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AUSTRALIA INC.

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WELL COMPLETION REPORT
TURRUM-3
INTERPRETED DATA
VOLUME 2

GIPPSLAND BASIN
VICTORIA

ESSO AUSTRALIA LIMITED

Compiled by: W.MUDGE

SEPT. 1986

TURRUM-3

WELL COMPLETION REPORT

VOLUME 2

(Interpretative Data)

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2394L/1

GEOLOGICAL AND GEOPHYSICAL ANALYSIS

PROGNOSIS (KB = 21M ASL)

Formation/Horizon	Pre-drill Depth (mSS)	Post-drill Depth (mSS)
SEASPRAY GROUP	61	60
LATROBE GROUP	1536.5	1550.0
a) Seismic Marker		
Lower L. balmei	2119.5	2154.0
Top of L-1.4.2. Reservoir	2517.5	2564.5
T. longus	2698.0	2675.0

INTRODUCTION

The primary objective of the Turrum-3 well was to further delineate the L-1.4.2 oil and gas reservoir and overlying L. balmei hydrocarbons. A secondary objective was to test the Cretaceous section beneath the "L" reservoirs. The well successfully tested the L-1.4.2 reservoir intersecting 12.0m of net gas sand and 6.50m of net oil sand. A GOC was intersected at 2583mSS and an OWC was interpreted from RFT pressures at 2594mSS. The acquisition of RFT pressure data through the remaining "L" reservoirs enabled the delineation of a further 6 major reservoir systems and interpretation of the respective fluid contacts and column sizes. The Cretaceous section was not successfully tested due to mechanical problems. The well was plugged and abandoned as a successful extension well.

PREVIOUS DRILLING HISTORY

The fault bounded closure drilled by Turrum-3 had been intersected by three previous wells. These were Marlin A6 and A24 (deviated), and Turrum-2. All encountered hydrocarbons over the same 500m stratigraphic interval of the lower L. balmei palynological zone. All hydrocarbons intersected were gas except for a thin oil leg at the base of the zone. Marlin A24 had an additional oil accumulation above the L-1.4.2 but below the next major reservoir the L-1.3.

Prior to drilling Turrum-3 only limited pressure and contact data had been available in any of the reservoirs. This made the confident prediction of reservoir systems, fluid contacts and column sizes difficult.

STRUCTURE

At the level of the Turrum "L" reservoirs the Latrobe Group is extensively faulted by a series of NW-SE trending discontinuous down to the SW normal faults. These faults form a series of tilted fault blocks with the strata dipping to the NE in each block. Superimposed over this is a gentle middle Eocene flexuring with a fold axis trending in a NE-SW direction. The closure is provided to the NE by the tilting of the fault blocks, to the SW by sealing faults and to the SE and NW by the folding.

Turrum-3 was drilled on the SE flank of the closure. The top of the Latrobe Group and the Lower L. balmei seismic marker were penetrated 13.5m and 34.5m deep to prediction respectively. The top of the L-1.4.2 reservoir came in 47m low to prediction due to the error on the Lower L. balmei seismic marker and the isopach to the L-1.4.2 reservoir being 12.5m thicker than predicted. The result was to significantly reduce closure at the level of the "L" reservoirs in the SE of the field.

STRATIGRAPHY

Turrum-3 penetrated 1489.0m of Miocene Gippsland Limestone/Lakes Entrance Formation. The top of the Lakes Entrance Formation is tentatively placed at 1302mKB based on a change in log character. The base of the Lakes Entrance Formation is Early Miocene in age (H1 zone).

The top of the Latrobe group is interpreted at 1571mKB. The interval 1571mKB-1757mKB is of Early Eocene age (P. asperopolus - L.M. diversus) and consists of thick channel sands, coals and shales. The sands are interpreted to have been deposited in a fluvial/estuarine environment. Support for this interpretation comes from the Core No.1 (1577-2586.3mKB). The shales and coals are interpreted to represent a coastal plain environment with a significant tidal influence.

The Late Paleocene interval (Upper L. balmei) 1771mKB-2055mKB consists of shales, coals and minor sands probably deposited in a coastal plain/tidal complex.

The Lower L. balmei sediments are shales, coals and thick channel sands similar to those of the Early Eocene. Sands, the base of which are at 2696mKB, 2611mKB, 2522mKB, 2353mKB and 2157mKB are interpreted to have been deposited in association with relative sea level falls and have broad lateral extent. All of these sands are interpreted to have been deposited in a fluvial/estuarine environment with the associated shales and coals representing a coastal plain/tidal environment. The very sandy section at the base of the Lower L. balmei is due to the amalgamation of facies of two relative sealevel falls.

The T. longus interval 2700-T.D. is represented by coals, shales and minor sands. No logs were obtained over the interval 2750-2995mKB. It is probable that these sediments were deposited in a coastal plain environment.

HYDROCARBONS

Turrum-3 encountered 82.25m of net gas sand and 9.0m of net oil sand. The majority of hydrocarbons occur in 7 separate accumulations.

L-1.4.2 Reservoir

This is the deepest "L" accumulation and the primary reservoir. The top of the reservoir is at 2586.0mKB. A total of 12.0m of net gas sand and 6.50m of net oil sand was intersected. Detailed delineation of net sand was made difficult due to cementation of the reservoir by dolomite-cement. This resulted in RFT pressure tests and wireline logs giving conflicting results ie. cemented intervals giving valid pressure tests (see log analyses). Core analysis indicates highly variable permeability in the cemented intervals.

A GOC was intersected at 2604.00mKB (2583mSS) which corresponds to that seen in Turrum-2. An OWC has been interpreted from RFT pressure data at 2615.00mKB (2594.00mSS). The OWC fell in a non-net section.

In Marlin A24 however oil is present below the interpreted OWC (see enclosure 1) The geological interpretation suggests the oil sand in A24 should be in communication with the L-1.4.2 reservoir intersected in Marlin A6, Turrum-2 and Turrum-3. It is probable that the TVD data for Marlin A24 is in error. A correction of -10m will bring Marlin A24 into line with the other wells.

