122°40'
122°35'
122°30'
122°25'
122°20'
122°15'
122°10'
122°05'
60°10'
60°05'
60°00'

HOME SIGNAL CSP
CELIBETA # 7
1591'

HOME SIGNAL CSP
CELIBETA # 6
1622'

HOME SIGNAL CSP
CELIBETA # 2
1592'

DOME PAN AM
ALM # CSP
CELIBETA C-77
1566'

HOME SIGNAL CSP
CELIBETA # 5
1586'

HOME SIGNAL CSP
CELIBETA # 1
1476'

LINE 2
LINE 6
LINE 1
LINE A
LINE 407
LINE 401
LINE 409
LINE 376
LINE 335
LINE 220

NORTHWEST TERRITORIES
BRITISH COLUMBIA

I
L
K
J

HRYHOR GEOPHYSICAL LTD.
CALGARY, ALBERTA

CELIBETA

SURFACE ELEVATION

HOME SIGNAL CSP
CELIBETA # 7
1510

HOME SIGNAL CSP
CELIBETA # 6
1622

HOME SIGNAL CSP
CELIBETA # 2
1592

DOME PAN AM
ALM x CSP
CELIBETA C-77
1568

HOME SIGNAL CSP
CELIBETA # 5
1586

HOME SIGNAL CSP
CELIBETA # 1
1476

60° 05'

60° 00'

NORTHWEST TERRITORIES

BRITISH COLUMBIA

59° 55'

NTS 94-0-15

NTS 94-0-16

I

L

K

J

122° 40'

122° 35'

122° 30'

122° 25'

122° 20'

122° 15'

122° 10'

122° 05'

HRYHOR GEOPHYSICAL LTD.
CALGARY, ALBERTA

CELIBETA

SURFACE ELEVATION

FOR CANADA SOUTHERN PETROLEUM LTD.

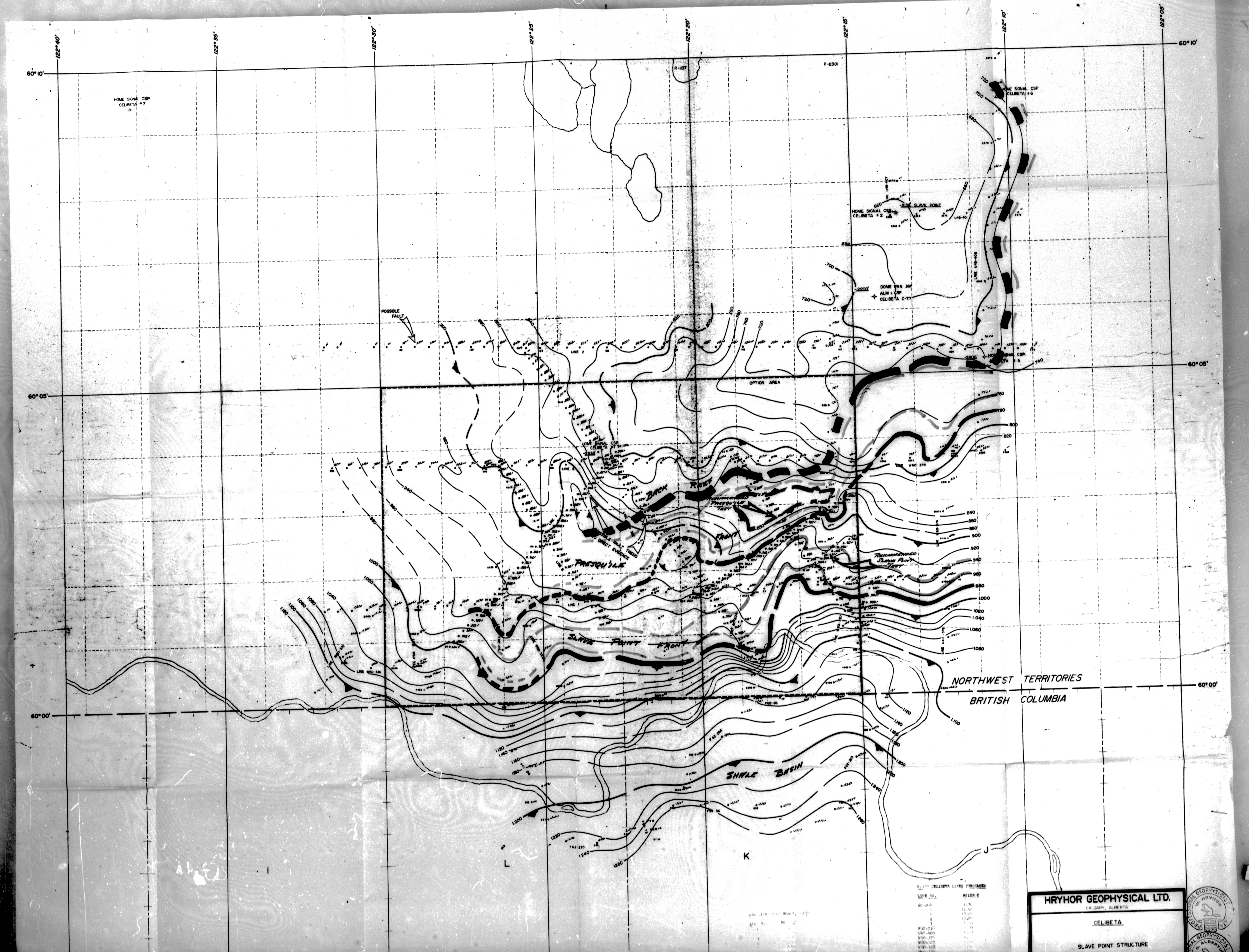
CONTOUR INTERVAL 25'	PROJECT NO. N-150
DATUM ELEV.	INTERPRETED BY
ELEV. CORR VEL	CONTOURED BY E.F. & D.K.
POSTED BY D.K. & E.F.	CHECKED BY W. HRYHOR
DRAFTED BY E.FOO	APPROVED BY W. HRYHOR
SCALE 2" = 1 mile	DATE JANUARY 1969

