

Bass Basin part VI

BASS ED-67 MARINE SEISMIC SURVEY

FINAL SUBSIDY REPORT

BY

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OR - 006

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Sydney, N.S.W., Australia  
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ABSTRACT

The Bass Basin started to form in the Upper Cretaceous. The basin originated as an embayment of the South Australia-Otway sea. An en-echelon system of faulting on the northeast and southwest flanks of the basin developed prior to the Cenozoic era and has had subsequent movement through the close of the Oligocene. Overall basin movement throughout most of the Tertiary has been characterised by subsidence. However, the King Island-Mornington Peninsula and other local areas remained relatively stable and are expressed today as structural highs. Some late uplift of local features is evident. Deposition underwent a transition from continental deltaic to marine deposits as the seas transgressed to the east.

The area of the "Bass ED-67 Marine Seismic Survey" is along the divide between the Bass and the Otway-Anglesea Basins. One new structural lead has been found and one old lead has been partially defined.

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## VARIABLE DENSITY SECTIONS (TWO (2) COPIES OF EACH)

LINES ED-58, ED-61, ED-81, ED-82, ED-83, ED-84,  
ES-58, ES-61, and ES-81

## INTRODUCTION

The Bass ED-67 Marine Seismic Survey was carried out for Esso Exploration Australia Inc., by Geophysical Services International. The survey commenced on November 27, 1967 and finished on December 1, 1967. The survey was conducted in Victoria Petroleum Exploration Permit No. 40 and Tasmania Exploration Licences No.1/60 and located in the northwestern end of the Bass Basin, northeast of King Island.

A total of 212.87 miles of six-fold common depth point reconnaissance data was recorded. In addition to the new survey, 38 miles of previously recorded six-fold and single-fold data were reprocessed to provide optimum control for correlating the new data.

## OBJECT OF SURVEY

The reason for the seismic program was to provide reconnaissance control in the one remaining potentially prospective unexplored area of the Esso-Hematite Bass Farm-in. The objective being to develop possible structural leads and to outline, more clearly, the geologic framework of the basin.

## INTERPRETATION

The seismic grid in the basin, except for local detailing, is reconnaissance and therefore the interpretation presented is of a regional nature. The new data recorded has extended this reconnaissance control into the northwestern margin of the basin providing a better correlation between the Bass Basin and the Otway-Anglesea Basin.

Generalized Geologic History - The Bass Basin lies at the southern end of the Paleozoic Tasman Geosyncline whose rocks probably exceed 40,000+ feet in thickness. This section is a complex of folded, faulted and intruded marine to non-marine sedimentary, metamorphic and igneous extrusive rocks. It is this sequence of rocks that underlies the clastics deposited during the Cretaceous and Tertiary times in the basin. These Paleozoics along with Mesozoic greywaches from north of the basin probably serve as the source for the Cretaceous and Tertiary sediments. The basement rocks drilled by Esso Bass-2 were probably Mesozoic volcanics and at Bass-3 were Precambrian low grade metamorphic rocks similar to those exposed in northwest Tasmania.

Prior to Cretaceous deposition, a system of faults, on trend with the northeastern Tasmanian fault systems, developed on the northeast and southwest flanks of the basin. The faults generally are en-echelon and, in some instances, form a system of horsts and grabens.

The thick section of Lower Cretaceous sediments found in the Anglesea area are not known in the Bass Basin. The eastern and southern depositional limits of these sediments were probably fault controlled. It is postulated that any of these sediments deposited within what later became the Bass Basin were laid down in an intermontaine basin environment and are restricted to local areas of accumulation.

The Bass Basin is of Upper Cretaceous depositional origin and began as a large embayment of the South Australian-Otway sea, bounded by Victoria and

Tasmania to the north and south and the Bassian Rise to the east. The area was further restricted by the Tasmania-King Island-Mornington Peninsula uplift to the west which has been a positive feature of varying degrees throughout the history of the Bass Basin. The Upper Cretaceous seas transgressed at least as far east as Esso Bass-3. Structural movement throughout most of the Tertiary was in the form of subsidence and block faulting with the present highs remaining as stable areas. Evidence of structural uplift noted in the basin is very young, at least post-Oligocene in age.

Gentle regional subsidence with swamp conditions and dominantly continental depositions began with the Upper Cretaceous and prevailed during the Paleocene and Lower Eocene. These sediments as seen in the three wells drilled in the basin are a deltaic complex made up of interbedded sandstone, siltstone, shale and coal. A marine pulse is evident near the top of this unit in Esso Bass-2. Local unconformities were prevalent throughout this period of sedimentation. The close of the Lower Eocene was marked by a period of gentle uplift, fault rejuvenation and a widespread occurrence of local unconformities.

Gentle subsidence resumed during the Upper Eocene with continual fault movements along the older fault zones. The 1500+ feet of sediments that were deposited at this time represent a period of transition from non-marine to restricted marine conditions. The Upper Eocene Demons Bluff marine shales and mudstones were apparently deposited conformably upon the shallow water Boona sandstones, which grade downward into the Lower Eocene continental sands, shales and coals. As the seas transgressed the basin margins, this unit pinched out to zero on basement, beyond the limits of the Paleocene-Lower Eocene deposits. The total Eocene to Basement interval thins to 750+ feet in the saddle between King Island and Mornington Peninsula. Local volcanic activity was evident at this time. Also gentle erosion around the margins of the embayment may have occurred at the close of the Eocene.

During the Oligocene, basin subsidence and marine transgressive deposition continued, depositing 1750± feet of sediments in the basin centre. The Oligocene sediments pinch out as they overlapped beyond the Eocene on basement towards the Bassian Rise and thin to approximately 500 feet in the saddle between King Island and Mornington Peninsula. The sediments were mostly shale and mudstone with some sandstone and tuffite. The tuffite was deposited by extensive volcanic activity which marked the close of the Oligocene. Many volcanic build-ups are recognizable on the seismic sections, particularly in the centre and western parts of the basin.

A time of major subsidence began with the Miocene. The transgressive seas and marine deposition continued. Over 4000 feet of Miocene and younger Cenozoic deposits were laid down. The areas north and south of the northwest-southeast trending faults on the flanks of the basin remained relatively stable while the centre portion subsided forming the basin as we see it today. The King Island-Mornington Peninsula high experienced its last major period of movement during the early Miocene. The Bassian Rise on the east continued to subside until it was completely overlapped by late Miocene sediments. These were the first rocks known to be deposited across the divide between the Bass and Gippsland Basins. Some mid-Miocene volcanic activity occurred. One of these build-ups was penetrated by Esso Bass-1.

A thin veneer of Quarternary sediments cover the Tertiary deposits.

Local Geologic Setting - The area covered by the Bass ED-67 Marine Seismic Survey is located along the crest and eastern flank of the King Island-Mornington Peninsula uplift. This divide between the Bass and Otway-Anglesea Basins is one of the few examples in the region of the Bass Basin of positive movement. The thick Lower Cretaceous deposited to the west is bounded in the east by this high basement feature. Some 2000± feet of sediments present in the saddle of the uplift pinch out in the direction where basement outcrops to the north and south and thicken to the east and west toward the basin deeps. The section towards the Anglesea area is postulated to thicken rapidly by a series of basement faults. However, good seismic examples of this hypothesis are lacking, but it is known that the sediments thicken gradually along the moderately faulted slopes into the Bass Basin.

The Upper Cretaceous to recent sediments seen in the Bass Basin are deposited across the divide between the Bass and Otway-Anglesea Basins. These sediments thin on to the uplift both by erosion and by structurally controlled deposition.

The low saddle on the arch has shifted slightly to the north from Eocene time to the present. An isopach of interval Top Eocene to Top Basement is shown by Plate IV to have a saddle position in the area of line ED-81. Present structural mapping shows the saddle of the Eocene and Oligocene is located north of line ED-61 (see Plates I and II). The saddle on Basement is broader and is divided into two parts by a positive area located on lines ED-61 and ED-84 (see Plate III).

Horizons Mapped - Four geological maps have been prepared from the seismic data in the Bass Basin. These are the Top of Oligocene; Top of Eocene; Basement structure maps and the Top of Eocene to Basement isopach map.

The Basement horizon has been mapped where basement is shallow enough for sufficient energy penetration to produce a reliable reflection. The general character of basement is a irregularly dipping high amplitude reflection. The energy level on the seismic recordings drops markedly below the basement reflection, which helps to isolate the sedimentary section. The structural map on Basement is presented by Plate III.

The Top of Eocene structure map is based on a good continuous reflection which correlates well throughout most of the basin. The Upper Eocene basal sand unit (Boona sand) as seen in Bass-1 and Bass-2 has good porosity and is considered a potential reservoir. The structure map on Top of Eocene is presented by Plate II and isopach Top of Eocene to Basement is presented by Plate IV.

The Top of Oligocene structure map is based on a high amplitude reflection often exhibiting erratic dips. The reflection becomes too shallow to map to the north and south where it approaches the basement outcrop areas. Many volcanic build-ups are apparent on the seismic sections at the Top of the Oligocene and the characteristic erratic dips are considered to be evidence of local volcanic deposition. Plate I is the structure of the Top of Oligocene.

Anomalies - Structural anomalies are not well developed in the Bass Basin. The King Island-Mornington Peninsula regional arch, a prominent feature of the basin, is also lacking in local structural reversals. There are, however, two structural anomalies worth discussing. These are the closed basement structure centred near the intersections of lines ED-61 and ED-84 and the closure mapped on the Top of Eocene is located by lines ES-62, ES-63 and ES-81.

The Basement structure on lines ED-61 and 84 is a broad low relief feature with at least 200 feet and possibly 450<sup>±</sup> feet of vertical relief. Present structure on Top of Eocene is a nose plunging from south across the area. During deposition of the gross interval Top of Eocene to Basement, Plate IV, a positive existed in this area as indicated by the thin on the isopach map. It is located in the divide on the north side of the saddle. Part of the north closure on the basement structure would appear to be created by the tilting that caused the shift in the saddle from its early position, south of the structure to its present position north of the structure. The shallowness of any potential reservoir, detracts from the attractiveness of this feature as a prospect. Basement at the highest point within the closure is about -1800 feet.

