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QUEENS CHANNEL

MARINE SEISMIC SURVEY

OP2 - N.T.

CAPE SCOTT

PORT KEATS

FINAL REPORT

QUEEN'S CHANNEL AREA: O. P. 2
NORTHERN TERRITORY, AUSTRALIA

MARINE SEISMIC SURVEY

for

AUSTRALIAN AQUITAINE PETROLEUM PARTY, LTD.

by

WESTERN GEOPHYSICAL COMPANY OF AMERICA

PARTY 86

OCTOBER, 1964

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These plans weren't found as of 2/7/85 A.T.

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PART I

PREVIOUS GEOLOGICAL
AND
GEOPHYSICAL HISTORY

The following Geological and Geophysical reports are quoted directly from a letter submitted to Western by the Australian Aquitaine Petroleum Party, Limited.

I. REGIONAL GEOLOGY

In our present state of knowledge, the Bonaparte Gulf Basin can be considered as separated into two distinct zones by the Queen's Channel.

- A Southern zone : Keep River - Ord River area,
- A Northern zone : Port Keats area.

This basin is represented in the sketch map given as Appendix II.

A. Southern Zone

Following a geological study of the outcrops, we can identify in this zone a succession of formations ranging from lower Cambrian to Carboniferous-Permian with a gap in the sedimentation during Upper Ordovician and Lower Devonian times. Southwards these Paleozoic formations are completely surrounded by outcropping Proterozoic series. The general stratigraphy of this zone of the Bonaparte Gulf Basin is represented in Appendix I.

On the South-Western margin, the Paleozoic series appear to rest unconformably on the Proterozoic rocks of the Kimberley Basin.

On the South-Eastern edge, a large and complex system of faults, trending SSW-NNE, appear to place in contact the Paleozoic and Proterozoic series.

In the centre of this Southern zone of the Bonaparte Gulf Basin, the prominent Pincombe Range represents a large Proterozoic horst trending SSW-NNE.

The various faults and/or fault systems existing in this zone are considered to have moved during the Paleozoic sedimentation, thereby influencing the very nature of the deposits especially during the Devonian period.

All rock units in the area present a regional dip varying from NE to NW, that is in the general direction of the Joseph Bonaparte Gulf.

It is considered possible that the structural elements revealed in this part of the Basin extend towards the north as suggested in the first interpretation given in Appendix III.

B. Northern Zone

In this zone, only part of the Permian Series appear to be represented in the outcrops under the designation of Port Keats Group. The problem of the eventual existence of Lower Paleozoic Series below the unconformable Permian rocks remain open.

Geological and Geophysical studies have revealed the existence, in this zone, of a structural scheme similar to the one encountered in the Southern zone, with a series of horsts and graben trending generally N-S. Furthermore, a complex system of faults is present on the Eastern margin of this area with a general SSW-NNE trend at the contact of the Paleozoic and Proterozoic rocks.

Regardless of this apparent similarity, the correlations between the Southern and Northern zones appear difficult as long as the Queen's Channel area remains unknown.

C. Queen's Channel Zone

The information of this zone is practically nil at the present time. However, the geographical extent of the Channel itself suggests a relationship with some important geological phenomenon at depth and possibly expressed, at last in part, by the strong gravity anomaly located at the North-Western extremity of the Queen's Channel. Therefore, two tentative interpretations are suggested here below:

The trend of the fault system which limits in both zones the extension of the Proterozoic rocks appears to depart from the general SSW-NNE direction towards the SW in the Northern zone in the vicinity of the Queen's Channel.

Therefore, the Eastern edge of both the Southern and the Northern zones of the Bonaparte Gulf Basin may not be directly aligned and connected.

This feature may be interpreted as suggesting the presence of Proterozoic rocks in the Queen's Channel, although the present configuration of the basin do not offer any other clue relative to this possibility (second interpretation - Appendix III).

In the Pelican Island as well as in Rocky Island, dips to the S and SE have been observed in the Permian Series. They could be interpreted as suggesting the existence in the Queen's Channel of a faulted area or a structurally high and tectonized zone (third interpretation in Appendix III).

As a conclusion and in the absence of further information, the Queen's Channel zone may not be merely an undisturbed area connecting the Northern and the Southern zone of the Bonaparte Gulf Basin.

II. PETROLEUM PROSPECTS

The petroleum prospects are unknown in this part of the Bonaparte Gulf Basin, but it is considered possible to find in the Queen's Channel zone the reservoirs known in the Southern part of the Basin and mainly found in the Devonian and Carboniferous series.

III. GEOPHYSICAL DATA

A. Gravity Survey

From 1955 to 1957 several gravity surveys were carried out both by B. M. R. and Mines Administrations Party Ltd. on ground on both sides of the Queen's Channel and in the

Channel itself by a B. M. R. team using underwater gravity meters.

These surveys had mainly shown the presence of two gravity lows, one on the Keep River area and the other one on the Port Keats area, while a gravity high was appearing in the Queen's Channel.

This feature suggested the existence of two basins separated by a high in the Queen's Channel.

B. Marine Seismic Survey

The marine seismic was carried out in 1961 by Seismograph Service Ltd. for Mines Administration.

This survey, which covered 185 miles, has generally given fair quality records mainly in the upper part of the section, we can probably say in the Permian. The result in the deeper part was generally too poor to allow a reliable interpretation and were also becoming mainly poor for all levels in the Queen's Channel.

From this survey, it seemed that the Queen's Channel was a high, fairly faulted area.

The general dip over the offshore off Port Keats area was of a North West direction.

An anticlinal feature crossed by a South West - North East fault was detected at the crossing of lines 2 and 3. On the western end of line 4, a general East dipping was appearing on some records.

The comparison between these results with the seismical data obtained on the Keep River area in 1962 by a G. S. I. crew working on behalf of Mines Administration Party Ltd. on the one hand and the results of the Pearce Point seismic survey conducted in 1963 by the Companie Generale de Geophisique for the Australian Aquitaine Petroleum Party Ltd. on the other hand, seemed to indicate that the investigation at depth of the marine seismic had not been deep enough.

The Pearce Point seismic survey has taught us also that the multiplication of both holes and geophones allowed to increase considerably the quality of the results. This information drove us to use a multiple coverage 300% for the next seismic survey.

