

DEPT. MATHEMATICS & ENG.



SUBSIDY REPORT

MORWONG -1

VICTORIA, AUSTRALIA

By

W. Threlfall

R. Brotherton

G. Short

Esso Australia Ltd.

April, 1973

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1. SUMMARY

(1) Drilling

Morwong-1 was drilled to a T.D. of 8,003' by Global Marine's floating rig "Glomar Conception". The rig commenced operations on December 9, 1972. The well was spudded on December 10, 1972 and was abandoned on December 27, 1972. Total rig time was 18.03 days.

Casing was set at 639' (20" in 26" hole) and 2748' (10-3/4" in 13-3/4" hole).

The well was plugged over the intervals 2850'-2573' and 505'-300'. The well head and pile joint were shot off and pulled to surface.

(2) Geological

Miocene to Recent marls, limestones, mudstones and calcarenites were drilled to a depth of 5422' (-5390') where the top of the Latrobe Group was encountered 180' below the original estimate. The Eocene and Paleocene section was found to consist of interbedded sandstones, shales and coals as anticipated.

The well encountered no hydrocarbon shows. Although many sand zones in the Latrobe have good porosity and permeability, they are water saturated.

II. INTRODUCTION

The Morwong-1 well was programmed to test a combined structural-stratigraphic trap located against the eastern side of the Marlin Channel between the Marlin and Tuna Fields. The trap is formed by Paleocene and Eocene sediments of the Latrobe Group being truncated and sealed in an updip position by the impermeable shales and marls infilling the Marlin channel.

The well was located in the same fault block as the Turrum-1 well and it was anticipated that it would also test the downdip limits of the gas reservoir found in Turrum-1.

III. WELL HISTORY

(1) General Data

(i) Well Name and Number

MORWONG-1

(ii) Operator and Address

Esso Exploration and Production Australia Inc.
C/- Price Waterhouse Nominees (Victoria) Pty. Ltd.
The National Mutual Centre,
447 Collins Street,
MELBOURNE VICTORIA 3000.

(iii) Title Holder and Address

Hematite Petroleum Pty. Ltd.
B.H.P. House,
140 William Street,
MELBOURNE VICTORIA 3000.

(iv) Petroleum Title

Petroleum Production Licence Vic L/4

(v) District

A.M.G. Zone 55

(vi) Location

Latitude 38° 13' 42.63" S
Longitude 148° 18' 45.32" E

(vii) Elevation

Mean Sea Level
(Water depth 208')

(viii) Total Depth

8,003'.

(ix) Spud Date

December 10, 1972

(x) Date T.D. Reached

December 26, 1972.

(xi) Date of Completion

December 27, 1972.

(xii) Rig Released

December 27, 1972.

(xiii) Drilling Time

Total Drilling time 18.03 days (actual time on bottom 9.75 days)

(xiv) Status

Plugged and abandoned as dry hole.

(xv) Total Cost

A.\$430,000

WELL HISTORY (Cont'd)

(2) Drilling Data

(i) Name and Address of Drilling Contractor

Global Marine A/Asia Pty. Ltd.
380 Lonsdale Street,
MELBOURNE VICTORIA 3000.

(ii) Drilling Plant

Make: National 1625
Type: Diesel Electric
Rated Capacity with
Drill Pipe Used: 25000 ft. with 5" drill pipe.
Motors:
Make: General Electric (X2) Caterpillar (X8)
Type: Diesel Electric D398 V12 Diesel
B.H.P.: 752 DI x 2 8720 Intermittent
6800 Continuous

(iii) Derrick

Make: Build by Continental EMSCo. using a Global
Marine Design.
Type: Standard type with travelling block guide rails.
Rated Capacity: 1,000,000 lb.

(iv) Pumps

Make: National x 2
Type: N1300
Size: 1300 HP each
Pump Motors
Make: General Electric
Type: DC Electric
B.H.P.: 752 - 2 per pump.

(v) Blowout Preventer Equipment

Make: Vetco/Shaffer/Cameron/Hydriil
Type: 3 Cameron, 1 Shaffer ram-type Preventers
1 Shaffer, 1 Hydriil bag-type Preventer.
Size: 16-3/4" for 5" drill pipe.
API Series: 1500; 5000 psi working pressure.

(vi) Hole Sizes and Depths

Conductor Hole: 26" to 700' KB
Surface Hole: 13-3/4" to 2805' KB
Exploration Hole: 9-7/8" to 8003' KB.

(vii) Casing and Liner Cementing Details

<u>Size</u>	<u>Weight</u>	<u>Grade</u>	<u>Range</u>	<u>Depth Set</u>
20"	91.5 lb/ft	X-52 LP	3	639' KB
10-3/4"	40.5 lb/ft	J55	3	2748' KB
			20"	10-3/4"
Position of Float Collar			N/A	Top of bottom joint
Position of Float Shoe			Bottom of string:	Bottom of string.
No. of Centralizers			6	10
Position of Centralizers			Top and bottom of bottom joint.	Top and bottom of 1st joint, one on every 2nd joint over 16 joints total.
			Top of 2nd joint free on 4th, 6th 8th joints.	
No. of Scratchers			Nil	Nil
Position of Scratchers			-	-
Cement used.			1194 sxs	600 sxs
Top of Cement			sea floor	1500' est.
Method used (plug, multi- stage, etc.)			Plug	Plug.

(viii) Drilling Fluid

Type: Lignosulphonate Fresh Water
 Average Weight: 10.6 ppg.
 Brief Details of Treatment, average weekly analysis: Mud pumped over shale shaker and through de-silter. Thinning accomplished by addition of fresh water, Q-Broxin and CCl6.

WT.	Vis.	W.L.	Filter Cake	pH	Sand
10.6	46	5.8	2/32	10.2	0.5%

List of Types and quantity of Mud materials and chemicals consumed:

Barites	1430 sx
Gel	795 sx
Caustic	5,320 lb.
Lignosulphonate	211 sx.
Lignite	99 sx

Nitrate added to the mud system was used as tracer indicating filtrate recovery on formation testing. From 4,870', the desired concentration of nitrate was maintained at approximately 100 ppm using 5 lb. of commercial pellet fertilizer per 100 bbls. of mud.

(ix) Water Supply

Barry's Beach tap water transported by workboats.

(x) Perforation & Shooting Record

Nil

(xi) (a) Plugging Back Cementation Jobs

	1	2
Length and Type of Plug:	277' (2850'-2673')	205' (505'-300')
No. of sacks used:	Neat 15.6 ppg 160 sx	Neat 15.6 ppg 94 sx
Methods uses:	Displacement through drill pipe.	
Whether plug job was satisfactorily tested:	Yes	Yes

(b) Squeeze Cementation Job

Nil.

(xii) Fishing Operation

On connection just after drilling out the surface casing shoe at 2748' the top bumper sub parted. Two runs were made with an overshot before the fish was recovered.

(xiii) Side-tracked Hole

Nil.

(3) Location

(i) Site Investigations Carried Out

Nil.

(ii) Anchoring Methods

10 x 30,000 lb. anchors were laid by workboats in a 45° / 95° pattern on an average radius of 1700 ft.

(iii) Transportation

1. Helicopters from Longford
2. Workboats from Barry's Beach

(4)

Sampling

(i) Ditch Cuttings

From 700', five sets of washed and dried samples every 10-30', to T.D. One set of unwashed, bagged samples every 10-30', one composite canned sample every 100'. All samples were lagged and caught off a standard shale shaker by Baroid Mud-Logging personnel under the supervision of an Esso wellsite geologist.

A set of washed and dried samples was taken for Hematite, Victorian Mines Department, and the Bureau of Mineral Resources - Subsidy Section. Esso retained two sets, one for paleontological processing and the other for storage. For descriptions see Appendix 3.

(ii) Coring

Core No.	Interval Cored	Footage Cut	Recovery in Feet	Recovered %
1	7546'-7553'	7'	7'	100%

For a full description of the core see Appendix 4.

(iii) Sidewall Sampling

Sidewalls were taken by a Schlumberger wireline device. 30 cores from one gun were attempted and 30 were recovered.

Depth	Recovered	Depth	Recovered
7920'	5/8"	5603'	3/4"
7704'	5/8"	5460'	1-1/2"
7526'	3/4"	5418'	3/4"
7390'	1/2"	5410'	1-1/2"
7284'	5/8"	5386'	3/4"
7148'	1/2"	5370'	1-3/4"
7044'	7/8"	5305'	7/8"
6877'	1"	4690'	3/4"
6752'	5/8"	4067'	1-3/8"
6636'	1-1/4"	3526'	1-1/2"
6492'	7/8"	3026'	1/2"
6378'	3/4"	2809'	1-1/4"
6279'	1/2"		
6148'	1-1/8"		
6018'	1"		
5947'	1"		
5876'	1"		
5746'	3/4"		

All samples were retained by Esso for paleontological processing. Any residue or unused portions were placed in storage. For full descriptions see Appendix 4.

(5) Logging and Surveys

(i) Electric Logging

Log	Interval	Scale
GR-BHCS-Cal	2795-634 (GR to 280')	2" & 5"
ISF-SCT	7996-2742	2" & 5"
FDC-CNL-GR-Cal	FDC & CNL 8002-5100 Cal to 2720'; GR to 2550'	2" & 5"

Copies of all logs are in Enclosure 9.

(ii) Penetration Rate & Gas Logging

Full records of penetration rates, chromatographic gas analyses and total gas measurements were made from 700' to T.D. Shale densities, 'd' exponent values and drillability measurements were made from 4000' to T.D. (See Enclosure 8.)

(iii) Temperature Surveys

Bottom hole temperatures were recorded by Schlumberger during logging. Maximum temperatures recorded are on each log header. A maximum BHT of 198°F was reached on the FDC/CNL/GR log, 9 hours after breaking circulation.

(iv) Other Well Surveys

A velocity survey was conducted at total depth (See Enclosure 6.)

6. Testing

No formation tests or production tests were carried out.

IV. GEOLOGY

(1) Summary of Previous Work

Exploration for oil and gas in the Gippsland Basin has been in progress since 1924 when oil and gas shows were encountered during the drilling of a water well near Lakes Entrance. A large number of wells were subsequently drilled by government agencies and private firms, all of which met with discouraging results, (K.A. Richards, B.M. Hopkins, 1969).

The modern exploration phase commenced onshore in 1954, when geophysical methods were used to delineate drilling targets. None of those prospects drilled encountered significant hydrocarbon accumulations.

Offshore exploration began in 1960, when the Broken Hill Pty. Ltd. conducted an aeromagnetic survey over their offshore lease. In 1962 Hematite Petroleum (a wholly owned subsidiary of B.H.P.) shot 1005 miles of single-fold, analog seismic data.

In 1964, an agreement between Esso and B.H.P. was ratified for the exploration of the Gippsland Basin. Later that year Esso conducted the "EG" seismic survey (722 miles) and on June 5, 1965 completed the first Gippsland offshore well as a gas discovery (Barracouta-1, previously known as EGS-1).

Subsequent Esso/BHP seismic surveys are as follows:

1966	ET Survey
1967	EX Survey
	EC Survey
1968	EH Survey
	G69A Survey
1969	G69A Survey
	G69B Survey
1970	G69B Survey
	G70A Survey
1971	G71A Survey
	G71B Survey
1972	G72A Survey

Including the initial discovery, the drilling program to date has totalled 48 exploratory and stepout wells.