Average porosities and water saturations are listed in Table 2.

A 1.0m oil accumulation occurs directly below the L-1.4.2 reservoir. RFT pressures indicate this is not in communication with the main accumulation. This accumulation probably has a significant stratigraphic trapping component and may have some updip potential.

"L" Reservoirs

Six other major accumulations were identified. The names, tops, nets, porosity, water saturations and contact data are summarised in Table 2.

All hydrocarbons encountered were gas except for a 2.5m oil leg in the L-1.1.1 reservoir. All contacts have been interpreted from RFT pressures, assuming no oil legs. The column size of the accumulations except the L-1.1.1 far exceed the mapped closure (See Wireline test Report). This may be due to the fault bounded closure not being valid at all levels of the "L" reservoirs i.e. some reservoirs may leak across the faults. Some support for this idea comes from the occurrence of gas at the L-1.3 level in Marlin-4. If this is the case the areal extent of the gas reservoirs is yet to be determined. Another possible interpretation is that the faults seal at all levels and fluid contacts are present down dip to the SE and NW.

With either interpretation there is also the potential for down dip oil legs in the gas sands. This is made possible by the large column sizes interpreted from the RFT data. (See wireline test report).

Follow-up work will be required in the areas of mapping and correlation to further delineate the L-1.1.1 to L-1.3 reservoirs.

Cretaceous

Due to mechanical problems wireline logs were not run over the interval 2750-2995mKB. This interval approximates the Cretaceous section.

Mudlog shows indicate hydrocarbons were intersected from 2795-2817mKB, 2893-2904mKB and 2929-2934mKB. The shallower intersection is probably gas while shows over the lower intervals indicate liquid hydrocarbons.

Marlin "N-1" Reservoir

Residual hydrocarbons were seen in Core No.1 (1577-1586.3mKB) representing a swept zone through the Marlin N-1 sand. Shows ceased between 1582-1583mKB representing an original OWC.

TABLE 2

RESERVOIR	TOP OF RESERVOIR mKB	TOP OF RESERVOIR mSS	BASE OF RESERVOIR mKB	BASE OF RESERVOIR mSS	NET GAS SAND	NET OIL SAND	GWC (mSS)	GOC (mSS)	OWC (mSS)	AVERAGE POROSITY (%)	AVERAGE SW (%)	COMMENTS
L-1.1.1	2139.25	2118.25	2157.25	2136.25	11.25	2.75		2132.50	2142.50	21.1(G) 21.9(O)	40.1 (G) 65.1 (O)	GOC by Logs OWC by RFT
L-1.1.2	2178.75	2157.75	2202.75	2181.75	8.5	-	2251.00			18.5	19.0	)
L-1.1.3	2298.50	2277.50	2332.00	2311.00	1.00	-	2387.00			12.8	25.7	)
L-1.2.1	2340.00	2319.00	2352.50	2331.50	1.25	-	2410.00			14.8	19.4	)GWC by RFT
L-1.2.3	2422.00	2401.00	2442.50	2421.50	15.50	-	2453.00			13.9	21.4	)
L-1.3	2489.75	2468.75	2521.75	2500.75	17.00	-	2594.00			17.4	11.3	)
L-1.4.2	2586.00	2565.00	2611.00	2590.00	12.00	6.50		2583.00	2594.00	11.3 (G) 4.4 (O)	27.3 (G) 48.5 (O)	GWC by RFT OWC by RFT

GEOPHYSICAL DISCUSSION

The Marlin and Turrum structures have been mapped using the 3D Survey G82C 3D which covers the majority of the structure as well as the 2D seismic data G77A, G80A and G81A which extends over the western and south-western flank.

The G82C 3D survey comprises 186 lines shot perpendicular to the intra-Latrobe NW-SE fault pattern. The 3D grid has a line spacing of 75m with cross lines generated at a 20 CDP spacing (250m). The 2D seismic grid has an average spacing of 1 km.

Eight horizons were mapped predrill.

- Top Latrobe (Gurnard)
- Base of Marlin Channel
- P. asperopolus Seismic Marker
- M. diversus Seismic Marker
- Upper L. balmei Seismic Marker
- Lower L. balmei Seismic Marker
- Top L-1.4.2 Reservoir
- T. longus Seismic Marker

The base of the Miocene high velocity channel, Intra Lower L. balmei, and T. lilliei Seismic Markers were also mapped in TWT.

An average TWT lag of 10 ms was established for the Top of Latrobe at the exploration wells, and was subtracted from all time horizons.

The horizons of interest were the Top of Latrobe, Lower L. balmei and L-1.4.2 reservoir.

Depth conversion to the Top of Latrobe was achieved using an average velocity map. The smoothed handpicked NMO velocities were multiplied by a conversion factor map generated from exploration and development well control.

The Top of Latrobe (Gurnard) was penetrated 13.5m deep to prediction. The pre-drill and post-drill average velocity values are almost identical. The error is due to the TWT pick lying slightly deeper on the section than interpreted. There is evidence of channelling at the Top of Latrobe at Turrum-3. This channelling is localised and introduces some uncertainty in the Top of Latrobe interpretation.

Below the Top of Latrobe depth maps were produced by isopaching. Interval velocities between the Top of Latrobe and each horizon were generated from the spacevels* output. Interval velocity conversion factor maps were produced from the available well control. The thickness of each interval was then summed to the depth at Top of Latrobe.

The Lower L. balmei seismic marker was intersected 34.5m deeper than predicted. The error was not in the TWT interpretation but in the interval velocity used to go to depth and was corrected by adjusting the interval velocity conversion factor map. With no other control on the SE margin of the structure, a much smaller conversion factor value had been used than was correct.

The L-1.4.2 reservoir lies between the Lower L. balmei and T. longus seismic markers. The Top of L-1.4.2 reservoir was determined by adding an isopach to the Lower L. balmei depth map. The isopach was generated using the Lower L. balmei/T. longus isopach as a guide and the control from three wells, T-2, MA6 and MA24. The isopach was 12.5m thicker than predicted, an error of 3%.