The Pearce Point seismic survey brought to evidence the structural high of Kulshill in the Port Keats area, and it seemed not impossible that this high is connected with that of the Queen's Channel.

APPENDIX I

I. STRATIGRAPHY

Lithostratigraphy			Chronostratigraphy	
Port Keats Group	?		Upper	PERMIAN
	Keep Inlet Formation		Lower	PERMIAN
Weaber Group 1200'	Border Creek Form. 380'		Upper	CARBONIFEROUS
	Point Spring Form. 1440'		Upper	CARBONIFEROUS
Milligan Formation 1440'	Milligan Formation 1440'		Lower	CARBONIFEROUS
Eight Mile Creek Group NE 2000' min. SE 4135 ± 500'	Septimus Formation 275'		Lower	CARBONIFEROUS
	Enga Formation 800'		Lower	CARBONIFEROUS
	Burt Range Form. 3000 ± 500'		Lower	CARBONIFEROUS
Transition Zone 1500' 600'	Transition Zone		Lower / Upper	CARBONIFEROUS / DEVONIAN
Cockatoo Group NW 4433' SE 3570'	N. W.	S. E.	Upper	DEVONIAN
	Form. F	Form. III 1125'	Upper	DEVONIAN
	Form. E		Upper	DEVONIAN
	Form. D	F. II 345'	Upper	DEVONIAN
	Form. C	Form. I 2100'	Upper	DEVONIAN
	Form. B		Upper	DEVONIAN
	Form. A		Upper	DEVONIAN
Carlton Group 4284'	Jump Up Formation 1310'		Ordovician / Upper	CAMBIAN
	Skewthorpe Formation 344'		Middle	CAMBIAN
	Hart Spring Formation 2030'		Middle	CAMBIAN
Antrim Plateau Volcanics			Lower	CAMBIAN
PROTEROZOIC			Undiferencial	