(2) Regional Geology

The Gippsland Basin occupies a portion of onshore Tasmania and South East Australia. Sedimentation has been continuous in some part of the basin from early Cretaceous to Recent time.

The Lower Cretaceous lacustrine and fluvial greywackes of the Strzelecki Group were deposited within an east-west rift system, the north and south boundaries of which were created by the limits of extensional faulting.

Upper Cretaceous through Eocene rocks (the Latrobe Group) represent a continuation of the lacustrine-fluvial environment except that the quartz sandstones are more mature and develop better reservoir characteristics. From early Paleocene through Eocene, the nonmarine depositional environment had a laterally equivalent marginal marine and marine edge, primarily in the southeast portion of the basin. A substantial portion of the Eocene depositional patterns are attributed to a complex system of channel cut and fill and associated marine incursions, (E.A. James, P.R. Evans, 1971).

Rocks of Oligocene age are mainly fine grained marine mudstones which had slow depositional rates. The site of coarse clastic deposition was confined to the hinterland along a narrow zone in the Yallourn Valley in the north west portion of the onshore Basin area.

Sedimentation during Early Miocene was similar to that of the Oligocene whereas very rapid deposition of marls, bryozoa-skeletal limestones and calcarenites occurred during Late Miocene through Pliocene. Submarine channelling and gross scour and fill features dominate the depositional characteristics and the resulting bedding configuration. The loading effect of this rapid deposition resulted in severe isostatic adjustment of the central to eastern portion of the offshore Gippsland Basin, with considerable tilting and change of the original Basin form.

Major oil and gas deposits have been discovered in the basin, most of which are found in either anticlinal culminations or combined anticlinal-paleotopographic closures at the top of the Latrobe Group.

(3) Stratigraphic Table

The stratigraphy encountered in Morwong-1 is summarised in the following table:

AGE	FORMATION	FM. TOP	SUBSEA DEPTH	THICKNESS
	Water	32' KB	Sea Level	208'
Miocene-Recent	Gippsland	240'	- 208'	(5182'
Mid Miocene	Gippsland	5389'	-5357'	
Middle Paleocene to Early Eocene	Latrobe Group	5422'	-5390'	2581' +

(4) Stratigraphic Descriptions

<u>Gippsland Formation</u>	900-2850	<u>Calcarenite</u> , light grey, soft to moderately hard, abundant foram tests and loose calcareous shell fragments embedded in a soft, calcareous, muddy matrix.
	2850-3820	<u>Marl</u> , soft, clayey, light grey, interbedded with marl, harder, more calcareous, massive, darker grey. Abundant foram tests.
	3820-4900	<u>Mudstone</u> , medium to dark grey, slightly fissile, slightly to highly calcareous, highly fossiliferous (dominantly foram tests). Becomes more indurated towards the base.
	4900-5422	<u>Shale</u> , medium grey, highly calcareous, fossiliferous, becomes slightly silty towards base.
<u>Latrobe Group</u>	5422-5730	Interbedded sandstone and siltstone with minor coal. <u>Sandstone</u> , clear, poorly consolidated quartz grains, very fine to medium grain, well sorted and rounded with traces of pyrite. <u>Siltstone</u> , light brown, very carbonaceous, friable to well indurated, occasionally bleeding gas. <u>Coal</u> , brown to black, dull to vitreous with traces of amber, often bleeding gas.
	5730-8003	This interval is dominantly <u>siltstone</u> with minor sands and thin <u>coal</u> horizons. <u>Siltstone</u> , grey brown to brown, often dolomitic, slightly friable to hard, carbonaceous.

5730-8003 Sandstone, frosted, consolidated quartz grains, very fine grained, well sorted, angular to well rounded, pyritic, calcareous cement with traces of dolomite.

Coal, black to brown, predominantly vitreous and brittle.

(5) Structure

Morwong, located midway between the Marlin and Tuna fields, is a combined paleotopographic and structural feature. It was formed by the Marlin Channel cutting the north-easterly plunging nose of the Marlin anticline. At this location the truncated Latrobe section is sealed in an updip position along the north-eastern channel edge.

Normal faulting, which divides the prospect into three fault blocks, increases closure to the north. These faults were active until approximately middle Eocene while the anticlinal growth occurred primarily from middle Eocene to middle Miocene.

(6) Hydrocarbon Occurrence

No shows of oil or gas were encountered even though suitable reservoir sands with interbedded sealing shales and coals were present as predicted. The lack of hydrocarbons is attributed to the limited drainage area available for the prospect.

The well penetrated the equivalent stratigraphic section to the gas reservoirs encountered in the Turrum-1 well in a downdip position. However, no shows were recorded. Presumably the lateral extension of these gas sands is limited as they cannot be correlated into Morwong-1. Thus, it is impossible to estimate their regional extent.

(7) Relevance to Geological Concepts

As predicted, the section penetrated to the top of the Latrobe Group consisted of Miocene to Recent marls, calcarenites and shales. There were no anomalous lithologies nor ages encountered.

Palynology indicates the Latrobe Group to be composed of Paleocene rocks overlain by a thin, eroded Lower Eocene section. Lithologically, the Latrobe section consists of alternating beds of thin, porous, point-bar sands; thick, silty, carbonaceous shales, thin crevasse sands, and thin coals. Neither the sands nor the coals could be correlated into Turrum-1. This sporadic, discontinuous deposition is typical of delta plain sedimentation. Such lithologies and their distribution were expected and necessary to the play concept.

The top of the Latrobe Group was 180' deeper than predicted by seismic interpretation. This depth discrepancy is due to the difficulties in seismic velocity interpretation in the area. This did not effect the structure significantly and does not detract from the validity of the test.

(8) Porosity and Permeability

The sandstones found in the Latrobe Group have excellent porosity and permeability. The overlying Gippsland Formation has no effective porosity (when the upper unconsolidated highly fossiliferous zone is disregarded). See Appendix No. V.

V. REFERENCES

James, E.A., Evans, P.R. "The Stratigraphy of Offshore Gippsland Basin, Australia", APEA March, 1971.

Richards, K.A., Hopkins, B.M. "Exploration in the Gippsland, Bass & Otway Basins, Australia", ECAFE, 1969.

LIST OF ENCLOSURES

1. Contour Map of Intra Latrobe Turrum Gas Sand Horizon 25' Above Gas Sand (-6901), Predrill.

Composite Structure Map Top Latrobe Group, Base of Turrum Formation, Base of Flounder Formation, Intra Latrobe Event. - Predrill.

2. Geological Cross Section A-A! Predrill.

3. Contour Map of Intra Latrobe Turrum Gas Sand Horizon 25' Above Gas Sand (-6901), PostDrill.

Composite Structure Map Top Latrobe Group, Base of Turrum Formation, Base of Flounder Formation, Intra Latrobe Event, - Postdrill.

4. Geological Cross Section A-A! Postdrill.

5. Geological Cross Section - B-B! Postdrill.

6. Time-Depth Curve.

7. Well History Chart.

8. Rocklog.
Baroid PPM Gas Chromatograph Log.
Baroid A.D.T. Log.
Baroid 'd' Exponent/Drillability Log.

9. ISF/SONIC 2" & 5"
FDC/GR/CNL/CAL 2" & 5"
BHC SONIC/GR 2" & 5"
Composite Log

APPENDIX 1

THE PALYNOLOGY OF
MORWONG - 1,
GIPPSLAND BASIN.

by.

A. D. PARTRIDGE

21st February 1973

INTRODUCTION

The spore-pollen zonation is based on well preserved and diverse assemblages from the sidewall cores. The same assemblages were recognised in the cuttings examined but these were not used in delimiting the zones because of the uncertainty of the depths owing to incorrect lag times.

The following spore-pollen zones are identified in Morwong-1:

Zone	Depth in Feet		Age
	Highest data	Lowest data	
<u>Triporopollenites bellus</u> Zone	5370	- 5418	Miocene
<u>Malvacipollis diversus</u> Zone	5460	- 5746	Early Eocene
<u>Lygistepollenites balmei</u> Zone	5876	- 7920	Paleocene

COMMENTS

The palynological evidence indicates that the top of Latrobe Group unconformity lies between 5418 and 5460 feet and represents a time break from Early Eocene to Early Miocene.

Dinoflagellates dominate the palynological assemblages from the Lakes Entrance Formation and are absent or rare to common in assemblages from the Latrobe Group. In the latter those assemblages in which contain a high proportion of dinoflagellates are generally dominated by only a single species, either Cyclonopelium retiintextum or Wetzeliella homomorpha. Dinoflagellates were the only marine fossils found in the Latrobe Group and are probably indicative of only a very marginal marine environment.

Reworked Early Cretaceous spore-pollen are present in the L. balmei and T. bellus Zones. Paleocene and early Eocene spore-pollen derived from the underlying Latrobe Group were also observed in the T. bellus Zone.

At total depth Morwong-1 was still within the L. balmei Zone based on well preserved and diverse assemblages containing common Lygistepollenites balmei. The top of the zone is taken at the extinction of Polycopites langstonii, Gambierina rudata and the last common occurrence of

Australopollis obscurus and L. balmei.

The M. diversus Zone is recognised by the occurrence of Spinizonocolpites prominatus, Intratiporopollenites notabilis, Proteacidites grandis Polycolpites esobalteus and the absence of any younger species. The occurrence of L. balmei and A. obscurus, indicator species for the underlying zone in the lowest sample (5746 feet) from the M. diversus Zone is considered to reflect the closeness of the zone boundary. The possibility of reworking is discounted because of the absence of other L. balmei Zone species while sample contamination has been checked for by reprocessing the sample.

The palynology assemblages between 5370 and 5418 feet are dominated by long ranging Oligocene-Miocene spore-pollen and dinoflagellate species which are referred to the T. bellus Zone on the basis of the occurrence of the spore Rugulatisporites micraulaxus.

	<u>SAMPLES EXAMINED</u>	
Sample	Depth (in feet)	Zone
SWC 24	5370* B D	<u>T. bellus</u> Zone
SWC 23	5386*	"
SWC 22	5410* K, B	"
SWC 21	5418*	"
SWC 20	5460*	Lower <u>M. diversus</u> Zone
SWC 19	5603	"
SWC 18	5746*	"
SWC 17	5876*	<u>L. balmei</u> Zone
SWC 16	5947*	"
SWC 15	6018* K	"
SWC 14	6148*	"
SWC 13	6279* K	"
SWC 12	6378*	"
SWC 11	6492*	"
SWC 10	6636	"
SWC 9	6752	"
SWC 8	6877 "	"

Sample	Depth (in feet)	Zone
SWC 7	7044	<u>L. balmei</u> Zone
SWC 6	7148 K	"
SWC 5	7284*	"
SWC 4	7390*	"
SWC 3	7526	"
Core - 1	7551½	Barren
Core - 1	7552	<u>L. balmei</u> Zone
SWC - 2	7704*	"
SWC - 1	7920	"

* Dinoflagellates present.