N-150

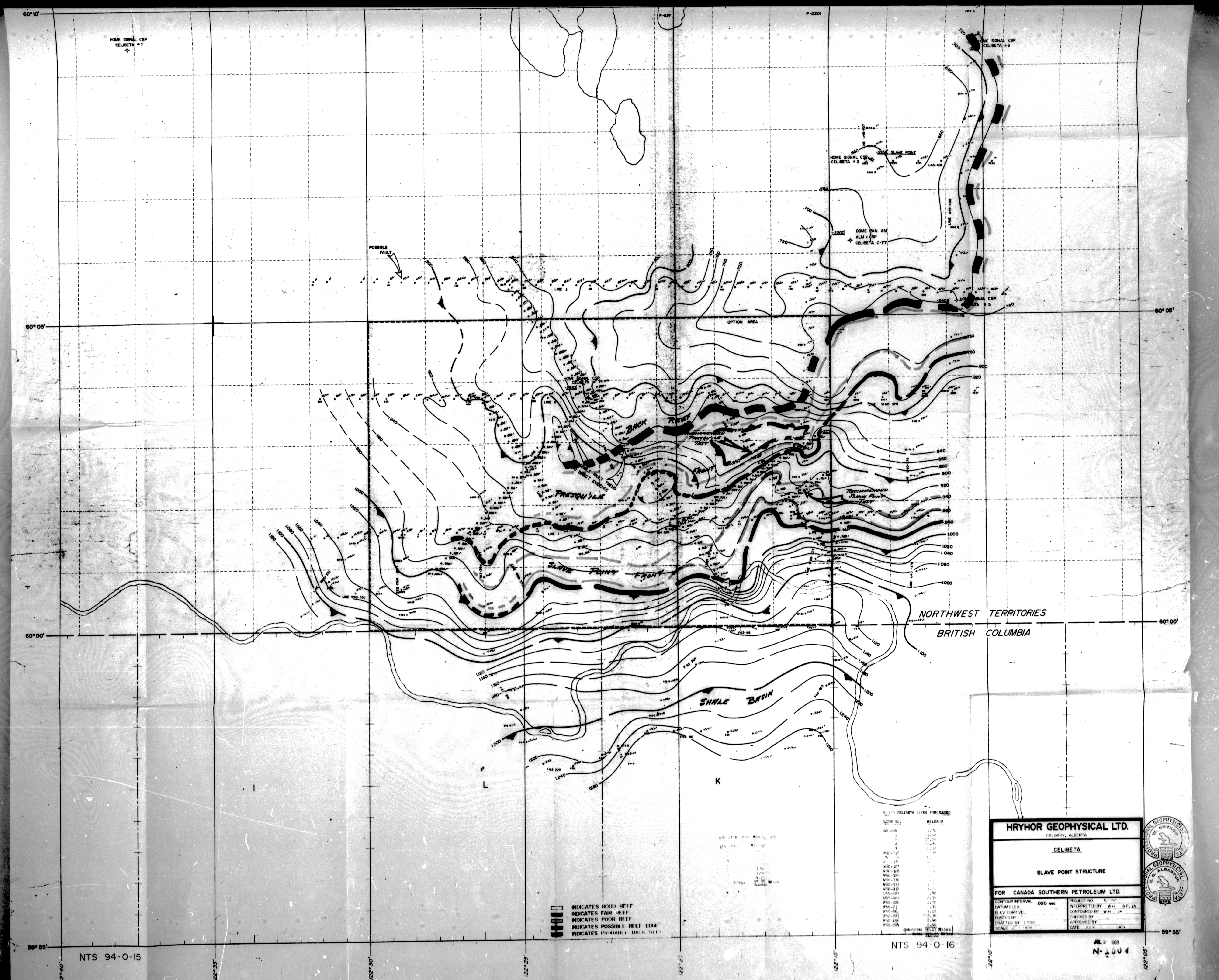
JUL 8 1969

PROFESSIONAL GEOPHYSICIST ALBERTA W. HRYHOR

PROFESSIONAL GEOPHYSICIST ALBERTA D.G. ALBERTUS



122°40'
122°35'
122°30'
122°25'
122°20'
122°15'
122°10'
122°05'
60°10'
60°05'
60°00'
HOME SIGNAL CSP CELIBETA #7
HOME SIGNAL CSP CELIBETA #6
HOME SIGNAL CSP CELIBETA #2
SLAVE POINT
DOME PAN AM ALM x CSP CELIBETA C-77
POSSIBLE FAULT
OPTION AREA
BACK REEF
FRONT
PRESQU'ILE
RECOMMENDED PRESQU'ILE TEST
RECOMMENDED SLAVE POINT TEST
SLAVE POINT FRONT
SHALE BASIN
NORTHWEST TERRITORIES
BRITISH COLUMBIA
L
K
J
I
LINES PURCHASED
MILEAGE
HRYHOR GEOPHYSICAL LTD.
CALGARY, ALBERTA
CELIBETA
SLAVE POINT STRUCTURE
PROFESSIONAL GEOPHYSICIST W. HRYHOR