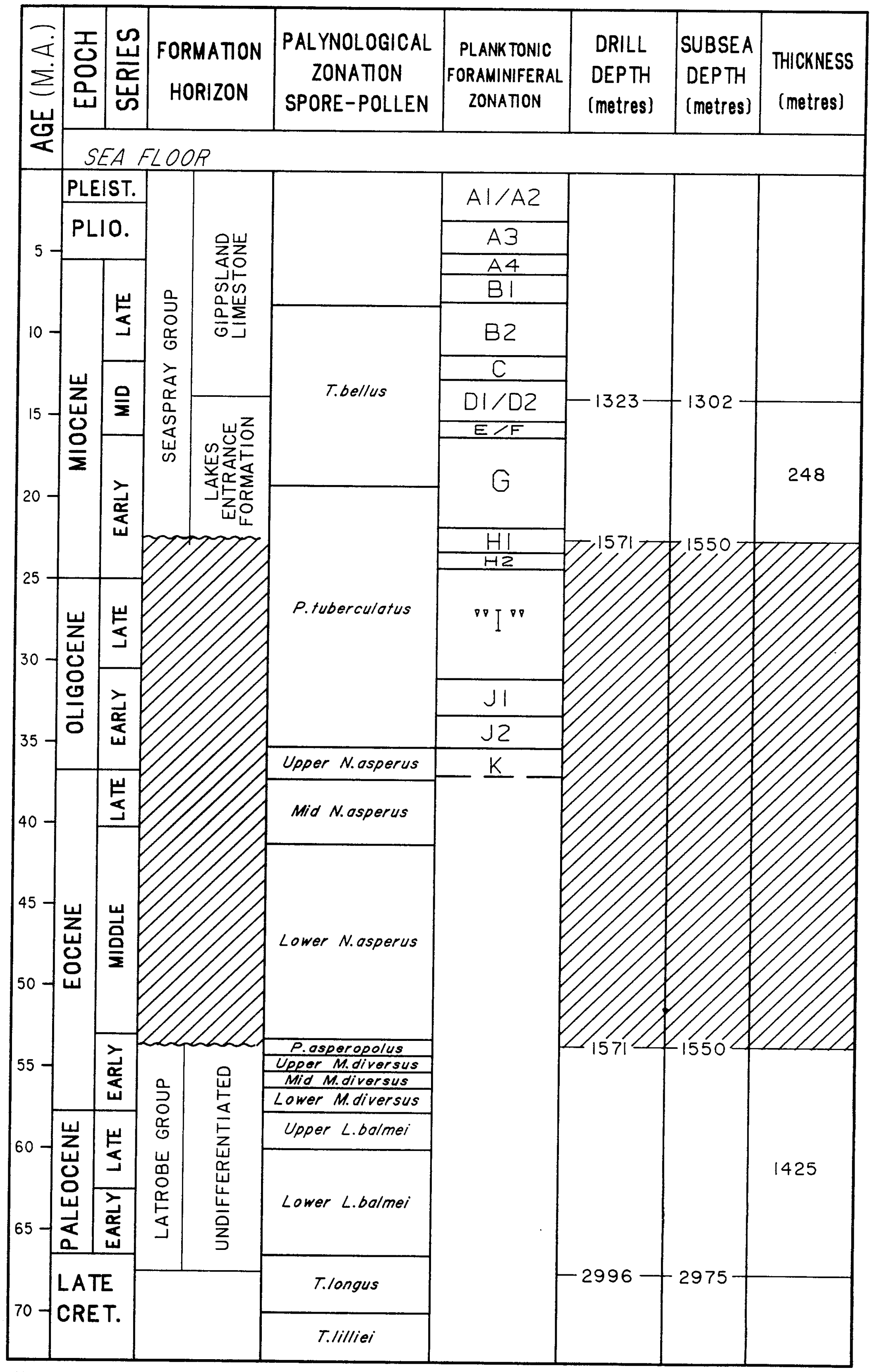
The summed effect of the isopach errors was such that the Top of L-1.4.2 reservoir was penetrated 47m low to prediction.

The T. longus seismic marker came in 23m shallower than predicted. The error was again due to an incorrect interval velocity value which was corrected via the conversion factor map.

* SPACEVELS is a GSI program that is primarily used for velocity modelling in 3D data volumes. From the model produced the various velocity fields required for 3D processing are computed. The model parameters output from SPACEVELS consist of horizon time, horizin depth, NMO velocities, RMS velocities, average velocities after migration and the interval velocities in each layer.

FIGURES

TURRUM-3
STRATIGRAPHIC TABLE



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APPENDIX 1

APPENDIX 1

FORAMINIFERAL ANALYSIS

OF TURRUM-3,

GIPPSLAND BASIN

by

M.J. HANNAH

Esso Australia Ltd. July 1985

Palaeontology Report: 1985/23

D.G. FILE = TURRUM3

PALEO.CARDS MBR = TURR3F

1702L

INTRODUCTION

BIOSTRATIGRAPHY

DATA SHEET

DATA SUMMARY

RANGE CHART

1702L/2

INTRODUCTION

Seven sidewall core samples were examined from across the Latrobe Group/Seaspray Group boundary. The top of the Latrobe Group lies between sidewall cores at 1573.5m and 1567.4m and is marked by a change from fine grained micaceous sand to a marl.

No ages could be obtained from within the Latrobe Group. The deepest sample from the Lakes Entrance Formation is at 1567.4m which is Early Miocene, Zone H-1 in age.

BIOSTRATIGRAPHY

(1) Zone H-1 - Early Miocene (1567.4m)

The presence of Globigerina woodi connecta without Globigerinoides trilobus in this sample assigns it to Zone H-1.

The fauna derived from this sample was of low diversity and very poorly preserved.