Reworked spore-pollen present in the samples are indicated by the following letters after the depth

K= Early Cretaceous

B= L. balmei Zone reworking

D =M. diversus Zone reworking

Rotary cutting samples were also examined from the following depths:

5380 - 400 ft (coal), 5460 - 70 ft, 5600 - 10 (coal) ft,

5810 - 20 ft, 5950 - 60ft, 6000 - 10 ft (coal),

6150 - 60 ft and 6200 - 10 ft.

BASIN GIPPSLAND

DATE _____

WELL NAME MORWONG -1

ELEVATION +32 FEET

AGE	PALYNOLOGIC ZONES	HIGHEST DATA				LOWEST DATA					
		Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time	Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time
EOCENE	<u>P. tuberculatus</u>										
	<u>U. N. asperus</u>										
	<u>M. N. asperus</u>										
	<u>L. N. asperus</u>										
	<u>P. asperopolus</u>										
	<u>U. M. diversus</u>										
	<u>M. M. diversus</u>										
	<u>L. M. diversus</u>	4560	0				5746	0			
PALEOCENE	<u>U. L. balmei</u>	5867	0				6492	0			
	<u>L. L. balmei</u>	6636	2	7148	0		7920	1			
	<u>T. longus</u>										
CRETACEOUS	<u>T. lilliei</u>										
	<u>N. senectus</u>										
	<u>C. trip./T. pach.</u>										
	<u>C. distocarin.</u>										
	<u>T. pannosus</u>										
EARLY CRETACEOUS											
PRE-CRETACEOUS											
	T.D.	8003									

COMMENTS: DINOFLAGELLATE ZONES:
Wetzeliella hyperacantha Zone 5746 (1)
Wetzeliella homomorpha Zone 5876 (1) - 6378 (1)
Eisenackia crassitabulata Zone 7390 (1) - 7704 (1)
The T. bellus Spore/Pollen Zone is present from 5370 (1) to 5418 (1)

- RATINGS: 0; SWC or CORE, EXCELLENT CONFIDENCE, assemblage with zone species of spores, pollen and microplankton.
 1; SWC or CORE, GOOD CONFIDENCE, assemblage with zone species of spores and pollen or microplankton.
 2; SWC or CORE, POOR CONFIDENCE, assemblage with non-diagnostic spores, pollen and/or microplankton.
 3; CUTTINGS, FAIR CONFIDENCE, assemblage with zone species of either spore and pollen or microplankton, or both.
 4; CUTTINGS, NO CONFIDENCE, assemblage with non-diagnostic spores, pollen and/or microplankton.

NOTE: If a sample cannot be assigned to one particular zone, then no entry should be made. Also, if an entry is given a 3 or 4 confidence rating, an alternate depth with a better confidence rating should be entered, if possible.

DATA RECORDED BY: ADP DATE Jan. 1973.

DATA REVISED BY: ADP DATE Jan. 1975.

BASIN

GIPPSLAND BASIN

DATE

22 Feb. 1973

WELL NAME

MORWONG -1

ELEVATION

+32 feet

AGE	PALYNOLOGIC ZONES	HIGHEST DATE				LOWEST DATE					
		Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time	Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time
OLIGOCENE	<u>T. bellus</u>	5370	1				5418	1			
	<u>P. tuberculatus</u>										
Eocene	<u>U. N. asperus</u>										
	<u>L. N. asperus</u>										
	<u>P. asperopolus</u>										
	<u>U. M. diversus</u>										
	<u>L. M. diversus</u>	5460	0				5746	0			
PALEOCENE	<u>L. balmei</u>	5876	1				7920	1			
	<u>T. longus</u>										
LATE CRETACEOUS	<u>T. lilliei</u>										
	<u>N. senectus</u>										
	<u>C. trip./T.pach.</u>										
	<u>C. distocarin.</u>										
EARLY CRETACEOUS	<u>T. pannosus</u>										
	<u>C. paradoxa</u>										
	<u>C. striatus</u>										
	<u>U. C. hughesii</u>										
	<u>L. C. hughesii</u>										
	<u>C. stylosus</u>										
Pre-Cretaceous											

COMMENTS: 'Upper' L. balmei Zone Top 5867' (1) — Bottom 6148' (1)'Lower' L. balmei Zone Top 6877' (1) — Bottom 7920' (1)

SWC's between 6279' & 6752' cannot yet be referred to these subzones.

- RATINGS: 0; SWC or CORE, EXCELLENT CONFIDENCE, assemblage with zone species of spores, pollen and microplankton.
- 1; SWC or CORE, GOOD CONFIDENCE, assemblage with zone species of spores and pollen or microplankton.
- 2; SWC or CORE, POOR CONFIDENCE, assemblage with non-diagnostic spores, pollen and/or microplankton.
- 3; CUTTINGS, FAIR CONFIDENCE, assemblage with zone species of either spores and pollen or microplankton, or both.
- 4; CUTTINGS, NO CONFIDENCE, assemblage with non-diagnostic spores, pollen and/or microplankton.

NOTE: If a sample cannot be assigned to one particular zone, then no entry should be made. Also, if an entry is given a 3 or 4 confidence rating, an alternate depth with a better confidence rating should be entered, if possible.

DATE RECORDED BY: A. D. PartridgeDATE 22 February 1973

DATE REVISED BY: _____

DATE _____

APPENDIX 2

FORAMINIFERAL BIOSTRATIGRAPHY

MORWONG - 1,
GIPPSLAND BASIN.

By

D. J. TAYLOR

25th January 1973

FORAMINIFERAL BIOSTRATIGRAPHY MORWONG-1 GIPPSLAND BASIN

Seventeen side wall cores were examined between 5876 and 2809 feet. No fauna was found in side wall cores at 5460, 5603, 5746 and 5876 feet. Some rotary cutting samples were examined but, as the designated depths were found to be unreliable, these samples are not included on the distribution sheets.

BIOSTRATIGRAPHY

Age	Zones	Depths in Feet	
		Top	Base
Upper Miocene	Zone D	2809	4690
" "	Zone E	5305	5370
Lower Miocene	Zone F	5386	5418

The base of the foraminiferal sequence is at 5418 feet while the highest sample examined is from 2809 feet.

The biostratigraphic zonation is that proposed by Taylor (1966) for off-shore Gippsland. Certain refinements to the scheme are in accordance with the New Zealand planktonic foraminiferal zonation outlined by Jenkins (1971).

The earliest fauna found is that at 5418 feet. Although preservation is poor, due to compaction and recrystallization, the association of Globigerinoides trilobus and G. bisphericus can be recognised. This association is diagnostic of Zone F which is at the top of the lower Miocene. The presence of Zone F at the base of the marine sequence, implies that the Oligocene and most of the lower Miocene is missing. More typical and diverse Zone F assemblages are present at 5410 and 5386 feet.

At 5370 feet, which is 16 feet above definite Zone F, Orbulina suturalis appears indicating the top of Zone E (= the O. suturalis Zone of Jenkins, 1971). It is probable that the basal part of Zone E (= the P. glomerosa curva Zone of Jenkins, 1971) is missing from the sequence. It is also

noted that specimens at and above 5370 feet are not recrystallized. Zone E fauna is also present at 5305 feet.

The first appearance of Orbulina universa and Globorotalia mayeri barisaensis is at 4690 feet and this association persists to the highest sample at 2809 feet. Therefore the interval between 4690 and 2809 feet represents Zone D.

ENVIRONMENT

The basal marine sample at 5418 feet is composed entirely of planktonic foraminifera. The dominance of planktonic forms (over 90% of the total fauna) persists to 3520 feet. Obviously the sediment was a globigerinid ooze of deep water origin. This conclusion is confirmed by the fact that the benthonic fauna includes such deep water species as Osangularia bengalensis, Discammina compressa, Siphouvigerina proboscidea and Sigmoilopsis schlumbergi.

There is a marked decline in the percentage of planktonic fauna at and above 3026 feet. This decline is accompanied by a predominance of shallow water Cibicides spp. in the benthonic fauna. Thus depth of deposition became progressively shallower.

REFERENCES

- JENKINS, D.G., 1971 - N.Z. Geol. Surv. Paleont. Bull. 42.
TAYLOR, D.J., 1966 - Appendix in Comm. Aust. Petrol. Search Subsidy Acts Publ. 76.

DISTRIBUTION SHEETS

Sheets 1 & 2 Distribution of planktonic and benthonic foraminifera and biostratigraphy.

Key to Sheets

T = side wall cores at 2809; 3026; 3526; 4067; 4690; 5305; 5370; 5386
5410; 5418; 5460; (N.F.F.); 5603 (N.F.F.);
5746 (N.F.F.) and 5876 (N.F.F.)

N.F.F. = No foraminifera found.

Rotary cutting samples were examined but depths were regarded as unreliable, so they are not included on distribution sheets.

No conventional cores were examined.

• = 1 to 20 specimens.

| = over 20 specimens.

	2800	3100	3400	3700	4000	4300	4600	4900	5200	5500	5800	6100
PLANKTONICS												
1. <i>Globigerina woodi</i>										••	•	
2. <i>Globigerina apertura</i>										••	••	
3. <i>Orbulina universa</i>							•					
4. <i>Globorotalia mayeri barisanensis</i>												
5. <i>Globorotalia miozea conoidea</i>												
6. <i>Globorotalia miozea</i>										••	••	
7. <i>Globigerinoides trilobus</i>			•							••	••	
8. <i>Globorotalia peripheroronda</i>			•		•		•					
9. <i>Globorotalia praemenardii</i>					•		•					
10. <i>Globigerinoides glomeratus circularis</i>					•		•					
11. <i>Globoguardina dehiscens</i>												
12. <i>Globigerinoides bisphericus</i>					•		•			••	••	
13. <i>Globigerina bulloides</i>											••	
14. <i>Globorotalia menardii</i>								•				
15. <i>Orbulina suturalis</i>										••	••	
16. <i>Globigerinoides trilobus (elongate)</i>										•	•	
CALC. BENTHONICS-I												
17. <i>Cibicides lobatulus (convex)</i>												
18. <i>Cibicides cygnorum</i>												
19. <i>Cibicides refulgens</i>	•											
20. <i>Gyrogoninoides zelandica</i>	•										••	
21. <i>Cibicides pseudoungarianus</i>		•								•		
22. <i>Cibicides perforatus</i>		•										
23. <i>Melonis sp. ?</i>		•										
24. <i>Cibicides thira</i>			•									
25. <i>Discopulvina berthelotti</i>			•									
26. <i>Aromalinoides procolligera</i>					•							
27. <i>Cibicides brevoralis</i>											•	
28. <i>Siphonina australis</i>											•	
29. <i>Osangularia bengalensis</i>											•	
	2800									E 5370		
									5305	5418		
										F		



Sample No.	Species	2800	3100	3400	3700	4000	4300	4600	4900	5200	5500	5800	6100
CALC. BENTHONICS - IV													
30.	<i>Cassidulina subglobosa</i>		•		•								
31.	<i>Cassidulina carinata</i>				•								
32.	<i>Sphaeroidina bulloides</i>				•						•		
33.	<i>Pulkenia sp.</i>							•			•		
CALC. BENTHONICS - V													
34.	<i>Euvigenerina miozea</i>												
35.	<i>Virgulina sp.</i>		•										
36.	<i>Globobulimina pacifica</i>							•			•		
37.	<i>Bolivina robusta</i>					•							
38.	<i>Euvigenerina maynei</i>										•		
39.	<i>Siphonovigenerina probosidae</i>												
CALC. BENTHONICS - VI													
40.	<i>Lenticulina sp.</i>				•						•		
41.	<i>Lenticulina mamilligera</i>		•										
42.	<i>Nodosaria sp.</i>					•		•					
43.	<i>Lagena sp.</i>												
44.	<i>Lingulina sp.</i>												
CALC. BENTHONICS - VII													
45.	<i>Sigmoilopsis schlumbergi</i>				•							•	
ARENACEOUS BENTHONICS - SIMPLE													
46.	<i>Bathysiphon sp. B.</i>				•								
47.	<i>Discammina compressa</i>				•								
48.	<i>Bathysiphon sp. A.</i>							•				•	
ARENACEOUS BENTHONICS - COMPLEX													
49.	<i>Siphonotextularia sp.</i>					•							
ECHINOID SPINES													
FINE QUARTZ													
MICA													

2800

D

5305

E 5370

578

F

Foram Zonules

		Highest Data	Quality	2 Way Time	Lowest Data	Quality	2 Way Time
MIOCENE	A Alternate						
	B Alternate						
	C Alternate						
	D 1 Alternate	2809	0		3026	1	
	D 2 Alternate	3520	0		4690	0	
	E Alternate	5305*	1		5370*	1	
	F Alternate	5386	0		5418	0	
	G Alternate						
	H 1 Alternate						
	H 2 Alternate						
	OLIGOCENE	I 1 Alternate					
I 2 Alternate							
J 1 Alternate							
J 2 Alternate							
ECC.	K Alternate						
	Pre K						

*E2 appears to be absent.

