011001

BASS BASIN
"GEOPHYSICAL EVALUATION"

Esso Standard Oil (Aust.) Ltd.,
September, 1967

OR – 026 (Vol 1)

MEMORANDUM

Geophysical Evaluation
Bass Basin, September 13, 1967

The geophysical exploration program accomplished during the past four months may be divided into two related projects, reprocessing and mapping. Key seismic lines were reprocessed to determine if better resolution of the seismic data could be gained by analog to digital conversion and deconvolution. Three new maps and three revised maps have been prepared. These incorporate new seismic control gained from the recently completed Otway survey and revisions necessary to the interpretation of the older data as a result of reprocessing.

Reprocessing - The Eastern Bass Strait Marine Seismic Survey was partially recorded using both analog and digital instruments. A six-fold C.D.P. line ES-52, and a single-fold line, ES-48, were experimentally processed digitally to compare the relative quality of the digital and analog data. The digital sections showed marked improvement over the coinciding analog sections, particularly the six-fold data.

A pilot reprocessing program was instigated to assay the advantages of digital reprocessing of analog data. Also processed were two simultaneously recorded digital lines where previously only the analog data had been used. The lines picked for this project were chosen to tie the three wells in the basin, cross the remaining untested closed structure, including the major range of the stratigraphic changes expected, and sample all the variations of recording techniques previously used.

Ten lines representing 413 miles of seismic data were reprocessed. The various types of recording techniques and instruments sampled by this project are as follows:

Lines	Type Recording	Recording Instruments
B-3, B-12 & B-21	Single-fold	A.M., Analog
EB-10 & EB-22	Six-fold	A.M., Analog
EK-10 & EK-27	Six-fold	F.M., Analog
ES-70	Single-fold	F.M., Analog
ES-39 & ES-80	Single-fold	Digital

The results show that in all instances digital processing produces superior seismic sections. The six-fold digitally recorded and processed data generate the best reflection resolution but the six-fold analog recorded and digital processed data are preferable to single-fold digital recorded and processed data.

Several factors contribute to the differences in reflection resolution in the various types of data. The two principal advantages that digitally recorded data have are true amplitude recovery, which makes possible a closer reproduction of the reflection amplitude produced by the different reflection coefficients, and the capability of better attenuation of water bottom multiples. Analog to digital converted data cannot be processed with true amplitude recovery. Digitally recorded data also have a better signal to noise ratio than analog data and the F.M. analog recording has a better ratio than the A.M. analog recording. The digital deconvolution filter does a better job of attenuating the water bottom multiples than any of the analog processing techniques.

Deconvolution accounts for the bulk of data improvement seen in the digitally processed analog data. Six-fold common-depth-point shooting gives better reflection resolution when properly stacked than does single-fold shooting due to the multiple and random noise cancellation produced by the data stacking. The out-out filter (no playback filtering) permits the higher frequency reflections of thin stratigraphic units to be mapped where high frequency interference does not have to be attenuated.

Only the six-fold digital or six-fold F.M. analog recorded data with digital processing have the quality of resolution required to map the critical stratigraphic units as they become very thin in the pinchout areas of the basin. Most of the six-fold C.D.P. control in the basin was shot to define structural leads and is located outside the wedge-out areas. Reprocessing the single-fold data would only give rise to minor adjustment to the structural picture of the basin and therefore would not add appreciably to our knowledge of the geology. We still cannot say conclusively that the Demons Bluff shale unit does or does not provide a seal at the pinchout edge of the Eocene sand.

No major analog to digital conversion and digital processing project should be considered now.

Mapping - The new and revised maps prepared during this study were necessary to further evaluate the Eocene pinchout to the north and east, to examine the significance of the gas show in Esso Bass No. 3, and to extend the maps to include the new control southeast of King Island.

Slight correlation changes due to better resolution of the reprocessed data required that the top of the Eocene and Basement structure maps be revised north and east of Esso Bass No. 2. A shelfward shift of the zero edge of the Eocene is the only change worthy of noting. The seismic evidence suggests that the shale unit at the top of the Eocene extends beyond the pinchout edge of the underlying Eocene sand where reflection resolution is reasonably good on the northeast flank of the basin. Data quality is poorer in the extreme east and southeast parts of the map where lack of a distinctive Basement reflection is the basic obstacle to the mapping of the pinchout.

The map on top of the Eocene sand represents the top of the reservoir unit, providing that the overlying Demons Bluff shale does not sand out towards the zero edge. The contouring indicates the limits to which the sand reflection can be correlated on the present data.

The interval map between the top of the Eocene sand and basement illustrates the shape of the potential reservoir. This map has only been constructed in the pinchout area of interest and is further limited to areas where a reliable basement reflection exists.

No mappable reflection exists at the gas sand in Esso Bass-3. A horizon .075 sec. (435 feet) above the gas show was chosen as the best event to represent structure at the gas horizon. The map is carried to the extent that the event could be correlated on the northeast and west limits. The reflection is truncated by the mid-Eocene unconformity to the south. A phantom horizon at the gas sand onlaps basement, as shown, and is not truncated by the unconformity.