HRYHOR GEOPHYSICAL LTD.
CALGARY, ALBERTA
CELIBETA
SLAVE POINT STRUCTURE
FOR CANADA SOUTHERN PETROLEUM LTD.
CONTOUR INTERVAL .020 sec.
DATUM ELEV.
ELEV CORR VEL
POSTED BY
DRAFTED BY E FOO
SCALE 2" = 1 mile
PROJECT NO. N-150
INTERPRETED BY W H AP, JA
CONTOURED BY W H , JA
CHECKED BY
APPROVED BY
DATE JULY 1969
PROFESSIONAL GEOPHYSICIST W. HRYHOR ALBERTA
PROFESSIONAL GEOPHYSICIST R. G. ALBERTUS ALBERTA
JUL 9 1969
INDICATES GOOD REEF
INDICATES FAIR REEF
INDICATES POOR REEF
INDICATES POSSIBLE REEF EDGE
INDICATES PROBABLE BACK REEF
NORTHWEST TERRITORIES
BRITISH COLUMBIA
SLAVE POINT FRONT
PRESQU'ILE
BACK REEF
SHALE BASIN
OPTION AREA
POSSIBLE FAULT
HOME SIGNAL CSP CELIBETA #7
HOME SIGNAL CSP CELIBETA #6
HOME SIGNAL CSP CELIBETA #2
DOME PAN AM ALM x CSP CELIBETA C-77
NTS 94-0-15
NTS 94-0-16
60°10'
60°05'
60°00'
59°55'
122°40'
122°35'
122°30'
122°25'
122°20'
122°15'
122°10'
122°05'
I
L
K
J
Sub-total 50.17 Miles

352-6-4-20

PROJECT #N-150

JULY, 1969

SEISMIC EVALUATION

OF THE

CELIBETA/N.W.T. AREA

FOR

CANADA SOUTHERN PETROLEUM LTD.

CALGARY, ALBERTA

HRYHOR GEOPHYSICAL LTD.

GEOPHYSICAL CONSULTANTS

CALGARY, ALBERTA

35°2-6-4-26

SEISMIC EVALUATION

OF THE

CELIBETA / N. W. T. AREA

FOR

CANADA SOUTHERN PETROLEUM LTD.

CALGARY, ALBERTA

REPORT BY: R. G. Albertus

APPROVED BY: W. Hryhor

PROJECT NO. N-150

DATE: July, 1969

I N D E X

SEISMIC EVALUATION OF THE CELIBETA / N. W. T. AREA

PROJECT NO. N-150

INTRODUCTION

In March of 1969, Western Geophysical Company of Canada Limited shot approximately twenty-six miles of 600% seismic coverage in the Celibeta Area, of the Northwest Territories. This area is roughly between 60° 00' North, and 60° 10' North, and from 122° 05' to 122° 35' West. The new shooting was integrated with approximately ninety miles of existing data.

The purpose of the project was to evaluate an option block bounded by 60° 00' North to 60° 05' North, and from 122° 15' West to 122° 30' West. This block is the south half of permits #1137 and #2301.

The primary interest was to locate the south termination of the Slave Point Carbonate Front, and with this information to isolate areas of potential Slave Point porosity and gas production, which could also be associated with Pine Point and Presqu'ile build-ups.

The nearest production is approximately three miles north of the option block, at the Slave Point gas well, Home Signal CSP Celibeta #2.

Reflection identification was made by a direct tie to a continuous velocity survey in the Home Signal CSP Celibeta #1 dry hole, located on the option block.

The general quality of the Wabamun reflection was fair, with some areas of character change. Northeast of the option block, the Wabamun reflection became shallow enough to be interfered with by the first breaks. In this area, the 3rd Lime was used to help pick the Wabamun. The Slave Point reflection was fair over most of the area, but was very poor along the carbonate edge.

CONCLUSIONS AND RECOMMENDATIONS - (See Wabamun to Slave Point Isochron Map)

A Presqu'ile front independent of the Slave Point front is indicated trending East-North-East approximately 2 miles south of the Home Signal CSP Celibeta #1 well. (See Figure 1)

The Slave Point front appears to nearly parallel the Presqu'ile front and is generally located approximately 1 mile south of the Presqu'ile front. (See Figure 2)

The two fronts nearly coincide approximately 3 miles East-South-East of the Home Signal CSP Celibeta #1 well. It is suggested that should dolomization of the Slave Point occur this area would be most prospective.

A SLAVE POINT-PRESQU'ILE TEST IS RECOMMENDED AT SHOT POINT 21 OF WESTERN LINE 3. (See Figure 1)

In addition to the above location THE PRESQU'ILE AND SLAVE POINT FRONTS COULD BE SEISMICALLY FOLLOWED TO AN UP-DIP POSITION AND TEST SITES CONSIDERED UPON ESTABLISHING THE CRITICAL CLOSURE.

Conversely A SLAVE POINT TEST AT SHOT POINT 6 OF WESTERN LINE 2 MAY BE CONSIDERED IN FRONT OF AND INDEPENDENT OF THE PRESQU'ILE FRONT in that a stratigraphic change along the front may be sufficient to create a stratigraphic trap, bearing in mind that the Kotcho Slave Point gas production is independent of the Presqu'ile front.

Respectfully submitted,

HRYHOR GEOPHYSICAL LTD.

R. G. Albertus, P. Geoph.

Approved by:

W. Hryhor, Chief Geoph.

Date: July 7, 1969

DISCUSSION OF MAPS

Surface Elevation Map

The dominant feature is the Petitot River and its' steep banks. Regional dip is to the southwest at approximately fifteen feet per mile from a high of approximately 1620 feet to approximately 1400 feet on the river banks. Then there is a sharp drop to the river level to approximately 1130 feet. Within three miles of the river there are many narrow erosion channels approximately forty to fifty feet deep, which make access near the river difficult. Most of this area is muskeg.

Slave Point Structure

This map shows the Slave Point structure in two-way time from a datum of 1500 feet. A Slave Point structural high is indicated in the vicinity of the Home Signal CSP Celibeta #2 well with a corrected seismic time of 0.660 seconds sub-datum. A near regional drop off of approximately 0.030 seconds per mile (approximately 2^{o} dip) is indicated to the Southwest.

A Slave Point dip is indicated to the South along the suggested Presqu'ile front described in CONCLUSIONS AND RECOMMENDATIONS. Immediately south of the suggested Presqu'ile front the structure appears near regional followed by a second more abrupt drop-off along the suggested Slave Point Front.