COMMENTS: Cuttings were regarded as being unreliable. No foraminifera were found in SWC's at 5460, 5603, 5746, 5876 and 5947 feet.

Note: If highest or lowest data is a 3 or 4, then an alternate 0, 1, 2 highest or lowest data will be filled in if control is available.

If a sample cannot be interpreted to be one zonule, as apart from the other, no entry should be made.

- 0 SWC or Core - Complete assemblage (very high confidence).
- 1 SWC or Core - Almost complete assemblage (high confidence).
- 2 SWC or Core - Close to zonule change but able to interpret (low confidence).
- 3 Cuttings - Complete assemblage (low confidence).
- 4 Cuttings - Incomplete assemblage, next to uninterpretable or SWC with depth suspicion (very low confidence).

Date Revised _____

By _____

APPENDIX 3

SAMPLE DESCRIPTIONS

- 750-2730 Calcarenite: light grey, soft, medium grained with abundant foram tests and calcareous shell fragments; soft marl matrix. Abundant cement cavings from 750' - 900'. Minor cement cavings below 900'.
- 2730-2790' Calcarenite: As above
Trace Marl: light grey, very soft and sticky.
- 2790-2810' 80% Calcarenite: as above
20% Marl: as above
- 10 $\frac{3}{4}$ " casing @ 2748'. Dropped string below bumper-sub. after drilling through casing shoe.
- 2810-2890' Abundant cement cavings
50% Marl: light grey, very soft and sticky, abundant foram tests
50% Calcarenite: light grey, fine grained, hard, grading to calcilutite
- 2890-2980' 100% Marl: light grey, very soft and sticky, with abundant foram. Marl washes out leaving loose foram tests in sample.
Abundant cement cavings
- 2980-3040' 100% Marl: light - medium grey, very soft and sticky to moderately hard.
- 3040-3100' 100% Marl: as above, appears to be predominantly soft and sticky but with interbedded hard, consolidated layers.
- 3100-3310' 100% Marl: as above
- 3310-3340' 100% Marl: as above
- 3340-3370' 100% Marl, predominantly light grey, very soft and sticky
- 3370-3400' 100% Marl; light grey, very soft, very sticky, with abundant foram tests.
- 3400-3460' 100% Marl: as above
- 3460-3520' 100% Marl: as above
- 3520-3610' 100% Marl: as above
- 3610-3700' 100% Marl: light grey, very soft, very sticky, with abundant foram tests.
- 3700-3730' 100% Marl: as above
- 3730-3790' 100% Marl, grading to mudstone
- 3790-3820' 100% Marl grading to mudstone. medium grey, medium hard; with foram tests; becoming less calcareous; trace gypsum and trace brown-black coal?
- NOTE CC16 (presolublised lignite) added to mud. Samples of CC16 contain both gypsum and black bituminous coal.
- 3820-3850' 100% Mudstone: medium grey; medium hard, very slightly fissile; calcareous, very fossiliferous (mainly forams)

Note trace coal, gypsum and pyrite observed but contributed to CC16. in mud.
- 3850-3880' 100% Mudstone as above
- 3880-3910' as above
- 3910-3970' 100% Mudstone as above
Note: coal and gypsum becoming rare.

3970-4000' Mudstone; medium grey, moderately hard, very slightly fissile; slightly calcareous, with occasional fossil mainly forams

4000'-4030' Mudstone as above

4030-4090' Mudstone as above

4090-4150' Mudstone as above

4150-4210' Mudstone as above

4210-4360' Mudstone, medium dark grey; moderately hard, slightly fissile, slightly calcareous; very fossiliferous

4360-4390' Mudstone as above

4390-4420' Mudstone as above

4420-4450' Mudstone as above

4450'-4463' Mudstone as above

N. Bit @ 4463'

4463-4480' 100% Mudstone as above

4480-4510' Mudstone as above

4510-4540' 100% mudstone, medium dark grey, moderately hard, slightly fissile, very calcareous, very fossiliferous

4540-4570' Mudstone as above

4570-4600' Mudstone grading to shale; becoming very fissile

4600-4630' 100% Shale; medium dark grey; moderately hard, fissile, calcareous, fossiliferous

4630-4660' 50% Shale; as above
50% Mudstone; light grey, soft, sticky, slightly calcareous, fossiliferous

4660-4690' 50% Shale as above
50% Mudstone as above

4690-4720' 50% Shale
50% Mudstone

4720-4780' 50% Shale
50% Mudstone

4780-4810' as above

4810-4840' as above

4870' Nitrate added to mud.

4840-4870' 50% Mudstone as above
50% Shale - silty in part, medium dark grey, buff, moderately hard, fissile in part, very calcareous, very fossiliferous

4870-4900' 50% Shale as above
50% Mudstone, light grey, very soft, mostly sticky, very calcareous, fossiliferous.

Formation
Change?

4900-4930' 100% Shale -silty in part, medium dark grey - buff.

- 4930-4960' 100% Shale - silty in part; medium grey - buff;
soft - moderately hard, very fossiliferous, very calcareous
- 4960-4990' 100% Shale as above
- 4990-5020' 100% Shale - very silty, medium grey - buff, moderately hard,
fossiliferous, calcareous, slightly pyritic.

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- 5020-5050' 100% Shale - silty; medium grey - buff, moderately hard,
very calcareous, very fossiliferous
- 5050-5080' 100% Shale - slightly silty as above
- 5080-5110' as above
- 5110-5140' as above
- 5140-5170' 100% Shale - slightly silty, medium grey - buff.
- 5170-5200' 100% Shale - very silty, buff - medium dark grey to green
shale, pyritic, moderately hard, calcareous, very fossiliferous
- 5200-5230' 100% Shale as above, with trace glauconite, pyrite, gypsum,
- 5230-5260' 100% Shale - very silty, buff - medium grey, trace pyrite,
calcareous, very fossiliferous, (mainly forams and bryozoa
- 5260-5290' 100% Shale - as above
- 5290-5320' 100% Shale - as above, trace pyrite, calcareous, very
fossiliferous
- 5320-5340' as above
- 5340-5360' 70% Shale as above
30% Siltstone, very light grey, very fossiliferous
- 5360-5380' 50% Siltstone, light grey - buff; friable
40% Shale as above
10% Sand, clear; coarse grained, rounded; loose grains

Circulate sample from 5444'

- 5380-5390' 50% Siltstone, light brown, carbonaceous; friable, bleeding gas
50% Coal, brown - black, dull, vitreous, bleeding gas.
Trace of coarse sand grains
- 5390-5400' 70% Siltstone as above
30% Coal as above
Trace loose coarse grains, quartz, No show.
Abundant cavings
- 5400-5410' 60% Sandstone, clear quartz, unconsolidated, very fine to
medium grained, well rounded; pyritic, no show.
40% Siltstone, light brown, carbonaceous, massive.
Trace coal
Abundant cavings
- 5410-5420' 80% Siltstone as above
10% Sandstone as above
10% Shale

Note: Sandstone very fine grained and is being lost over screen. Desander
removing large quantity of sandstone

- 5420-5430' 50% Sandstone, clear quartz, unconsolidated, fine to medium
grained, subangular to rounded, pyritic. No show.
50% Siltstone, light brown; carbonaceous, massive

- 5430-5440' 60% Sandstone as above. No show
40% Siltstone as above.
- 5440-5450' 50% Sandstone as above. No show
50% Siltstone. as above.
- 5450-5460' 80% Sandstone, clear, loose quartz grains, fine to medium, subangular to rounded, pyritic, trace glauconite, No show
20% Siltstone as above
- 5460-5470' 20% Sandstone as above
20% Siltstone as above
50% Shale - very carbonaceous; medium to dark brown, firm
10% Coal
- 5470-5480' 20% Siltstone as above
70% Shale - very carbonaceous, as above, bleeding gas
10% Coal brown-black, bleeding gas.
- 5480-5490' 70% Sandstone, clear quartz, unconsolidated, very fine to medium grained, subangular to rounded, No show. Moderately sorted, pyritic
30% Shale - very carbonaceous, very silty, as above
Abundant cavings
- 5490-5500' 70% Sandstone as above
30% Shale as above
Abundant cavings
- 5500-5510' 50% Sandstone as above, no shows
30% Siltstone, very carbonaceous, friable, medium brown
20% Shale, dark brown, very carbonaceous, firm
Abundant cavings
- 5510-5520' 50% Sandstone as above, no shows
50% Siltstone as above
Abundant cavings
- 5520-5530' 70% Sandstone as above, no show
30% Siltstone as above
Abundant cavings
- 5530-5540' 80% Sandstone as above, no show
20% Siltstone as above
Abundant cavings
- 5540-5550' 60% Sandstone as above, No show
20% Siltstone as above
Abundant cavings
20% Coal, brown-black, bleeding gas.
- 5550-5560' 70% Sandstone, clear quartz, unconsolidated, very fine to medium predominantly very fine grained, subangular to rounded, no show
30% Siltstone - shaly, very carbonaceous, dark brown
Abundant cavings
- 5560-5570' 50% Sandstone as above, No show
50% Siltstone as above
Abundant cavings
- Note: Sandstone very fine grained and is being lost over shaker screen.
De-sander removing large quantities of very fine sand.
- 5570-5580' 100% Sandstone, clear quartz grains, unconsolidated, very fine to medium, predominantly very fine grained, subrounded to rounded, moderately well sorted, trace pyrite, no show
Abundant cavings