The maps on the top of the Eocene, the mid-Eocene unconformity and Basement, were extended to include the additional control provided by Otway survey lines EO-38, EO-63, and EO-59. Centered at shot point 1466 on line EO-50 is an anomalously deep depression within the embayment extending southward between King Island and Tasmania. The sediments within this hole may be predominantly older than those drilled so far in the Bass Basin. The lower Eocene - Paleocene sediments are being truncated by the mid-Eocene unconformity south of Esso Bass-3 and may have been stripped off, leaving upper Cretaceous rocks at the unconformity subcrop. The relation of the sediments to the King Island uplift are not known in this area.

Future Program - The pinchout area in the eastern part of the Bass Basin is still considered a potential prospect. We have established the type of recording required and that the existing control is not adequate to map the pinchouts. A similar type of prospect (Groper) is currently being detailed immediately across the Bassian Rise in the Gippsland Basin. Since the Gippsland play has more in its favour, updip from production and a better chance for a seal, we are deferring further action in this part of the Bass Basin until the results from "Groper" are analyzed.

The one remaining unexplored area of the Esso-Hematite Bass farm-in where sufficient sedimentary section and structural deformation may create prospective leads is in the northwest corner of the farm-in. This area is on the east flank of the King Island-Mornington Peninsula uplift which divides the Bass and the Otway-Anglesea basins. Present information indicates that the upper Eocene covers this basement high providing possible source and reservoir rocks.

The 220 miles of reconnaissance profiles proposed for 1967 will provide the control necessary to delineate the structural potential of this area and help explain the genetic relation of the Bass and Otway Basins. The data will be recorded using digital instruments and the six-fold C.D.P. shooting techniques to provide the best possible geologic resolution. Lines ES-58, ES-61, and ES-81, which will be extended by the new control, will be reprocessed digitally to standardize the presentation format.

Two hundred miles of additional program is proposed for 1968. This will be programmed after the pending survey has been appraised.

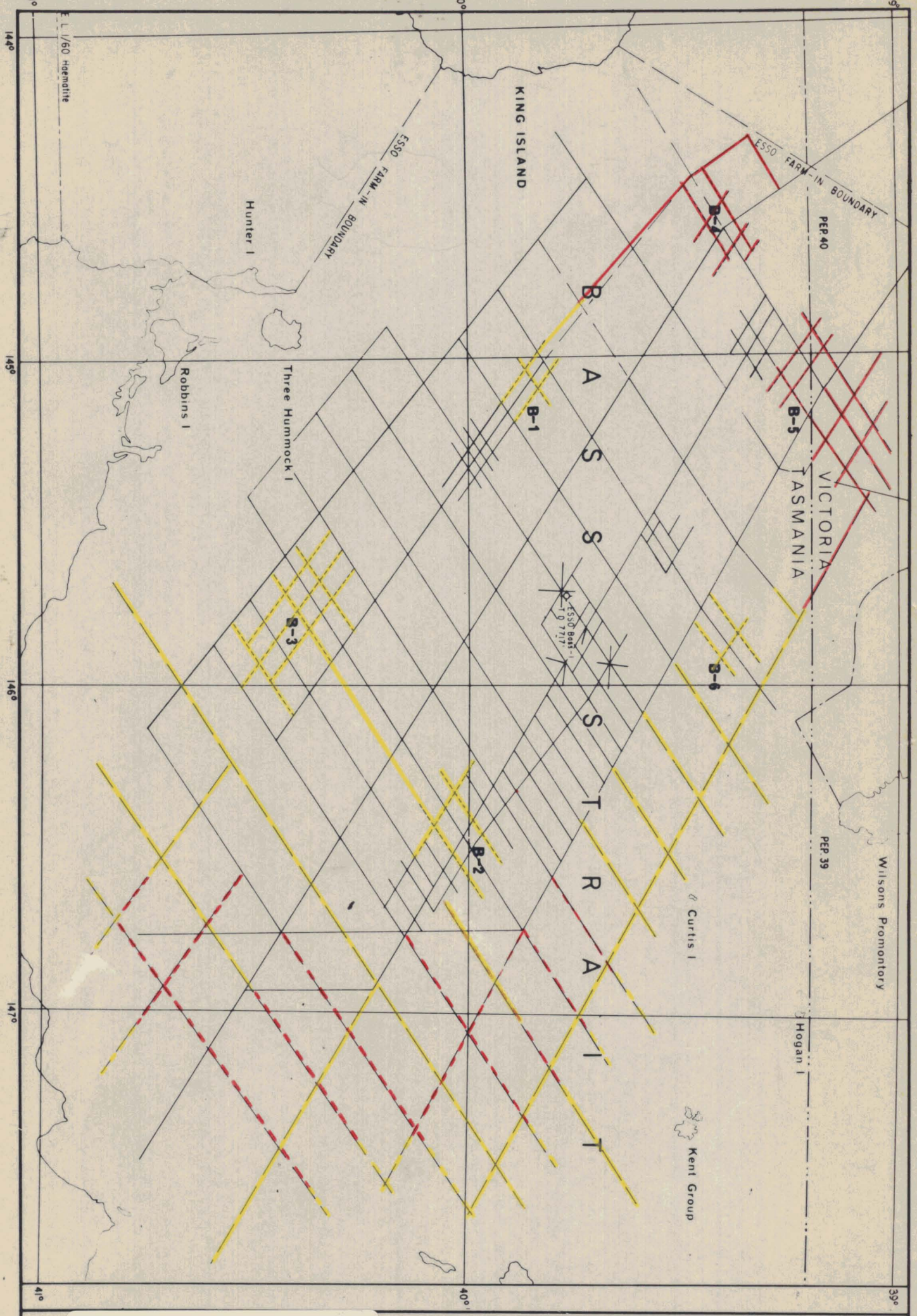
WCP:YMH

W.C. Presley

ENCLOSURES;