Wabamun to Slave Point - Isochron

This map shows the two-way time interval between the Wabamun and the Slave Point. The Slave Point Carbonate Front has been approximately delineated by the 0.620 second contour,

with values greater than this indicating partial or complete loss of the Slave Point Carbonate.

A second front is shown on this map approximately two miles in back (away from the shale basin) of the Slave Point Front. This front has additional thinning of the Slave Point to Wabamun interval, and may be the result of a Presqu'ile reef build-up. This second front is considered most prospective due to the fact it should contain a greater thickness of gas bearing porosity.

Within the option area, the two fronts seem to parallel each other and the Petitot River. On the western edge of the area the Presqu'ile front may turn north, while the Slave Point front continues in a northwest direction. In the east, the Presqu'ile front is suggested just south of the Home Signal CSP Celibeta #5 dry hole, and due to poor quality is not well defined and possibly continues north from there to just west of the Home Signal CSP Celibeta #6 dry hole. The two fronts appear to be closest at the recommended location of shot point 21, Western line 3.

There is some problem with the Wabamun reflection south and west of the Home Signal CSP Celibeta #1 well, which may indicate a geologic disturbance such as a fault. However, there is not sufficient evidence to positively indicate the nature of the disturbance.

STRUCTURAL CALCULATION METHOD

The following procedure was used for the structural mapping of the data in the Celibeta Area.

1. Add the uphole time to the raw time to correct data to surface-to-surface time.

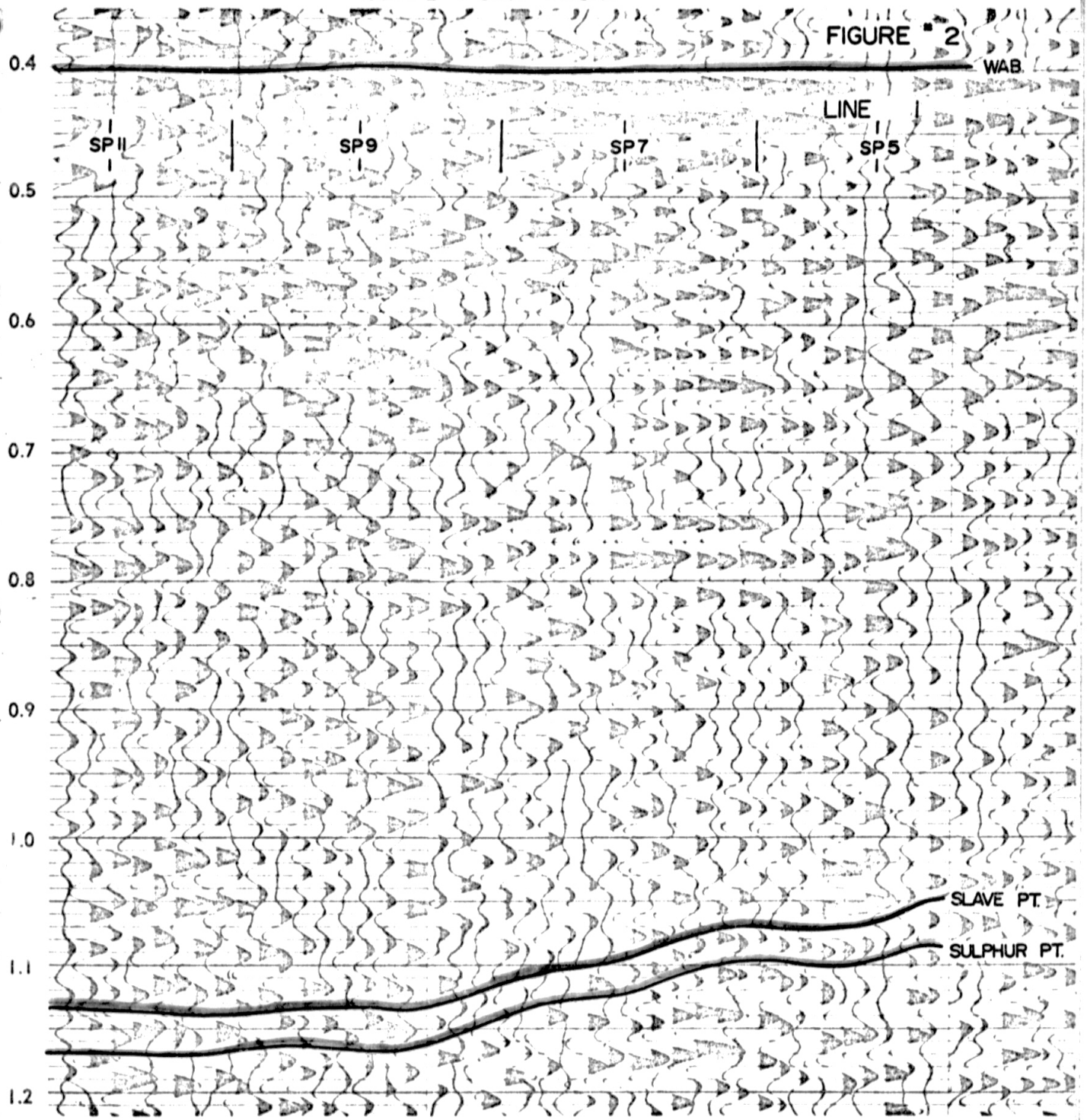
2. Subtract uphole lag due to near surface low velocity by using refraction replacement velocity (V_R=11,000 feet per second) and allowing for a two-way path.

3. Apply a two-way elevation correction to a datum of 1500 feet above sea level using a datum correction velocity. (V_D=12,000 feet per second) chosen to eliminate any over-burden variations, as well as, loading effect due to velocity being a function of depth.