SKETCH MAP

APPENDIX. III

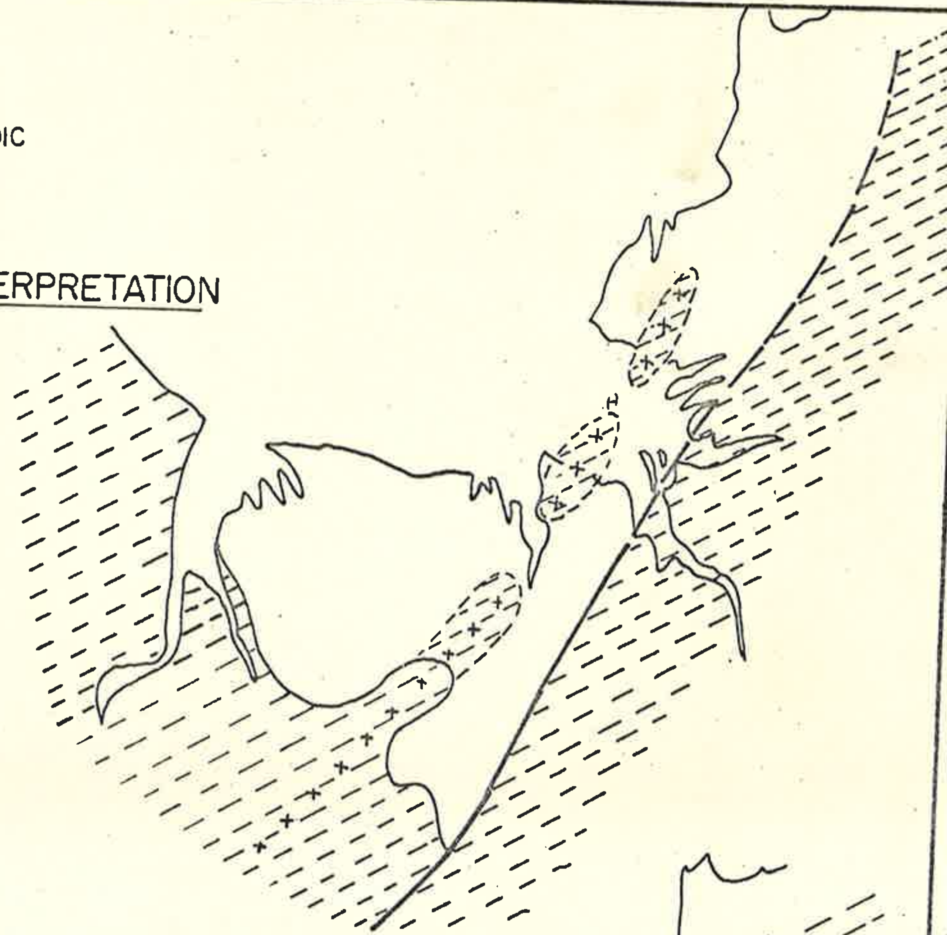
BONAPARTE GULF BASIN

PERMIT:	STATES: WESTERN AUSTRALIA NORTHERN TERRITOR
DATE: OCTOBER 1964	AUTHOR:
SCALE: 1/2 534 400	

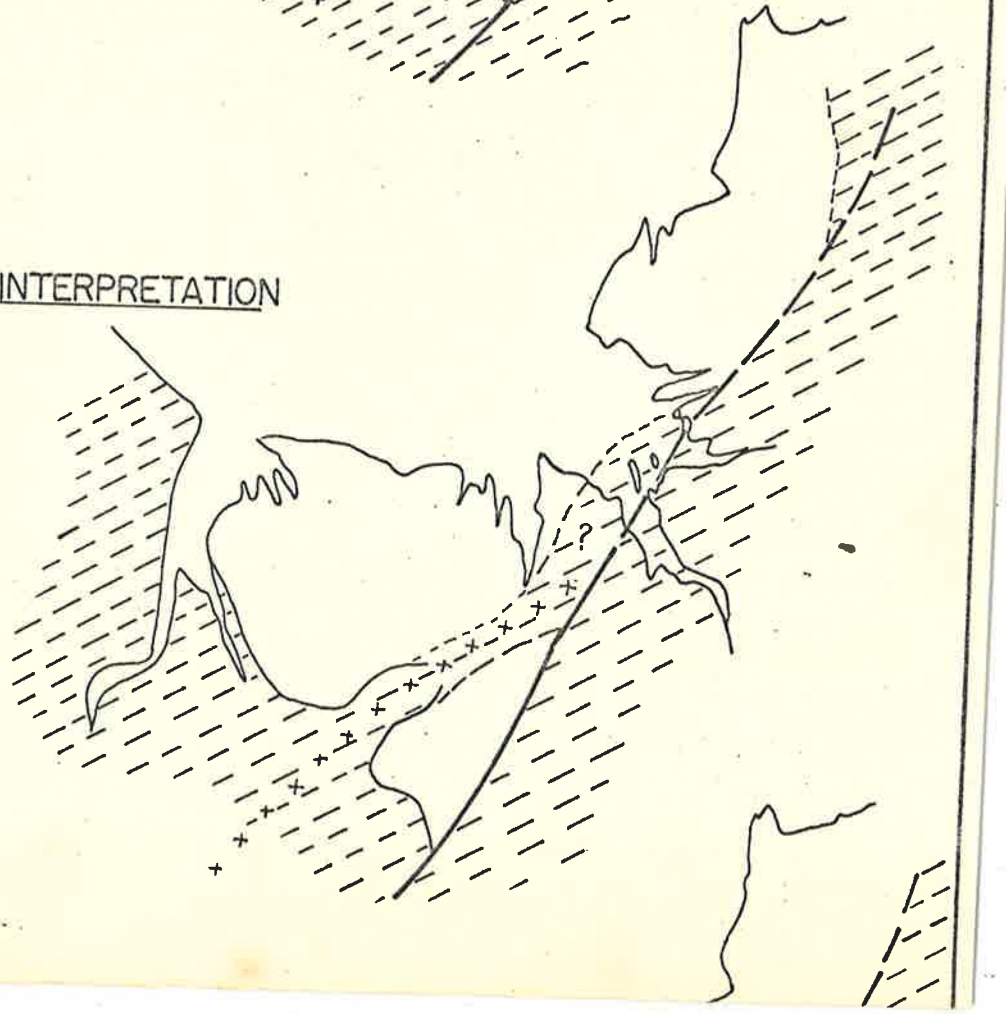
PALEOZOIC

PROTEROZOIC

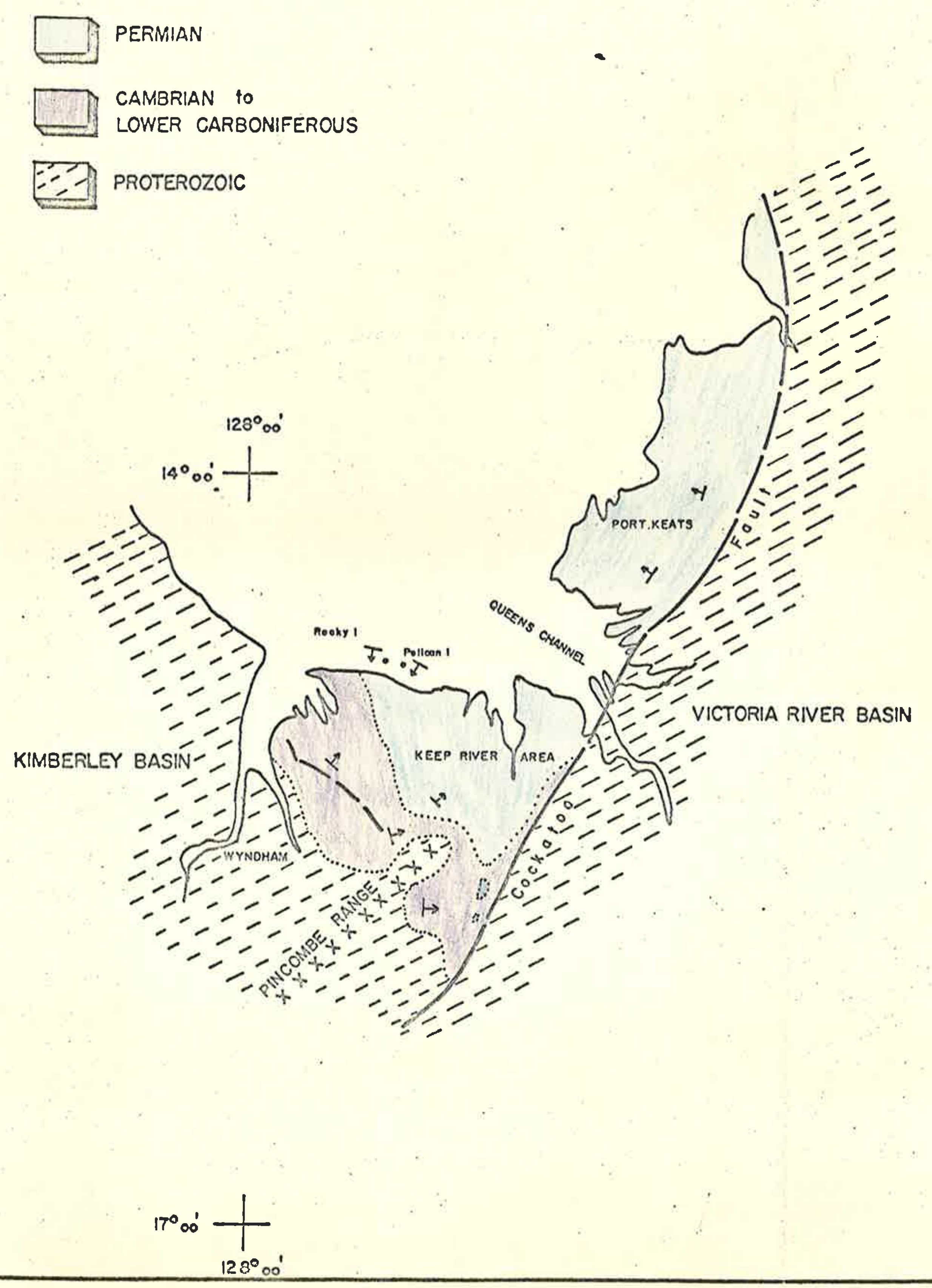
FIRST INTERPRETATION



SECOND INTERPRETATION



SKETCH MAP APPENDIX II	PERMIT:	STATES: WESTERN AUSTRALIA NORTHERN TERRITORY
	DATE: OCTOBER 1964	AUTHOR:
BONAPARTE GULF BASIN	SCALE: 1/2534400	



A. A. P. DRG N° 824

PART II

QUEEN'S CHANNEL SEISMIC SURVEY

BY

WESTERN GEOPHYSICAL COMPANY OF AMERICA

I. GENERAL INFORMATION

A. Location of Crew

The field crew was headquartered in Darwin, Northern Territory, Australia. The interpretive office was located in Shreveport, Louisiana.