The large very low relief (150 feet of vertical closure) structure mapped on the Top of the Eocene and centred at the intersection of ES-56 and ES-62, even though detailed by shooting, must still only be considered a lead since it is based mostly on poor data. This area was a low throughout early deposition and was later uplifted to form the present structure. This structural eversion was most likely associated with the very young north-south trending fault lying to the east. See VDF lines ES-56, ES-62, ES-81, B-10, and B-12. Correlations on analog lines B-10, B-22, ES-55, ES-56, ES-62 and ES-63 are very poor due to poor corrections and water bottom multiple interference. These lines could be substantially improved by reprocessing the data digitally. Better delineation of this structure is required before it can be considered as a prospect.

Three basement block fault structures and eight areas of Oligocene volcanic build-ups are non-prospective anomalies in the area of the survey. Basement is faulted to or very near to the surface of the sea bottom on the two blocks crossed by lines ED-81 and ED-84. The third basement block crossed by lines B-23 and ES-59 is somewhat smaller in area and is covered by the Oligocene sediments. The interpreted late Oligocene volcanic build-ups are very similar to that drilled by Bass-1. The largest build-up is approximately 30 square miles in area and is centred near the intersection of lines EB-1 and EB-3.

### CONCLUSIONS

The delineation of the local geology and the understanding of the regional relationship of the Bass and Otway-Anglesea Basins have been improved by this survey and the reconnaissance picture of the Bass Basin is now complete.

The King Island-Mornington Peninsula uplift has two local structural closures of questionable importance, the shallow basement structure near the intersections of lines ED-61 and ED-84 and the young structure based on poor data centred near the intersection of lines ES-57 and ES-62.

## APPENDIX A

DATA QUALITY AND RELIABILITY

The quality of the Bass ED-67 Marine Seismic Survey is generally good, ranging from fair to very good. The new six-fold ED lines show the best quality followed closely by the reprocessed six-fold and single ES lines. The improvement of the six-fold ED-67 survey data over the six-fold Eastern Bass Strait Survey data is attributed to the split spread shooting technique which provided better shallow signal to noise relationships. The digital processing of the dual analog and digital recorded ES data showed marked improvement over the analog processing, mostly because of the digital deconvolution technique.

The new data has been integrated with the previously recorded analog data in the area of the survey to produce the interpretation presented. The older data ranges in quality from poor to good. Therefore, in some areas the quality of the mapping is considered poor, but for the most part is reliable.



## APPENDIX B

FIELD OPERATIONS REPORT  
MARINE SEISMIC SURVEY  
OTWAY\*AND BASS BASINS (AUSTRALIA)  
27 November 1967 to 2 December 1967

for  
ESSO EXPLORATION AUSTRALIA INC.

by  
GEOPHYSICAL SERVICE INTERNATIONAL (GSI)  
A division of Texas Instruments Australia Limited  
Sydney, New South Wales, Australia

GSI Party 973

D. R. Bealer, Operations Supervisor  
Art Martens, Client Representative

January 1968  
\* This report contains reference to 61.14 miles of Otway EP-67 Marine Seismic Survey shooting which is not applicable to the Bass ED-67 Marine Seismic Survey



## ABSTRACT

A marine seismic survey was conducted by Geophysical Service International (GSI) Party 973 (M/V CARIBBEAN SEAL) for Esso Exploration Australia Inc. from 27 November 1967 to 2 December 1967 in Otway and Bass basins, Australia. Predetermined shotpoint positions were IBM-computed.

Navigation was by Hifix operated by Amalgamated Decca Surveys Pty. Ltd. (DECCA) under contract to GSI. The shipboard survey equipment and the shore stations were operated by DECCA personnel.

Logs were maintained on all instrument settings, streamer depths, water depths, ship positions and shotpoint and streamer locations.

Field headquarters were established in St. Kilda, Victoria, Australia.

The seismic program, survey method, instrumentation operating techniques and operational results are presented in this report.



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## PLATES

Plate	Description
A	THE SEISMIC PROGRAM
B	SPREAD DETAILS
	1. SHOT BETWEEN 12 AND 13
	2. SHOT BETWEEN 18 AND 19
	3. SHOT OFF NO. 24
	4. SHOT OFF NO. 1
C	CABLE DIAGRAM — <i>MISSING</i>



SECTION I  
AREA OF SURVEY

A. SEISMIC PROGRAM

The seismic program (Plate A) was in the Otway and Bass basins. Lines were shot for sixfold common depth point (CDP) coverage. Shotpoints were numbered consecutively, beginning with SP 1 in each area.

B. PHYSICAL CONDITIONS

The survey was located in areas of relatively flat seabed. Average water depth was about 36 ftm. Recorded water depths ranged from approximately 29 to 42 ftm.

The weather conditions were good throughout the project.



## SECTION II STREAMER

The neutrally-buoyant 6900-ft streamer (Plate C) employed throughout the prospect has 24 equally-spaced 100-ft long-live sections. Each live section has 20 crystal detectors spaced at 4 ft 10.5 in. intervals, the outputs of which yield one trace. Adjacent live sections, including groups 12 and 13 were separated by two dead sections each 100 ft long.

There were four stretch sections and one dead section preceding group 24. The stretch sections contained nylon stress members to attenuate noise generated by the towing vessel. One dead section and one stretch section followed the last live section (group 1) and a tail buoy was attached to the end of the streamer by a nylon rope.

The streamer was ballasted to ride horizontally below wave action. A variable length of nonbuoyant lead-in cable connected the streamer to the towing vessel. Streamlined weights were attached to the end of the lead-in cable. Under continuous tow, the streamer became hydrodynamically stable at a depth which is a function of its speed through the water, the length of the lead-in cable and the relative buoyancy along the streamer's length.

Six pressure-sensitive depth transducers, spaced along the streamer's length, displayed streamer-depth readings in the range of 0 to 100 ft. Readings were taken from meters in the instrument room. Average streamer depth was 50 ft.



Digital recording was done with group 24 at the head end of the streamer.

Reverse polarity was discovered in one trace after the initial polarity tests had been evaluated. This was corrected and noted on the quality-control daily report.



### SECTION III SYSTEMS

#### A. RECORDING AND AMPLIFICATION SYSTEM

The output of each live-streamer section was amplified by a Texas Instruments Model 10,000 Amplifier System, recorded by a Texas Instruments 10,000 Seismic Digital Field System (DFS), and a direct playback made on a SIE-VR06 photo-oscillograph, simultaneously. A monitor record was made periodically.

Non-filter recordings, amplifier parallel tests, dynamic-range tests, and other periodic, quality-control instrument tests were performed prior to production work. Ambient noise level and straight-gain recordings were taken daily to determine signal-to-noise ratios. Dynamic range determination tests of the DFS, Programmed Gain Control (PGC) calibration check, instrument noise tests, and Ganged Automatic Gain Control (GAGC) oscillator tests were performed daily.

Instrument settings for production work were established initially after consultation with the client representative.

#### B. WATERBREAK SYSTEM

Direct path, shot-to-detector energy provided data for locating the shot relative to the streamer. First-arrival signal was taken from selected streamer groups and fed to waterbreak amplifiers which respond to the frequency of water-borne acoustic energy. Waterbreaks appeared on traces 26, 27, 28, 29, and 30 on monitors and playbacks. Waterbreaks were recorded in the appropriate tape channels by the DFS.



## SECTION IV OPERATING TECHNIQUES

### A. SURVEYING

DECCA was subcontracted to GSI to provide positioning throughout the project. Hi-fix was the system used, and all equipment was operated by DECCA personnel.

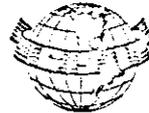
The initial calibration (Appendix A), was carried out by crossing the base-line extensions at the master station and also at the two slave extensions. The CARIBBEAN SEAL then carried the calibration for the remainder of the short-term project and tied in correctly at the final calibration.

The shooting boat IMLAY carried DECCA recording equipment and recordings of its position were made during production shooting.

The setback distance from antenna to shotpoint varied as did the shotpoint location, and these variations were noted with the post-plot coordinates.

### B. SHOOTING

The M/V IMLAY was used as a shooting boat throughout the project. The firing line was attached to the charge which was supported by an inflated plastic bag. The charge was fired about 100 ft. behind the shooting boat and at a depth of approximately 6 ft. The blaster, controlled by the GSI clock system, detonated the charges. At the instant the blaster fired, a signal was received at the DFS which then designated the next clock pulse on tape as timing-word zero. This is seen as a time break on trace 4 of the monitors or playbacks. Charges were fired every 600 ft. for the sixfold CDP coverage. The explosive used was Nitro-Carbo-Nitrate in 50-lb. canisters. Charge size at a shotpoint is noted on the observer's logs.



### C. RECORDING AND SHOOTING CYCLE

The recording and shooting cycle was determined by the ship's traverse between predetermined shotpoint intervals. This time interval was set into a master clock (an interval timer which zeros and resets automatically) which controlled the recording and shooting sequence. Changes in ship's speed were compensated for at the master clock. The master clock, set into a Time Co-ordinator Unit, controlled an interval timer in the instrument room, which transmitted a loading and a firing tone to the shooting boat. Hifix readings were taken at the shot instant. A relay controlled by the instrument room counter caused a mark to be placed on the fathogram at the shot instant.

Two continuously recording fathometers were available on the recording boat, one on the bridge and the other in the instrument room. The latter was used during all recordings. A lead-line check was made on 25 November and both fathometers were found to be accurate to the nearest foot. Lines were identified on the fathogram and every tenth shotpoint numbered.



SECTION V  
CONCLUSION

Production on this project was successful with over 50-mi shooting/day being average for the five days of shooting. The weather was good throughout, and this, aided by the fact there was no trouble with the equipment, led to high production and good quality data.

The client representative, Mr. Art Martins, was aboard for the duration of the shooting and his co-operation with the crew was appreciated.

Respectfully submitted,

Donald R. Bealer  
Operations Supervisor



APPENDIX A  
INITIAL AND FINAL DECCA CALIBRATION



## CALIBRATION REPORT

The survey party travelled from Sydney to Bass Basin area on Saturday, 25th November.

The calibration was carried out in conjunction with the recording vessel CARIBBEAN SEAL.

The Hi-Fix antenna on CARIBBEAN SEAL was intersected by simultaneous theodolite observations from two observers ashore at previously surveyed marks. The co-ordinated position of the antenna at each fix was computed and these co-ordinates converted to computed Hi-Fix readings which were then compared to the observed Hi-Fix readings taken at the relevant fix.

The above procedure was followed in the vicinity of Master Station at Cape Schanck and Slave I at Cape Liptrap. These observations were completed by 1845 Monday, 27th November. In order to enable the CARIBBEAN SEAL to proceed with her survey with the minimum of delay, a selection of the fixes in the vicinity of Master were computed in the field. Also during Monday, 27th November, the total number of lanes in Patt I were observed in CARIBBEAN SEAL by obtaining the Hi-Fix readings of the Patt I extension at Master and Patt I extension at Slave I.