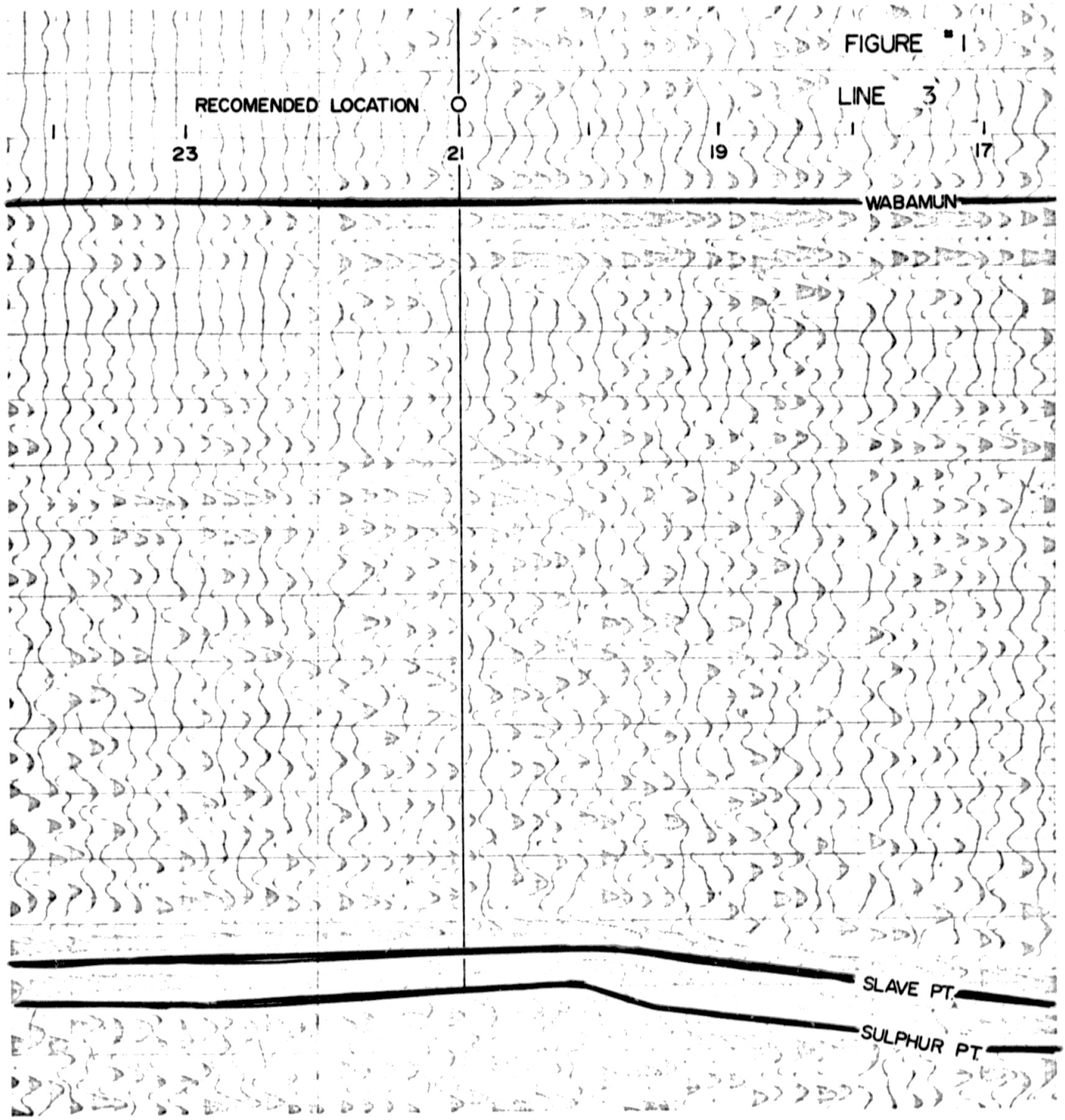
4. Correct for secondary weathering (drift) as necessary using V_R=11,000 feet per second as the replacement velocity. A linear refraction correction method was applied. To compensate for refraction dips a constant V_R was drawn through the critical distance.

SLAVE POINT FRONT

FIGURE 2



PRESQU'ILE FRONT



DISPLAY SECTIONS

Contractor	Line No's.	Processor	Stack & Playouts	AVC	Filter	Flattened or Struct.	Type
* Western #5	1 - 7	* GSI	* 600% NTG 600% FTG	off	25 - 65 from 0 - 700 20 - 60 from 200 - 2000	at Wabamun 0.400 seconds	Wiggle and VA

* Western Geophysical Co. of Canada Ltd.
Geophysical Service Incorporated
Near Trace Gather
Far Trace Gather

SHOOTING PROCEDURES

Contractor Party No.	Date	Instrument Type Tape Type	Geophone Type " Array	Gain Control	Recording Filter	Shot Spacing Charge & Depth	Spread Type	No. of Stations % coverage
estern 56	1956	Unknown	Unknown 5 over 150 feet	AVC Fast	CP	2 x 10 lb. @ 40 ft.	Splits	24 traces 100%
eiland	1959	Unknown	Unknown 3 Over 110 feet	100% Gain S-3 AGC	1 - 32 - 0	1 x 5/16 lb. @ 40 ft.	Splits	24 traces 100%
estern 62	1960	FA 32 PF 28	FB x 6 over 150 feet	AGC T	FLH	5 x 1 1/4 lb. @ 38 ft.	Splits	24 traces 100%
eismotech	1961	GA 11	EVS 2 9 over 112 feet	Unknown	1-30 / 1-92	3 x 5/8 lb. @ 40 ft.	Splits	24 traces 100%
nited 40	1962	UGC 1-38 TI-431	EVS 4HS 6 over 150 feet	AVC Slow	1 W	5 x 1 1/4 lb, at 40 ft.	Splits	24 traces 100%
estern 60	1962	FA 32 PF 28	FB x 28 cycle	AGC T	5 - 270	3 x 1 lb. @ 38 Ft.	Splits	24 traces 100%
nited 45	1963	FA H4B F 42	EVS 15 6 over 150 feet	AGC 6	X-X	3 x 1 1/4 lb. @ 40 ft.	Splits	24 traces 100%
estern 50	1969	TFA - 1 AM Tape	L2 - 20 Cycle 9 over 200 feet	AVC Tape	CFM	2 x 5 lb. @ 43 ft.	Splits	36 traces 600%

estern Geophysical Co. of Canada Ltd.
eiland Exploration Canada Ltd.
eismotech 64 Ltd.
nited Geophysical Co.