- 5580-5590' 20% Sandstone as above, No show
60% Siltstone as above
20% Shale as above
Trace coal and abundant cavings
- 5590-5600' 10% Sandstone as above. No show
70% Siltstone
20% Shale
Trace coal and abundant cavings
- 5600-5610' 100% Coal; dark brown-black, dull-vitreous,
with trace amber; bleeding gas profusely
C₁ 30,000 ppm. 26 units
- 5610-5620' 10% Sandstone as above
60% Siltstone; carbonaceous, dark brown, friable
30% Shale - very carbonaceous, with coal laminae
Abundant cavings from marine section
- 5620-5630' 60% Sandstone as above
20% Siltstone as above
20% Shale as above
Trace coal
- 5630-5640' as above
- 5640-5650' 80% Sand, clear unconsolidated quartz very fine to medium
predominantly fine grained, subrounded to rounded, moderate
sorting No show.
20% Siltstone as above
- Note: Only reliable sample is one taken from flow line prior to screen
- 5650-5660' 100% Sandstone, clear quartz, unconsolidated, very fine to
coarse grained, predominantly medium to coarse, well rounded
moderately sorted, pyritic, No show
Trace siltstone and coal
- 5660-5670' 80% Sandstone as above, No show
20% Siltstone, very carbonaceous, dark brown, friable
Abundant cavings
- 5670-5680' 100% Sandstone, clear quartz, unconsolidated, very fine to
coarse grained, predominantly medium to coarse, well rounded,
moderately sorted, pyritic. No show
- 5680-5690' 50% Sandstone as above. No show
40% Siltstone as above
10% Coal as above
- 5690-5700' 70% Sandstone. No show
30% Siltstone; very carbonaceous, dark brown
Abundant cavings
- 5700-5710' 80% Sandstone, clear quartz, unconsolidated, coarse to pebbly,
angular, to subrounded, poor sorting, No show
20% Siltstone - carbonaceous as above
Abundant cavings
- 5710-5720' 50% Sandstone
50% Siltstone
Abundant cavings
- 5720-5730' as above
- 5730-5740' 50% Siltstone
50% Shale - very carbonaceous, dark brown, with coal
laminae, firm.

- 5740-5750' 20% Siltstone
80% Shale, very carbonaceous, pyritic, firm
- 5750-5760' 100% Shale, as above
P.O.H. for N.B. at 5769.
N.B. @ 5770'
- 5760-5770' 40% Siltstone; very carbonaceous, friable, dark brown,
60% Shale, very carbonaceous, dark brown with coal
laminae, slight gas bleed.
- 5770-5780' 30% Siltstone as above
70% Shale as above
Trace coal
- 5780-5790' 30% Siltstone as above
70% Shale as above
Trace sandstone
- 5790-5800' 50% Siltstone buff - dark brown, very carbonaceous in
part, friable
50% Shale as above
- 5800-5810' 80% Siltstone as above
20% Shale as above
- 5810-5820' 80% Siltstone as above
20% Shale as above
- 5820-5830' 10% Dolomite, light brown, very hard, massive,
conchoidal fracture;
60% Siltstone; buff light brown, carbonaceous, friable
30% Shale carbonaceous, firm
- 5830-5840' 60% Siltstone buff - light brown; carbonaceous, dolomitic,
cement, friable - hard;
40% Shale as above
- 5840-5850' 70% Siltstone as above
30% Shale as above
- 5850-5860' 20% Siltstone
80% Coal brown - black, bleeding gas, dull - vitreous,
pyritic.
- 5860-5870' 80% Siltstone as above
20% Coal
Trace dolomite and shale
- 5870-5880' 100% Coal
- 5880-5890' 10% Dolomite
90% Siltstone; buff-light brown friable to hard, dolomitic
cement; trace amber and coal, dull yellow mineral fluorescence.
Trace sandstone
- 5890-5900' 10% Dolomite as above
90% Siltstone as above
Trace Sandstone
- 5900-5910' 10% Dolomite
90% Siltstone
Trace sandstone
- 5910-5920' 70% Sandstone; clear - frosted quartz grains, loose, very
fine to medium grained, subrounded to rounded; moderately well
sorted, with pyrite and glauconite grains, good porosity and
permeability. No show
30% Siltstone

- 5920-5930' 20% Sandstone as above
80% Siltstone light grey - buff; dolomitic in part,
micaceous, friable - hard, dull yellow, mineral fluorescence.
- 5930-5940' 30% Shale as above
70% Coal; bleeding gas
Trace siltstone and sandstone
- 5940-5950' 30% Shale as above
60% Siltstone as above, very carbonaceous
10% Coal
- 5950-5960' 80% Siltstone - carbonaceous, dolomitic in part; buff-
dark brown, dull mineral fluorescence
20% Shale as above

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- 5960-5970' 70% Sandstone; clear loose quartz grain, very fine
to pebble, predominantly medium to coarse, subangular to
subrounded, poorly sorted, dull yellow mineral fluorescence,
no cut, no show
30% Siltstone as above, carbonaceous
- 5970-80' 20% Sandstone; frosted consolidated quartz, very fine
grained, well sorted, subangular to subrounded pyritic,
calcareous cement; moderately hard, trace dolomite,
very dull yellow mineral fluorescence, no cut. no show
80% siltstone as above, carbonaceous
- 5980-5990' 30% Sandstone as above
70% Siltstone as above
- 5990-6000' 10% Sandstone as above
90% Siltstone, buff-dark brown; friable to hard, carbonaceous, mica-
ceous, dolomitic in part, dull yellow mineral fluorescence;
No show
- 6000-6010' 10% Sandstone as above
60% Siltstone as above
30% Shale buff - light brown, soft to firm, carbonaceous
in part
- 6010-6020' 50% Shale
50% Coal
- 6020-6030' 30% Siltstone
70% Shale
- 6030-6040' 50% Siltstone
50% Shale, very carbonaceous, silty, dark brown;
bleeding gas.
- 6040-6050' 10% Sandstone, consolidated, very fine grained, calcareous
cement, fair - poor porosity and permeability. No show
60% Siltstone as above
30% Shale as above
- 6050-6060' 10% Sandstone as above, abundant pyrite
60% Siltstone as above
30% Shale as above
- 6060-6070' 10% Sandstone as above
90% Siltstone
- 6070-6080' 30% Sandstone, calcareous cement, argillaceous, very fine
to silty, trace mica, poor permeability and porosity, no show
dull yellow mineral fluorescence.
10% Sandstone, clear, unconsolidated grains; medium to coarse
grained. No show
60% Siltstone; buff

- 6080-6090' 40% Sandstone, very light grey, very fine - silty, moderate sorting; argillaceous, calcareous, trace mica, trace dolomite; poor porosity and permeability; trace dull yellow mineral fluorescence. No show
60% Siltstone as above
- 6090-6100' 60% Siltstone as above
40% Shale as above
- 6100-6110' 20% Siltstone, medium brown, carbonaceous, argillaceous, mica; very friable to hard.
80% Coal, dark brown - black, dull-vitreous, slight gas bleed
- 6110-6120' 10% Dolomite, buff, very hard, brittle, conchoidal fracture
90% Shale; grey - buff; firm
- 6120-6130' 50% Dolomite, buff, hard, massive
30% Siltstone as above
20% Shale as above
- 6130-6140' 50% Dolomite buff; hard, massive
50% Siltstone; buff, carbonaceous, dolomitic, firm to hard
- 6140-6150' 60% Dolomite as above
10% Sandstone, very fine grained as above
30% Siltstone as above
- 6150-6160' 10% Sandstone light grey, very fine grained, consolidated, subangular to subrounded, argillaceous and calcareous cement
30% Dolomite as above
30% Siltstone as above
20% Shale as above
- 6160-6170' 20% Sandstone, light grey, very fine grained, subangular to subrounded, moderately well sorted, partly argillaceous and calcareous
30% Dolomite as above
50% Siltstone, very carbonaceous, dolomitic in part, firm to hard.
- 6170-6180' 10% Sandstone as above
20% Dolomite
70% Siltstone - dolomitic
- 6180-6190' 100% Siltstone - dolomitic; buff, hard; brittle, conchoidal fracture
- 6190-6200' 60% Siltstone-dolomitic
40% Shale
- 6200-6210' 40% Siltstone - dolomitic
60% Coal
- 6210-6230' 80% Siltstone, buff, very dolomitic in part, carbonaceous, friable-very hard.
20% Shale - brown carbonaceous, firm.
- P.O.H. for New Bit 6247'.

- 6230 - 40'
(L.A.T.) 100% Calcareous Mudstone, light grey-dark grey, moderately soft - firm. (Cavings)

Tr. Coal
- 6240 - 50' 30% Siltstone, brown, non calcareous, carbonaceous, moderately firm. Trace Coal, sandstone, pyrite, dolomite.

70% Cavings
- 6250' - 60' 50% Siltstone
10% Coal
40% Cavings (calcareous mudstone)
- 6260 - 70' 30% Siltstone slightly sandy in part.
20% Dolomite
50% Cavings
- 6270' - 80' 90% Siltstone, brown, very dolomitic in part, carbonaceous.
10% Coal
Tr. Cavings

Circulate @ 6316'
- 6280' - 90' 90% Siltstone, grey brown - brown as above.
10% Coal
Trace Sand
- 6290' - 6300' 20% Coal, black, trace amber
80% Siltstone, very dolomitic
Abundant cavings
- 6300' - 20' 100% Siltstone, sandy, dolomitic, no show (fine sand may be washing away) pyrite
Desander: minor sand, common pyrite
- 6320' - 40' Samples predominantly cavings of calc. mudstone.
20% Coal, black, hard brittle
80% Siltstone, brown, carbonaceous, slightly dolomitic, slightly sandy in part
- 6340' - 50' 30% Coal slightly shaly
70% Siltstone sandy, pyritic
- 6350' - 60' 90% Sandstone, buff - grey, silt - fine, tight, hard dolomitic, slightly pyritic, no fluorescence.
10% Siltstone as above
- 6360' - 70' 90% Sandstone, very dolomitic, tight
10% Siltstone as above.
- 6370' - 80' 20% Coal
20% Sandstone trace loose quartz
60% Siltstone
- 6380' - 90' 20% Coal
50% Sandstone as above
30% Siltstone
- 6390' - 6400' 80% Sandstone, very silty, dolomitic
20% Siltstone