The total number of lanes observed in Patt I checked with the computed figures, and the preliminary computations of the calibration observations in the vicinity of Master gave satisfactory results, enabling pattern corrections to be applied to the Slaves at 2100 on Monday, 27th November.

The chain was then effectively operational subject to completion of the computations and further checks if required. Corrected



Hi-Fix co-ordinates of reference points in Westernport Bay and for the Base line extensions were passed to CARIBBEAN SEAL at a rendezvous at Flinders in Westernport Bay at 0100 Tuesday, 28th November, enabling CARIBBEAN SEAL to sail at dawn to commence her programme.

The completed computations showed an anomaly in the readings obtained in the vicinity of Cape Liptrap and these were subsequently disregarded. Although the original settings applied were not seriously in doubt it was decided that the survey party should carry out a further check in the vicinity of Apollo Bay.

This check was carried out by surveying in the seaward end of the jetty at Apollo Bay. The co-ordinates obtained were converted to Hi-Fix co-ordinates and these compared with observed Hi-Fix readings obtained from a Hi-Fix Ship receiver established at the end of the jetty. These readings checked within 2/100th of a lane for both patterns and confirmed the original pattern settings.

The final pattern settings and opposite slave readings were :

<u>At Slave I</u>		<u>At Slave II</u>	
Patt I	Patt II	Patt I	Patt II
.25	.85	.94	.28

Corrected Hi-Fix Co-ordinates

<u>Reference Point</u>	<u>Patt I</u>	<u>Patt II</u>
Flinders Jetty	106.70	000.20
Flinders Buoy Flashing G.	148.68	000.41
Patt. I - Master Extension	000.08	
Patt. I - Slave Extension	1250.89	
Apollo Bay Jetty	93.99	1428.89



Total number of lanes observed Patt I	1250.89
	<u>000.08</u>
	1250.81
	<u><u>          </u></u>
Total number of lanes computed in Patt I	1250.98
	<u><u>          </u></u>

The results are considered satisfactory.

Diary of events and summary of observations are attached.

N. L. Sanderson.



APPENDIX B  
MAPS SHOWING DECCA SHORE STATION POSITIONS



## CAPE SCHANCK MASTER

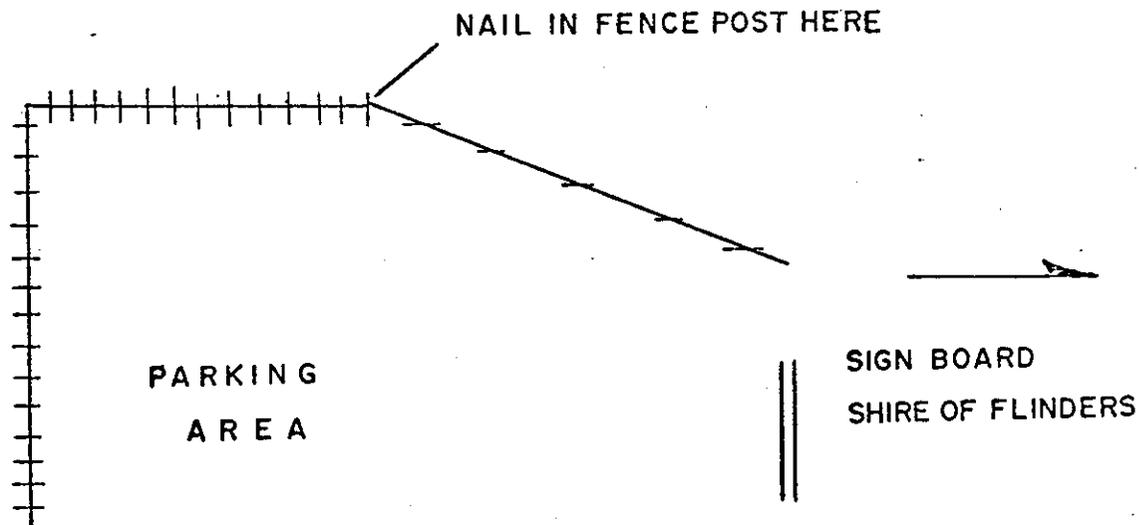
### Access Cape Schanck Trig and Wallermyong trig

Take the road from Rosebud to Flinders (via Boneo). After 8 miles you reach the turning to Cape Schanck on the right hand side. Cape Schanck is on the corner. Proceed along the road to Flinders, pass the bridge over the creek and on the right hand side just after the gravel road becomes asphalt you will find the estate "Clondrisse" (about 2.5 miles from Cape Schanck corner). On the road from "Clondrisse" to Main Ridge (leading north) the Wallermyong army trig is on the left hand side of the road on the farm "Wallermyong".

### Calibration Points

#### Calibration I : Access

Follow the road from Cape Schanck trig to Cape Schanck lighthouse. Follow this road to the far end and you will reach the parking area. The point is the fence-post itself, where the fence makes an angle. There is a nail on the top of the fencepost.





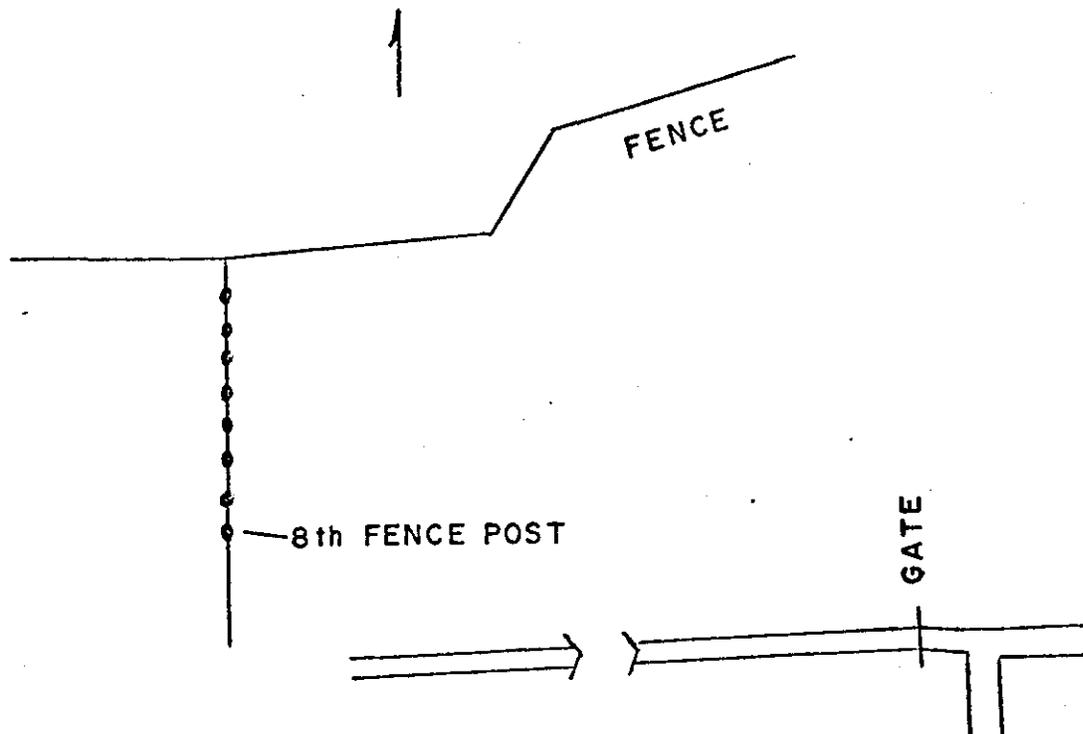
## APOLLO BAY SLAVE II

The Hi-Fix site is on a landtongue in Marengo, 1-3/4 miles southwest of Apollo Bay. The land is flat and ideal for a Hi-Fix station. It is Foreshore land (Secretary, Apollo Bay Foreshore Commission).

Calibration Points: Apollo II, Slave 2, Apollo IV.

### Access Apollo II

Follow the main road from Apollo Bay Hotel to the east and turn off to the left into Tuxion Road. Follow this road for about 2.5 miles until you reach a sign "High View". Follow the road up the hill for 0.55 miles. Proceed through the gate on the left hand side, follow the track up the first hill and up the second hill. The point is along the fence on top of the second hill (Old Army trig, co-ordinates unknown).



### Apollo IV

Follow the road from Shenes Creek to Mount Sabine for about 6 miles. The point is an old Army quadripod on top of a hill on the left hand side of the road, between two telegraph poles just below the telegraph line.



Calibration Points:

Liptrap II, Slave I Station, Liptrap IV, Liptrap V.

Access Liptrap II

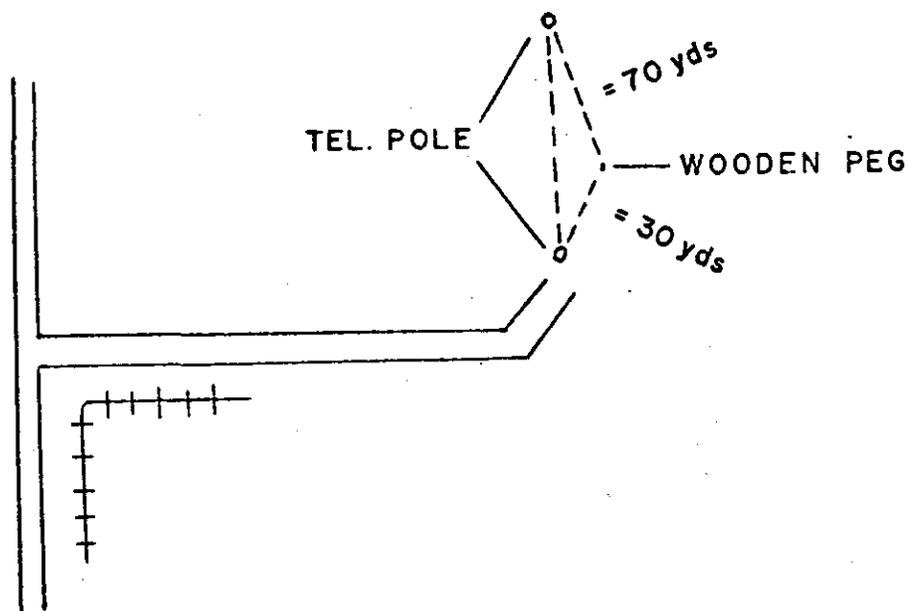
Follow the road from Liptrap lighthouse for approximately 1 mile. Turn left at the point where on the left hand side of the road the land is fenced. Proceed along the fence for about 3/4 mile until another fence is reached and turn 30° to the left for approximately 200 yards. The point is an iron pipe in the open field and could be difficult to find. Access with four wheel drive vehicles only.