B. Length of Project

Shooting operations were begun on May 23, 1964, and completed on July 1, 1964. The interpretation was completed on October 10, 1964.

C. Location of Area

This area is located in Petroleum Tenement O. P. 2 in the southeast corner of Joseph Bonaparte Gulf, extending roughly from Pearce Point on the north to Turtle Point on the south. Refer to Plate I for an Area Location Plat.

D. Objective of Survey

The major objective of this survey is (1) to establish the relationship between the Port Keats Area to the north and the Keep River Area to the south, (2) to check the high indicated in Queen's Channel by the 1955 to 1957 Gravity surveys, (3) to check the possible southern extension of a structure indicated by the Pearce Point Seismic Survey, and (4) to verify the east dip on line 4 of the former Port Keats Marine Seismic Survey of 1961 (along line QC9).

On a broader scale, the survey was conducted to give additional information as to the general structure of the offshore area of permit O. P. 2.

E. Operating Conditions

Operations in the Queen's Channel Area were hampered by tides in excess of 20 feet and tidal currents of 6 to 10 knots. In addition, the area is inaccurately charted, with channels and shoals shifting annually which, in conjunction with the strong tidal currents, made coastal navigation considerably more hazardous than usual.

F. Surveying

Two types of electronic surveying were used to place the recording boat at predetermined shot positions. SHORAN was used over most of the Queen's Channel Area while RAYDIST was necessary for the QC9 and QC10 lines. Both systems were furnished by Offshore Navigation, Inc., New Orleans, Louisiana.

1. "SHORAN"

The SHORAN system is a direct range method and consists of a mobile indicating unit mounted on the recording boat and two or more base stations permanently fixed (for a given network) at shore positions. This system is line-of-sight and normal rules of triangulation apply. Since it is line-of-sight, the range from a given base station is limited. In order to triangulate in good angles and to have sufficient range to reach the desired program, it was necessary to move the base stations. A total of four base station set ups were necessary in the Queen's Channel Area. Because of the short range of the SHORAN system it was necessary to use the RAYDIST system for the outermost Queen's Channel program.

2. "RAYDIST"

The RAYDIST system was used where the desired program was beyond SHORAN range. In this system (noted type N) three fixed transmitting stations and one mobile unit, mounted on the recording boat, are employed. The position of the recording boat is established by the intersection of hyperbolic lines of position. These lines of position are determined by the continuous wave phase comparison method and are designated "lanes". For coordinate purposes the lanes from one transmitting station are called "red lanes" and from the other, "green lanes". The lane count for both red and green lanes is registered continuously on phase meters and recorded permanently by a scribing device called a "continuous strip chart recorder". It is possible to register any desired location within range of the transmitting stations in red and green lane coordinates. These coordinates are easily converted to a rectangular system for posting on maps.

3. Basic Control

The two base stations required by the SHORAN system were installed aboard two landing craft which were beached at the desired points and moved to new locations when necessary. The base stations were not tied to known geographic markers but geographic coordinates were scaled as closely as possible from AGS charts SD-52 and photo control maps of the 1:48,000 series.

Basic control for the RAYDIST base stations was unavailable. The geographic coordinates were scaled as closely as possible from AGS Charts SC-52 and SD-52. Some inaccuracy in the shot point positions can be expected but if the base station positions are accurately fixed at some later date, the data can be re-computed and the shot locations accurately determined.

4. Location of Points on Maps

Base maps were constructed on the ATM (Australian Transverse Mercator) projection. Shot positions were post-plotted by ONI in New Orleans. A more complete discussion of SHORAN and RAYDIST methods and techniques is presented in a separate report submitted by ONI.

II. RECORDING

A. Major Boat Equipment

1. M/V "Oil Creek" - a 90-foot steel hull vessel powered by two 6-110 General Motors diesel engines and especially designed and equipped for use as a geophysical recording boat. Special equipment includes: ship to ship and ship to shore radio, radar, fathometer, and a power reel capable of handling floating geophone cable in excess of 8000 feet.

2. M/V "Bluff Creek" - a steel hull vessel of similar design and construction to the recording boat. As a shooting boat she is capable of carrying a full load capacity of 120,000 pounds of marine explosives.

3. M/V "Nelma" - this steel hull vessel of much smaller design was used as a supply boat for that portion of the survey controlled by RAYDIST.

B. Methods

The normal two-boat suspended charge operation was followed throughout this survey. In this method of operation the shooting boat cruises parallel to the detector cable, which has been previously towed into position by the recording boat, and drops the charge opposite the center buoy of the cable at a distance of about 400 feet. After the shooting boat has moved away, the charge (which is suspended five feet below the surface for optimum effect) is detonated electronically by the Observer.

C. Cable

A Vector Marine dual purpose cable (of Western design) was used throughout the survey.

The dual purpose cable is effectively two cables in one - a long cable and a short cable. The long portion of the cable consists of 24 groups of detectors uniformly spaced 100 meters apart with the exception of group 12 to 13 which is 200 meters. The short portion of the cable consists of 24 groups spaced 50 meters apart except 12 to 13 which is 100 meters. Each group (in both cables) consists of two dual dynamic pressure seismometers spaced 2 meters apart. (Note: Seis spacing for all shooting after May 31, 1964, is 20 meters.)

The overall distance from the center of group 1 to the center of group 24 is 2400 meters on the long spread and 1200 meters on the short spread. The cable lead-in measured from the SHORAN antennae to the center of the first group is 172 meters. Refer to Plate II for a schematic diagram of this cable.

D. Dual Recording

Through use of this special cable it is possible to make two simultaneous 24-trace recordings at each shot point on tape and/or paper. One recording covers the long cable (2400 meters) while the other covers the short cable (1200 meters).

E. Reversing Plugs

In order to hold cruising time to a minimum by allowing the freedom of shooting all lines in either direction, and yet obtain records tying together in a predetermined direction, cable reversing plugs were used on certain lines. As a check on the direction of shooting the time break appears on trace 4 of the monitor record when the reversing plugs were not in use and on 21 when the plugs were in use.

