_A = 11,400 feet/sec. (east)
Shot by Western Geophysical Ltd.
Geophysicist: K. Brillon
Approved by: , District Geophysicist

Scale: 1 = 100,000
0.010 sec. = 62 feet
Contour Interval: 0.020 sec.
Enclosure No. 2
Date: June, 1972

2 OF 2

125°30'

125°00'

124°30'

124°00'

123°00'

65°30'

65°

MAHONY LAKE

Campsite

Campsite

Campsite

Campsite

Campsite

Well location has been relocated with recent information

Well has been relocated with recent information

GOVERNMENT REPORT MAP

Prepared by

ATLANTIC RICHFIELD CANADA LTD.

Northern Exploration District

GREAT BEAR LAKE AREA, N.W.T.

BASAL CRETACEOUS TO CAMBRIAN ISOCHRON MAP

Datum: 1,000' a.s.l.
V_0 = 10,000 feet/sec.
V_1 = 19,800 feet/sec. (west)
V_2 = 19,200 feet/sec. (east)
Shot by Western Geophysical Ltd.
Geophysicist: E. Arillon
Approved by: _____, District Geophysicist

Scale: 1 = 100,000
0.010 sec. = 99 feet
Contour Interval: 0.020 sec.
Enclosure No. 3
Date: June, 1972

ENCLOSURE 3

11 OF 2

ENCLOSURE 3

DEVELOPMENT REPORT MAP

Prepared by

ATLANTIC RICHFIELD CANADA LTD.

Northern Exploration District

GREAT BEAR LAKE AREA, N.W.T.

BASAL CRETACEOUS TO CAMBRIAN ISOCHRON MAP

Datum: 1,000' a.s.l.
V_1 = 10,000 feet/sec.
V_2 = 19,800 feet/sec. (west)
V_3 = 17,200 feet/sec. (east)
Plot by Western Geophysical Ltd.
Geophysicist: K. Brillon
Approved by: _____, District Geophysicist

Scale: 1 = 100,000
0.010 sec. = 99 feet
Contour Interval: 0.020 sec.
Enclosure No. 3
Date: June, 1972

2 OF 2

125°00'

124°30'

65°

MANONY LAKE

Campsite

Campsite

Campsite

Campsite

Low

High

High

GOVERNMENT REPORT MAP

ENCLOSURE 1

Prepared By

ATLANTIC RICHFIELD CANADA LTD.

Northern Exploration District

GREAT BEAR LAKE AREA, N.W.T.

BASAL CRETACEOUS TIME STRUCTURE MAP

Datum: 1,000' a.s.l.
V_c = 10,000 feet/sec.
V_w = 9,805 feet/sec. (west)
V_A = 7,600 feet/sec. (east)
Shot by: Western Geophysical Ltd.
Geophysicist: K. Brillus
Approved by: . District Geophysicist

Scale: 1 = 100,000
0.010 sec. = 49 feet
Contour Interval: 0.020 sec.
Enclosure No. 1
Date: June, 1972

1 OF 2

Composite

Composite

Composite

High

LOW

MANONY LAKE

Composite

High

65°

GOVERNMENT REPORT MAP

ENCLOSURE 4

Prepared by

ATLANTIC RICHFIELD CANADA LTD.

Northern Exploration District

GREAT BEAR LAKE AREA, N.W.T.

BASAL CRETACEOUS TIME STRUCTURE MAP

Datum: 1,000' a.s.l.
V_c = 10,000 feet/sec.
V_A = 9,800 feet/sec. (west)
V_A = 7,600 feet/sec. (east)
Shot by Western Geophysical Ltd.
Geophysicist: K. Brillon
Approved by: . District Geophysicist

Scale: 1 = 100,000
0.010 sec. = 49 feet
Contour Interval: 0.020 sec.
Enclosure No. 4
Date: June, 1972

GREAT BEAR

2 of 2