SEISMIC SURVEY

EBBUTT HILLS AREA

DISTRICT OF MACKENZIE

NORTHWEST TERRITORIES

for

IMPERIAL OIL ENTERPRISES LIMITED

by

GEOPHYSICAL SERVICE INCORPORATED

Calgary, Alberta

February 18 - April 3, 1963

TABLE OF CONTENTS

INTRODUCTION

Prospect:	Ebbutt Hills Area, District of Mackenzie, Northwest Territories.
Detailed Location:	Approximately 70 miles northwest of Fort Simpson, Northwest Territories, including latitudes 62° 20' to 62° 40', and longitudes 122° 15' to 122° 45', (map sheet 95-J-Camsell Bend).
Surveyed by:	Geophysical Service Inc., Party 410, (Imperial Party 26). Jasper B. Hart, Party Chief.
Surveyed for:	Imperial Oil Enterprises Limited, Mr. Lloyd R. Hatlelid, Client Representative
Party Headquarters:	Field camp located on the prospect.
Dates of shooting:	February 21, to March 29, 1963.
Purpose:	To further delineate structural conditions outlined by data obtained from previous surveys in the area.

GEOLOGY

The area is located east of the Camsell Range, northeast of the Nahanni Range and west of the Ebbutt Hills.

Surface material at higher elevations near the Ebbutt Hills consists of glacial debris while the area south of Willowlake River and east of Camsell Bend on the Mackenzie River is overlain with muskeg and re-worked stream deposits.

According to regional geology the prospect is located on the east flank of the Great Bear Slave Lake Basin which lies between the

Rocky Mountains to the west and the Canadian Shield to the east.

PHYSICAL CONDITIONS

The area is situated immediately east of the Mackenzie River where terrain varies from flat wooded muskeg areas near major tributaries to more rugged topography in the vicinity of the Ebbutt Hills to the east.

Three D-7 Bulldozers operated by Red Earth Construction Co. were required to clean existing lines and cut new trails. On one occasion during the latter part of March it was necessary to snow plow drifted areas of open muskeg along the access road to Fort Simpson.

Weather was mostly clear and cold during the shooting period. A severe cold spell with blowing snow during the latter part of March hampered field operations to some extent. However, no time was lost due to inclement weather.

FIELD METHODS

Surveying:

A transit and chain were used for normal operations. Use of an alidade and plane table was advantageous for surveying crooked spreads.

Horizontal and vertical control was established from temporary bench marks established by Imperial Party 12 and Imperial

Party 55, namely BM12-39, 12-36, 12-30, 12-29, 12-27, 12-26, 12-25 and 55-26. Vertical ties were within 3.7 feet. Maximum horizontal mistie was 250 feet. All loops were closed and dead end lines were rerun.

Elevations were established for shotpoints, groups adjacent to shotpoints, and intermediate groups on the spread. All group elevations were surveyed in areas of extreme elevation changes. A magnetic declination of north 36° east was used.

Drilling:

Two truck mounted Mayhew 1000 Series and one Failing 1000 Series Drills operated by Kenaston Exploration Drilling Company were used. Four water trucks were required to ensure an adequate supply of water.

Drilling conditions were poor to good. Rock bits were required for nearly every hole due to boulders. Insert type finger bits were used in localized areas of clay and/or shale. Bran was used extensively due to lost circulation.

Holes were normally drilled to 45 feet through muskeg, clay and boulders. Sand and gravel was present in some holes.

Shooting:

Normal shots consisted of three inline holes fifty-feet apart

preloaded to forty-three feet with a 5/8 pound charge (Geogel).

In areas of thick low velocity material a single hole loaded with a 2.5 to 5.0 pound charge was shot approximately every fourth set-up.

Recording:

A split continuous spread 1320 feet in length consisting of twelve groups spaced at intervals of 110 feet was standard for the area. When spreads were shortened groups were dropped and the 110-foot intervals were maintained. Sixteen seismometers (27 CPS) were evenly spaced over 110 feet, (220 feet in muskeg areas), and connected in parallel. During the latter part of the shooting a series-parallel arrangement was used.

All shots were recorded straight on Carter tapes with no filtering. Non-filtered playbacks were made for each shot with no AVC action.

From February 21, through until March 4, an additional recording system consisting of Texas Instruments "8000 Series" Amplifiers and a Techno Magnetic Recorder was used together with the standard Carter instruments.

For better near surface velocity control some shots were recorded at ends of normal split spreads.

See Plate I for further details regarding the spread arrangement and instrumental details.

METHOD OF CALCULATION

Near Surface Corrections:

All seismograms were corrected to a level reference plane of 1500 feet above sea level using a replacement velocity of 8000 feet per second and uphole travel time control for the timed traces.