Sheet 1	Completed-program for Eastern Bass Strait Marine Seismic Survey
Plate I	Structure Contour Map - Top of Eocene
Plate II	Structure Contour Map - Top of Upper Eocene Sand
Plate II2	Structure Contour Map - Top of Eocene additional 31 July 1966
Plate III	Structure Contour Map - Mid-Eocene Unconformity
Plate IV	Structure Contour Map – Top of Basement
Plate V	Structure Contour Map – Reflection 435' above Bass – 3 Gas Sand
Plate VI	Isopach Map – Top Upper Eocene Sand to Basement
Plate VII	Proposed Program Bass ED-67 Marine Seismic Survey

011005



5 cm

Previous seismic control

Completed C D P program) 1050 miles

Completed single fold program)

Remaining program - 560 miles

ESSO EXPLORATION AUSTRALIA INC.

COMPLETED PROGRAM FOR EASTERN BASS STRAIT MARINE SEISMIC SURVEY

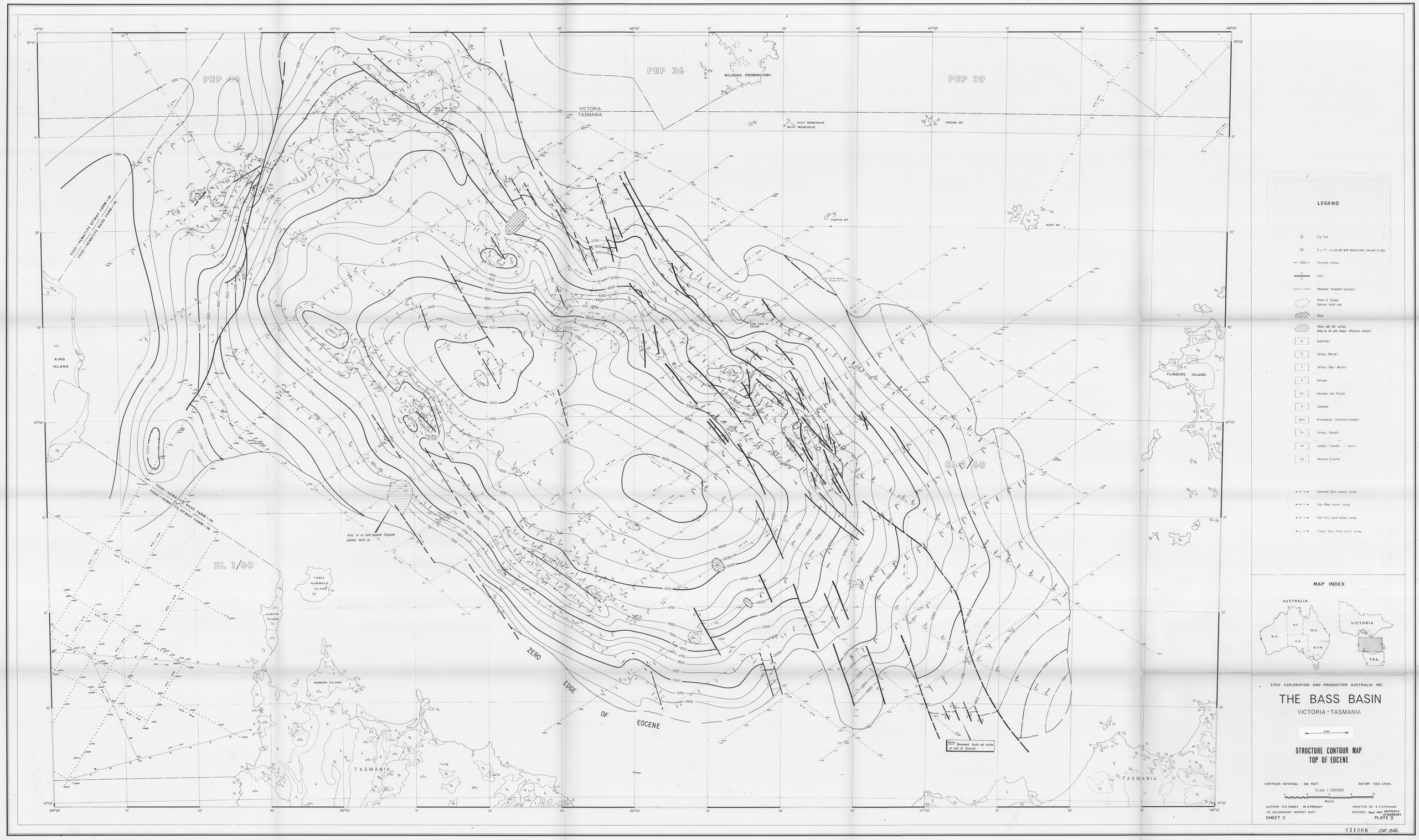
20 15 10 5 0 20

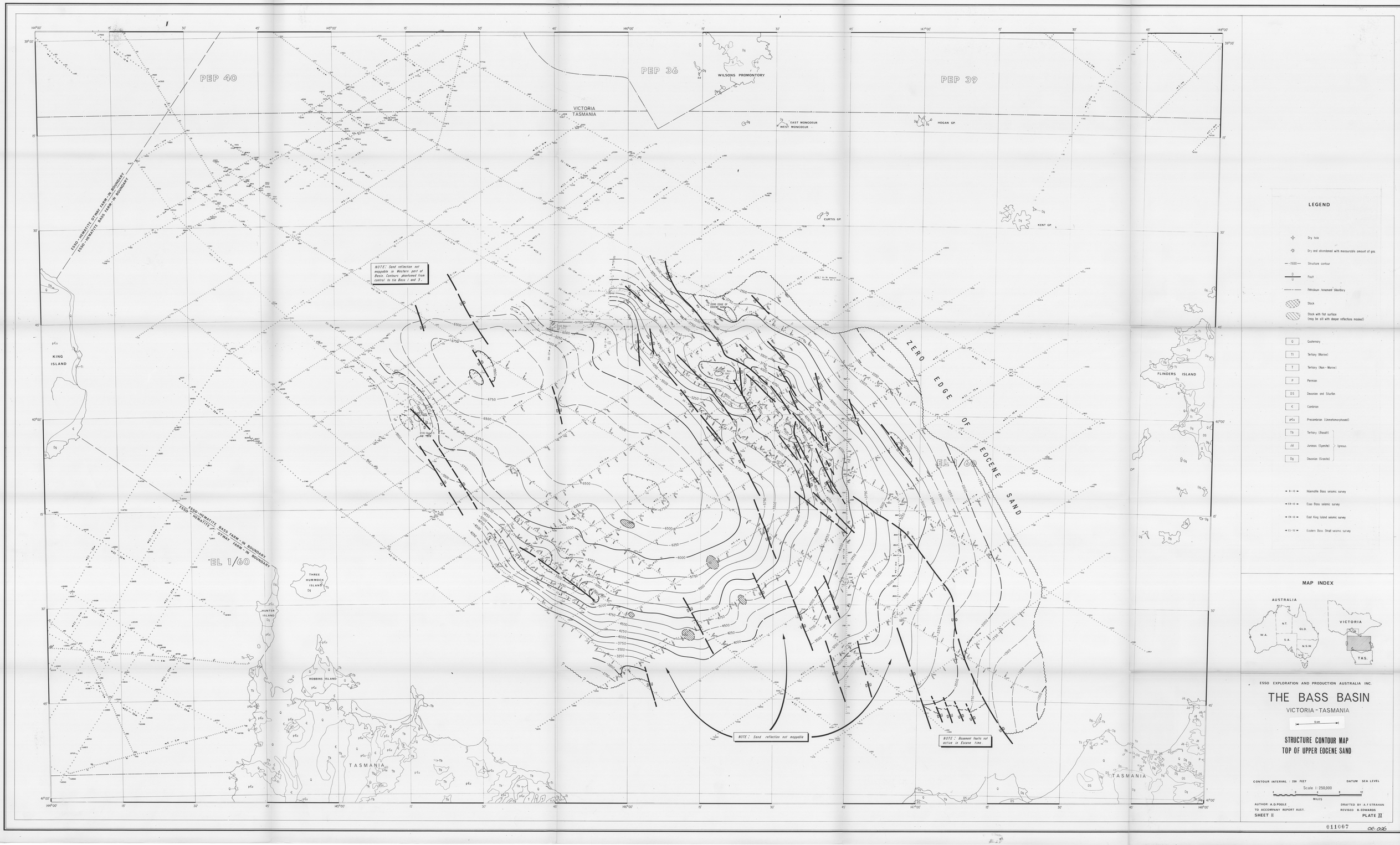
SCALE IN MILES

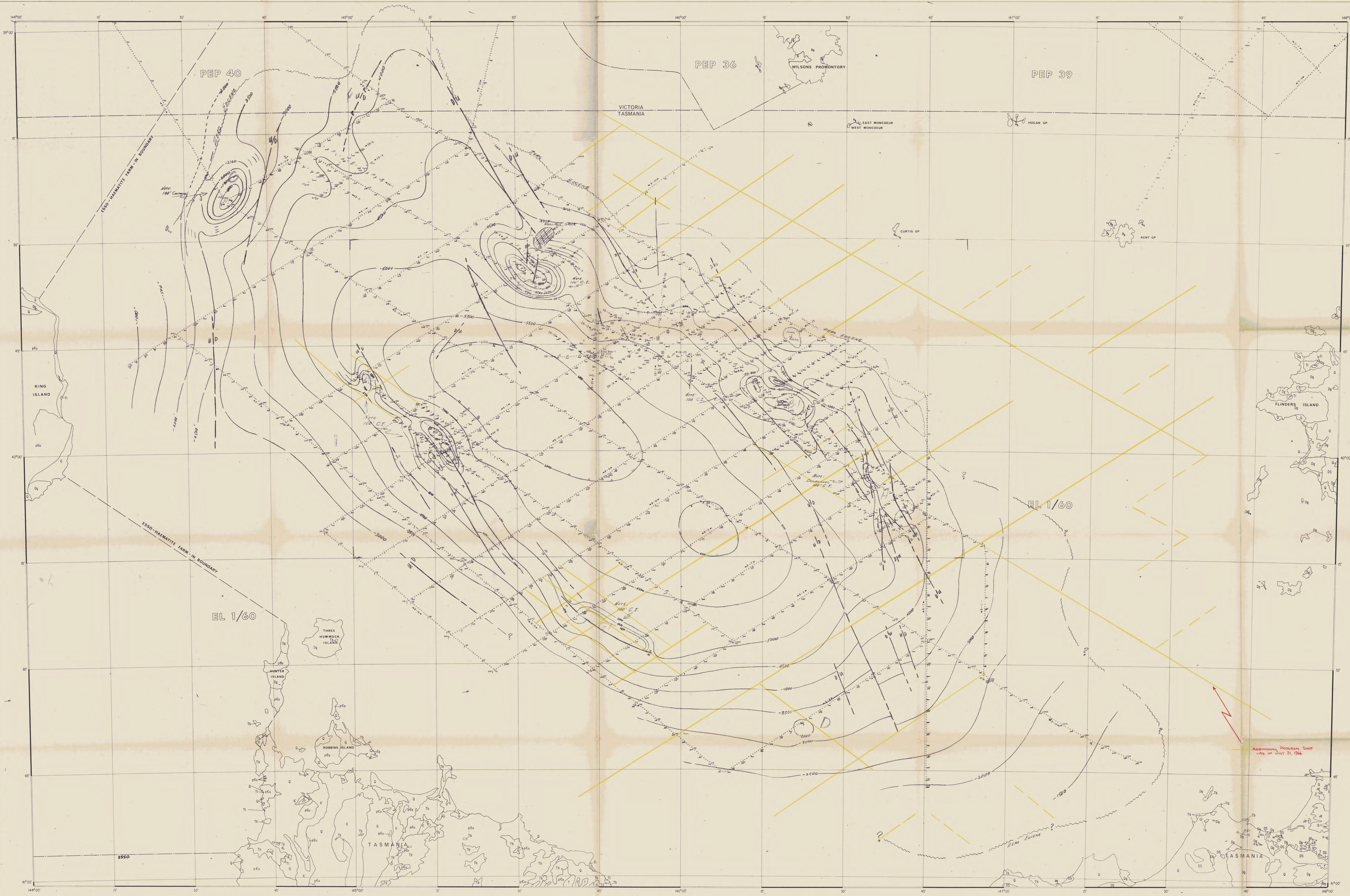
SHEET 1

Aug. 1966

OR-026


PEP 40
PEP 36
PEP 39
WILSONS PROMONTORY
VICTORIA
TASMANIA
EAST MONCOEUR
WEST MONCOEUR
HOGAN GP.
CURTIS GP.
KENT GP.
ESSO-HEMATITE OTWAY FARM-IN
ESSO-HEMATITE BASS FARM-IN
KING ISLAND
FLINDERS ISLAND
EL 1/60
THREE HUMMOCK ISLAND
HUNTER ISLAND