(2) Zone G - Early Miocene (1561.0m-1552.9m)

The appearance of Globigerinoides trilobus in the sample at 1561.0m marks the base of this zone. Preservation of fauna from this interval is quite good, although it deteriorates down hole. Diversity was moderate.

TABLE-1

INTERPRETATIVE DATA SUMMARY - TURRUM-3

DEPTH (M)	SWC NO.	PRESERVATION	PLANKTONIC DIVERSITY	ZONE (conf. Rtg.)	AGE
1552.9	69	Good	Moderate	G (1)	Early Miocene
1557.0	67	Fair	Moderate	G (1)	Early Miocene
1561.0	65	Poor	Moderate	G (1)	Early Miocene
1565.0	63	Abyssmal	-	?	Indeterminate
1567.4	62	Poor	Low	H-1 (2)	Early Miocene
1573.5	58	-	Barren	?	Indeterminate
1571.5	57	-	Barren	?	Indeterminate

1702L/4

MICROPALEONTOLOGICAL DATA SHEET

BASIN: Gippsland ELEVATION: KB: 21 GL: -60

WELL NAME: Turrum-3 TOTAL DEPTH: 2996.0

AGE		FORAM. ZONULES	HIGHEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	LOWEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
PLEISTOCENE		A_1										
		A_2										
PLIOCENE		A_3										
		A_4										
		B_1										
MIOCENE	LATE	B_2										
		C										
	MIDDLE	D_1										
		D_2										
		E_1										
		E_2										
	EARLY	F										
		G	1552.9	1				1561.0	1			
		H_1	1567.4	2								
OLIGOCENE	LATE	H_2										
		I_1										
		I_2										
	EARLY	J_1										
		J_2										
EOCENE		K										
		Pre-K										

COMMENTS: Top of G = Top sample examined.

CONFIDENCE RATING:
- O: 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).

NOTE: If an entry is given a 3 or 4 confidence rating, an alternative depth with a better confidence rating should be entered, if possible. If a sample cannot be assigned to one particular zone, then no entry should be made, unless a range of zones is given where the highest possible limit will appear in one zone and the lowest possible limit in another.

DATA RECORDED BY: M.J. Hannah DATE: July 1985

DATA REVISED BY: DATE:

PE900493

This is an enclosure indicator page.
The enclosure PE900493 is enclosed within the container PE902424 at this location in this document.

The enclosure PE900493 has the following characteristics:

ITEM_BARCODE =	PE900493
CONTAINER_BARCODE =	PE902424
NAME =	Foraminifera Range Chart
BASIN =	GIPPSLAND
PERMIT =	VIC/L3
TYPE =	WELL
SUBTYPE =	DIAGRAM
DESCRIPTION =	Planktonic Foraminifera Range Chart for Turrum-3
REMARKS =	
DATE_CREATED =	31/07/85
DATE_RECEIVED =	31/07/87
W_NO =	W899
WELL_NAME =	TURRUM-3
CONTRACTOR =	
CLIENT_OP_CO =	ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 2

APPENDIX 2

APPENDIX

PALYNOLOGICAL ANALYSIS OF TURRUM-3

GIPPSLAND BASIN, SOUTHEASTERN AUSTRALIA

by

Neil G. Marshall

Esso Australia Ltd.

Palaeontology Report 1985/25 July 19, 1985

1738L

CONTENTS

INTRODUCTION

Sixty-four sidewall core and eight cutting samples were examined for palynomorphs from Turrum-3. Occurrences of spore-pollen and dinoflagellate species in each sample are recorded on the enclosed range chart. Tables 1 and 3 summarize interpretative and basic palynological data, and anomalous occurrences of spores-pollen and dinoflagellates are listed in Table 2.

SUMMARY TABLE

AGE	FORMATION	PALYNOLOGY ZONE	DEPTH (in metres K.B)
Early-Middle Miocene	Lakes Entrance Formation	T. bellus	1460
Miocene - Early Oligocene (?)	Lakes Entrance Formation	P. tuberculatus	1479.9 - 1567.4
		log break at 1571 m	
Early Eocene	Latrobe Group	P. asperopolus	1573.5
Early Eocene	Latrobe Group	Upper M. diversus	1576.5
		Middle M. diversus	1596-1642
		Lower M. diversus	1660.7 - 1736.9
Late Paleocene	Latrobe Group	Upper L. balmei	1750.5 - 2034
Early-Late Paleocene	Latrobe Group	Lower L. balmei	2061 - 2647
Maastrichtian	Latrobe Group	Upper T. longus	2705 - 2850
		T. longus (undifferentiated)	2875 - 2995
		T.D. 2995m	

GEOLOGICAL COMMENTS

1. Palynological analyses confirm the zonal assignments given to the seismic markers used in the geophysical mapping of the Turrum structure. The recognition of the Tricolpites longus Zone in samples from the basal portion of Turrum-3 confirms that the well terminated in a shale-sandstone interval of Late Cretaceous age. Because of technical problems encountered while testing the basal portion of the well, only cutting samples were available from the Late Cretaceous sequence. All other samples analysed from Turrum-3 consisted of sidewall core samples.

2. Reasonably good correlation exists between the spore-pollen zones recognized in Turrum-3 and those identified in the better sampled wells within the Turrum-Marlin area: these being Turrum-1 and -2, and Marlin-4. There is generally insufficient sample control in other wells within the Turrum-Marlin area to make meaningful correlations of the spore-pollen zones with Turrum-3. More refined correlations using an integration of spore-pollen and dinoflagellate zones are presently being attempted.