Access Liptrap IV

See access diagram Hi-Fix station.

Access Liptrap V

Follow the road from the lighthouse to Liptrap Trig for about 2 miles. On the right hand side of the road you will find an unfenced property with a track leading into it. First follow the track for about 100 yards. It is not advisable to go any further with the landrover. If you walk along the track you will see two telegraph poles on top of a small hill.





## MAPS

## CAPE LIPTRAP HI-FIX SLAVE I

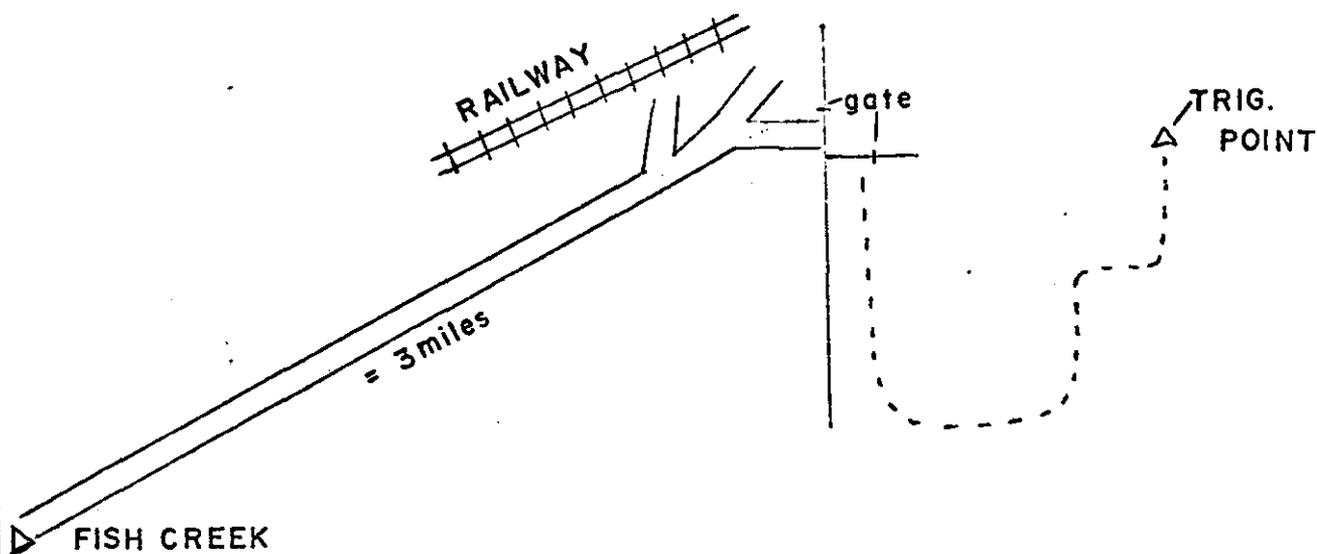
<u>Original Trigdata</u>	<u>Eastings</u>	<u>Northings</u>
Cape Liptrap Trig:	396 871.20	211 208.60
Mount Hoddle Trig:	413 515.20	228 897.00

Access Cape Liptrap

See enclosed access diagram, pages 2A, 2B.

Access Mount Hoddle

Follow the road from Fish Creek to Hoddle (Foster) for about 3 miles. Just before the railway crossing follow the new higher road and turn direct sharp to the right. Upon entering property turn sharp right, proceed through gateway and follow the track along the fence line. Proceed through the next gate at the foot of a small hill. Take the right hand track along the fence and follow the track until the trip is reached (beacon is visible). Access to trig by four wheel drive vehicles only.





<u>Traverse Point</u>	<u>Unadjusted Angles as Measured</u>	<u>Measured Distance in Yards Corr- ected for : N, Slope Height Scale Factors</u>	<u>Final Eastings</u>	<u>Final Northings</u>
Mount Hoddle Cape Liptrap Trig	166° 57' 18"			
Liptrap I	194° 25' 09"	1656.55	396 037.6	209 777.0
Liptrap II	127° 20' 16"	5460.00	392 201.7	205 891.4
Liptrap III=Hi-Fix)	121° 52' 30"	1052.63	392 348.8	204 849.0
Liptrap IV SI )	119° 10' 05"	372.92	392 689.8	204 698.3
Liptrap V	166° 26' 41"	3002.51	395 088.0	206 504.9
Mount Hoddle Liptrap Trig	003° 48' 19"	29000.03		

Misclosure in traverse 18" Difference E = .83, Difference N = .31

Co-ordinates Liptrap Lighthouse from 3 intersections

E = 392 714.1

N = 204 255.6



SURVEY REPORT  
N. W. BASS BASIN & N. E. OTWAY BASIN  
ESSO EXPLORATION AUST.

LAND SURVEY

The DECCA Hi-Fix system was operated in the Hyperbolic mode and the station sites selected were :

SLAVE I	(Cape Liptrap)	392 348.8 E	204 849.0 N
MASTER	(Cape Schanck)	297 223.2 E	253 679.0 N
SLAVE II	(Apollo Bay)	178 175.0 E	216 959.1 N

Co-ordinates on A. T. M. Projection Zone 7.

The station sites were surveyed by tellurometer traverses run from existing geodetic control.

The surveys were carried out by Amalgamated Decca Surveys under contract to G. S. I.

CALIBRATIONS

The Hi-Fix chain was initially calibrated at positions close to the Master and Slave I. Theodolite intersections, from surveyed points, were made of the Hi-Fix antenna on board the CARIBBEAN SEAL. The vessel also checked the lane count of Patt I by crossing both extensions of the base line. A further check was made at Apollo Bay, using an independent Hi-Fix receiver.

The results obtained were considered satisfactory.



Detailed reports by A.D.S. on the station surveys and the calibrations are submitted separate to this report.

#### MAPPING

Shotpoint location maps were drafted by G.S. I. in their Sydney office from shotpoint co-ordinates supplied by Amalgamated Decca Surveys.

N. V. Gale.



APPENDIX C  
GENERAL OPERATIONAL INFORMATION



APPENDIX C  
GENERAL OPERATIONAL INFORMATION

Client	Esso Exploration Australia Inc.
GSI party	973
Area of survey	Otway and Bass basins (Victoria) (and Tasmania)
Date commenced	27 November 1967
Date finished	2 December 1967
Shotpoint spacing	600 ft (sixfold CDP)
Elapsed days on project	6
Production days	5
Nonproduction days	1

BASS BASIN VICTORIA

Total Mileage	165.14 Miles
---------------	--------------

BASS BASIN TASMANIA

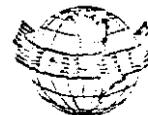
Total Mileage	47.73 Miles
---------------	-------------

OTWAY BASIN VICTORIA

Total Mileage	53.98 Miles
Surcharge Mileage	7.16 Miles

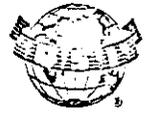


APPENDIX D  
TYPICAL SPREAD DETAILS



APPENDIX D  
TYPICAL SPREAD DETAILS

Type	24-group, neutrally buoyant
Length	Center group 1 to center group 24 6900 ft
Group interval	300 ft
Interval between 12 and 13	300 ft
Length live section	100 ft
Length dead section	100 ft
Type detector	Crystal
Detectors/group	20
Detector interval	4 ft 10-1/2 in.
Charge size	50 lb
Shot depth average	6 ft
Shot offset average	500 ft
Detector depth average	40 ft



APPENDIX E  
TYPICAL INSTRUMENT DETAILS



APPENDIX E  
TYPICAL INSTRUMENT DETAILS

Texas Instruments Model 10,000 Amplifier System

Recording Settings

Initial gain	40-43
Final gain	90-95
GAGC expansion	80 db/sec
AGC level	6-10

<u>Filters</u>	<u>Frequency</u>	<u>Slope</u>
High cut	70-92	24
Low cut	8	12

Playbacks - direct

Texas Instruments 10,000 Seismic DFS

Channel 1-24	Seismic Trace 1-24
25	
26	WB 5
27	WB 20
28	WB 24
29	WB 10
30	Gain
31	WB 1, 15
0	Timing word

SIE - VR06 Photo-Oscillograph

Galvo 1-24	Seismic Trace 1-24
25	Channel 30 monitor
26	WB



## Galvo

27 WB  
 28 WB  
 29 WB  
 30 WB  
 31 100 cycles external fork

Paper width 6 in.  
 Paper speed 6.401 ips  
 Record length 4 and 5 sec  
 Timing lines Timing-line generator

## Waterbreak Amplifiers

<u>Amplifier</u>	<u>Group No.</u>	<u>Trace</u>
1	24	27
2	20	28
3	15	30
4	10	26
5	5	29
6	1	30

