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FINAL REPORT

OF

REFLECTION SEISMOGRAPH SURVEY

THE IVERSON LAKE PROSPECT

OF THE

ENGLISH CHIEF RIVER

AREA

N.W.T.

FOR

TECK CORPORATION LTD.

BY

CENTURY GEOPHYSICAL CORPORATION OF CANADA

PARTY NO. 31

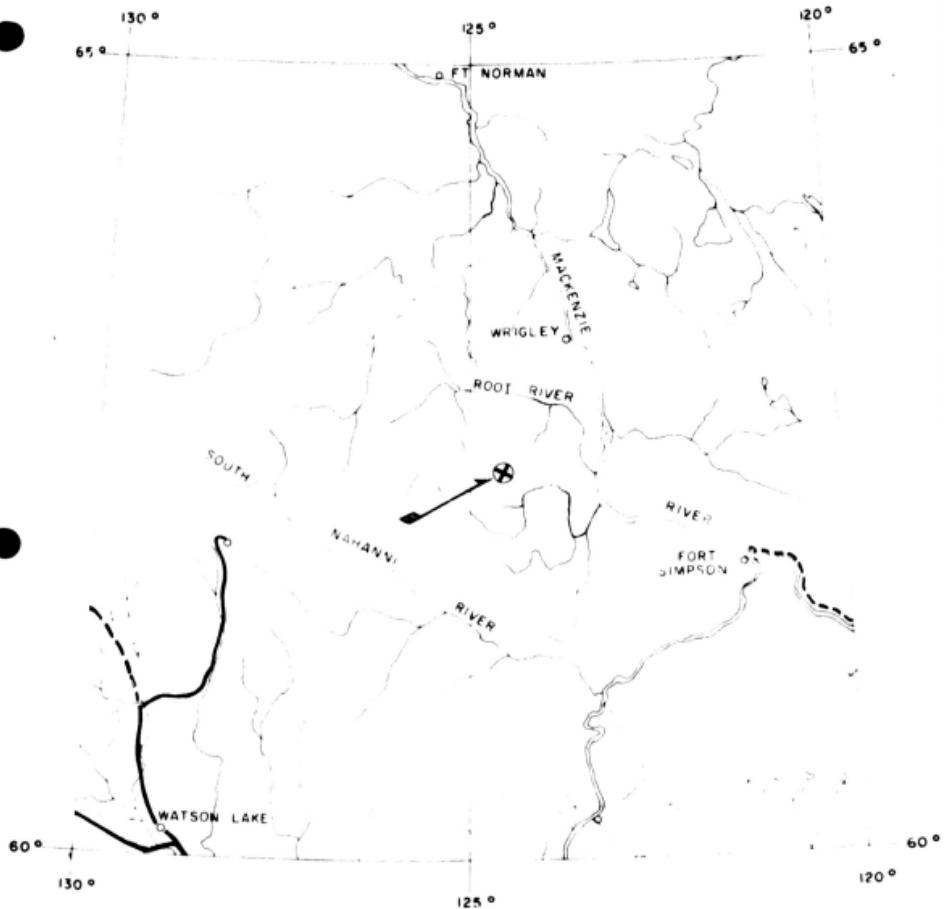
JULY 1965

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### IVERSON LAKE AREA

"PROJECT LOCATION"

*Century*

INTRODUCTION:

The Iverson Lake project was located approximately 110 air miles northwest of the town of Fort Simpson, N.W.T. Field operations were conducted from a tent camp site situated on the west shore of Iverson Lake.

The survey was conducted during the month of July, 1965, under the direction of Party Chief W. R. Adolphe and Party Manager C. W. Gray. Mr. R. D. Waines supervised the crew for Century Geophysical Corporation of Canada.

Approximately 7 miles of reconnaissance line was shot in an attempt to substantiate the existence of the English Chief Anticline mapped by surface geological methods, and to determine anomalous conditions in the subsurface, such as reef development, faulting, etc.

Since the area was inaccessible by land units during summer months, the operation was conducted with a helicopter used to transport personnel and equipment.