6400' - 10'	60% <u>Siltstone</u> tending sandy 20% <u>Dolomite</u> , microcrystalline 20% <u>Sandstone</u> , very fine to fine, silty, dolomitic, tight
6410' - 20'	100% <u>Siltstone</u> , brown, dolomitic, sandy in part.
6420' - 40'	10% <u>Coal</u> 10% <u>Sandstone</u> 80% <u>Siltstone</u>
6440' - 50'	40% <u>Coal</u> 20% <u>Siltstone</u> 40% <u>Shale</u> , brown, soft - moderately firm, slightly silty
6450' - 70'	20% <u>Coal</u> 20% <u>Siltstone</u> 60% <u>Shale</u> , samples muddy Occasional coarse - very coarse, subrounded to rounded clear quartz grains throughout.
6470' - 80'	10% <u>Coal</u> 90% <u>Siltstone</u> shaly in part
	6497 - POOH to CB Run J-33
6480' - 90'	Predominantly cavings 10% <u>Coal</u> 90% <u>Siltstone</u>
6490' - 6500'	100% <u>Coal</u> black, silty in part, slight bleed of gas Trace pyrite
6500' - 10'	20% <u>Coal</u> 40% <u>Siltstone</u> , brown, friable to firm, carbonaceous 30% <u>Sandstone</u> , grey, friable to firm, silty to very fine, slightly micaceous, no show 10% <u>Dolomitic siltstone</u> , grey, tight
6510' - 20'	20% <u>Coal</u> 10% <u>Sandstone</u> , low porosity/permeability, no show 20% <u>Dolomitic siltstone</u> 50% <u>Siltstone</u>
6520' - 40'	30% <u>Coal</u> 60% <u>Siltstone</u> 10% <u>Sandstone</u> , dolomitic in part, slightly friable to hard, no show
6540' - 50'	90% <u>Siltstone</u> , slightly sandy 10% <u>Sandstone</u> , silty to fine, occasionally medium, carbonaceous in part, as above Rare loose quartz
6550' - 60'	90% <u>Coal</u> 10% <u>Siltstone</u>
6560' - 70'	30% <u>Coal</u> 30% <u>Siltstone</u> , tending sandy 40% <u>Sand</u> , milky - white, medium to very coarse, subangular to subrounded, unconsolidated, no show
6570' - 80'	50% <u>Siltstone</u> 50% <u>Sand</u> , minor sandstone, medium to coarse, friable to hard, some clay matrix, trace pyrite.
6580' - 90'	70% <u>Siltstone</u> 30% <u>Sand</u>

- 6590' - 6620' 90% Siltstone becoming sandy
10% Sand/Sandstone
- 6620' - 30' 100% Siltstone, sandy in part
Trace Quartz, Sandstone
- 6630' - 40' 80% Siltstone, brown, carbonaceous, sandy, firm
20% Sandstone, light grey, very fine to fine, even
grained and silt - medium, brown grey, poorly sorted,
friable, fair - good porosity/permeability, no show
- 6640' - 50' 70% Siltstone, sandy
30% Sandstone, light grey - brown grey, silt - medium
poorly sorted in part, trace dolomite, pyrite, friable
to firm, no show, fair porosity/permeability
- 6650' - 70' 90% Siltstone brown, carbonaceous, sandy
10% Sandstone, silty - medium
- 6670' - 80' 10% Coal
90% Siltstone
Trace Sandstone
- 6680' - 6700' 100% Siltstone
- 6700' - 10' 90% Siltstone
10% Sandstone, some loose quartz grains, pyritic
- 6710' - 40' 100% Siltstone, minor sandstone
- 6740' - 50' 10% Coal
90% Siltstone
- 6750' - 60' 90% Siltstone
10% Sandstone
- 6760' - 70' 80% Siltstone
20% Sandstone, buff, fine to medium, subangular to
subrounded, moderately sorted, dolomitic or slightly
calcareous clay matrix, tight, very poor porosity
and permeability, abundant mineral fluorescence, loose
quartz common
- 6770' - 80' 40% Siltstone
60% Sandstone, very fine to medium, occasionally coarse,
poor to moderate sorting, subangular to subrounded,
dolomitic clay cement/matrix, tight, hard, gold yellow.
mineral fluorescence, no show, occasional coarse quartz
grains
- 6780' - 90' 90% Sandstone, firm - hard, welded appearance indurated
tight bright gold yellow mineral fluorescence, trace only
crush cut.
10% Siltstone
- 6790' - 6810' 30% Sandstone, mineral fluorescence only as above, trace
pyrite
70% Siltstone
- 6810' - 30' 20% Sandstone, mineral fluorescence, carbonaceous in part
80% Siltstone, slightly sandy
- 6830' - 40' 20% Sandstone, abundant pyrite
80% Siltstone
- 6840' - 60' 10% Sandstone, trace friable silty sandstone, pyrite common
90% Siltstone

Circulate @ 6653
Drilling break
8-10' about 100'/hr

- 6860' - 70' 10% Coal
70% Siltstone, sandy in part
20% Sandstone
- 6870' - 80' 40% Coal
40% Siltstone
20% Sandstone, minor fluorescence even grained fair porosity and permeability, no show mostly tight dolomite with bright mineral fluorescence.
- 6880' - 90' 30% Sandstone dirtier, carbonaceous
70% Siltstone
- 6890' - 6900' 20% Sandstone, dolomite to mineral fluorescence
80% Siltstone
- 6900' - 10' 40% Siltstone, sandy
20% Sandstone, grey-brown grey, silty - medium, friable to firm, dolomitic in part, some mineral fluorescence generally carbonaceous, no show
40% Sand, medium to very coarse, milky-white, loose quartz grains, subangular to subrounded, trace pyrite, no show
- 6910' - 20' 10% Siltstone, trace coal
10% Sandstone, carbonaceous - dolomitic, tight - fair porosity and permeability, no show, some mineral fluorescence
80% Sand, medium to very coarse, subrounded, trace pyrite, no show
- 6920' - 30' 20% Siltstone to silty sandstone
10% Sandstone, some bright mineral fluorescence.
70% Sand, coarse to granule, subrounded to rounded, pyrite common, no show
- 6930' - 40' 10% Sandstone
90% Sand
- 6940' - 50' 30% Sand
70% Sandstone, dolomitic, matrix - mineral fluorescence
- 6950' - 60' 80% Sand, clear - white, medium to granular, subangular to rounded
20% Sandstone bright mineral fluorescence, no cut
- 6960' - 70' 80% Sand, clear-white, coarse to granular, subangular to rounded, unconsolidated, no show
20% Sandstone, buff, brown grey, dolomitic, matrix. fine to coarse, subangular, poorly sorted, bright mineral fluorescence.
- 6970' - 90' 100% Sand, trace sandstone, pyrite
- 6990' - 7000' 80% Sand, trace sandstone
20% Siltstone
- 7000' - 7010' 20% Sand
80% Siltstone, brown grey to brown, very sandy in part carbonaceous, friable to firm.
- 7010' - 20' 30% Sand
70% Siltstone, trace coal
- 7020' - 40' 100% Siltstone, tending to very fine sandstone buff - grey brown, friable to hard, dolomitic in part
Minor sand, trace coal

Circulate samples
@ 6932
Erratic break up
to 75'/hr.

7500' - 10' 10% Coal
60% Siltstone
30% Sandstone, buff - brown grey, silty to fine, even grained
friable, no show
(GRAB SAMPLE 7510-15 100% Coal)

7510' - 20' 10% Coal
90% Siltstone

7520' - 30' 10% Coal
80% Siltstone
10% Sandstone, silty - very fine, friable, no show
(7535 GRAB SAMPLE 10% Coal)
(5 units HW 30% Sandstone)
(Minor dolomite)

Circulate @ 7546'

7530' - 46' 50% Sand, clear - white, fine to very coarse, subangular to
subrounded, poorly sorted, generally unconsolidated, some friable,
minor dolomitic matrix, no fluorescence, no cut, pyrite common
10% Coal
40% Siltstone (including dolomite)
POOH to cut core #1

23rd December, 1972.

7546' - 53' Core #1 Cut 7 Rec. 7 (100%)

7553' - 60' Predominantly cavings
40% Coal (highly interpretative)
60% Siltstone

7560' - 70' 10% Coal
10% Sandstone, fine to coarse, friable - unconsolidated
80% Siltstone

7570' - 80' 20% Coal
10% Sandstone
70% Siltstone

7880' - 90' 80% Coal
20% Siltstone

7590' - 7600' 10% Coal
20% Sandstone, no show
70% Siltstone

7600' - 10' 10% Coal
10% Siltstone
80% Sandstone, grey brown, silty to medium, friable-hard, minor
matrix, occasionally dolomitic, non calcareous, slightly micaceous,
carbonaceous, occasionally pyritic, no show

7610' - 20' 70% Siltstone, trace coal
30% Sandstone, grey brown-grey, no show as above

7620' - 30' 90% Siltstone
10% Sandstone

(7635 GRAB SAMPLE Coal HW 35 units)

7630' - 40' 20% Coal
10% Sandstone
70% Siltstone, very carbonaceous

23rd December, 1972
A.J. Rigg

7640' - 7660' 20% Coal: dark black, shiny, conchoidal fracture.
10% Sandstone, fine grained, consolidated, light grey to brown,
trace silt size grains, minor matrix, firm to hard,

7640' - 7660' (Cont.) slightly pyritic. No show.
70% Siltstone, light brown to dark brown, hard
trace sand size grains, very carbonaceous to carbonaceous in
part

7660' - 70' 30% Coal, as above
60% Siltstone as above
10% Sand - mainly as above but with trace medium to coarse
grains, unconsolidated quartz grains, rounded.

7670' - 80' Trace only coal as above
60% Siltstone as above, brown - light grey, carbonaceous
firm to hard
30% Sandstone, as above, fine grained, consolidated.
light brown to brown, trace siltstone.
10% Dolomite, light brown to white, hard fractured.

P.O.H. to W.O.W. - J-33 Run back in.

24th December, 1972.

7680' - 7700' 80% Siltstone as above
10% Sandstone, as above, fine grained, consolidated.
firm to hard, moderately well sorted, trace carbonaceous
material, clear to white quartz, trace fines
10% Coal as above
Trace dolomite.

7700' - 7710' 70% Siltstone as above with thin lenses of dolomite, trace sand
grains and abundant carbonaceous material.
20% Sandstone, as above hard to very hard, occasional poorly sorted,
probable poor porosity and permeability, dolomite cement.
10% Coal - as above

7710' - 20' 80% Siltstone as above
10% Sandstone - generally as above, increase in carbonaceous
material - quartz generally white to light brown, trace clear,
hard, moderately well sorted. No shows
10% Coal
Trace dolomite.

7720' - 7730' 90% Siltstone as above
10% Coal
Trace Sandstone as above and trace loose coarse grained quartz.

7730'-7740' 70% Siltstone as above
30% Coal as above
Trace sandstone as above, some very carbonaceous, poorly
sorted, poor porosity and permeability.

7740' - 7750' 90% Siltstone as above, light to dark brown, abundant
carbonaceous material, firm, trace sand grains.
10% Coal as above
Trace Sandstone as above, and trace pyrite-massive.

7750' - 60' 70% Siltstone as above
30% Coal as above

7760' - 70' 90% Siltstone as above, very carbonaceous in part.
10% Coal as above
Trace dolomite: hard, light brown - white.

7770' - 80' 80% Siltstone as above.
10% Coal as above
10% Sandstone very fine to fine grained, well sorted, clear to
white quartz, consolidated, firm to hard.

7780' - 7790' 90% Siltstone, light brown to dark brown, firm to hard, trace to very carbonaceous, some carb. stringers.
10% Sandstone, very fine to fine grained trace fines, generally clear to white quartz grain with (?) glauconite.
Trace coal.

Washed out bumper sub at 1445 hours @ 7798'. Samples circulated after trip.

25th December, 1972.

7790' - 7800' 10% Siltstone, as above
90% Coal
Trace Sandstone as above.

7800' - 7810' 80% Siltstone as above
10% Coal as above
10% Sandstone, very fine to fine grained, consolidated, firm to hard, generally clear to white quartz. Some massive pyrite assoc. Also grains massive pyrite.