121° 30'

121° 15'

121° 00'

60° 25'

60° 20'

60° 15'

TROUT

LAKE

ISLAND

RIVER

1800'

1900'

2000'

2100'

2200'

PAN AM HOME CSP
ET AL A-1
N. ISLAND R.
1712'

DOME PAN AM
ALMX CSP
ISLAND RIVER
2183'

PROFESSIONAL GEOPHYSICIST ALBERTA
R. O. ALBERTUS

HRYHOR GEOPHYSICAL LTD.

TROUT LAKE

SURFACE ELEVATION

FOR CANADA SOUTHERN PETROLEUM LTD.

CONTOUR INTERVAL 25 ft.

E.F.

E. FOO
A. PASECHNIK

121° 30'
121° 15'
121° 00'
60° 25'
60° 20'
60° 15'

TROUT LAKE

ISLAND RIVER

PAN AM HOME CSP ET AL A-1 N. ISLAND R. 1555

DOME PAN AM ALMX CSP ISLAND RIVER 1595

LINE 1
LINE 2
LINE 3

E-56

CSP 100%
CSP 45%

LINE NO.	MILEAGE
LINE 1	5.5
LINE 2	6.8
LINE 3	3.5
TOTAL	15.8 miles

PROFESSIONAL GEOPHYSICIST ALBERTA R. G. ALBERTUS

1152

JUN 18 1969

121° 30'
121° 15'
121° 00'
60° 25'
60° 20'
60° 15'