DISCUSSION OF RESULTS:

A period of extremely wet weather combined with a helicopter mechanical failure delayed operations to a point where a portion of the original program had to be abandoned. The remaining program was selected to provide the most widespread control with reasonable reliability with the time available.

Due to unexpected drilling problems encountered, the planned alternative of surface shooting was employed over the majority of the survey. The results of the surface shooting are considered to be reasonably reliable.

Accurate identification and depth assignment of reflections was not possible with the lack of velocity information in the area. However, a study of the geological information supplied by Teck Corporation, in conjunction with the seismic information, yielded a logical and fairly reliable interpretation of reflection sources.

Generally, the interpretation submitted substantiates the anticline discussed in the geological report but indicates structures not apparent from the surface geology. One of these features appears on line 3 and is interpreted as a possible shallow reef development to the northeast bounded on the southwest by a shale basin (funeral?) that appears to extend across line 2. Unfortunately, record quality at this depth on the extreme southwest end of the program was very poor, therefore control at the base of the shale was lost. Both the mixed and unmixed migrated sections indicate this seismic anomaly, interpreted as a reef development. Another possible interpretation of the event is low angle faulting.

Some evidence of small scale thrust faulting was observed immediately southwest of the suspected shallow reef, but the existence of this feature is considered to be questionable.

The second feature noted is the sudden discontinuance of a reflection appearing at S.P. 20, on line 2, at a depth of approximately 4000 feet. It is suspected that a continuous carbonate development with very small velocity contrasts is present southwest of this point. The reflection to the northeast is thought to originate with the appearance of a shale member at this point. The possibility of reef development

where the suspected shale member ceases coincides roughly with the Manitoe reef development suggested in the geological report.

RECOMMENDATIONS:

The reconnaissance nature of the program prohibits recommendation of a drill site. Considerably more seismic control would be required prior to recommendations of this type.

In the event future seismic work is considered in the area, the possibilities of a track crew during winter months should be investigated. Due to the distance from the nearest supply centre, the crew would undoubtedly require fixed wing air support. The area could possibly be worked during summer months with muskeg vehicles but it is recommended that in this event the equipment should be moved in prior to spring break-up.

The helicopter operation would be the most versatile for summer work and, with minor modifications to the drills to enable subsurface shooting, this type of operation would probably be preferable. The surface shooting employed yielded reasonable results but subsurface shooting would be preferred in future work.

OPERATIONS:

1. General Accessibility:

The remote location of the area resulted in the exclusive utilization of air transport to conduct the operation in the summer months. Some previously cut seismic trails were present in the general area, but it is felt that the

where the suspected shale member ceases coincides roughly with the Manitoe reef development suggested in the geological report.

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OPERATIONS:

1. General Accessibility:

The remote location of the area resulted in the exclusive utilization of air transport to conduct the operation in the summer months. Some previously cut seismic trails were present in the general area, but it is felt that the

distance and terrain between Iverson Lake and the MacKenzie River would make the use of track-type vehicles during summer months impractical unless the equipment were moved in during winter months.

a) Surface Conditions:

The vegetation in the region was entirely muskeg and moss. Stunted evergreen growth covered the area surveyed.

b) Topography:

The surveyed area was located in the foothills of the MacKenzie Mountains and was therefore quite hilly with numerous fairly deeply incised creeks.

c) Logistics:

As mentioned, the operation was exclusively dependent upon air transportation. The initial move from Edmonton to Fort Simpson was via a Pacific Western Airlines chartered DC-4. Subsequent ferrying from Fort Simpson to Iverson Lake was accomplished using an Otter aircraft on floats owned and operated by Pacific Western Airlines. Miscellaneous supplies were flown from Fort Simpson to Iverson Lake by Northern Mountain Airlines operating from base in Fort Simpson.

Movement of equipment and personnel to and from camp and in the field was accomplished with a Bell Super G helicopter, initially. Mechanical problems with this machine necessitated replacing the Bell with a Hiller 12E during the operation.