F. Shot Point Interval - Spread Length

A constant shot point interval of 400 meters was used in preplotting the shot point locations. This gave 300% overlapping subsurface coverage by the long cable.

Actual spread lengths were computed from water arrival times recorded on the lower portion of the long cable monitor record through special "water break amplifiers". The eight water arrival traces recorded times to groups 1, 4, 7, 10, 15, 18, 21 and 24 of the long cable. Groups

7 and 18 correspond to groups 1 and 24 of the short cable.

In parts of the area where tidal currents and sand bars were problems, the shot point interval was increased to 600 meters to allow the recording boat to manouvre the cable. This gave 100% subsurface coverage by the short cable.

G. Explosive Charges

The charge size varied from 16-2/3 pounds to 100 pounds. The average charge per shot was 58. 2 pounds.

H. Instrumentation

1. Magnetic Tapes

Two magnetic tapes were recorded simultaneously by Western-Techno tape recorders at each shot point. One tape recorded energy received from the short cable while the other recorded energy from the long cable. Western FA-32S amplifiers equipped with variable gain control and plug-in-type filters were used.

The tapes were recorded in the broad-band FL filter, tape AVC and an unmixed circuit. Refer to Plate III for a comparison of filter response characteristics.

The Western-Techno tape records 26 tracks of energy. When the tape is in drum position track O is on the left and records the 100 cycle timing signal. Tracks 1 through 24 are the seismic traces. Track 25 records the time break. Two additional tracks, 26 and 27 are available but were unused.

All tapes were recorded at one-half normal speed.

2. Monitor Records

A conventional 24-trace monitor record was recorded simultaneously with the tape recordings. This record monitored the long spread tape and recorded the water arrival times. Monitor records were recorded at 8 inches per second.

3. Field Playbacks

All short spread tapes were played back in "squiggle-trace" presentation. These served as monitors for the short cable tapes. Constant gain playbacks were made from every fifth long spread tape to serve as an additional check of the recording operation. These were recorded at 8 inches per second. All field playbacks were recorded in filters CNA, CFV, or 18-63.

I. Compositing and Playback Procedures

In the Shreveport Compositing Center the field tapes were stacked to 300% with the exception of portions of lines QC1, QC6, QC7 and QC8 which were shot with 600 meter spacing. The stacked tapes were played back unmixed in standard AVC through the CNA filter which had been chosen from samples as the most suitable filter for the area. Changes in filter choice were necessary on the northwest end of line QC3 where the CFE filter was used and on lines QC9 and QC10 where the CEW filter was found to be more suitable.

An SIE camera was utilized in playback to obtain sections with the dimensions specified by the Client.

J. Presentation of Data

Variable Area (VA) record sections were prepared from playbacks of the stacked tapes. All sections were made to a horizontal scale of 300 meters per inch and a vertical scale 6 inches per second. A complete set of reduced sections on film were furnished to the Client at a scale of 3.75 inches per second.

Long and short spread (100%) VA record sections were made (at the above scale) from dynamically corrected tapes to give continuous subsurface coverage. A sampling of 15% of the area was processed in this manner to serve as a comparison with the stacked sections.

On those lines shot with 600 meter spacing only 100% short spread record sections were made.

III. COMPUTING

A. Specific Methods

Each field record was labelled giving recording and other pertinent data for future reference. Corrections for a sea level datum were computed and a zero reference point set.

Magnetic tape playback records were corrected to a sea level reference plane by raising the shot and detectors to the surface at water velocity (4900 feet per second) and applying the appropriate filter lags.

A typical correction would be:

FL Tape Lag	-.012 seconds
CNA Playback Filter Lag	-.028 seconds
Depth of Shot Correction	+.001 seconds
Depth of Geophone Correction	+.003 seconds
Net Correction	-.036 seconds

B. Velocities and Dynamic Trace Corrections

A water velocity of 4900 feet per second was used throughout the prospect for determining spread lengths and record corrections.

The velocities to be used for dynamic trace corrections were derived from a normal moveout velocity analysis. Normal moveout plots were made from the average normal moveout of competent reflections taken from records selected from all lines of the survey. These were plotted against two-way time and an average velocity for the area was determined. The appropriate Western velocity function was selected on the basis of this velocity.

Dynamic corrections in the stacking procedure were made using Western's 46/9B velocity function over most of the area. The 37/6B function was used on lines QC2, QC9 and QC10. The two functions are very similar. As the velocity gradient changed over the area the cam activation (Cam Break) time was varied accordingly.

The tapes for the 100% long spread record sections were corrected using the 46/9B function while the 100% short spread record sections were corrected using the 20/3B function.

IV. MAPS

A. Base Maps

Base Maps of permanent cronar film were constructed by Western from shot point location maps supplied by ONI. These maps were made at a scale of 1:100,000.

B. Structure Maps

Structure maps were prepared in two-way record times as listed below:

1. Reflection Horizon "A"

   average reflection time - .800 seconds

2. Reflection Horizon "B"

   average reflection time - 1.300 seconds

3. Isotime: Interval "A" to "B"

4. Water Depth (in feet)

All maps were contoured on an interval of .025 seconds with the exception of the Water Depth Map which is contoured in feet (contour interval 20 feet).

V. INTERPRETATION

A. Origin of Horizons

1. Reflection Horizon "A"

This horizon was picked as a strong shallow reflection that carries over the majority of the area. Two horizon breaks were used (line QC6-130 and QC3-600) where the reflection became either too shallow or data too poor. Thus the horizon that was carried over map 4 is a much shallower reflection than that to the south on map 5.

2. Reflection Horizon "B"

This horizon was started in a strong reflection event on line QC2. Although this event became weak in places, it was continued over the majority of the prospect. As with Horizon "A", two horizon breaks had to be used to allow a reliable mapping depth on map 4 and on line QC7.

3. Isotime: Interval "A" to "B"

The A to B Isotime extends over the same area as Horizon "A".

4. Water Depth

Water depths were recorded over the entire area by a fathometer. The readings were converted to feet and posted at the appropriate locations.

B. Data Quality

The data quality over the area as a whole is fair. The poorest data can be generally outlined as lying between lines QC1 and QC8 and south of line QC2. The data at the "A" Horizon is much better than that of the "B" Horizon with the exception of the northwest end of line QC3, all of line QC9, and line QC10. The two reflections mapped on these lines are graded very good at both levels.