Timebreak Monitor True TB in trace 4

Timing-Word Zero (two) trace 8

Playback - same

SIMRAD Model 515-47 fathometer

Scale A 0-120 ftm  
 B 90-210 ftm  
 C 180-300 ftm



APPENDIX F  
KEY PERSONNEL



APPENDIX F  
KEY PERSONNEL

GSI

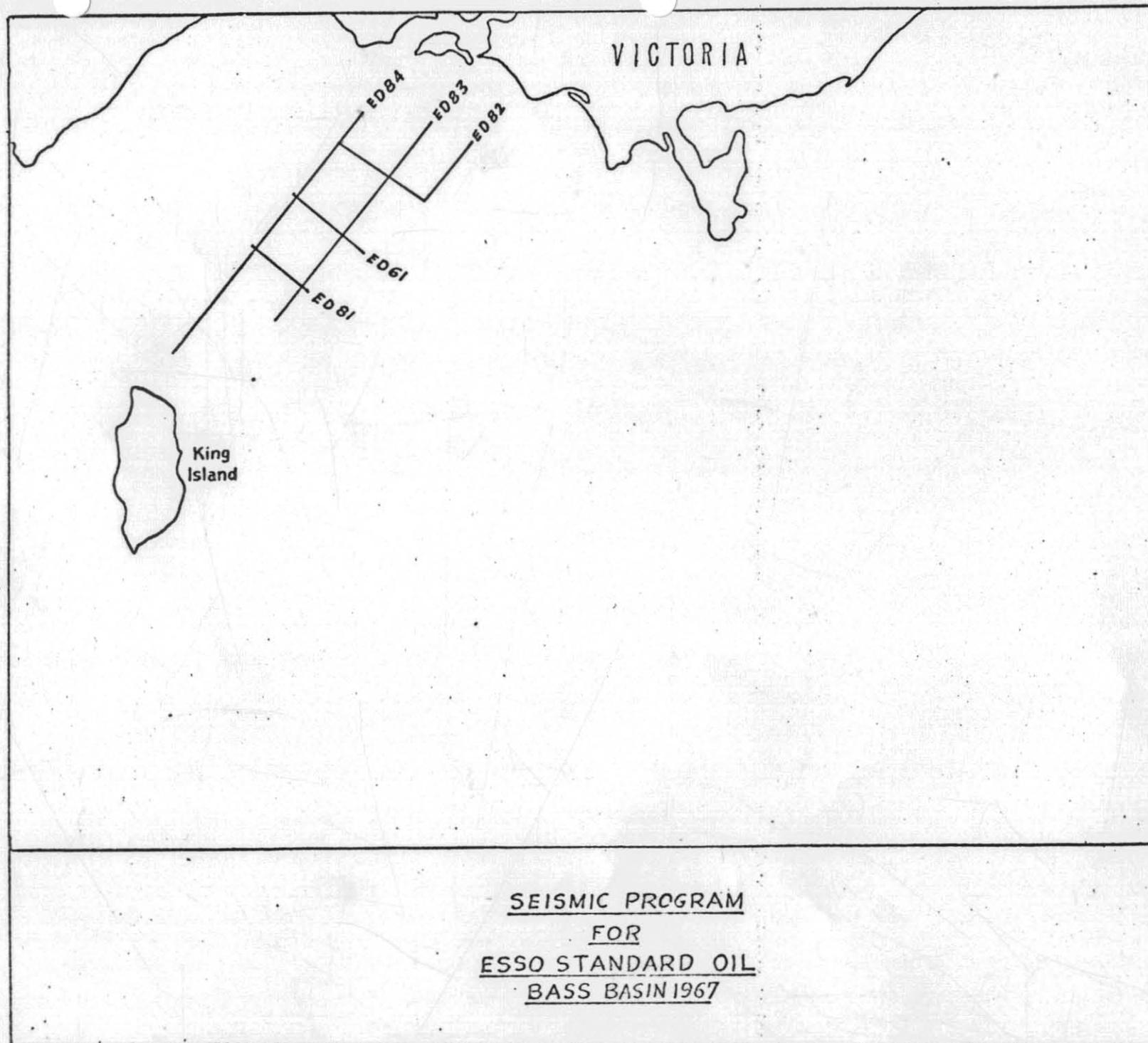
Operations supervisor	D. R. Bealer
Quality-control engineer	K. W. Evans
Party manager	L. Helstrom
Administrator	A. Smith
Instrument engineers	L. Willard
	A. Horak
Shooter	L. Gibson

DECCA

Supervisor	C. Rolfe
Operators	N. Dick
	P. Green
	P. McKenna

Captain M/V CARIBBEAN SEAL	R. Hegerburg
Captain M/V IMLAY	P. Warren

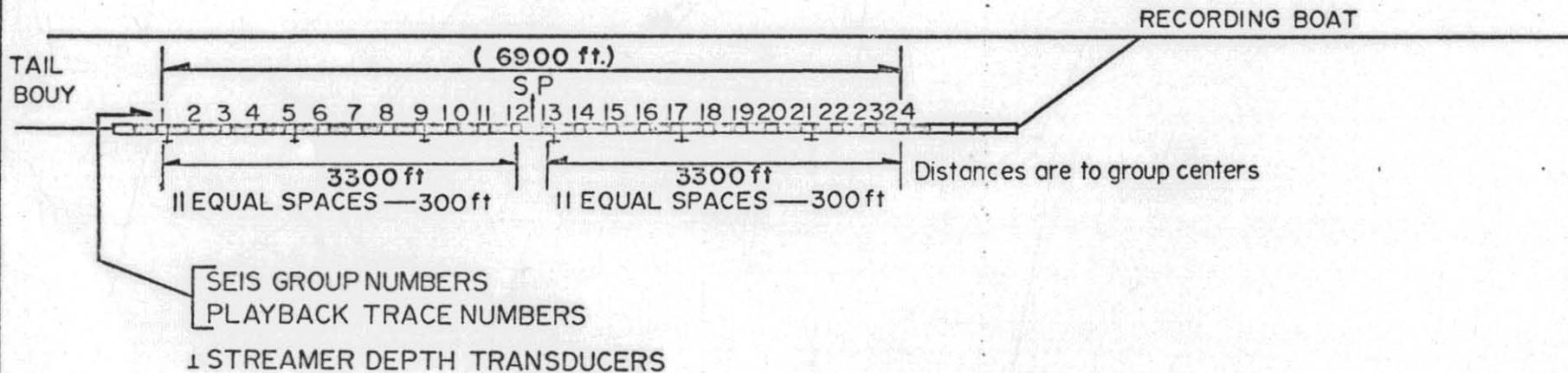
050042



SEISMIC PROGRAM  
FOR  
ESSO STANDARD OIL  
BASS BASIN 1967

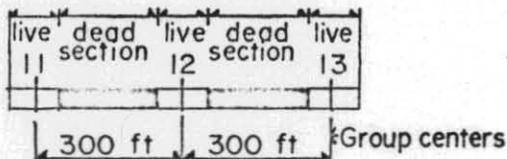
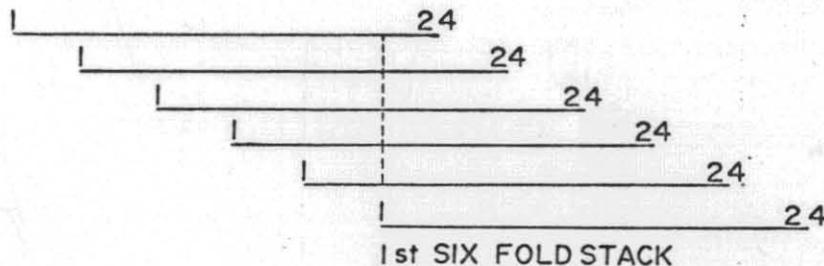
050043

GSI-709



SUBSURFACE

- 1st SHOT
- 2nd SHOT
- 3rd SHOT
- 4th SHOT
- 5th SHOT
- 6th SHOT



Enlarged section of streamer

WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
	30

MARINE CABLE DIAGRAM

(SPLIT SPREAD — 24 GROUPS)

GSI Party 973

Ship M/V CARIBBEAN SEAL

Client ESSO

Area OTWAY and BASS BASINS

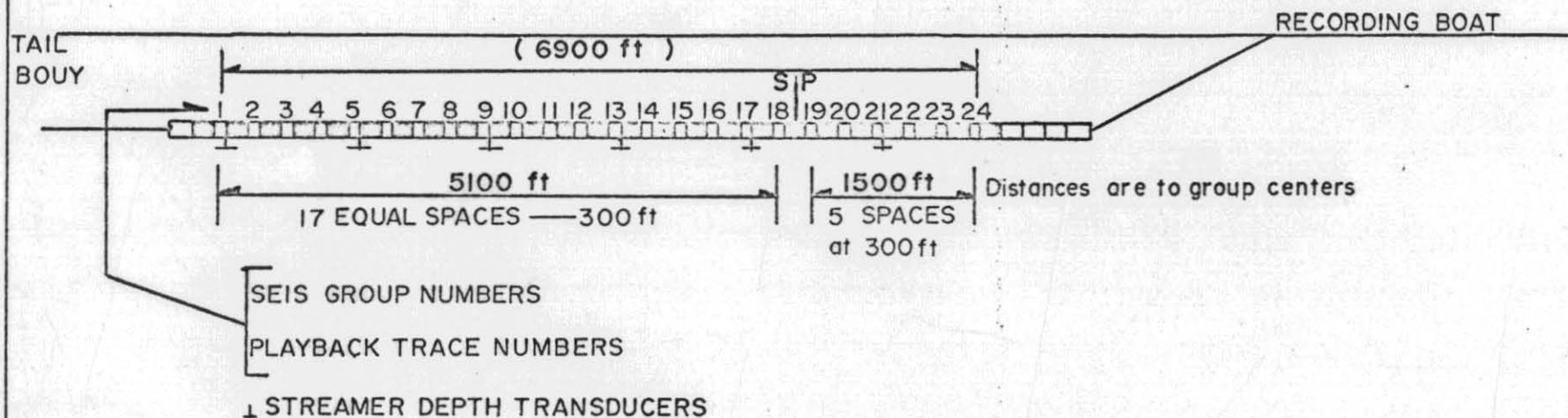
Date NOV-DEC 1967



PLATE B.1

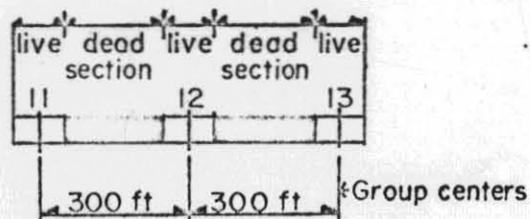
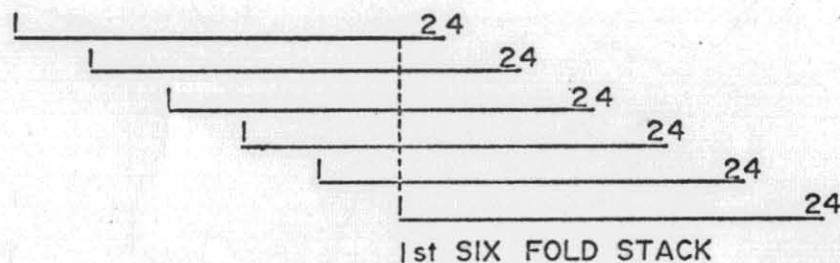
050044