Communications with Fort Simpson and Calgary were maintained with a 100 watt Marconi 4-channel single side band radio working into the Whitehorse, Fort Nelson, and Hay River radio-telephone terminals.

A tent camp owned and catered by Century Geophysical was used for the duration of the work on the project.

Line cutting was done by men hired in Wrigley through the Indian agent in Fort Simpson.

2. Drilling:

Two portable "Winkie" Model GM-10 diamond drills, equipped with a two-speed transmission and Moymo Model PRA4-22 pumps, were tried in an effort to drill shot holes and shoot normal seismic "split" spreads. The drills were designed to be broken down for helicopter transportation by a machine of 500 lb. capacity. Due to the inadequacy of the pumps while drilling in the unexpected sand layers encountered, the decision was made to resort to the alternate method of shooting offset inlines and surface shots.

3. Surveying:

a) Surveying Instruments:

Horizontal and vertical survey control was established using a Wild T-1 theodolite.

b) Bench Marks:

No bench marks were available in the area, therefore, the published lake elevation was used for vertical control on lines 1 and 2. Horizontal direction was established from star shots. Line 3 is 22,000 feet northeast of Line 2 and inaccessible by land for practical purposes. Elevation control on this line was based on an average of several helicopter altimeter readings using the lake elevation as a base elevation. Horizontal control was established from the use of air photos and prominent land marks.

All lines were double run to detect and eliminate survey mistakes.

4. Outside Services:

As previously mentioned, all air transportation and line cutting was subcontracted. In addition, one drill owned by Smut-Connors of Red Deer was rented for the duration of the survey.

5. Recording:

a) Equipment:

The recording instruments used consisted of Geo Space Model 111 amplifiers coupled with a Fortune SR-5 tape transport and a Southwestern Industrial Electronics 50 trace camera. A radio tone signal system was incorporated to receive and record the shot instant. The aforementioned equipment was mounted in a darkroom designed to be moved with a light helicopter.

b) Spread Length:

Initially a standard "split" spread extending 1800 feet either side of the shot point was used. Use of jumper cables allowed recorder set-ups every third shot point, thus minimizing the number of moves, by helicopter, of the recorder. Since the drill power proved inadequate for the conditions encountered, the spread layout was changed to a 3600 foot spread with the shot point offset 1800 feet from the end of the cable, and surface shooting employed.

Nine Electro-Tech EVS-2 in a series-parallel wiring harness were employed per trace.

c) Equipment Settings:

All seismic information was recorded using a broad band (1/20 - 1/98) filter setting. Monitor and direct playbacks (unamplified) as well as amplified playbacks were made of each shot. Gain settings varied with the apparent energy return. No instrument mixing was carried out in the field, but mixing of corrected results was employed as an aid to interpretation as discussed later.

COMPUTATION:

All reflection times were corrected to a reference datum of 2300 feet above sea level on lines 1 and 3, and 2600 feet above sea level on line 2 utilizing an elevation correction velocity of 12,000 feet per second. Effects of the low velocity near surface layer were removed utilizing an excess time method based on the refraction plots of the first arrivals. The observed apparent velocity of the higher speed zone was 13,500 feet per second.

INTERPRETATION:

1. Velocity Data:

a) Source of Reflection Identification:

No velocity surveys pertinent to the specific area were available. The nearest survey was FPC Tenneco Root River 1-60 drilled 27 miles to the northeast and consequently the velocity distribution was not applicable to the survey area. The normal moveout was used to determine an approximate velocity distribution and therefore reflection identifications and depths can only be considered approximate.

b) Record Section Construction:

Isochron record sections were constructed as an interpretation aid using the following procedure.

- (i) All specimen tapes were run through the playback centre removing the effects of normal moveout only.
- (ii) The above playouts were used to determine static corrections for construction of flattened isochron sections.
- (iii) Due to the airblast and other forms of suspected interference, a replay of the isochron sections was made using a heavy (33%) bi-directional electronic mix, in a successful attempt to at least partially remove unwanted noise.

c) Plotted Cross Sections:

The unmixed and the mixed sections were both used in independent interpretations and the results plotted on structure cross sections.