The base of the Apteodinium homomorphum dinoflagellate Zone defines a readily identifiable marker within the Lygistepollenites balmei Zone in the Marlin-Turrum area, and is recognized in Turrum-2 and -3, and Marlin -1, -2 and -4. The lateral distribution of dinoflagellate zones older than the A. homomorphum Zone in these wells is assessed below.

a) Eisenackia crassitabulata Zone : recognized in Turrum-1 (6900-7116') and Turrum-2 (7520'), and Marlin-4 (6954-7310'), but not in Turrum-3. Based on correlation with other wells, this zone would be expected to occur in Turrum-3 between 2350-2500m. Its apparent absence may be due to either low yields of dinoflagellates in the material studied or non-sampling of the appropriate horizon.

b) *Isabelidinium druggii* Zone : recognized in Marlin-1 (8468') and Turrum-1 (8142'), but not in Turrum-2 and -3 and Marlin-4. The zonal species is often rare and has a sporadic distribution, and its absence may be due to non-sampling of the critical horizon.

3. Hannah (1985) has examined five samples from the basal portion of the Lakes Entrance Formation for foraminifera. The dates indicated by these fossils confirm those inferred from the spore-pollen and dinoflagellates.

4. Turrum-3 contains the first record in the offshore Gippsland Basin of *Triporopollenites bellus*, the marker species of *T. bellus* Zone. It occurs with the foraminiferal Zone C (Hannah, pers. comm.), which is stratigraphically younger than its first known occurrence onshore. This offshore occurrence is consistent with known range of species.

BIOSTRATIGRAPHY

The spore-pollen zones have been identified using the criteria proposed by Stover & Partridge (1973). The dinoflagellate zones are modifications on the scheme of Partridge (1976). Discussions of the dinoflagellate assemblages and their zonal assignments are given with the descriptions of their associated spore-pollen assemblages.

Tricolpites longus Zone (undifferentiated) 2875-2995 m.

The four cutting samples placed in the interval are characterized by the occurrence of *Gambierina rudata*, *G. edwardsii*, *Tetracolporites verrucosus*, and the zonal species *Tricolpites longus*. The samples lack the taxa used by Macphail (1983) to subdivide the zone into Upper and Lower *T. longus* zonules.

Upper *Tricolpites longus* Zone 2705-2850 m.

The four cutting samples assigned to the interval are characterized by the presence of *Gambierina rudata*, *G. edwardsii*, *Tetracolporites verrucosus*, *Tricolpites longus*, and *Stereisporites punctatus*. Following Macphail (1983), the association of *T. longus* with *S. punctatus* has been used to assign these samples to the upper zonule of the *T. longus* Zone.

Lower Lygistepollenites balmei Zone 2061-2647 m.

Palynomorph assemblages are usually fairly to poorly preserved and are frequently pyritized, and can be characterized by the consistent, and often frequent occurrence of Lygistepollenites balmei. The presence of Nothofagidites kaitangata, Tetracolporites verrucosus, Gambierina edwardsii, G. rudata, and Australopollis obscurus, without taxa indicative of the Upper L. balmei Zone, is diagnostic of the Lower L. balmei Zone. Tricolpites waiparaensis occurs in a sample (2647 m) from the Lower L. balmei Zone and is not known to range above this interval in other wells from Gippsland.

Dinoflagellates also occur within this section and some distinctive taxa identified are: Glaphyrocysta retiintexta, Senegalinium dilwynense, Deflandrea medcalfii/dartmooria, Hystrichosphaeridium sp., Palaeocystodinium sp., and species of the Palaeoperidinium bassensis ms. complex. Apectodinium homomorphum first appears in the upper part of the Lower L. balmei Zone (2301 m) and this event defines the base of the A. homomorphum Zone. One specimen of Eisenackia circumtabulata was seen in the lowermost sample of the zone (2647 m). The only other records of this taxon in the Gippsland Basin are in Marlin-4 at 8250 ft and Pilotfish 1A at 2921 m, where it also occurs within the Lower L. balmei Zone. None of the dinoflagellates identified enabled the recognition of the Eisenackia crassitabalata or Trithyrodinium evittii Zones, which are often associated with the Lower L. balmei Zone in other wells from the Gippsland Basin.

Upper *Lygistepollenites balmei* Zone 1750.5-2034 m.

The base of the Upper *L. balmei* Zone was placed at the first occurrence of *Proteacidites annularis* at 1750.5 m. Some other first occurrences indicative of this subdivision are *Proteacidites latrobensis* at 1926 m, *Cyathidites gigantis* at 1888.9 m, and *Banksieacidites lunatus* ms. (previously referred to *B. elongatus*) at 1768.4 m. Consistent with this subdivision is the prominence of *L. balmei* and the occurrence of general *L. balmei* Zone indicators such as *Polycolpites langstonii*, *Latrobosporites crassus*, *Australopollis obscurus*, *Integricorpus antipodus*, *Nothofagidites kaitangata*, *Haloragacidites harrisii*, and *Verrucosisporites kopukuensis*.

Samples between 1768.4-2034 m usually contain low diversity dinoflagellate assemblages with the dominant elements being *Apectodinium homomorphum* and species of the *Palaeoperidinium bassensis* ms. complex. These are placed in the *A. homomorphum* Zone. The uppermost sample of the Upper *L. balmei* Zone at 1750.5 m is placed in the *Apectodinium hyperacanthum* dinoflagellate Zone, which is based on the occurrence of the zonal species and *Kenleyia lophophora*.

Lower *Malvacipollis diversus* Zone 1600.7-1736.9 m.

The base of the zone is defined by the first occurrences of *Crassiretitriletes vanraadshoovenii* and *Spinizonocolpites prominatus*. Other important taxa recorded in the interval are *Malvacipollis diversus*, *M. subtilis*, *Proteacidites grandis*, *P. incurvatus*, *Peromonolites vellosus*, *Intratriporopollenites notabilis*, and *Cupanieidites orthoteichus*.

The basal sample (1736.9 m) of the zone is assigned to the *Apectodinium hyperacanthum* dinoflagellate Zone due to the occurrences of *Kenleyia lophophora* and the zonal species.

Middle Malvacipollis diversus Zone 1642-1596 mm.

Only one sample at 1642 m, could be confidently assigned to the Middle M. diversus Zone, based on the first occurrences of Proteacidites tuberculiformis, P. alveolatus, and P. leightonii. The occurrences of Myrtaceoipollenites australis, Proteacidites grandis, and Schizaea digitatoides are also indicative of this zone.