C. Faulting

It is quite evident on the record sections that certain parts of the area are highly faulted. One such zone appears to cross the area from southwest to northeast between lines QC1 and QC8. Another zone was just penetrated by the southeast end of line QC5. A faulted zone was encountered on the east end of line QC9 and the south end of line QC10.

The throw on all faults was based on reflection correlation or loop misclosure. In no instance were faults of poor quality assigned throw. Numerous possible faults were noted on the maps, however these were not assigned throw either because their size could not be determined or their importance to the interpretation was considered minor.

With the loose reconnaissance type control that was shot in the area, it is difficult to say what the exact fault alignment should be. In general however the fault cuts (including the possible faults) tend to align themselves in a northeast-southwest direction. With additional control a more refined fault pattern could be established.

D. Section Comparison

One hundred (100%) per cent variable area record sections of the long and short cable were made on 15% of the shooting. These were used as a comparison against the 300% stacked sections. It was noted that in every case, the stacked sections were superior, however, the 100% sections were found to have some advantages over the stacked sections.

Sections of the short spread were better for close-in detail of faults and for data above .500 seconds. Sections of the long spread were useful in detecting multiples, especially in the deep part of the section (below 2.000 seconds).

E. Structural Discussion

Structural features of interest include two closed anticlines and several seismic leads.

1. Primary Structures

The predominant structure of the area is located at shot point 418 on line QC3. A second closure is present on the same line at shot point 427.

The largest and most prominent of these features measures approximately 2 by 4 miles and if closure against the fault (graded good) is included has closure in excess of .130 seconds (1400 feet).

2. Secondary Structures

A structurally high area is indicated on the southwest side of Queen's Channel along lines QC6 and QC7. These are undefined with the present control but the indication is that this trend comes from the southwest and continues toward the northeast with accompanying faults.

An area of faulting and structural buildup is indicated on the east end of line QC9 as well as the south end of line QC10. Whether these two are related or not could not be established with the present control.

F. Conclusions and Recommendations

Before any reliable conclusion can be made on the Queen's Channel Area, all of the seismic data from previous surveys will have to be integrated with the present survey. Once this is accomplished, the gravity and geological information can be weighed along with the seismic data to determine if the objectives of the survey have been completed.

Some important facts have been established by this survey.

1. Data quality is greatly improved by the 300% stacking process.
2. Near surface basement is indicated immediately outside the survey on the southwest side of Queen's Channel.
3. The Queen's Channel proper appears to have more sedimentary section below Horizon B than the area to the north, offshore from Port Keats.*
4. An undefined high area is indicated at the outlet of Keep River southwest of Turtle Point.
5. Regional dip is generally toward the northwest.

It is recommended that if additional shooting is carried out in the area that at least three-fold coverage be used. Six-fold coverage is recommended if interest is primarily in the deeper section (below Horizon "B").

As noted several times throughout this report, additional program is desirable for better relationship, especially in reference to those lines left hanging with no loop ties.

(* This may be due to the absence of good reflectors in the deep data of that part of the area.)

Those areas with structures or indicated structures require a closer grid for complete delineation.

If detail work of the area is contemplated, it would be desirable to have 100% long and short spread sections for multiple discrimination and fault interpretation.

VI. STATISTICAL DATA

Client:

Australian Aquitaine Petroleum Party, Limited

129 Elizabeth Street

Brisbane, Queensland, Australia

Contractor:

Western Geophysical Company of America

933 North La Brea Avenue

Los Angeles 38, California, U. S. A.

Key Personnel:

V. C. Boyd	Supervisor
J. A. Dees	Operations Manager
J. A. Rasmussen	Operations Co-ordinator
A. C. McEachern	Operations Co-ordinator
J. E. Dawson	Observer
K. Caillouet	Observer
J. B. Hebert	Shooter
K. Kovacic	Supervisor SHORAN and RAYDIST Operations