TROUT LAKE

ISLAND RIVER

SUGGESTED GRABEN

CSP 100%
CSP 45%

LINE NO.	MILEAGE
LINE 1	5.5
LINE 2	6.8
LINE 3	3.5
TOTAL	15.8 miles

POSSIBLE KEG RIVER REEF EDGE

PROPOSED NEW SHOOTING OR PURCHASE

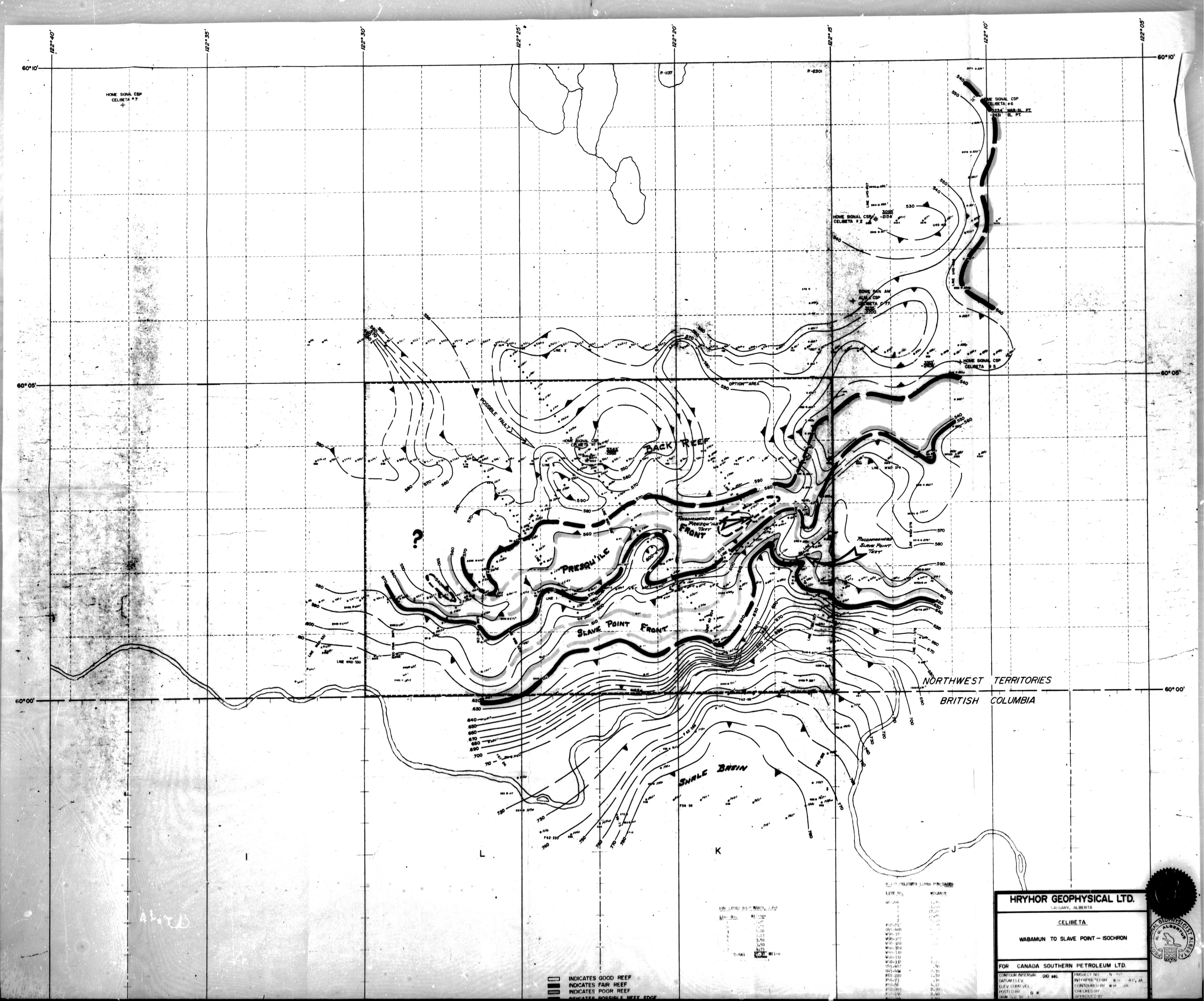
DATA AVAILABLE

PROFESSIONAL GEOPHYSICIST ALBERTA R. O. ALBERTUS

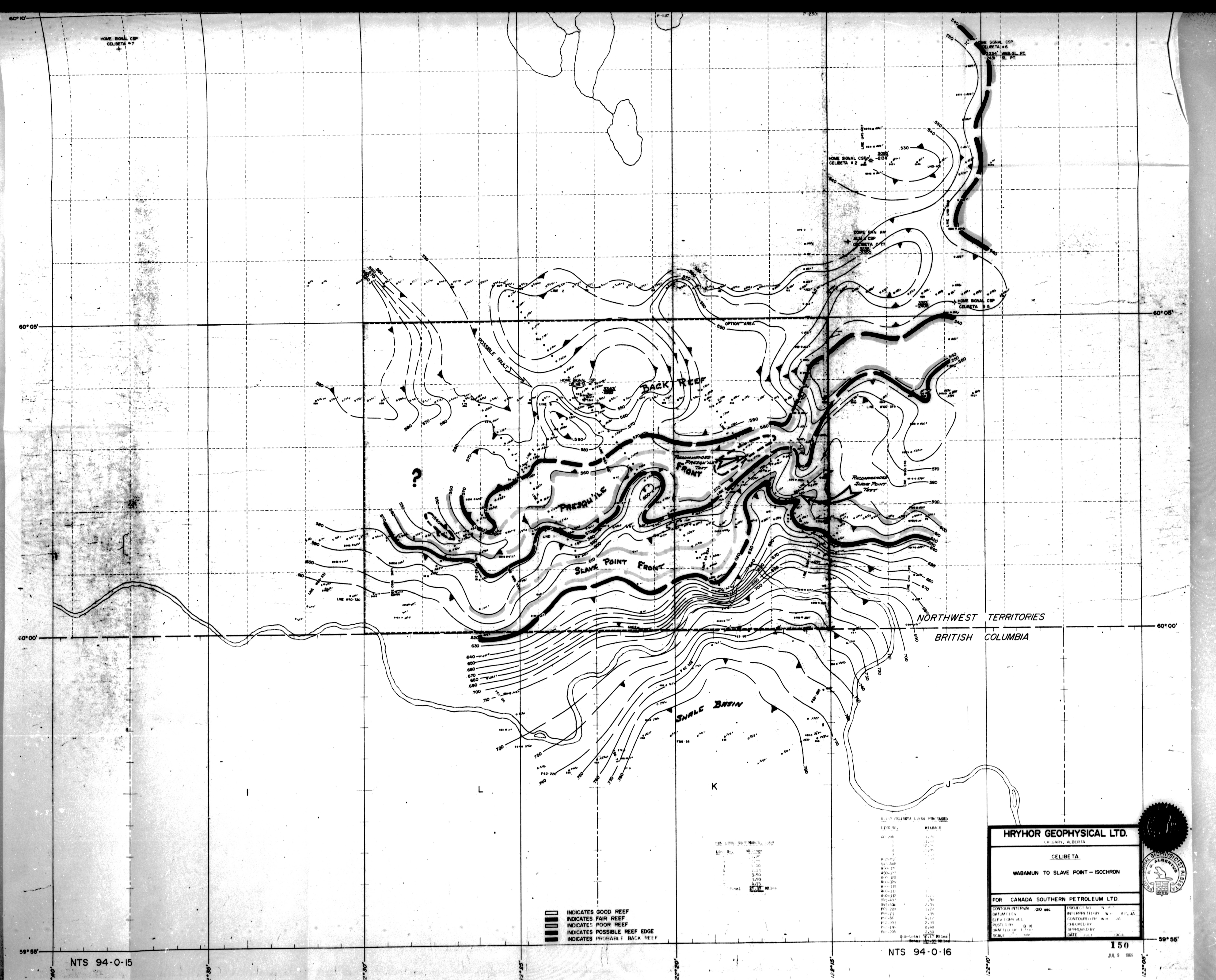
[redacted]

N-152

JUN 18 1969



122°40'
122°35'
122°30'
122°25'
122°20'
122°15'
122°10'
122°05'
60°10'
60°05'
60°00'
HOME SIGNAL CSP CELIBETA #7
HOME SIGNAL CSP CELIBETA #6
HOME SIGNAL CSP CELIBETA #2
POSSIBLE FAULT
OPTION AREA
BACK REEF
PRESQU'ILE FRONT
PRESQU'ILE
SLAVE POINT FRONT
RECOMMENDED PRESQU'ILE TEST
RECOMMENDED SLAVE POINT TEST
SHALE BASIN
NORTHWEST TERRITORIES
BRITISH COLUMBIA
I
L
K
J
HRYHOR GEOPHYSICAL LTD.
CALGARY, ALBERTA
CELIBETA
WABAMUN TO SLAVE POINT – ISOCHRON
FOR CANADA SOUTHERN PETROLEUM LTD.
CONTOUR INTERVAL .010 sec.
DATUM ELEV.
ELEV CORR VEL
POSTED BY D. K.
DRAFTED BY
PROJECT NO.
INTERPRETED BY
CONTOURED BY
CHECKED BY
APPROVED BY
INDICATES GOOD REEF
INDICATES FAIR REEF
INDICATES POOR REEF
INDICATES POSSIBLE REEF EDGE