ROBBINS ISLAND
ZERO EDGE OF EOCENE
Note: Basement faults not active at end of Eocene.
LEGEND
Dry hole
Structure contour
Fault
Petroleum tenement boundary
Areas of Eocene Volcanic build-ups
Stock
Stock with flat surface (may be sill with deeper reflections masked)
Q Quaternary
Tl Tertiary (Marine)
T Tertiary (Non-Marine)
P Permian
DS Devonian and Silurian
Є Cambrian
p€u Precambrian (Unmetamorphosed)
Tb Tertiary (Basalt)
Jd Jurassic (Syenite)
Dg Devonian (Granite)
Igneous
Haematite Bass seismic survey
Esso Bass seismic survey
East King Island seismic survey
Eastern Bass Strait seismic survey
MAP INDEX
AUSTRALIA
VICTORIA
TAS.
ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.
THE BASS BASIN
VICTORIA-TASMANIA
STRUCTURE CONTOUR MAP
TOP OF EOCENE
CONTOUR INTERVAL : 250 FEET
DATUM : SEA LEVEL
Scale 1:250,000
MILES
AUTHOR P.E.TOWEY W.C.PRESLEY
TO ACCOMPANY REPORT AUST.
SHEET II
DRAFTED BY A.F.STRAHAN
REVISED Sept. 1967 AD.POOLE J.E.BURBURY
PLATE I
011006 OR-026


PEP 40
PEP 36
PEP 39
WILSONS PROMONTORY
VICTORIA
TASMANIA
EAST MONCOEUR
WEST MONCOEUR
HOGAN GP.
CURTIS GP.
KENT GP.
ESSO-HEMATITE OTWAY FARM-IN BOUNDARY
ESSO-HEMATITE BASS FARM-IN BOUNDARY