The steep dips observed on the unmixed sections were migrated using the procedure outlined by Rice and the resulting dip segments plotted in depth.

All sections used in the interpretation have been submitted with this report.

PRESENTATION OF RESULTS:

a) Maps:

Since the program consisted of a series of reconnaissance lines oriented end to end roughly perpendicular to strike with

no strike lines, a two dimensional presentation of data in the form of cross sections was felt to be the only practical method of illustrating results. For this reason only, a shot point location map and a map indicating apparent dip were constructed.

b) Cross Sections Submitted:

The following cross sections were constructed to illustrate the results of the seismic program:

- (i) Final Depth Interpretation - all observed dips on the unmixed record sections migrated to their apparent origin and plotted in depth. The actual reflection depths are subject to the limitations discussed under Velocity Data.
- (ii) Migrated Time - as above with reflections plotted in time rather than depth.
- (iii) Time Section - plotted from the mixed isochron record sections. An approximate depth scale has been added to aid in reflection identifications.

In addition to the above, the mixed and unmixed isochron record sections utilized in the interpretation are included under separate cover.

Respectfully submitted,

CENTURY GEOPHYSICAL CORPORATION OF CANADA

*W. Adolphe*

W. Adolphe  
Party Chief

APPROVED: *R. D. Williams*  
R. D. Williams, SUPERVISOR

APPROVED: \_\_\_\_\_  
J. L. Robinson, Vice-President

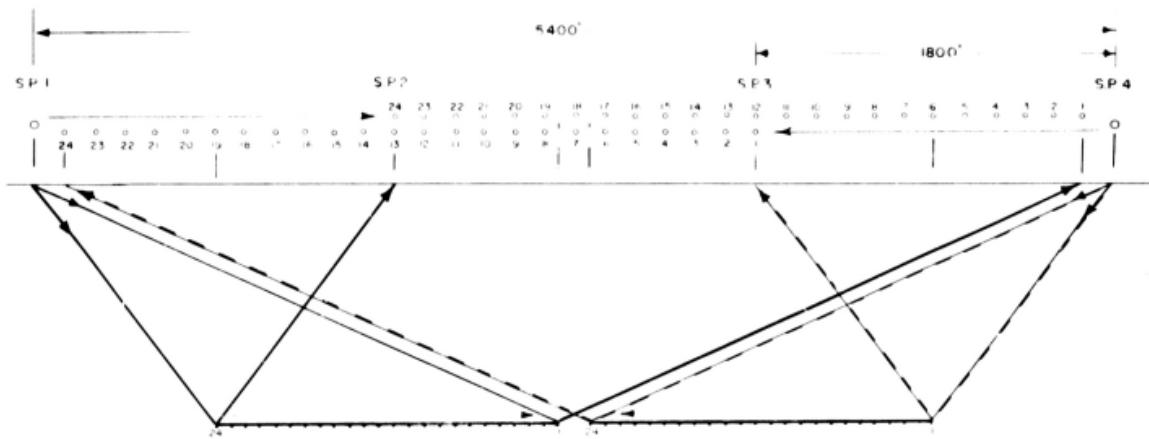
EFFICIENCY STATISTICS

Date Work Started.....July 12, 1965

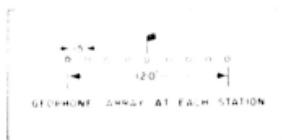
Date Work Completed.....July 31, 1965

Recorder:

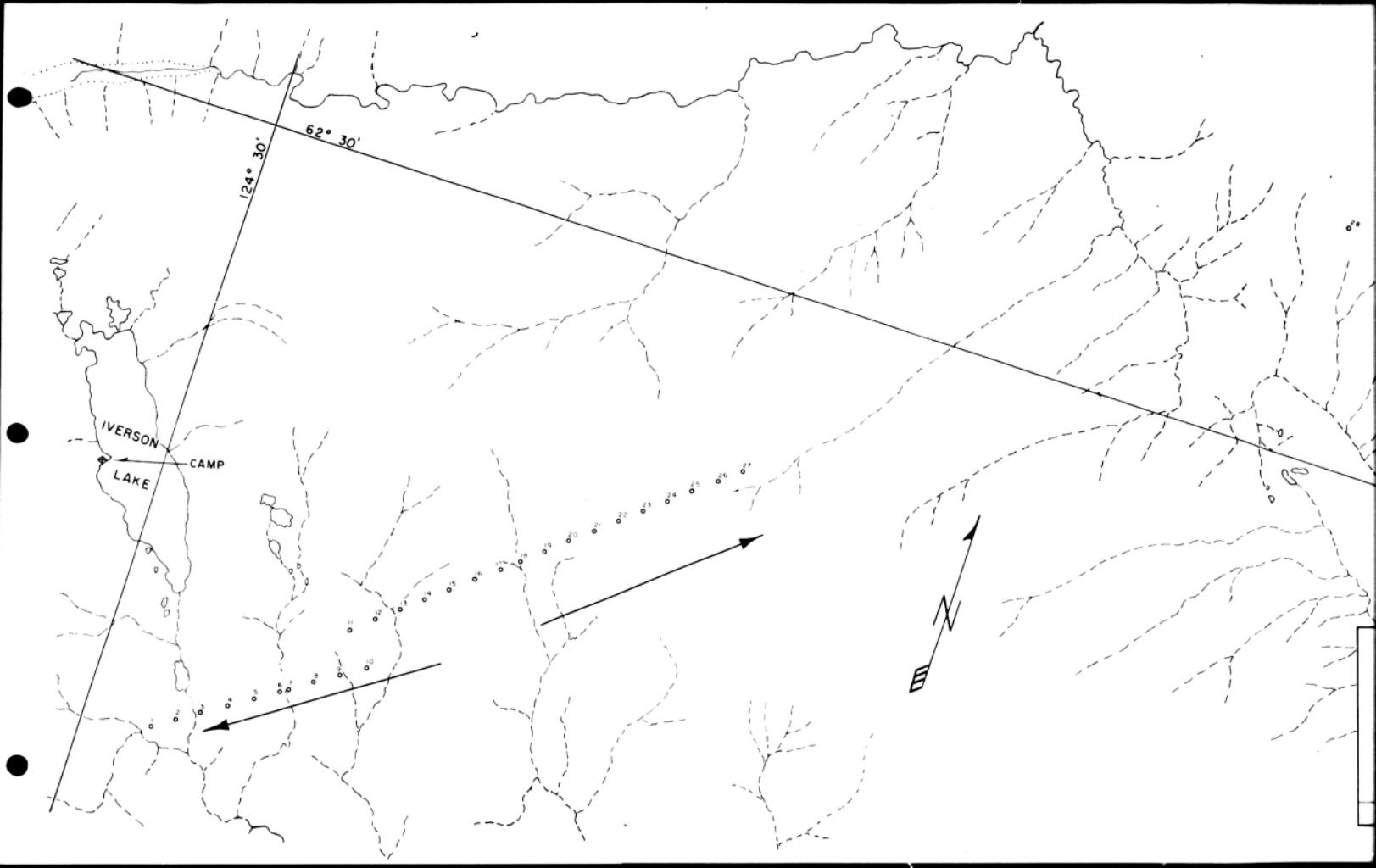
Working Days.....	9
Standby Days (rain).....	4
Helicopter Breakdown.....	5
Travel Days.....	2
Recorder Locations.....	5
Profiles.....	44
Subsurface Coverage (miles).....	7
Average Distance to Field (air miles).....	2 to 11
Total Shot Points Recorded.....	24
Total Number of Shots Taken.....	26
Dynamite Used (pounds).....	4000
Caps Used.....	120