GSI-709



## SUBSURFACE

1st SHOT  
2nd SHOT  
3rd SHOT  
4th SHOT  
5th SHOT  
6th SHOT



Enlarged section of streamer

WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
1	30

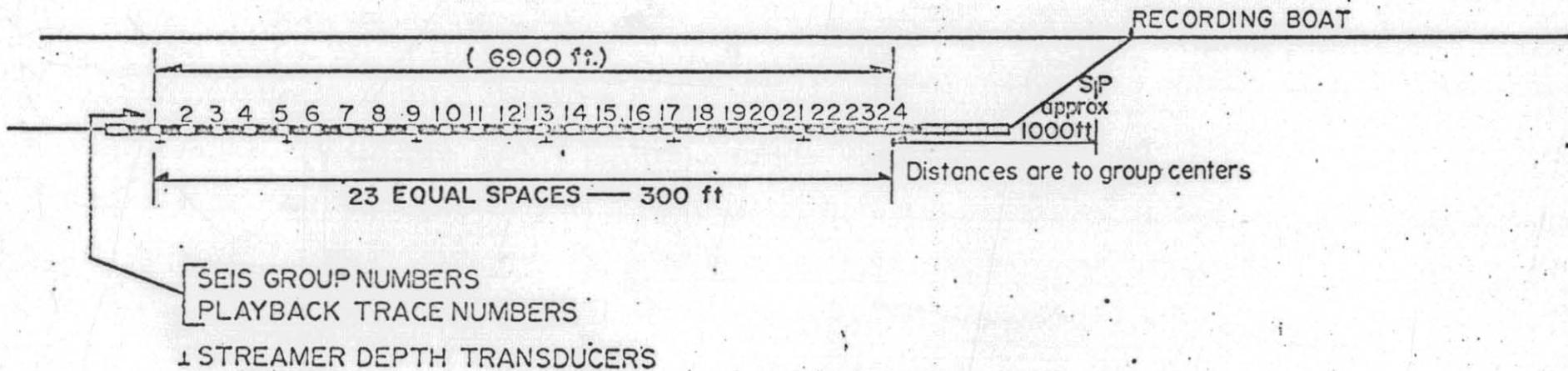
## MARINE CABLE DIAGRAM

( S.P. BETWEEN GROUPS 18 and 19 )

GSI Party 973Ship M/V CARIBBEAN SEALClient ESSOArea OTWAY and BASS BASINSDate NOV — DEC 1967

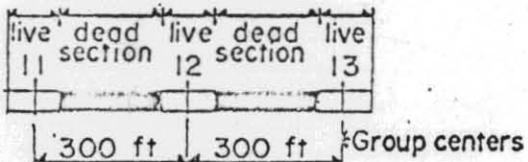
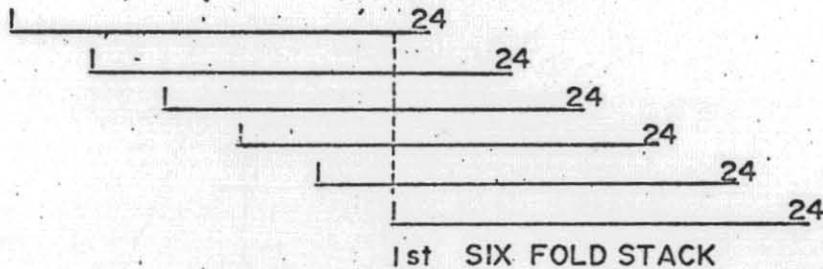
050045

GS1-709



SUBSURFACE

- 1st SHOT
- 2nd SHOT
- 3rd SHOT
- 4th SHOT
- 5th SHOT
- 6th SHOT



Enlarged section of streamer

WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
	30

MARINE CABLE DIAGRAM

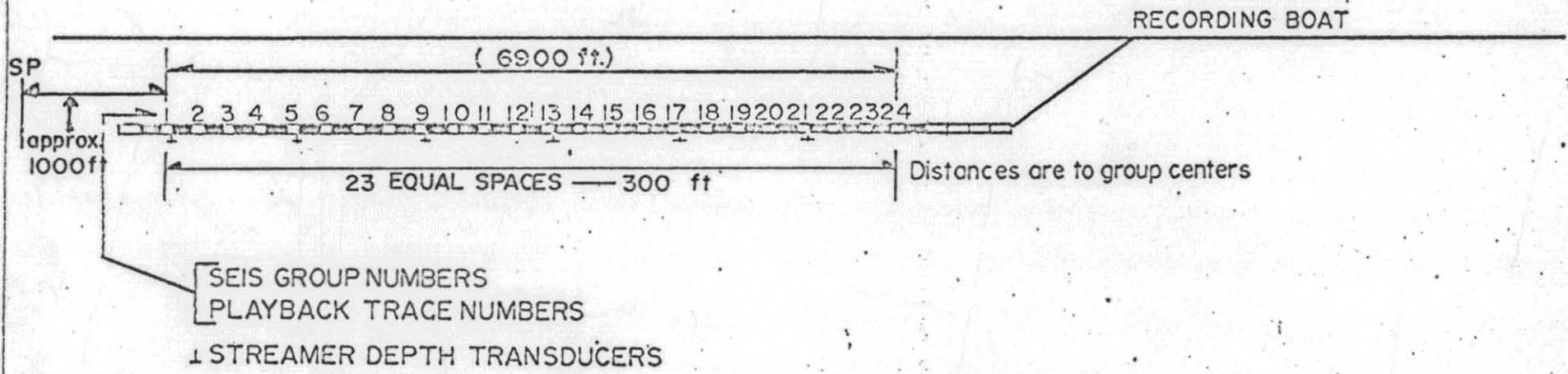
S.P. OFF GROUP NO. 24  
 GSI Party 973  
 Ship M/V CARIBBEAN SEAL  
 Client FSSO  
 Area OTWAY and BASS BASINS  
 Date NOV-DEC 1967



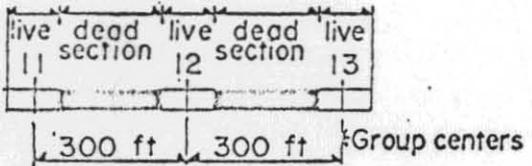
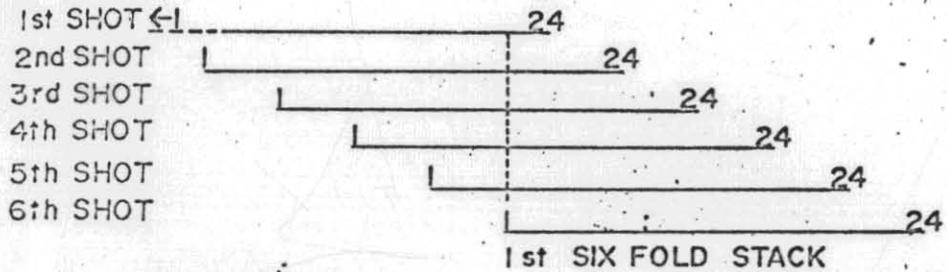
PLATE B-3

050046

GSI-709



SUBSURFACE



Enlarged section of streamer

WATER BREAKS FROM SEIS GROUPS	DISPLAYED ON SEISMOGRAM TRACES
24	27
20	28
15	30
10	26
5	29
1	30

MARINE CABLE DIAGRAM

S.P. OFF GROUP NO. 1

GSI Party 973

Ship M/V CARIBBEAN SEAL

Client ESSO

Area OTWAY and BASS BASINS

Date NOV-DEC 1967

PLATE B-4

## A P P E N D I X C

DATA PROCESSING PROCEDURES

Processing of field data was carried out at the Geophysical Services International Digital Processing Centre located in St. Leonards, N.S.W.

The Centre consists of two digital computers designed and built by the Texas Instrument Company especially for geophysical data reduction with the necessary I/O units.

1. TIAC MODEL 827A: This is a modified version of the TIAC 827 computer with increased storage capacity, a faster convolver unit and a more efficient supervisory program. All GSI processing programs that are in use can be run on this computer.
2. TIAC MODEL 870: The newest of the TIAC series which is capable of processing 7,9, and 21 track field tapes. This unit is used for format conversions, analog to digital transcriptions, general seismic processing, and controls the on-line camera plotter unit for section presentation.

All field data were processed using the GSI ML-300 processing package. This package is composed of a series of optional programs for back to back processing, thus achieving maximum operational efficiency. The ML-300 package is comprised of the following routines:

1. WMT: Write intermediate output records.
2. LEANMO or MEANMO: Automated edit, true amplitude recovery, static corrections and normal moveout corrections for Land or Marine records.
3. RNM: Residual moveout corrections, edit and static corrections.
4. ARD: Time-invariant deconvolution with maximum of 64 points per filter and without filter normalization.
5. DCN: Time-invariant deconvolution with a maximum of 510 points per filter and filter normalization.
6. TVD: Time-variant deconvolution with a maximum of 58 points per filter and optional filter normalization.
7. ARD2: Deconvolution for reverberations in the water layer.
8. DGF: Time-invariant digital or antialias filtering.
9. TVF: Time-variant digital filtering.
10. DPS: N-fold CDP stacking of records from continuous spread (all group intervals equal) and exponential scaling and trace equalization of output.
11. MX6: N-fold mixing and exponential scaling and trace equalization of output.

For general processing of recorded field data routines 1, 2, 4, 5, 6, 8, 9, and 10 were used in various combinations. Additional routines were used in filter evaluations, deconvolution analysis, power density spectrum analysis, autocorrelation functions, and data quality evaluations.

The computation of the Time Vs. Avge.Velocity curves used in the NMO routine were derived from velocity gathers from the field tapes. Final corrected velocities were computed for each area of shooting. These calculations were carried out by Esso personnel.

In the processing of the six-fold CDP data, single fold monitor sections were displayed before and after stacking to insure that the best possible velocity control had been used.

The final section plotting was done on film using the variable density mode. A high precision densitometer was used to keep the zero signal density level at the mid point of the linear portion of the film exposure scale. All sections were plotted at 3.75 inches per second vertical scale and 24 traces per inch horizontal scale.

In order to obtain the best possible data quality output, two to four Esso personnel were officed at the GSI Processing Centre at all times.