NOTE: Sand reflection not mappable in Western part of Basin. Contours phantomed from control to the Bass 1 and 3.
KING ISLAND
ZERO EDGE OF EOCENE SAND
FLINDERS ISLAND
EL 1/60
THREE HUMMOCK ISLAND
HUNTER ISLAND
ROBBINS ISLAND
TASMANIA
NOTE: Sand reflection not mappable
NOTE: Basement faults not active in Eocene time.
LEGEND
Dry hole
Dry and abandoned with measurable amount of gas
Structure contour
Fault
Petroleum tenement Boundary
Stock
Stock with flat surface (may be sill with deeper reflections masked)
Q Quaternary
Tl Tertiary (Marine)
T Tertiary (Non-Marine)
P Permian
DS Devonian and Silurian
Є Cambrian
p€u Precambrian (Unmetamorphosed)
Tb Tertiary (Basalt)
Jd Jurassic (Syenite)
Dg Devonian (Granite)
Igneous
B-10 Haematite Bass seismic survey
EB-10 Esso Bass seismic survey
EK-10 East King Island seismic survey
ES-52 Eastern Bass Strait seismic survey
MAP INDEX
AUSTRALIA
W.A.
N.T.
QLD.
S.A.
N.S.W.
VIC.
VICTORIA
TAS.
ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.
THE BASS BASIN
VICTORIA - TASMANIA
5 cm
STRUCTURE CONTOUR MAP
TOP OF UPPER EOCENE SAND
CONTOUR INTERVAL : 250 FEET
DATUM SEA LEVEL
Scale 1:250,000
MILES
AUTHOR: A.D. POOLE
TO ACCOMPANY REPORT AUST.
SHEET II
DRAFTED BY: A.F. STRAHAN
REVISED B. EDWARDS
PLATE II
011007
OR-026