Dinoflagellates recorded at this level include Deflandrea longispinosa (the most common taxon), D. medcalfii/dartmooria, Spinidinium sp., Cordosphaeridium inodes, Spiniferites ramosus, and Paralecaniella indentata.

The four samples above this level at 1596, 1604.5, 1611.5, and 1623.4 m contain spore-pollen assemblages indicative of a general M. diversus Zone age, but lack the index species needed for a more precise zonal determination. These are assigned to the Middle M. diversus Zone on negative evidence. The lower three of these samples (1596, 1604.5, 1611.5 m) contain dinoflagellate assemblages that are similar to the one from the Middle M. diversus Zone at 1642 m.

Upper Malvacipollis diversus Zone 1576.5 m.

Characteristic species recorded from this level are Anacolosidites acutulus, Intratriporopollenites notabilis, Myrtaceoipollenites australis, Proteacidites annularis, P. grandis, P. latrobensis, P. leightonii, P. tuberculiformis, Triporopollenites helosus and T. scabratus. This assemblage is considered to span the Middle and Upper M. diversus Zone, and it lacks the index species Myrtaceidites tenuis and Proteacidites pachypolus which would enable the distinction of the upper subdivision. Identification of the Upper M. diversus Zone is based on the first occurrence of the dinoflagellate species Homotryblium tasmaniense. Since recognition of this spore-pollen zonule is based largely on dinoflagellate evidence, it is given a low confidence rating.

Homotryblium tasmaniense and Deflandrea longispinosa are the most common dinoflagellates in the assemblage.

Proteacidites asperopolus Zone 1573.5 m.

The zone is identified primarily by the first occurrence of the zonal species. Other important taxa in the assemblage are Cupanieidites orthoteichus, Intratriporopollenites notabilis, Myrtaceidites tenuis, Proteacidites pachypolus and Santalumidites cainozoicus.

Dinoflagellates recorded from this level are Deflandrea longispinosa, Spinidinium sp., Spiniferites ramosus, and Homotryblium tasmaniense.

<u>Proteacidites tuberculatus</u> Zone 1479.9-1567.4 m.

The zone is characterized by the occurrence of <u>Cyatheacidites annulatus</u>, <u>Foveotriletes crater</u>, and <u>F. lacunosus</u>.

The interval is dominated by dinoflagellates and some important species are <u>Nematosphaeropsis balcombiana</u>, <u>N. rhizoma</u> ms., <u>Protoellipsoidinium simplex</u> ms., <u>Dinosphaera mammilatus</u> ms., <u>Batiacasphaera amplectus</u> ms., <u>Tuberculodinium vancompoae</u>, and <u>Cyclopsiella vieta</u>.

<u>Triporopollenites bellus</u> Zone 1460 m.

Identification of the zone is based on the occurrence of <u>T. bellus</u> at this level. This is the first record of this species in the offshore Gippsland Basin. The sample contains a similar dinoflagellate assemblage to those recorded from the upper part of the <u>Proteacidites tuberculatus</u> Zone.

TAXONOMIC CHANGES AND NEW TAXA IDENTIFIED

1. Palaeoperidinium bassensis ms. complex: This complex consists of a morphologically similar group of species with a combination, Type A+I3P archeopyle. They have a thin periphragm with an indistinct sculpture, occasionally a thin endophragm occupying most of the cyst, and weak apical and antapical horns. They often occur in assemblages of low diversity within the L. balmei Zone.

2. On the Data Sheets and Tables 1 and 3, Deflandrea medcalfii/dartmooria is recorded as D. medcalfii.

REFERENCES

HANNAH, M.J. 1985. Foraminiferal analysis of Turrum-3, Gippsland Basin. Esso Australia Ltd Palaeontological Report 1985/23.

PARTRIDGE, A.D., 1976. The Geological Expression of Eustacy in the Early Tertiary of the Gippsland Basin. APEA. J. 16, 73-79.

STOVER, L.E. & PARTRIDGE, A.D., 1973. Tertiary and Late Cretaceous spores and pollen from the Gippsland Basin, southeastern Australia. Proc. R. Soc. Victoria, 85, 237-286.

PALYNOLOGY DATA SHEET

BASIN: Gippsland　　ELEVATION: KB: +21m　GL: -60m

WELL NAME: Turrum-3　　TOTAL DEPTH: 2996m

AGE	PALYNOLOGICAL ZONES	HIGHEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	LOWEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
NEOGENE	*T. pleistocenicus*										
	M. lipsis										
	C. bifurcatus										
	T. bellus	1460	1				1460	1			
PALEOGENE	*P. tuberculatus*	1479.9	2				1567.4	1			
	Upper *N. asperus*										
	Mid *N. asperus*										
	Lower *N. asperus*										
	P. asperopolus	1573.5	0				1573.5	0			
	Upper *M. diversus*	1576.5	2				1576.5	2			
	Mid *M. diversus*	1596	2				1642	0			
	Lower *M. diversus*	1660.7	2				1736.9	0			
	Upper *L. balmei*	1750.5	0				2034	2			
	Lower *L. balmei*	2061	2				2647	0			
LATE CRETACEOUS	Upper *T. longus*	2705	3				2850	3			
	T. longus	2875	3				2995	3			
	T. lilliei										
	N. senectus										
	T. apoxyexinus										
	P. mawsonii										
	A. distocarinatus										
EARLY CRET.	*P. pannosus*										
	C. paradoxa										
	C. striatus										
	C. hughesi										
	F. wonthaggiensis										
	C. australiensis										

COMMENTS: Apectodinium homomorphum Zone (2301-1768.4m); A. hypercanthum Zone (1750.5-1736.9m).
Material studied from the T. longus Zone consisted of 8 cutting samples.

CONFIDENCE RATING:
- O: 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 an entry is given a 3 or 4 confidence rating, an alternative depth with a better confidence rating should be entered, if possible. If a sample cannot be assigned to one particular zone, then no entry should be made, unless a range of zones is given where the highest possible limit will appear in one zone and the lowest possible limit in another.