Number of Shot Points

400 meter spacing -------------------------- 1027

600 meter spacing -------------------------- 58

Mileage -------------------------------- 278.5 miles

Explosives Used -------------------- 63,100-1/3 pounds

Average Explosive Charge per shot point ----- 58.2 pounds

Location of Field Headquarters -------- Darwin, Australia

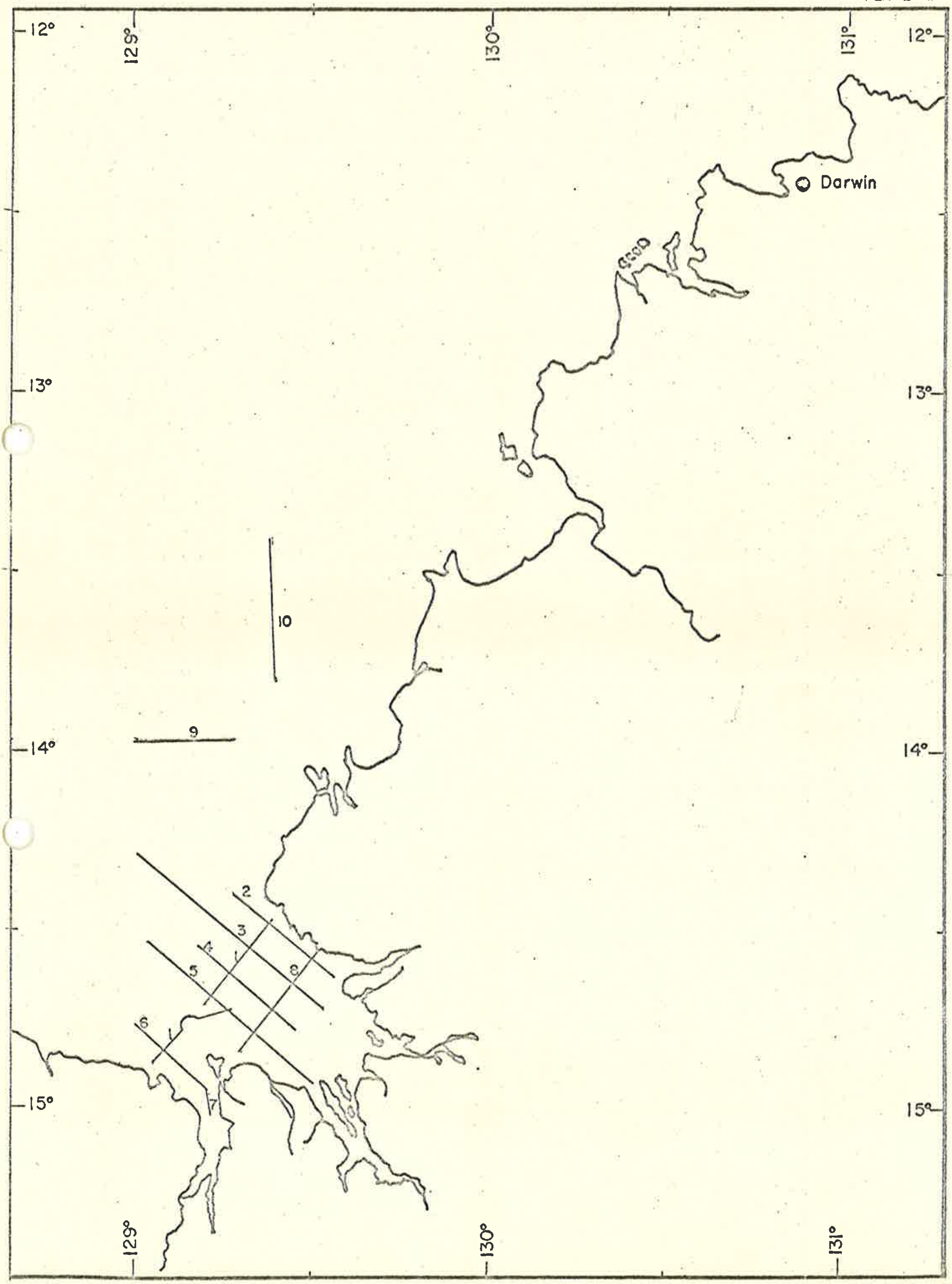
Location of Interpretive Offices------Shreveport, Louisiana

Survey commenced ---------------------- May 23, 1964

Survey completed ------------------------- July 1, 1964

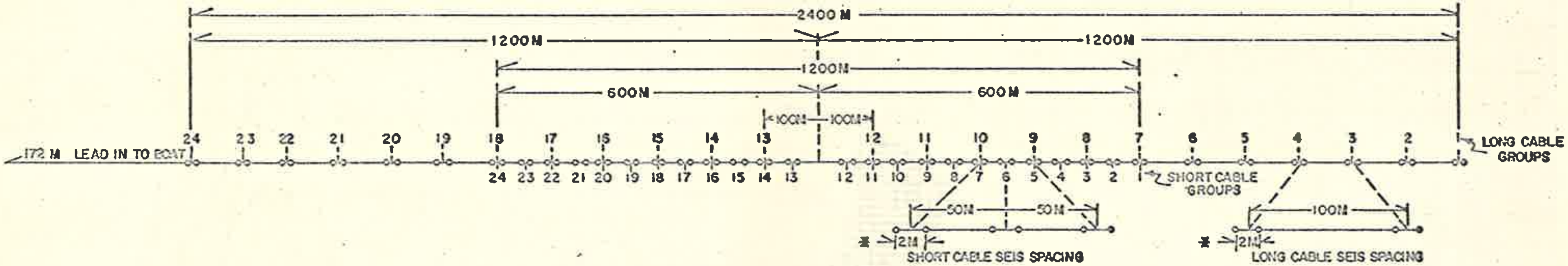
Interpretation completed -------------- October 10, 1964

PLATE I



AREA LOCATION PLAT

DIAGRAM OF DUAL CABLE



TWO (2) DUAL WESTERN PRESSURE GEOPHONES PER GROUP

MEASUREMENTS NOT CORRECTED FOR SAG

* SEIS SPACING ON WORK AFTER MAY 31, 1964, 20 METERS

Western

GEOPHYSICAL COMPANY OF AMERICA

PLATE II

WESTERN GEOPHYSICAL
DIVISION OF LITTON INDUSTRIES

NORMAL MOVEOUT CAM CALIBRATION

for

WESTERN TAPE TRANSPORT MODEL B-A26-2 M024

AUSTRALIAN AQUITAINE PETROLEUM PTY. LTD.

Date	Velocity Function	Spread	Cam	Multiplier	Elevator	Break Time	Computed By
		2400	20/38	1.0	0	.400	
		4000	46/98	1.0	0	.520	
		4000	37/63	1.6	-4	.560	