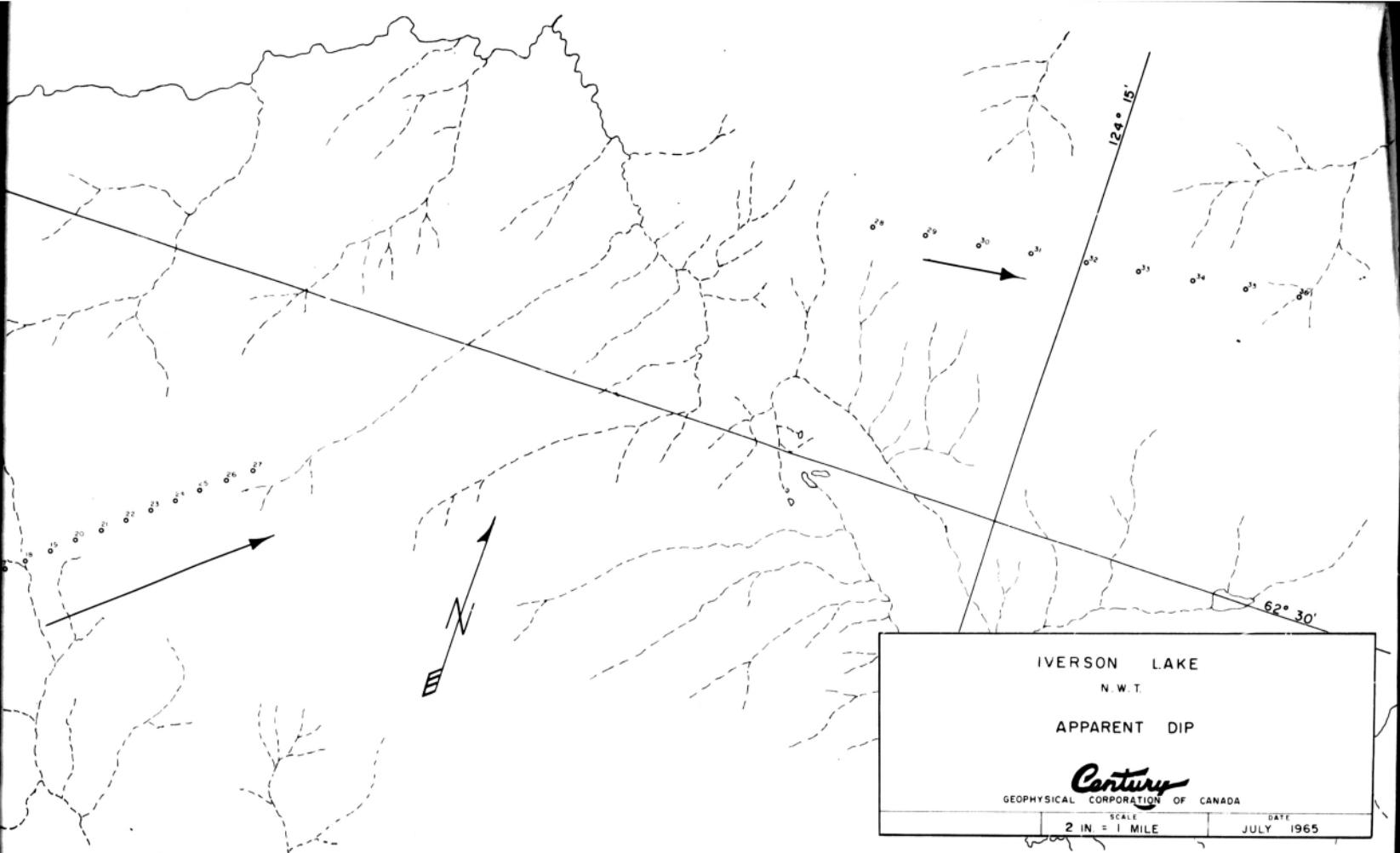


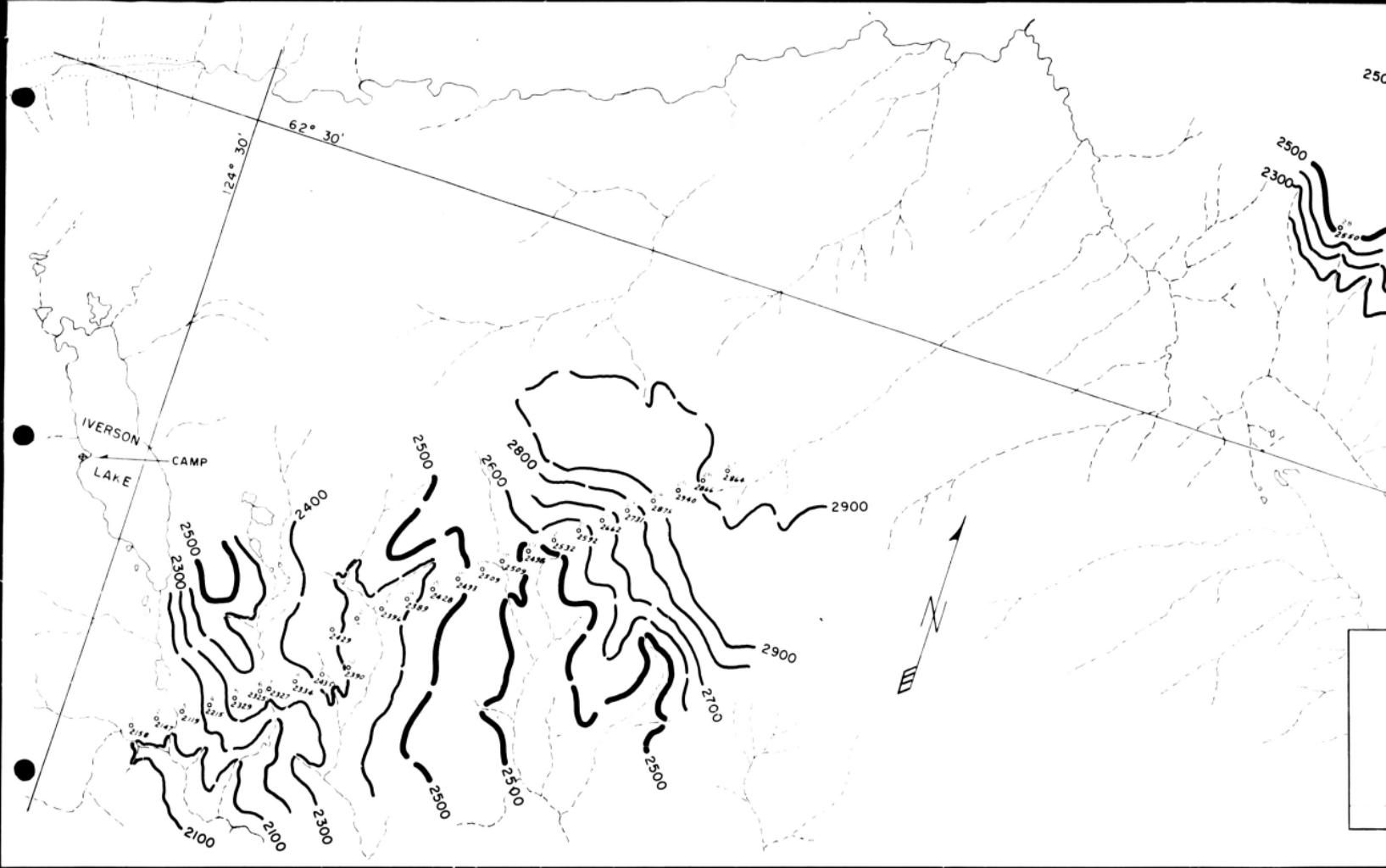
## SPREAD LAYOUT DIAGRAM

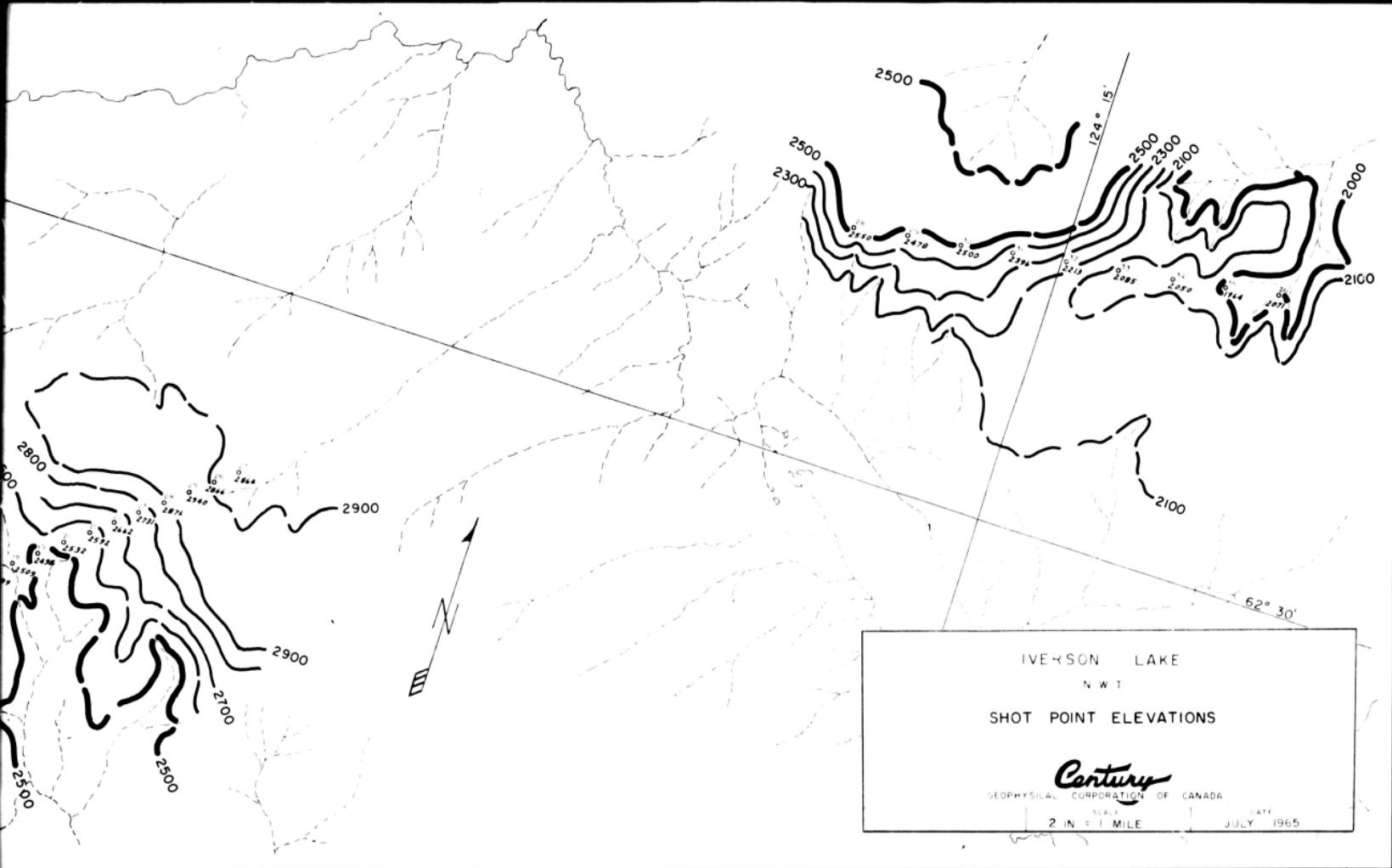


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LINE 1 - N. 87° E.

LINE 2 - N. 87° E.

SEA LEVEL

SEA LEVEL

SEA LEVEL

1000

2000

3000

4000

5000

6000

7000

8000

9000

10000

CARBONATE SECTION

POSSIBLE SHALE BASIN

DATA - N. 87° E. LINE PROFILE  
From Survey Report, 1962  
by TELA CORPORATION, LTD  
For Texaco, S. S. Johnson, TELA Camp  
Surveyor: W. H. Johnson, Texaco  
Date: 1962