DATA RECORDED BY: Neil G. Marshall　　DATE: 2/7/1985

DATA REVISED BY: ____________　　DATE: ____________

TABLE I: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 81	1460	T. bellus	Indet	Early-Middle Miocene	1	T. bellus, C. annulatus, T. vancompoae
SWC 79	1479.9	P. tuberculatus	Indet	Early Miocene-Oligocene	2	F. lacunosus, N. rhizoma
SWC 78	1489.9	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, T. vancompoae, D. mammilatus N. rhizoma, P. simplex
SWC 76	1510	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, T. vancompoae, N. rhizoma P. simplex
SWC 75	1520	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, N. rhizoma, P. simplex
SWC 74	1530	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, T. vancompoae, P. simplex
SWC 73	1537.9	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, T. vancompoae, P. simplex N. rhizoma
SWC 72	1545	P. tuberculatus	Indet	Early Miocene-Oligocene	0	N. rhizoma, D. mammilatus, P. simplex
SWC 69	1552.9	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, N. rhizoma, P. simplex
SWC 67	1557	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, N. rhizoma, P. simplex
SWC 66	1558.9	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, P. simplex
SWC 65	1561	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, N. rhizoma, P. simplex, D. mammilatus
SWC 63	1565	P. tuberculatus	Indet	Early Miocene-Oligocene	0	C. annulatus, N. rhizoma, P. simplex
SWC 62	1567.4	P. tuberculatus	Indet	Early Miocene-Oligocene	0	N. rhizoma, P. simplex
SWC 58	1573.5	P. asperopolus	Indet	Early Middle Eocene	0	P. asperopolus, P. pachypolus, S. cainozoicus

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TABLE 1: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 57	1576.5	Upper M. diversus	Indet	Early Eocene	2	P. tuberculiformis, A. acutullus, H. tasmaniense
SWC 55	1596	Middle M. diversus	-	Early Eocene	2	
SWC 54	1604.5	Middle M. diversus	Indet	Early Eocene	2	P. grandis, M. diversus, D. dartmooria, D. longispinosa
SWC 53	1611.5	Middle M. diversus	Indet	Early Eocene	2	P. grandis, M. diversus, A. hyperacanthum D. dartmooria
SWC 52	1623.5	Middle M. diversus	Indet	Early Eocene	2	P. grandis, M. diversus, D. longispinosa
SWC 51	1642	Middle M. diversus	Indet	Early Eocene	0	P. tuberculiformis, M. australis, P. alveolatus, D. longispinosa, D. dartmooria
SWC 50	1660.7	Lower M. diversus	Indet	Early Eocene	2	C. orthoteichus, M. diversus, P. grandis T. ambiguus
SWC 49	1675.5	Lower M. diversus	-	Early Eocene	2	P. grandis, P. vellosus
SWC 48	1686	M. diversus	-	Early Eocene		P. grandis, P. annularis, P. latrobensis
SWC 47	1703.4	Indet	-	-		P. grandis
SWC 46	1718.5	Lower M. diversus	-	Early Eocene	2	M. diversus
SWC 45	1736.9	Lower M. diversus	A. hyperacanthum	Early Eocene	0	M. diversus, C. vanraadshoovenii, C. orthoteichus, S. prominatus, A. hyperacanthum
SWC 44	1750.5	Upper L. balmei	A. hyperacanthum	Late Paleocene	0	L. balmei, M. diversus, P. annularis, A. homomorphum, A. hyperacanthum
SWC 43	1768.4	Upper L. balmei	A. homomorphum	Late Paleocene	0	L. balmei, C. gigantis, M. diversus, P. annularis, A. homomorphum

TABLE I: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 42	1777	Upper L. balmei	A. homomorphum	Late Paleocene	1	L. balmei, C. gigantis, A. homomorphum
SWC 41	1785	Upper L. balmei	-	Late Paleocene	2	L. balmei, G. edwardsii
SWC 40	1796.5	Upper L. balmei	A. homomorphum	Late Paleocene	2	L. balmei, M. subtilus, P. latrobensis, A. homomorphum
SWC 39	1813	Upper L. balmei	A. homomorphum	Late Paleocene	0	L. balmei, C. gigantis, P. langstonii, A. homomorphum
SWC 38	1837	Upper L. balmei	A. homomorphum	Late Paleocene	0	L. balmei, C. gigantis, A. homomorphum
SWC 37	1868	Upper L. balmei	A. homomorphum	Late Paleocene	2	L. balmei, V. kopukuensis, A. homomorphum
SWC 36	1888.9	Upper L. balmei	Indet	Late Paleocene	0	L. balmei, C. gigantis, V. kopukuensis
SWC 35	1926	Upper L. balmei	A. homomorphum	Late Paleocene	2	L. balmei, P. langstonii, P. latrobensis, A. homomorphum
SWC 34	1963.5	Upper L. balmei	A. homomorphum	Late Paleocene	2	L. balmei, A. homomorphum
SWC 33	1995	Upper L. balmei	A. homomorphum	Late Paleocene	2	L. balmei, P. langstonii, A. homomorphum
SWC 32	2034	Upper L. balmei	A. homomorphum	Late Paleocene	2	L. balmei, P. langstonii, P. annularis, A. homomorphum
SWC 31	2061	Lower L. balmei	Indet	Paleocene	2	L. balmei, N. kaitangata
SWC 30	2090	Lower L. balmei	A. homomorphum	Paleocene	2	L. balmei, N. kaitangata, G. rudata, G. edwardsii, A. homomorphum
SWC 29	2127	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, N. kaitangata, A. homomorphum
SWC 28	2157	Lower L. balmei	A. homomorphum	Paleocene	2	L. balmei, N. kaitangata, A. homomorphum