## A P P E N D I X D

BASS BASINGENERALIZED TIME VS DEPTH CHART

<u>DEPTH</u>	<u>TWO-WAY TIME</u>
0	.000
250	.084
500	.167
750	.240
1000	.311
1250	.380
1500	.446
1750	.516
2000	.584
2250	.650
2500	.716
2750	.781
3000	.845
3250	.910
3500	.970
3750	1.036
4000	1.100
4250	1.160
4500	1.218
4750	1.270
5000	1.321
5250	1.372
5500	1.423
5750	1.473
6000	1.523
6250	1.571
6500	1.616
6750	1.659
7000	1.701
7250	1.743
7500	1.784
7750	1.825
8000	1.865

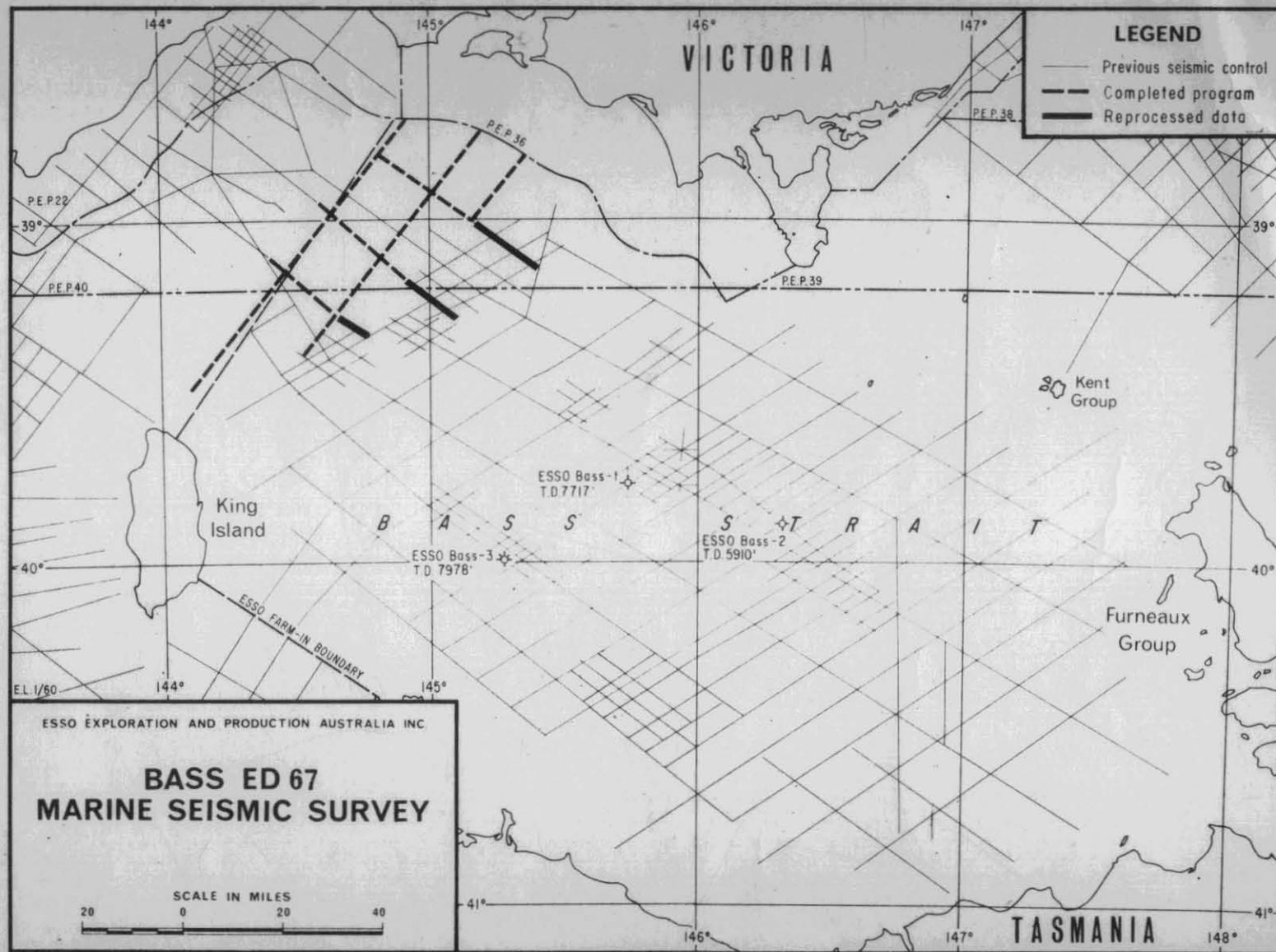
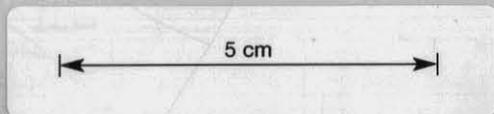
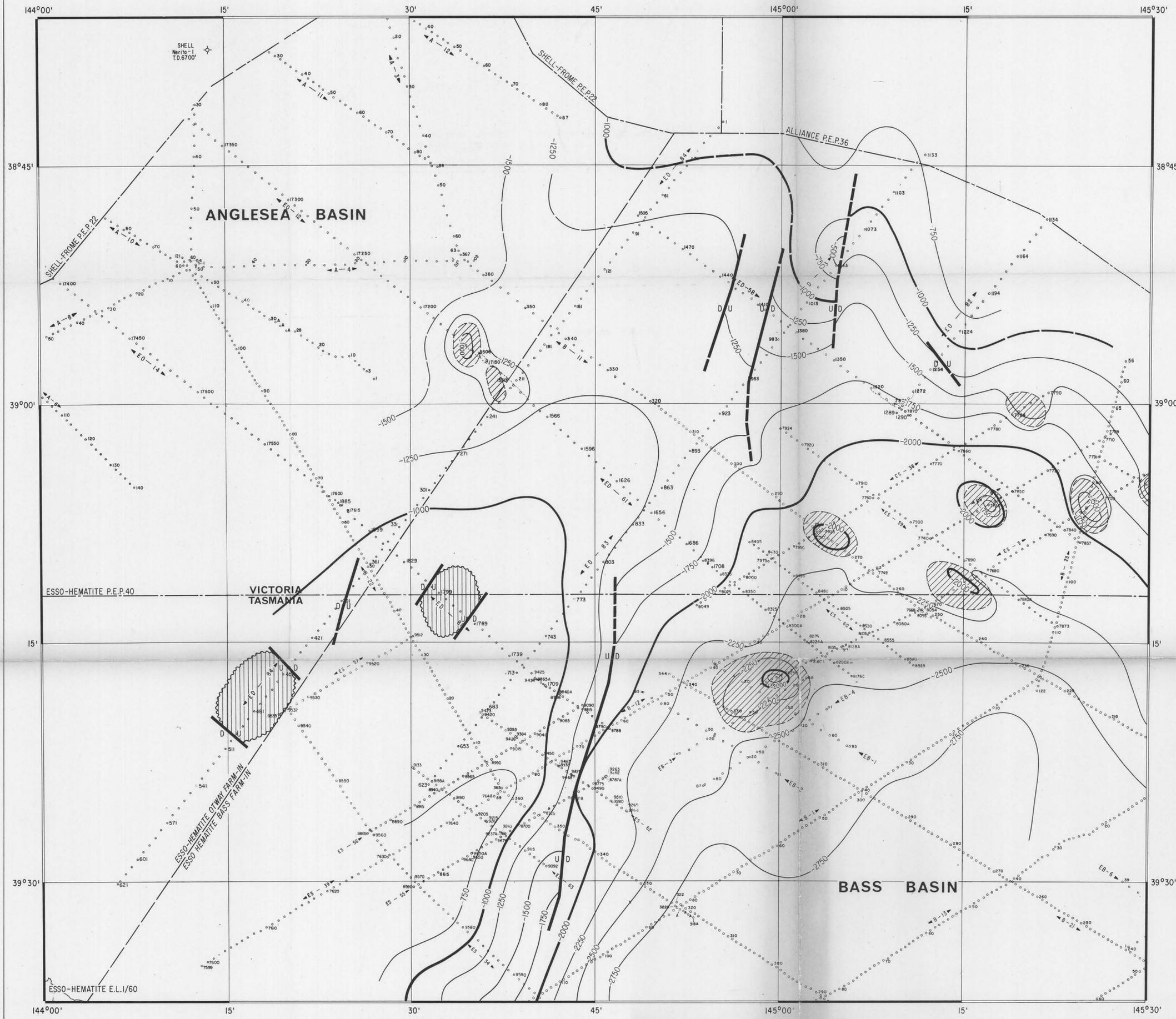


FIGURE 1

Bass Basin part VI





**LEGEND**

- 5000 — Structure contours in feet
- ED-84 — ED-67 seismic survey
- B-10 — Hematite Bass seismic survey
- A-11 — Hematite Anglesea survey
- EB-10 — Esso Bass seismic survey
- EO-14 — Esso offshore Otway survey
- ES-52 — Eastern Bass Strait survey
- Seismic shot point
- ⊕ Well, dry and abandoned
- U — Fault, 'D' downthrown side
- — Petroleum tenement boundary
- — Farm-in boundary
- ▨ Area of Oligocene volcanic build-up
- ▤ Basement at surface due to block faulting