◄ EK-10 ► East King Island seismic survey

MAP INDEX

AUSTRALIA — W.A. — N.T. — QLD. — S.A. — N.S.W. — VIC. — T.

VICTORIA — TAS.

ESSO EXPLORATION AUSTRALIA INC., SYDNEY, NEW SOUTH WALES

THE BASS BASIN

VICTORIA - TASMANIA

TOP OF EOCENE STRUCTURE CONTOUR MAP

5 cm

CONTOUR INTERVAL = 500 ft. DATUM = SEA LEVEL

JANUARY 1966

Scale 1:250,000

4 0 4 8 12

MILES

AUTHOR: W.C. PRESLEY

DRAFTED BY: A.F STRAHAN

TO ACCOMPANY REPORT AUST. 39

REVISED

SHEET II

PLATE II (2)

011008 OR-026

PEP 40

PEP 36

PEP 39

WILSONS PROMONTORY

VICTORIA
TASMANIA

EAST MONCOEUR
WEST MONCOEUR

HOGAN GP.

CURTIS GP.

KENT GP.

ESSO–HEMATITE GIPPSLAND FARM–IN
ESSO–HEMATITE BASS FARM–IN

ESSO–HEMATITE OTWAY FARM–IN
ESSO–HEMATITE BASS FARM–IN

ZERO EDGE OF PALEOCENE — LOWER EOCENE

ZERO EDGE OF PALEOCENE — LOWER EOCENE

KING ISLAND

FLINDERS ISLAND

EL 1/68

EL 1/60

THREE HUMMOCK ISLAND

HUNTER ISLAND

ROBBINS ISLAND

TASMANIA

TASMANIA

Area of no data beneath Oligocene volcanic build-up

LEGEND

- Dry hole
- Dry and abandoned with measurable amount of gas
- —1500— Structure contour
- D / U Fault
- Petroleum tenement boundary
- Stock
- Stock with flat surface (may be sill with deeper reflections masked)

Q	Quaternary
T1	Tertiary (Marine)
T	Tertiary (Non – Marine)
P	Permian
DS	Devonian and Silurian
€	Cambrian
pCu	Precambrian (Unmetamorphosed)
Tb	Tertiary (Basalt)
Jd	Jurassic (Syenite) — Igneous
Dg	Devonian (Granite) — Igneous

- B–10 Hitemhite Bass seismic survey
- EB–10 Esso Bass seismic survey
- EK–10 East King Island seismic survey
- ES–52 Eastern Bass Strait seismic survey

MAP INDEX

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE BASS BASIN

VICTORIA – TASMANIA

5 cm

STRUCTURE CONTOUR MAP ON MID–EOCENE UNCONFORMITY

CONTOUR INTERVAL: 250 FEET — DATUM: SEA LEVEL

Scale 1:250,000

0 2 4 6 12
MILES

AUTHOR: W.C. PRESLEY – J.E.BURBURY, Sept. 1967 — DRAFTED BY: A.F.STRAHAN, B. MINTO

TO ACCOMPANY

PLATE III

011009 CK-G26

PEP 40

PEP 36

PEP 39

EL 1/60

VICTORIA
TASMANIA

TASMANIA

WILSONS PROMONTORY

EAST MONCOEUR
WEST MONCOEUR

HOGAN GP

CURTIS GP

KENT GP

ESSO–HEMATITE GIPPSLAND FARM–IN

ESSO–HEMATITE BASS FARM–IN

ESSO–HEMATITE OTWAY FARM–IN

ESSO–HEMATITE BASS FARM–IN

ESSO–HEMATITE OTWAY FARM–IN

AREA OF QUESTIONABLE BASEMENT/ HORST BLOCK

BASEMENT REFLECTION CENTRE NOT RELIABLE IN BASIN

Area of no data beneath Cretaceous volcanic build-up

KING ISLAND

THREE HUMMOCK ISLAND

HUNTER ISLAND

ROBBINS ISLAND

FLINDERS ISLAND

Furneaux Group

Kent Is.