Additional corrections applied to compensate for a near surface low velocity material were derived using a rectilinear method outlined by Imperial Oil Enterprises Limited.

Corrections for Record Sections:

Static corrections of control traces were based on computed near surface corrections with an adjustment on end traces to compensate for misties. Statics for intermediate groups were determined by prorating the time corrections calculated for centre traces.

A family of normal move-out time curves was furnished by Imperial Oil Enterprises Limited. Each curve was assigned a "K" value. Proper "K" values for dynamic corrections were established by matching NMO time (from monitor records), with the proper curve of the nomograph.

Time Cross Sections:

Cross sections are plotted vertically in time using a scale

of 1 inch = 0.100 second. The horizontal scale is 1 inch = 1320 feet. Surface elevations and thicknesses of the low velocity layer are plotted on each section using a scale of 1 inch = 400 feet. Questionable correlations are indicated by connecting time values with broken lines.

DISCUSSION OF RESULTS

Record Quality:

With the exception of the northwest and extreme western part of the prospect fair to good reflections originating near the top of the Hume formation were present and continuous correlation of this horizon was possible. Basement reflections were generally poor with questionable continuity and identification of these events was unreliable in the western portion of the area. Extraneous near surface energy (side-swipe) is thought to cause the deteriorated quality of these deeper events. Also, in some cases fine sand overlain by dry muskeg appeared to have a pronounced filtering effect on the reflected signal causing substantial decrease in the signal to noise ratio.

Mapping Horizons:

On the basis of correlations to seismograms obtained from a previous survey in the area the horizons mapped are believed to be as follows:

a. Near Hume Top - approximate time = 0.500 second
b. Pre-Cambrian - approximate time = 0.700 second

A structural contour map for the Hume horizon and an isochron map for time intervals between the Hume and Pre-Cambrian horizons was prepared on a scale of 1" = 2 miles, and using a contour interval of 0.020 second.

A surface elevation map was also prepared using a contour interval of fifty-feet.

All base maps were supplied by Imperial Oil Enterprises Limited, and include data obtained from previous surveys in the area.

Structural Conditions:

The structural map presented indicates regional west to southwest dip.

The most noteworthy structural feature is the zone of faulting mapped in the western part of the area. Data obtained on Line 9 during the current survey indicates the presence of the two faults mapped. These faults appear as low angle thrusts with throws of approximately 0.100 seconds. Dip is considerably steeper on the up thrown blocks.

Except for a suggested high trend, based on sparse data, along the eastern part of the area, contours indicate a westward dipping monocline with some hint of turnover at the fault face. Irregularities in the contouring are thought to result from inadequate corrections for anomalous near surface velocity materials.

The isochron map for the Hume to Pre-Cambrian interval indicates thickening to the west. A broad re-entrant thick mapped in the central portion of the area breaks the general continuity and sets up an anomalous thin in the south central part of the prospect.

SUMMARY AND CONCLUSIONS

The structural contour map submitted shows the general geologic trend but local anomalies are considered unreliable because of inadequate near surface corrections. Also, poor data obtained from basement reflections makes the reliability of the isochron map somewhat questionable. Extraneous near surface energy and the possible existence of section multiples could account for the deteriorated quality of the deeper events.

Should further work in the area be contemplated, it is suggested that better control of the near surface low velocity layer be obtained by shooting long refraction profiles at each shot location. Also, a noise study would be advantageous for determining optimum geophone arrays.

RECOMMENDATIONS

The zone of faulting in the western part of the prospect is the most significant anomaly mapped, and additional work is recommended to further outline and delineate possible stratigraphic traps along the fault interfaces.

ACKNOWLEDGEMENTS

The author wishes to acknowledge the valued assistance, and co-operative efforts which were extended during the survey by Messrs. Lloyd R. Hatlelid and Bob Jordan, of Imperial Oil Enterprises Limited.