7810' - 7820' As above

7820' - 7830' As above

7830' - 7840' 70% Siltstone, as above, very carbonaceous,
20% Coal - very pyritic in part
10% Sandstone as above

7840' - 7850' 80% Siltstone as above
10% Coal - less pyritic
10% Sandstone. Generally as above but also trace coarse grain, angular, clear to white quartz grains.

7850' - 7860' 70% Siltstone - light brown to dark brown, very carbonaceous in part, occasional sand size grains, firm to hard,
10% Coal - black to brown-black, occasional pyrite, conchoidal fracture, bright.
20% Sandstone: predominantly medium to coarse grained, unconsolidated, clear to white, quartz grains, subangular to subrounded, some rounded. Good porosity and permeability. Trace fine to medium grained, consolidated sandstone as above. No shows.

7860' - 7870' 80% Siltstone as above
10% Coal as above
10% Sandstone: predominantly fine grained, consolidated, firm to hard, clear to white quartz, with trace fines. Also trace unconsolidated sandstone as above. No shows. Trace pyrite.

7870' - 7880' 90% Siltstone as above
10% Sandstone as above
Trace coal

7880' - 7890' 80% Siltstone as above
20% Sandstone as above
Trace coal

7890' - 7900' 70% Siltstone as above
30% Sandstone as above. Generally fine grained, consolidated, firm to hard, friable - slightly argillaceous. Moderately well sorted. No shows.
Trace Coal.

7900' - 7910' 80% Siltstone as above
10% Coal as above
10% Sandstone as above

- 7910' - 7920' As above
80% Siltstone: as above light brown to dark brown, very carbonaceous, firm to hard, pyritic in part.
10% Coal as above, very pyritic in part.
10% Sandstone; generally fine to medium grained, firm yet friable, subrounded to rounded quartz, clear to white, consolidated.
- 7920' - 7930' 70% Siltstone as above: abundant pyrite
10% Coal as above, decrease in pyrite.
20% Sandstone and Sand
Sandstone as above
Sand: medium to coarse grained, subangular to subrounded, clear to white quartz grains. No shows.
- 7930' - 7940' 40% Siltstone :as above
60% Sandstone: predominantly Sand: unconsolidated, medium to coarse grained, subangular to subrounded, white to clear quartz grains. No shows.
Trace fine grained sand. Abundant massive pyrite.
Trace coal.
- 7940' - 7950' 30% Siltstone: as above
60% Sand: as above. Plus abundant pyrite.
10% Sandstone: fine grained, light brown - white, consolidated, firm but friable. No shows.
Trace Coal
- 7950' - 7960' 30% Siltstone: as above
70% Sand and Sandstone as above
- 7960' - 7970' 80% Siltstone: as above, decrease in pyrite
20% Sandstone: as above - both fine grained, consolidated, and medium to coarse grains, unconsolidated quartz grains.
- 7970' - 7980' 90% Siltstone as above
10% Sandstone: unconsolidated, medium to coarse grained, subangular to subrounded, clear to white, quartz grains.
- 7980' - 7990' 100% Siltstone as above.
Trace Sandstone as above
- 7990' - 8000' As above.


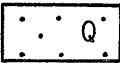
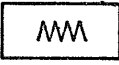


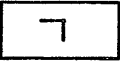


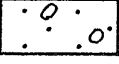
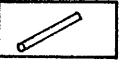
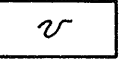
APPENDIX 4

CORE DESCRIPTIONS

AND

SIDEWALL CORE DESCRIPTIONS

LEGEND OF CORE DESCRIPTION

	Shale		Sandy (Silica)
	Silt		Silty (Silica)
	Sandstone		Micaceous
	Coal		Carbonaceous Matter
	Conglomerate		Plant Remains
			Burrows

s Sharp Contact

g Gradational Contact

ESSO STANDARD OIL (AUSTRALIA) LTD.

CORE DESCRIPTION

Core No. 1

WELL MORWONG-1

Well Cored 7546-53 ft., Cut 7 ft., Recovered 7 ft., (100%) Fm. Latrobe

Bit Type Christensen C-2 Bit Size 8-15/32 in., Desc. by Bruce McKay Date 23/12/1972

Depth & Coring Rate (min./ft.)	Graphic (1" = 5')	Shows	Interval (ft.)	Descriptive Lithology
36 7546			7546-50 4'	Sandstone, light grey, fine - very coarse, subangular - rounded, poor - moderate sorting, friable - moderately firm, micaceous, slightly calcareous clay matrix, some pyrite aggregates, fair - good porosity and permeability. No odour, fluorescence or cut. Minor thin wavy carbonaceous stringers. Large scale cross bedding especially at top.
			7550-50½'	½' Coal dark brown-black, very silty and shaly
			7550½-52	1½' Siltstone light grey-brown grey, shaly tending to claystone, very carbonaceous in part, plant remains
			7552-53'	1' Interbedded Siltstone and Sandstone Thinly interbedded at top, sandstone increasing towards base, also increase in grainsize, silt-medium, carbonaceous, clay matrix, non calcareous, fair porosity and permeability, no show

REMARKS: High torque
 Palynology samples 7551½, 7552
 Overburden Ø K analysis 7547'

FORM R 257 3/72

NO.	DEPTH	REC	ROCK TYPE	MODIFIERS		CAL	COLOR	INDUR	GRAIN	SRTG	RND	DISS	CLAY	STAIN	FLUORESCENCE					CUT FLUOR.					SHOW	PROB	REMARKS - GAS		
				4	5										6	7	8	9	10	11	12	% Rk	DISTR	INTEN				COLOR	INTEN
1	7920	5/8"	SLTST	QTZS, CARB.	-	-	V.L. Gry.	Fri.	Slt,	Mod	S. a.	25															N.S.	N	1500/400/-
2	7704	5/8"	CLYST	Qtz, Mica,	Mod	-	M. Gry	Hard	v.f.f.	Mod	?	30															N.S.	N	2000/-/700
3	7526	3/4"	CLYST	Qtz, Mica,	SL.	-	Brn.	Hard	v.f.f.	Mod	?	30															N.S.	N	3000/800/-
4	7390	1/2"	CLYST	Qtz, Mica,	Mod	-	Med. Dk	Hard	v.f.f.	Mod	?	30															N.S.	N	3000/1200/-
5	7284	5/8"	CLYST	Qtz, Mica	--	-	Med, Lt	Hard	v.f.f.	Mod-	?	25															N.S.	N	4500/1200/-
6	7148	1/2"	CLYST	Qtz, Arg,	SL.	-	Dk. Gry	Hard	v.f.f.	Mod.	?	20															N.S.	N	3000/800/-
7	7044	7/8"	CLYST	Qtz, Arg,	V.	-	Med. Dk	Hard	v.f.f.	Mod.	?	20															N.S.	N	9000/1400/60
8	6877	1"	CLYST	Qtz, Arg.	-	-	Med.	Hard	v.f.f.	Mod	?	20															N.S.	N	13,000/1800/1000
9	6752	5/8"	CLYST	Qtz, Arg.	SL.	-	Dk.	Firm	v.f.f.	Mod	?	30															N.S.	N	2000/900/150
10	6636	1 1/4"	CLYST	Qtz, Arg.	-	-	Med.	Firm	v.f.f.	Mod	?	25															N.S.	N	7500/2000/1100
11	6492	7/8"	CLYST	Qtz, Arg.	-	-	Med. Dk	Hard	v.f.f.	Mod	?	25															N.S.	N	10,500/1200/200
12	6378	3/4"	CLYST	Qtz, Arg.	-	-	Med. Dk	Hard	v.f.f.	Mod.	?	30															N.S.	N	2500/900/100
13	6279	1/2"	CLYST	Qtz, Arg,	Mod	-	Med.	Hard	v.f.f.	Mod	?	30															N.S.	N	100/Tr.
14	6148	1-	CLYST	Qtzs, Arg.	-	-	Med.	Hard	v.f.f.	Mod	?	30															N.S.	N	4000/300/Tr.

C1/C2/C3
REMARKS - GAS

WELL MORWONG-1

ESSO AUSTRALIA LTD. SIDEWALL CORE DESCRIPTIONS

PAGE 2 OF 2

GEOLOGIST Andy Rigg

ATT 30 REC 30

SERVICE CO Schlumberger/Baroid IES RUN NO 1 SWC RUN NO 1

DATE 26/12/72

FORM R 257 3 72

NO. 1a	DEPTH	REC	ROCK TYPE	MODIFIERS		CAL	COLOR	INDUR DEG	GRAIN SIZE	SRTG	RND	DISS CLAY	STAIN	FLOURESCENCE				CUT FLUOR.				SHOW	PROB PROD	REMARKS - GAS					
				4	5									% RK	DISTR 14	INTEN 15	COLOR 16	INTEN 17	COLOR 18	QUAN 19	COLOR 20								
15	6018	1"	CLYST	Qtzs, Arg.	-	Med.	Hard	v.f.f.	Mod.	?	>25												N.S.	N	3500/-/-				
16	5947	1"	"	Qtzs, Arg.	-	Med.	Hard	v.f.f.	Mod	?	>25													N.S.	N	2500/600/Tr.			
17	5876	1"	"	Qtzs, Mica	-	Med.	Hard	v.f.f.	Mod	?	>30														N.S.	N	3000/Tr./Tr.		
18	5746	3/4"	SILTST	Qtzs, Arg. Carb.	-	Med.	Hrd.	v.f.f.	Mod	?	15															N.S.	N	1200/Tr.	
19	5603	3/4"	"	Qtzs, Arg.	-	Med.	Lt. Hard	v.f.f.	Mod	?	>25																N.S.	N	5000/900/100
20	5460	1 1/2"	"	Mica	-	Gry.	"	"	"	"	>25																N.S.	N	2300/800/150
21	5418	3/4"	"	" + Pyr.	v	"	Firm	"	"	"	>25																N.S.	N	2300/Tr./Tr.
22	5410	1 1/2"	"	Arg.	v	Lt. Gry	Hard	"	"	"	>25																N.S.	N	7500/-/Tr.
23	5386	3/4"	"	"	v	"	"	"	"	"	>25																N.S.	N	2300/-/Tr.
24	5370	1-	"	"	"	"	"	"	"	"	>25																N.S.	N	13,000/-/100
25	5305	7/8"	"	"	"	"	"	"	"	"	>25																N.S.	N	2000/-/-
26	4690	3/4"	"	"	"	"	"	"	"	"	>25																N.S.	N	2500/100/Tr.
27	4067	1-	"	"	"	"	"	"	"	"	>25																N.S.	N	25/-/-
28	3526	1 1/2"	"	"	"	"	"	"	"	"	>25																N.S.	N	7000/-/-
29	3026	1 1/2"	"	"	"	"	"	"	"	"	>25																N.S.	N	1400/-/-
30	2809	1 1/2"	"	"	"	"	"	"	"	"	>25																N.S.	N	7500/-/-

APPENDIX 5

LIST AND INTERPRETATION OF LOGS & SURVEYS

The following logs and wireline services were performed by Schlumberger in Morwong-1.