HOME SIGNAL CSP CELIBETA #7
HOME SIGNAL CSP CELIBETA #6
HOME SIGNAL CSP CELIBETA #2
HOME SIGNAL CSP CELIBETA #5
POSSIBLE FAULT
OPTION AREA
BACK REEF
PRESQU'ILE
FRONT
RECOMMENDED PRESQU'ILE TEST
RECOMMENDED SLAVE POINT TEST
SLAVE POINT FRONT
SHALE BASIN
NORTHWEST TERRITORIES
BRITISH COLUMBIA
60° 10'
60° 05'
60° 00'
59° 55'
122° 40'
122° 35'
122° 30'
122° 25'
122° 20'
122° 15'
122° 10'
122° 05'
I
L
K
J
NTS 94-0-15
NTS 94-0-16
INDICATES GOOD REEF
INDICATES FAIR REEF
INDICATES POOR REEF
INDICATES POSSIBLE REEF EDGE
INDICATES PROBABLE BACK REEF
HRYHOR GEOPHYSICAL LTD.
CALGARY, ALBERTA
CELIBETA
WABAMUN TO SLAVE POINT — ISOCHRON
FOR CANADA SOUTHERN PETROLEUM LTD.
CONTOUR INTERVAL .010 sec.
DATUM ELEV
ELEV CORR VEL
POSTED BY D. K.
DRAFTED BY
SCALE
PROJECT NO.
INTERPRETED BY W.H. A.P., JA
CONTOURED BY W.H. JA
CHECKED BY
APPROVED BY
DATE JULY 1969
PROFESSIONAL GEOPHYSICIST ALBERTA
R. G. ALBERTUS
150
JUL 9 1969

[redacted] PETROLEUM LTD.

[redacted] ALBERTA

PRYHOR GEOPHYSICAL LTD.

GEOPHYSICAL CONSULTANTS

CALGARY, ALBERTA

SEISMIC EVALUATION

OF THE

TROUT LAKE AREA

FOR

CANADA SOUTHERN PETROLEUM LTD.

CALGARY, ALBERTA

REPORT BY: E. Foo

APPROVED BY: R. G. Albertus

PROJECT NO. N-152

DATE: July, 1969

I N D E X

SEISMIC EVALUATION OF THE TROUT LAKE AREA, NORTHWEST TERRITORIES

PROJECT NO. N-152

INTRODUCTION

Western Geophysical Company of Canada Ltd. shot sixteen miles of program in the Trout Lake Area of the Northwest Territories, during the month of March, 1969. The program consisted of three lines, which tied the Dome Pan Am Almx CSP Island R. E-56, and the Pan Am Home CSP et al A-1 N. Island R. O-12 dry and abandoned wells.

Nearest production encountered in the area of interest is the Pure P. A. Trainor Lake C-39, and the H. B. P. A. S. Island R. M-41 Slave Point gas wells, which are approximately seventeen miles east, and twenty miles south, respectively.

The purpose of this evaluation was to locate a Keg River Reef build-up, or the termination of the Slave Point Carbonate front, which would be favourable for the accumulation of gas and oil.

CONCLUSIONS AND RECOMMENDATIONS

(See 1st Lime to Slave Point Map)

WELL CARDS INDICATE THE PRESENCE OF KEG RIVER REEF IN WELL E-56, BUT NOT IN THE O-12 WELL.

THE ISOCHRON THINNING AT THE SOUTH END OF LINE #1, ACROSS THE E-56 WELL, INDICATES POSSIBLE BUILD-UP OF THE KEG RIVER.

IT IS RECOMMENDED THAT ADDITIONAL DATA AVAILABLE IN THE AREA BE EXAMINED TO FURTHER DELINEATE THE EXTENT OF THE THINNING IN THE AREA OF THE E-56 WELL. FOLLOWING THIS EXAMINATION, ADDITIONAL NEW SHOOTING OR PURCHASE MAY BE NECESSARY AS SHOWN ON THE 1st LIME TO SLAVE POINT MAP.

GENERAL DISCUSSION

Reflections were identified using an integrated sonic log and geological markers in the O-12 Well. These, in turn, were tied to the markers in the E-56 Well. Record quality of the reflections from the 1st Lime, Utahn, 3rd Lime, and Slave Point levels were generally good. The existence of the shown faults is questionable, however, due to the character of the Slave Point event, faults were shown.

Respectfully submitted,

HRYHOR GEOPHYSICAL LTD.

E. Foo, Seismologist

Approved by:

R. G. Albertus, P. Geoph.

Date: June 18, 1969

DISCUSSION OF MAPS

1st Lime to Slave Point

This is the Key Map in the area. Isochron thinning of Line #1, to the southeast across the E-56 Well, is encouraging, and indicates possible Keg River build-up. The faults, as shown, on Lines #2 and #3 are feasible, and are perpendicular to the strike of the Slave Point in the area. Additional seismic available, and the recommended new shooting or purchase are shown on this map.

1st Lime to Utahn

In general, confirms the existence of the indicated trends as shown on the 1st Lime to Slave Point Map.

SHOOTING PROCEDURES

Contractor Party No.	Date	Instrument Type Tape Type	Geophone Type " Array	Gain Control	Recording Filter	Shot Spacing Charge & Depth	Spread Type	No. of Station % cover age
Western Geophysical Company of Canada Ltd.	March, 1969	TFA - 1 Techno	12 - 20 cycle 9 @ 25 feet	1-[illegible]	CEM	2 @ 70 feet 5 # @ 40 - 45 Feet	Split 3850-110-0-110-3850	36 stations 300%

DISPLAY SECTIONS

Contractor	Line No's.	Processor	Stack & Playouts	AVC	Filter	Flattened or Struct.	Type
Western Geophysical Company of Canada Ltd.	1, 2, & 3.	Geophysical Service Inc.	300% 100%NTG 100%FTG	Slow	1/25 - 1/65	at 0.700 seconds 1st Lime	Digital VA Wiggle

NTG - Near Trace Gather
FTG - Far Trace Gather