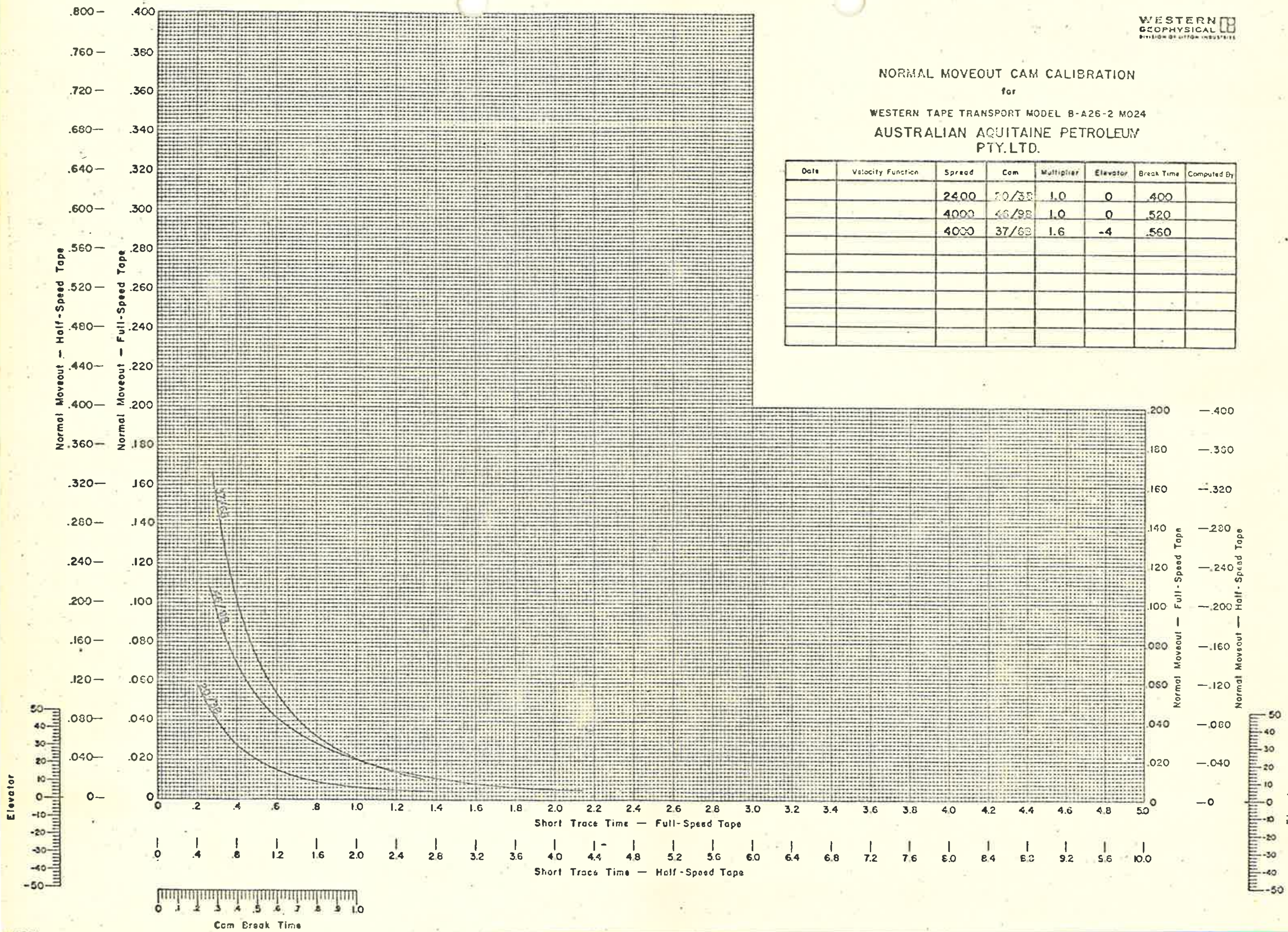
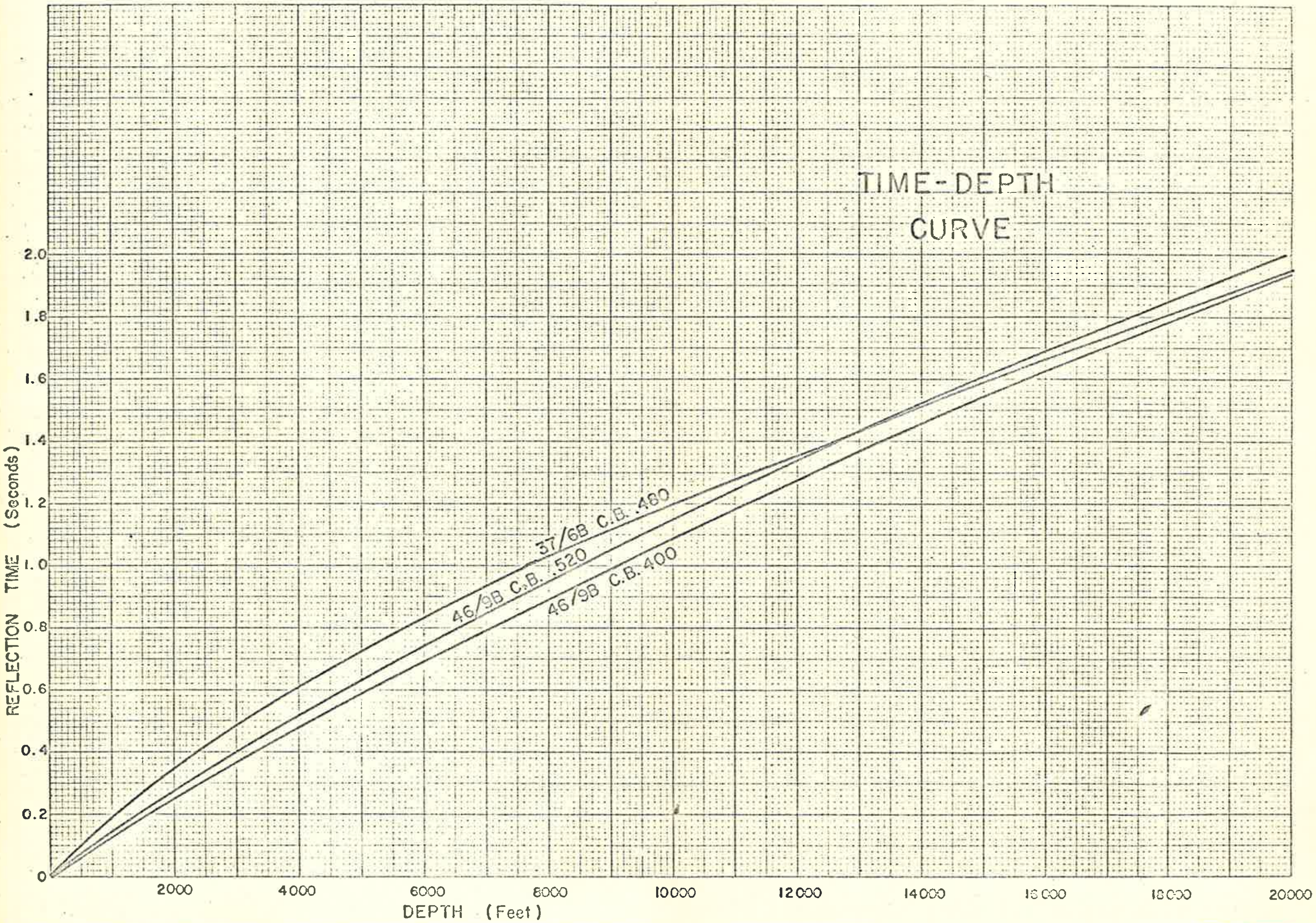


PLATE IV



TIME-DEPTH
CURVE
37/6B C.B. 480
46/9B C.B. 520
46/9B C.B. 400
REFLECTION TIME (Seconds)
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2000
4000
6000
8000
10000
12000
14000
16000
18000
20000
DEPTH (Feet)

PLATE V