Respectfully submitted,

J B Hart

Jasper B. Hart, Party Chief

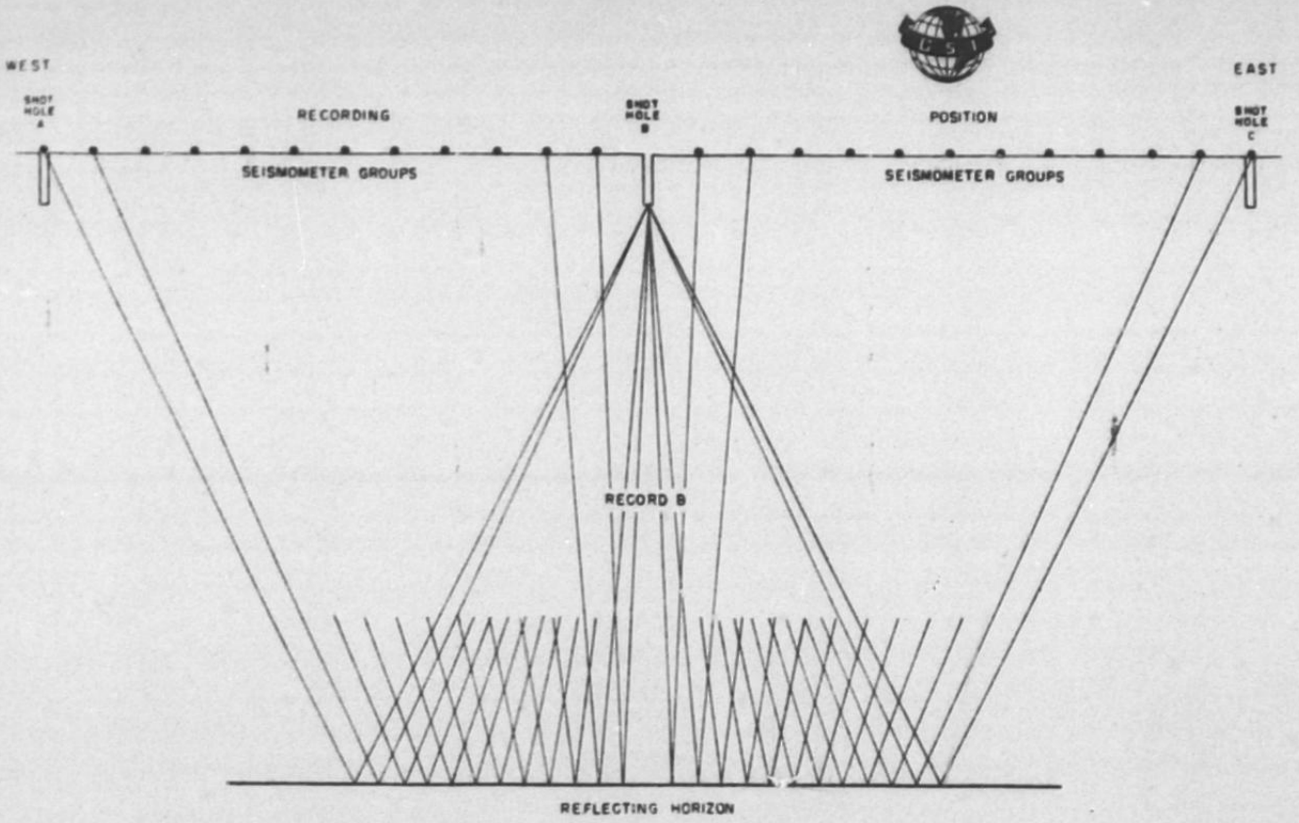
S. Claus, Supervisor

KEY PERSONNEL

Party Chief	J. B. Hart
Geophysical Engineer	John Eyres
Computer	Earl Barrows
Observer	Mack Goodwin
Assistant-Observer	Mack Keillor
Shooter	Ed. Wurst and Gary Cappis
Driller	John Fiechter, A. R. Martin, Louis Blain, Kenaston Exploration Drilling Company, George Yelich, Owner.
Surveyor	Clarke Shatosky
Junior Surveyor	Cliff Schuh

GENERAL STATISTICAL DATA

Total length of traverse (feet)	556, 270
Number of days worked	41.1
Number of profiles shot	850
Average profiles per day	20.7
Number of depth shots	504
Average depth shots per profile	1.68
Total dynamite (pounds)	1100
Average dynamite per profile (pounds)	1.3
Average dynamite per depth shot (pounds)	2.2
Number of holes drilled	1363
Total footage	59, 610
Average depth drilled (feet)	43.7
Average depth of holes on specimen record (feet)	43
Range of elevations (feet)	2032 to 594



SPREAD ARRANGEMENT FOR CONTINUOUS CORRELATION

SPLIT SPREAD

TRACE EQUIPMENT

DESCRIPTION OF SPREAD

Seismometers per spread	384
Seismometer groups	24
Seismometer per group	16
Normal distance between groups	110 ft.
Distance to centre of first group	110 ft.
Normal distance between shot locations	1320 ft.
Number of holes per shot location	3
Normal distance between shot holes	50 ft.
Distance between seismometers within group	7 or 15'

INSTRUMENTAL DETAIL

Seismometer Series	EVS (27 cps)
Magnetic Recording System	FR-1
Circuit Used	Straight

TYPICAL CONDITIONS

Average Hole Depth	43'
Average charge	1-7/8 per 3-Hole Pattern
Optimum filter	0-0
Shooting Medium	Clay with boulders

EBBUTT HILLS AREA