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

**THE BASS BASIN**

VICTORIA - TASMANIA

050051

**STRUCTURE CONTOUR MAP  
ON TOP OF OLIGOCENE**

Contour Interval: 250 feet Datum: Sea level



AUTHOR: W.C. PRESLEY DRAFTED: F. WEETMAN

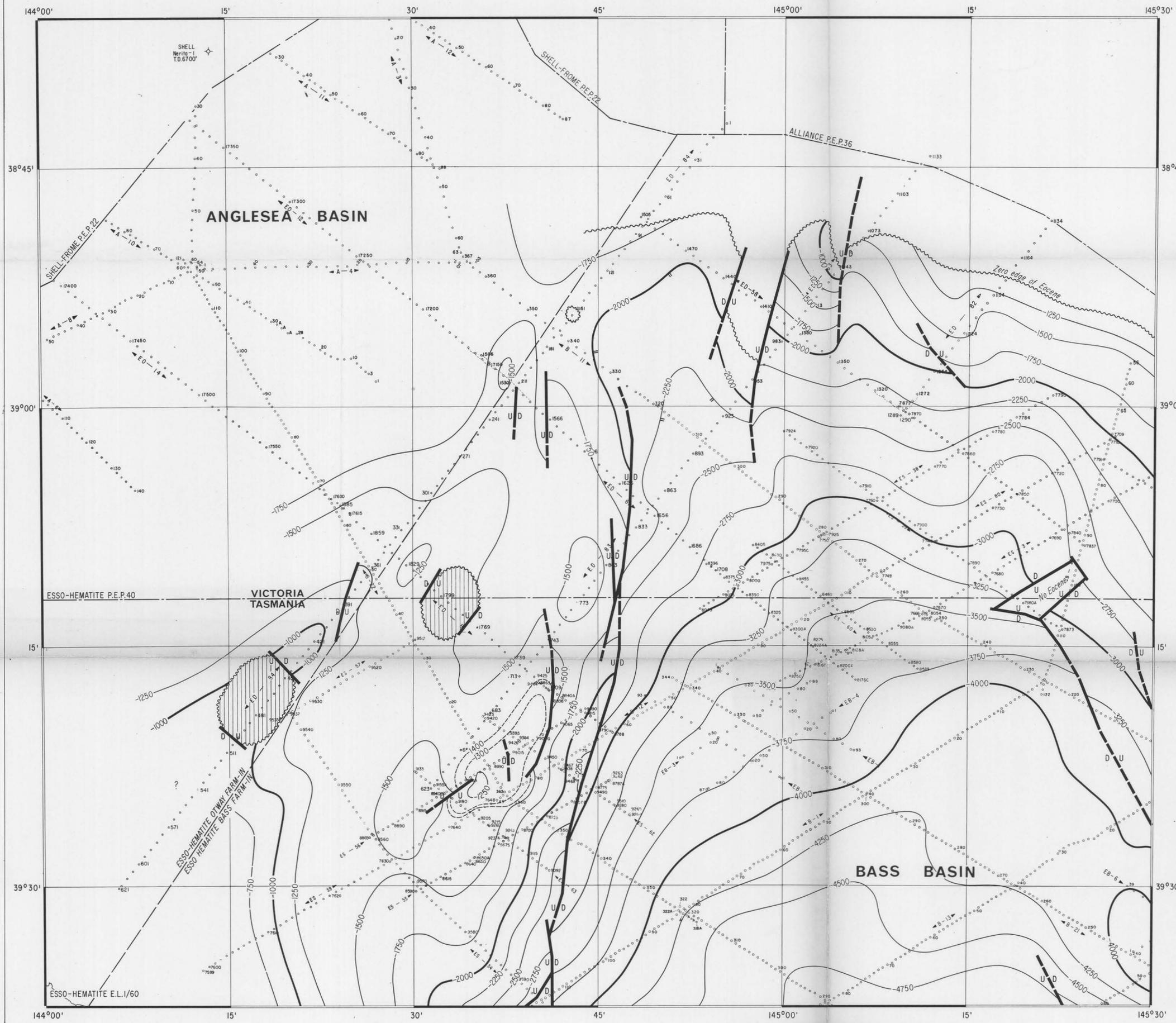
TO ACCOMPANY: FINAL REPORT, BASS BASIN ED-67 MARINE SEISMIC SURVEY, APRIL 1968

PLATE I

Bass Basin part VI



OR-006



**LEGEND**

- 5000 — Structure contours in feet
- ◄ ED-84 ► ED-67 seismic survey
- ◄ B-10 ► Hematite Bass seismic survey
- ◄ A-11 ► Hematite Anglesea survey
- ◄ EB-10 ► Esso Bass seismic survey
- ◄ EO-14 ► Esso offshore Otway survey
- ◄ ES-52 ► Eastern Bass Strait survey
- Seismic shot point
- ⊕ Well, dry and abandoned
- U D Fault, D' downthrown side
- Petroleum tenement boundary
- Farm-in boundary
- ▨ Basement at surface due to block faulting

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

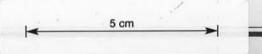
**THE BASS BASIN**  
 VICTORIA - TASMANIA  
 050052  
 STRUCTURE CONTOUR MAP  
 ON TOP OF EOCENE

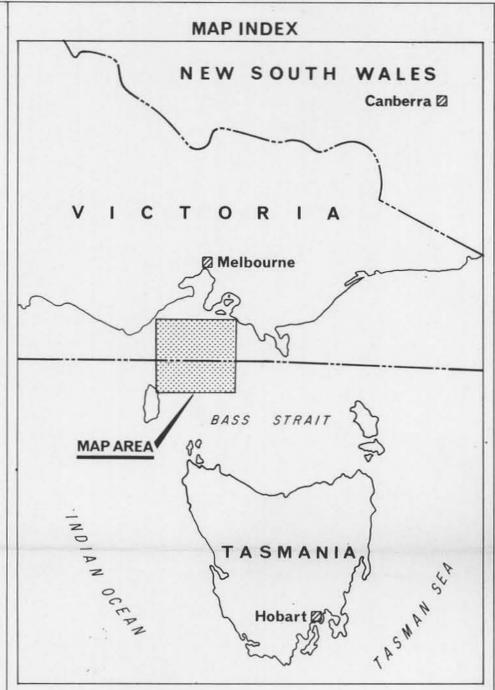
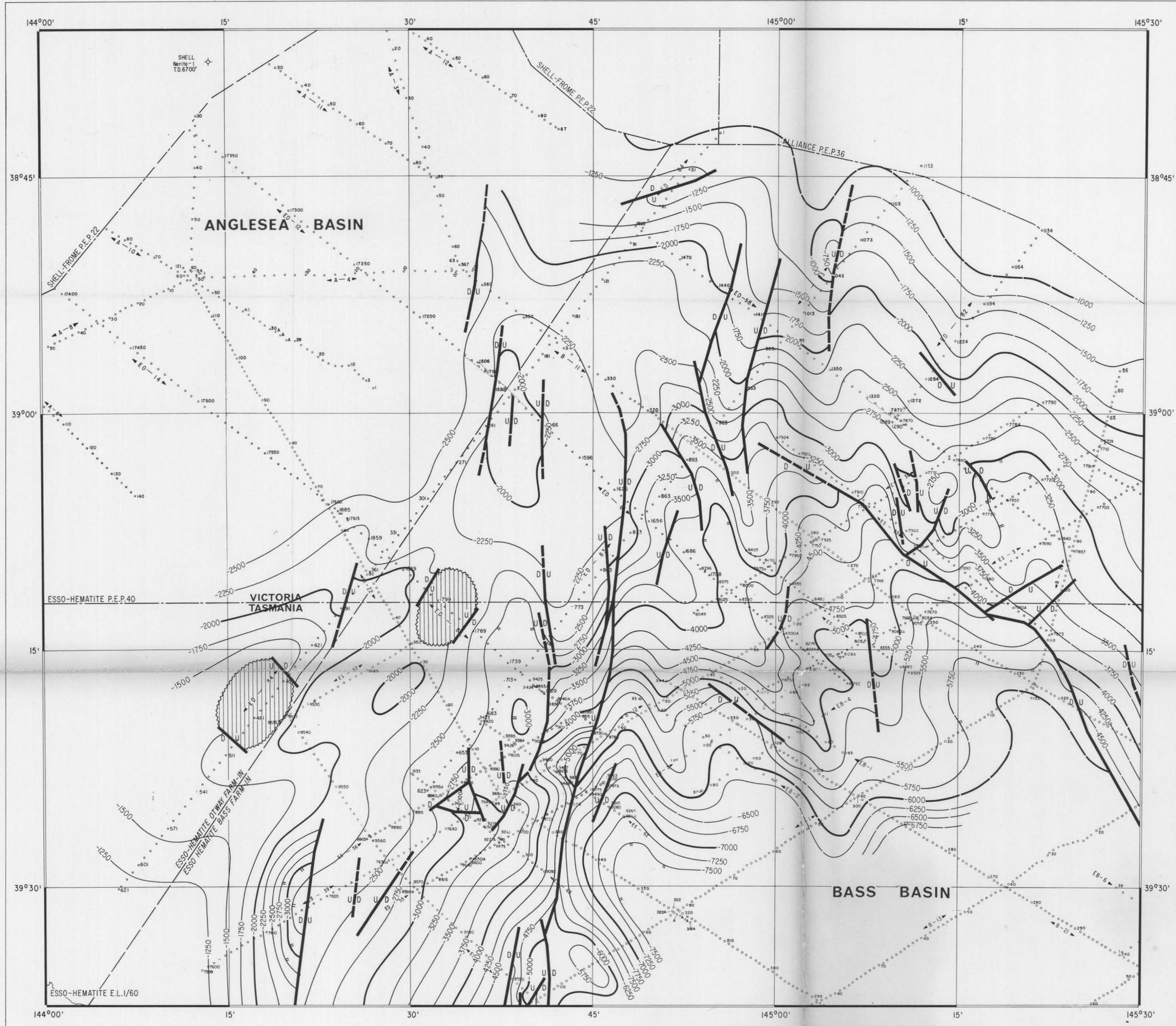
Contour Interval: 250 feet Datum: Sea level



AUTHOR: W.C. PRESLEY DRAFTED: F. WEETMAN  
 TO ACCOMPANY: FINAL REPORT, BASS BASIN ED-67  
 MARINE SEISMIC SURVEY, APRIL 1968

PLATE II





**LEGEND**

- 5000 — Structure contours in feet
- ◄ ED-67 ► ED-67 seismic survey
- ◄ B-10 ► Hematite Bass seismic survey
- ◄ A-11 ► Hematite Anglesea survey
- ◄ EB-10 ► Esso Bass seismic survey
- ◄ EO-14 ► Esso offshore Otway survey
- ◄ ES-52 ► Eastern Bass Strait survey
- Seismic shot point
- ☆ Well, dry and abandoned
- U / D Fault, 'U' upthrown side
- Petroleum tenement boundary
- Farm-in boundary
- ▨ Basement at surface due to block faulting

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

**THE BASS BASIN**  
VICTORIA - TASMANIA

**STRUCTURE CONTOUR MAP**  
**ON TOP OF BASEMENT**  
050053

Contour Interval: 250 feet Datum: Sea level



AUTHOR: W.C. PRESLEY DRAFTED: F. WEETMAN  
TO ACCOMPANY: FINAL REPORT, BASS BASIN ED-67  
MARINE SEISMIC SURVEY, APRIL 1968

PLATE III



OR-006



**LEGEND**

- 2000 — Isopach contour in feet
- ◄ ED-84 ► ED-67 seismic survey
- ◄ B-10 ► Hematite Bass seismic survey
- ◄ A-11 ► Hematite Anglesea survey
- ◄ EB-10 ► Esso Bass seismic survey
- ◄ EO-14 ► Esso offshore Otway survey
- ◄ ES-52 ► Eastern Bass Strait survey
- Seismic shot point
- ★ Well, dry and abandoned
- U D Fault, 'D' downthrown side
- - - Petroleum tenement boundary
- Form-in boundary
- ▨ Basement at surface due to block faulting

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

**THE BASS BASIN**  
VICTORIA - TASMANIA

**ISOPACH CONTOUR MAP OF INTERVAL**  
**TOP OF EOCENE TO TOP OF BASEMENT**  
050054

Contour Interval: 250 feet Datum: Sea level



AUTHOR: W.C. PRESLEY DRAFTED: F.WEETMAN  
TO ACCOMPANY: FINAL REPORT, BASS BASIN ED-67  
MARINE SEISMIC SURVEY, APRIL 1968

**PLATE IV**