- (1) GR/BHCS/Cal (Gamma ray, bore hole compensated sonic and caliper tool)
2" & 5" scale - interval 2795-634' G.R. to 280'.
- (2) ISF/SONIC (Spherically focused induction - sonic combination tool).
2" & 5" scale - interval 7996 - 2742'
- (3) FDC/CNL/GR/Cal (Compensated formation density, compensated neutron, gamma ray and caliper combination tool).
2" & 5" scale - interval FDC & CNL 8003 - 5100
CAL 8003 - 2720
GR 8003 - 2550
- (4) Velocity survey - 9 shots fired over the interval 7890-3996'
(See time depth enclosure 6)
- (5) Shot 30 sidewall cores and recovered 30 in interval 7920'-2809'

The next page gives R.B. King's analysis of the most likely reservoir sands. No indication of hydrocarbons is apparent.

WELL LOG ANALYSIS REPORT

Form R167 6/70
Page 1

c.c. B.R. Griffith
W.F. Threlfall

TO WELL FILE

OPERATOR Esso Australia Ltd.

WELL MORWONG-1

DATE 29/12/72

STATE VICTORIA

ELEV. 32' KB

DEPTH INTERVAL	POROSITY ESTIMATE	WATER SAT. ESTIMATE	REMARKS
5435 - 46 (11)	25.5 - 26.5	100	Formation water productive
5446 - 51 (5)	26 - 27	100	Formation water productive
5519 - 28 (9)	28.5 - 29.5	100	Formation water productive
5587 - 91 (4)	27 - 28.5	100	Formation water productive
5591 - 96 (5)	30.5 - 32	100	Formation water productive
5662 - 67 (5)	28 - 29	100	Formation water productive
5667 - 76 (9)	26 - 27	100	Formation water productive
5678 - 81 (3)	26.5 - 28	100	Formation water productive
5681 - 87 (6)	23.5 - 25	100	Formation water productive
5687 - 91 (4)	29 - 30	100	Formation water productive
5691 - 96 (5)	22.5 - 23.5	100	Formation water productive
5696 - 5706 (10)	29 - 30	100	Formation water productive
'06 - 13 (7)	25 - 26	100	Formation water productive
5713 - 16 (3)	29.5 - 31	100	Formation water productive
5718 - 21 (3)	26 - 27	100	Formation water productive
5721 - 28 (7)	29.5 - 31	100	Formation water productive
7537 - 41 (4*)	14 - 15	100	Formation water productive
7541 - 44 (3)	23 - 24	100	Formation water productive
7544 - 50 (6)	27 - 28	100	Formation water productive
7550 - 52 (2)	21 - 22.5	100	Formation water productive
7557 - 64 (7*)	13.5 - 14.5	100	Formation water productive
7564 - 71 (7*)	15 - 16	100	Formation water productive
774 - 76 (2)	25 - 26	100	Formation water productive
7926 - 32 (6*)	15.5 - 17	100	Formation water productive
7932 - 43 (11)	24 - 25.5	100	Formation water productive
7944 - 51 (7)	18.5 - 20	100	Formation water productive
7951 - 62 (11)	21 - 22.5	100	Formation water productive
ISF DEPTHS			
* Shaley sands			

TESTS:

FORMATION:

LATROBE GROUP

LOGS:

ISF-BHC, FDC-CNL-GR

COMMENTS:

Sand quality remains good although not every sand is listed.
No indication of hydrocarbon was recognized.


 BY R.B. KING

PE902345

This is an enclosure indicator page.
The enclosure PE902345 is enclosed within the
container PE902337 at this location in this
document.

The enclosure PE902345 has the following characteristics:

- ITEM_BARCODE = PE902345
- CONTAINER_BARCODE = PE902337
 - NAME = Structure Map Intra Latrobe Horizon 25'
above turrum gas sand
 - BASIN = GIPPSLAND
 - PERMIT = VIC/L4
 - TYPE = SEISMIC
 - SUBTYPE = HRZN_CONTR_MAP
- DESCRIPTION = Structure Map Intra Latrobe Horizon 25'
above turrum gas sand (enclosure from
WCR) for Murwong-1
- REMARKS =
- DATE_CREATED = 31/10/1972
- DATE_RECEIVED =
- W_NO = W660
- WELL_NAME = Morwong-1
- CONTRACTOR =
- CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902766

This is an enclosure indicator page.
The enclosure PE902766 is enclosed within the
container PE902337 at this location in this
document.

The enclosure PE902766 has the following characteristics:

ITEM_BARCODE = PE902766
CONTAINER_BARCODE = PE902337
NAME = Geological Cross Section A-A' Pre
Drilling
BASIN = GIPPSLAND
PERMIT = VIC/L4
TYPE = WELL
SUBTYPE = CROSS_SECTION
DESCRIPTION = Geological Cross Section A-A' Pre
Drilling (enclosure from WCR) for
Morwong-1
REMARKS =
DATE_CREATED = 30/11/1972
DATE_RECEIVED =
W_NO = W660
WELL_NAME = Morwong-1
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902767

This is an enclosure indicator page.
The enclosure PE902767 is enclosed within the
container PE902337 at this location in this
document.

The enclosure PE902767 has the following characteristics:

- ITEM_BARCODE = PE902767
- CONTAINER_BARCODE = PE902337
- NAME = Morwong Prospect Composite Structure
Map
- BASIN = GIPPSLAND
- PERMIT = VIC/L4
- TYPE = WELL
- SUBTYPE = HRZN_CNTR_MAP
- DESCRIPTION = Morwong Prospect Composite Structure
Map, Pre-Drilling (enclosure from
WCR) for Morwong-1
- REMARKS =
- DATE_CREATED = 1/11/72
- DATE_RECEIVED =
- W_NO = W660
- WELL_NAME = Morwong-1
- CONTRACTOR = ESSO
- CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902338

This is an enclosure indicator page.
The enclosure PE902338 is enclosed within the
container PE902337 at this location in this
document.

The enclosure PE902338 has the following characteristics:

ITEM_BARCODE = PE902338
CONTAINER_BARCODE = PE902337
NAME = Norwong Prospect Composite Structure
Map
BASIN = GIPPSLAND
PERMIT = VIC/L4
TYPE = SEISMIC
SUBTYPE = HRZN_CNTR_MAP
DESCRIPTION = Morwong Prospect Composite Structure
Map, Post drill, (enclosure from WCR)
for Morwong-1
REMARKS =
DATE_CREATED = 31/03/73
DATE_RECEIVED =
W_NO = W660
WELL_NAME = Morwong-1
CONTRACTOR =
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902339

This is an enclosure indicator page.
The enclosure PE902339 is enclosed within the
container PE902337 at this location in this
document.

The enclosure PE902339 has the following characteristics:

ITEM_BARCODE = PE902339
CONTAINER_BARCODE = PE902337
NAME = Geological Cross Section A-A' After
Drilling
BASIN = GIPPSLAND
PERMIT = VIC/L4
TYPE = WELL
SUBTYPE = CROSS_SECTION
DESCRIPTION = Geological Cross Section A-A' After
Drilling 9enclosure from WCR) for
Morwong-1
REMARKS =
DATE_CREATED = 30/04/73
DATE_RECEIVED =
W_NO = W660
WELL_NAME = Morwong-1
CONTRACTOR =
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902340

This is an enclosure indicator page.
The enclosure PE902340 is enclosed within the
container PE902337 at this location in this
document.

The enclosure PE902340 has the following characteristics:

ITEM_BARCODE = PE902340
CONTAINER_BARCODE = PE902337
NAME = Morwong Prospect Geological Cross
Section B-B' After Drilling
BASIN = GIPPSLAND
PERMIT = VIC/L4
TYPE = WELL
SUBTYPE = CROSS_SECTION
DESCRIPTION = Morwong Prospect Geological Cross
Section B-B' After Drilling (enclosure
from WCR) for Morwong-1
REMARKS =
DATE_CREATED = 30/04/1973
DATE_RECEIVED =
W_NO = W660
WELL_NAME = Morwong-1
CONTRACTOR =
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902341

This is an enclosure indicator page.
The enclosure PE902341 is enclosed within the
container PE902337 at this location in this
document.

The enclosure PE902341 has the following characteristics:

- ITEM_BARCODE = PE902341
- CONTAINER_BARCODE = PE902337
- NAME = Time Depth Curve
- BASIN = GIPPSLAND
- PERMIT = VIC/L4
- TYPE = WELL
- SUBTYPE = VELOCITY_CHART
- DESCRIPTION = Time Depth Curve(enclosure from wCR)
for Morwong-1
- REMARKS =
- DATE_CREATED = 26/12/1972
- DATE_RECEIVED =
- W_NO = W660
- WELL_NAME = Morwong-1
- CONTRACTOR = ESSO
- CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902343

This is an enclosure indicator page.
The enclosure PE902343 is enclosed within the
container PE902337 at this location in this
document.

The enclosure PE902343 has the following characteristics:

- ITEM_BARCODE = PE902343
- CONTAINER_BARCODE = PE902337
 - NAME = Well History Chart
 - BASIN = GIPPSLAND
 - PERMIT = VIC/L4
 - TYPE = WELL
 - SUBTYPE = DIAGRAM
- DESCRIPTION = Well History Chart (enclosure from WCR)
for Morwong-1
- REMARKS =
- DATE_CREATED = 31/03/1973
- DATE_RECEIVED =
 - W_NO = W660
 - WELL_NAME = Morwong-1
 - CONTRACTOR = ESSO
 - CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE601446

This is an enclosure indicator page.
The enclosure PE601446 is enclosed within the
container PE902337 at this location in this
document.

The enclosure PE601446 has the following characteristics:

ITEM_BARCODE = PE601446
CONTAINER_BARCODE = PE902337
NAME = Rock Log Clastics
BASIN = GIPPSLAND
PERMIT = VIC/L4
TYPE = WELL
SUBTYPE = WELL_LOG
DESCRIPTION = Rock Log Clastics(enclosure from WCR)
for Morwong-1
REMARKS =
DATE_CREATED = 25/12/1972
DATE_RECEIVED =
W_NO = W660
WELL_NAME = Morwong-1
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE604602

This is an enclosure indicator page.
The enclosure PE604602 is enclosed within the
container PE902337 at this location in this
document.

The enclosure PE604602 has the following characteristics:

ITEM_BARCODE = PE604602
CONTAINER_BARCODE = PE902337
 NAME = Well Composite Log
 BASIN = GIPPSLAND
 PERMIT = VIC/L4
 TYPE = WELL
 SUBTYPE = COMPOSITE_LOG
DESCRIPTION = Well Composite Log for Morwong-1
REMARKS =
DATE_CREATED = 26/12/1972
DATE_RECEIVED =
 W_NO = W660
 WELL_NAME = MORWONG-1
CONTRACTOR =
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

PE902344

This is an enclosure indicator page.
The enclosure PE902344 is enclosed within the
container PE902337 at this location in this
document.

The enclosure PE902344 has the following characteristics:

ITEM_BARCODE = PE902344
CONTAINER_BARCODE = PE902337
NAME = Baroid ppm Log
BASIN = GIPPSLAND
PERMIT = VIC/L4
TYPE = WELL
SUBTYPE = MUD_LOG
DESCRIPTION = Baroid ppm Log/Mud log (enclosure from
WCR) for Morwong-1
REMARKS =
DATE_CREATED = 25/12/1972
DATE_RECEIVED =
W_NO = W660
WELL_NAME = Morwong-1
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)