LEGEND

- Dry hole
- Dry and abandoned with measurable amount of gas
- —1500— Structure contour
- D / U Fault
- Petroleum tenement boundary
- Stock with flat surface (may be tilt with deeper reflections masked)

Q	Quaternary	
Tl	Tertiary (Marine)	
T	Tertiary (Non – Marine)	
P	Permian	
DS	Devonian and Silurian	
€	Cambrian	
pCu	Precambrian (Unmetamorphosed)	
Tb	Tertiary (Basalt)	
Jd	Jurassic (Dyenite)	Igneous
Dg	Devonian (Granite)	

- B–10 Hematite Bass seismic survey
- EB–10 Esso Bass seismic survey
- EK–10 East King Island seismic survey
- ES–52 Eastern Bass Strait seismic survey

MAP INDEX

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE BASS BASIN

VICTORIA – TASMANIA

5 cm

STRUCTURE CONTOUR MAP ON TOP OF BASEMENT

CONTOUR INTERVAL: 500 FEET

DATUM: SEA LEVEL

Scale 1:250,000

4 0 4 8 12

MILES

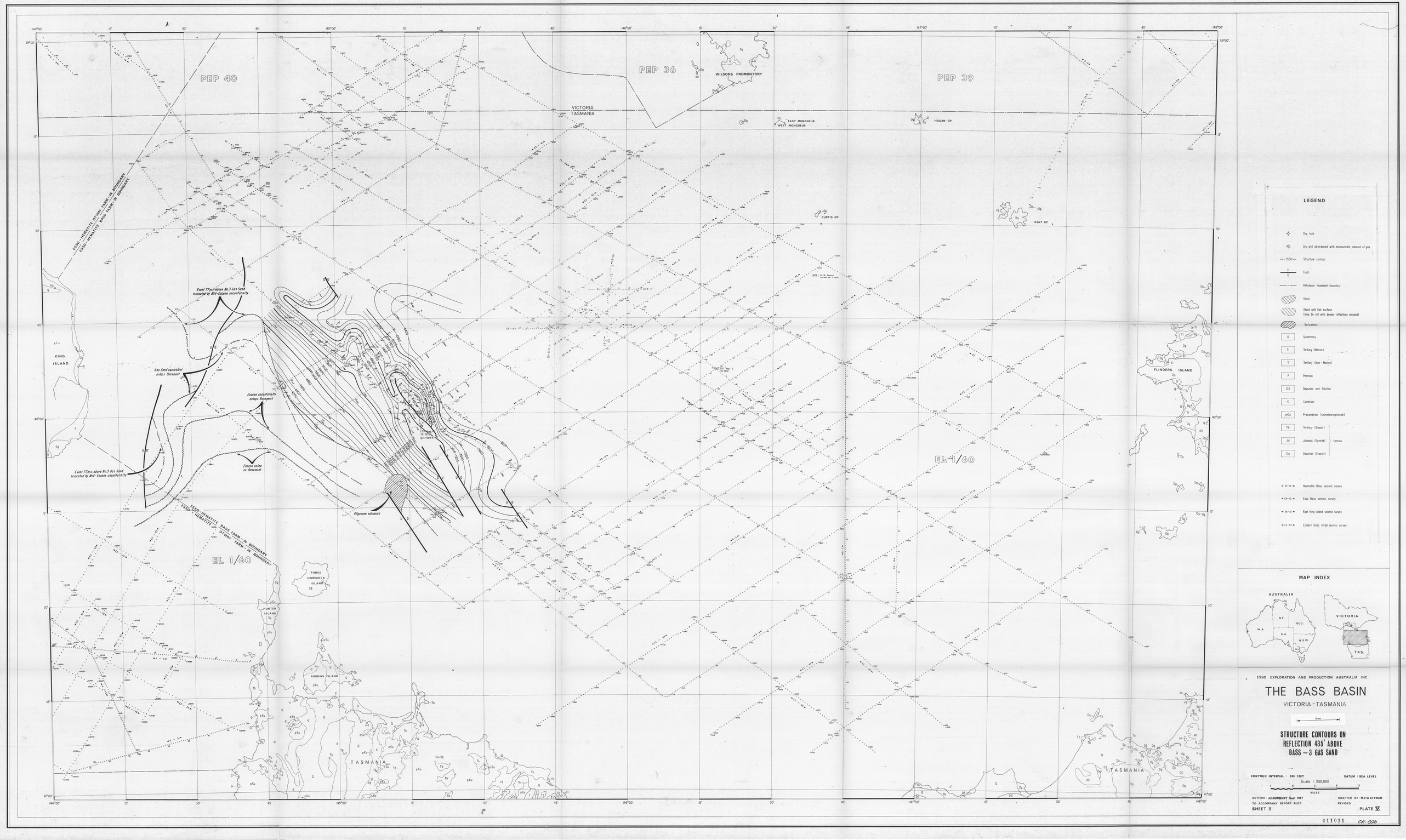
AUTHOR: J. BURBURY – A.D. POOLE, Sept. 1967

DRAFTED BY: A.F. STRAHAN
R. WINTO

TO ACCOMPANY:

PLATE IV

011010


PEP 40
PEP 36
PEP 39
VICTORIA
TASMANIA
WILSONS PROMONTORY
EAST MONCOEUR
WEST MONCOEUR
HOGAN GP.
CURTIS GP.
KENT GP.
KING ISLAND
FLINDERS ISLAND
THREE HUMMOCK ISLAND
HUNTER ISLAND
ROBBINS ISLAND
TASMANIA
ESSO-HEMATITE OTWAY FARM-IN BOUNDARY
ESSO-HEMATITE BASS FARM-IN BOUNDARY
Event 77m.s. above No.3 Gas Sand truncated by Mid-Eocene unconformity
Gas Sand equivalent onlaps Basement
Eocene unconformity onlaps Basement
Eocene onlap on Basement
Oligocene volcanics
EL 1/60
LEGEND
Dry hole
Dry and abandoned with measurable amount of gas
Structure contour
Fault
Petroleum tenement boundary
Stock
Stock with flat surface (may be sill with deeper reflections masked)
Volcanics
Q Quaternary
Tl Tertiary (Marine)
T Tertiary (Non-Marine)
P Permian
DS Devonian and Silurian
€ Cambrian
p€u Precambrian (Unmetamorphosed)
Tb Tertiary (Basalt)
Jd Jurassic (Syenite)
Dg Devonian (Granite)
Igneous
B-10 Haematite Bass seismic survey
EB-10 Esso Bass seismic survey
EK-10 East King Island seismic survey
ES-52 Eastern Bass Strait seismic survey
MAP INDEX
AUSTRALIA
W.A.
N.T.
QLD.
S.A.
N.S.W.
VIC.
VICTORIA
TAS.
ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.
THE BASS BASIN
VICTORIA - TASMANIA
5 cm
STRUCTURE CONTOURS ON REFLECTION 435' ABOVE BASS - 3 GAS SAND
CONTOUR INTERVAL : 200 FEET
DATUM : SEA LEVEL
Scale 1:250,000
MILES
AUTHOR: J.E.BURBURY Sept 1967
TO ACCOMPANY REPORT AUST.
SHEET II
DRAFTED BY: M.F.WEETMAN
REVISED
PLATE V
011011
CR-036

PEP 40

PEP 36

PEP 39

VICTORIA
TASMANIA

WILSONS PROMONTORY

EAST MONCOEUR
WEST MONCOEUR

HOGAN GP.

CURTIS GP.

KENT GP.

ESSO-HEMATITE OTWAY FARM-IN BOUNDARY
ESSO-HEMATITE BASS FARM-IN BOUNDARY

EL 1/60

KING ISLAND

THREE HUMMOCK ISLAND

HUNTER ISLAND

ROBBINS ISLAND

FLINDERS ISLAND

TASMANIA

Pipeline Rock

Kent Is.

LEGEND

- Dry hole
- Dry and abandoned with measurable amount of gas
- —1500— Structure contour
- Fault
- Petroleum tenement boundary
- Stock
- Stock with flat surface (may be sill with deeper reflections masked)

Q	Quaternary	
Tl	Tertiary (Marine)	
T	Tertiary (Non - Marine)	
P	Permian	
DS	Devonian and Silurian	
€	Cambrian	
pCu	Precambrian (Unmetamorphosed)	
Tb	Tertiary (Basalt)	
Jd	Jurassic (Syenite)	Igneous
Dg	Devonian (Granite)	

- → B-10 → Haematite Bass seismic survey
- → EB-10 → Esso Bass seismic survey
- → EK-10 → East King Island seismic survey
- → ES-57 → Eastern Bass Strait seismic survey

MAP INDEX

ESSO EXPLORATION AND PRODUCTION AUSTRALIA INC.

THE BASS BASIN

VICTORIA - TASMANIA

5 cm

ISOPACH MAP TOP UPPER EOCENE SAND TO BASEMENT

ISOPACH INTERVAL : 500 FEET — DATUM SEA LEVEL

Scale 1:250,000

0 4 8 12 MILES

AUTHOR: A.D.POOLE Sept 1983 — DRAFTED BY: A.F.STRAHAN

TO ACCOMPANY REPORT AUST. — REVISED M.R.CHÂTENAY

SHEET II — PLATE XV

011012 OR-005

144°00' 15' 30' 45' 145°00' 15' 30' 45' 146°00'

38°00'

PORT PHILLIP BAY

GEELONG

6

256

22

27

FRENCH ISLAND

WESTERN PORT

PHILLIP ISLAND

ARCO-WOODSIDE

WONTHAGGI

ALLIANCE

FROME-B.H.

36

28

30'

45'

BASS STRAIT

40

ED-58

ED-82

ED-84

ED-61

ED-83

ED-81

PEP 40

39°00'

15'

30'

45'

VICTORIA

TASMANIA

ESSO-HAEMATITE FARM-IN BOUNDARY

Cruise Bass

KING ISLAND

Dg

Q

p€u

Tl

€

ESSO-HAEMATITE FARM-IN BOUNDARY

Bass Cruise

EL 1/60

THREE HUMMOCK ISLAND

HUNTER ISLAND

ROBBINS ISLAND

TASMANIA

Tb

40°00'

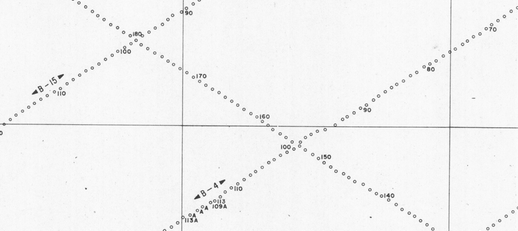
41°00'

ESSO Bass-1
T.D. 7717'

ESSO Bass-3

BASS ED 67 MARINE SEISMIC SURVEY PROGRAM
211 mi.

MAP INDEX



ESSO EXPLORATION & PRODUCTION AUSTRALIA INC.

THE BASS BASIN

VICTORIA - TASMANIA

PROPOSED PROGRAM
BASS ED-67 MARINE
SEISMIC SURVEY

5 cm

Scale 1:250,000

4 0 4 8 12
MILES

AUTHOR:
TO ACCOMPANY REPORT AUST.

DRAFTED BY: A.F STRAHAN
REVISED

PLATE VII

011013

OR-026