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TABLE I: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 27	2158.4	Lower L. balmei	Indet	Paleocene	1	L. balmei, N. kaitangata, G. rudata
SWC 26	2160.5	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, A. homomorphum
SWC 25	2162	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, A. homomorphum, E. kaitangata
SWC 24	2166	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, A. homomorphum
SWC 23	2194.9	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, N. kaitangata, G. rudata,
SWC 22	2225.5	Lower L. balmei	Indet	Paleocene	1	L. balmei, N. kaitangata, G. edwardsii
SWC 21	2261.9	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, N. kaitangata, A. homomorphum, D. dartmooria
SWC 20	2301	Lower L. balmei	A. homomorphum	Paleocene	1	L. balmei, A. homomorphum
SWC 19	2323	Lower L. balmei	Indet	Paleocene	1	L. balmei, G. rudata
SWC 18	2327..3	Lower L. balmei	Indet	Paleocene	1	L. balmei.
SWC 16	2397	Lower L. balmei	Indet	Paleocene	1	L. balmei, N. kaitangata
SWC 15	2399	Lower L. balmei	-	Paleocene	1	L. balmei, G. rudata, T. marginatus
SWC 14	2444	Lower L. balmei	-	Paleocene	1	L. balmei, A. obscurus
SWC 13	2485.9	Lower L. balmei	-	Paleocene	1	L. balmei, G. rudata
SWC 11	2562.9	Lower L. balmei	Indet	Paleocene	1	L. balmei
SWC 10	2571.9	Lower L. balmei	-	Paleocene	1	G. edwardsii, H. harrisii
SWC 9	2576.9	Lower L. balmei	-	Paleocene	0	L. balmei, G. rudata
SWC 6	2604	Indet	-	Paleocene		G. rudata, A. obscurus
SWC 5	2614	Lower L. balmei	Indet	Paleocene	1	L. balmei, S. dilwynense

TABLE 1: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

SAMPLE NO.	DEPTH (m)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 4	2647	Lower *L. balmei*	Indet	Paleocene	0	*L. balmei*, *G. edwardsii*, *G. rudata*, *T. verucosus*, *T. waiparaensis*, *E. circumtabulata*
CTS	2700-05	Upper *T. longus*	Indet	Maastrichtian	3	*G. rudata*, *T. longus*
CTS	2755-60	Upper *T. longus*	Indet	Maastrichtian	3	*G. rudata*, *S. punctatus*
CTS	2805-10	Upper *T. longus*	-	Maastrichtian	3	*G. edwardsii*, *G. rudata*, *S. punctatus*, *T. longus*
CTS	2845-50	Upper *T. longus*	-	Maastrichtian	3	*G. rudata*, *S. punctatus*
CTS	2870-75	*T. longus*	Indet	Maastrichtian		*G. rudata*, *T. verrucosus*, *T. longus*
CTS	2975-80	Indet	Indet			*G. rudata*, *G. edwardsii*, *T. verrucosus*
CTS	2985-90	*T. longus*	Indet			*G. rudata*, *G. edwardsii*, *T. verrucosus*
CTS	2990-95	*T. longus*	-	Maastrichtian		*G. rudata*, *G. edwardsii*, *T. verrucosus*, *T. longus*

TABLE 2

ANOMALOUS AND UNUSUAL OCCURRENCES OF SPORE-POLLEN AND DINOFLAGELLATE TAXA

SAMPLE NO.	DEPTH(m)	ZONE	TAXON	COMMENTS
SWC 50	1660.7	Lower M. diversus	T. ambiguus	1 specimen; not known consistently below Middle M. diversus Zone
SWC 49	1675.5	Lower M. diversus	T. scabratus	Occurs frequently; not known below Upper M. diversus Zone
SWC 49	1675.5	Lower M. diversus	H. tasmaniense	1 specimen; not known below Middle M. diversus Zone
SWC 48	1686	M. diversus	L. balmei	Rare occurrence; not known consistently above Upper L. balmei Zone
SWC 44	1750.5	Upper L. balmei	M. diversus	Rare occurrence; not known consistently below M. diversus Zone
SWC 43	1768.4	Upper L. balmei	M. subtilis	Rare occurrence; not known consistently below M. diversus Zone
SWC 40	1796.5	Upper L. balmei	M. subtilis	Rare occurrence; not known consistently below M. diversus Zone
SWC 39	1813	Upper L. balmei	M. subtilis	Rare occurrence; not known consistently below M. diversus Zone
SWC 4	2647	Lower L. balmei	M. diversus	1 specimen; not known consistently below M. diversus Zone

<u>TABLE 3: SUMMARY OF BASIC PALYNOLOGICAL DATA</u>

DIVERSITY -	low	medium	high
S & P	less than 10	10-30	greater than 30
D	1-3	3-10	10

SAMPLE NO.	DEPTH (m)	YIELD SPORE-POLLEN	YIELD DINOS	DIVERSITY SPORE-POLLEN	DIVERSITY DINOS	PRESERVATION	LITHOLOGY	PYRIZATION	COMMENTS
SWC 81	1460	Low	Medium	Low	Medium	Good	calc. slt.		
SWC 79	1479.9	Low	High	Low	Medium	Good	calc. slt.		
SWC 78	1489.9	Low	Medium	Low	Medium	Good	calc. sh.		
SWC 76	1510	Low	High	Low	Medium	Good	calc. sh.		
SWC 75	1520	Low	Medium	Low	Medium	Good	calc. slt.		
SWC 74	1530	Low	High	Low	Medium	Good	calc. sh.		
SWC 73	1537.9	Low	High	Low	Medium	Good	calc. sh.		
SWC 72	1545	Low	Medium	Low	Medium	Good	calc. slt.		
SWC 69	1552.9	Low	High	Low	Medium	Good	calc. slt.		
SWC 67	1557	Low	High	Low	Medium	Good	calc. sh.		
SWC 66	1558.9	Low	High	Low	Medium	Good	calc. cl.st.		
SWC 65	1561	Low	High	Low	Medium	Good	calc. sh.		
SWC 63	1565	Low	High	Low	Medium	Good	calc. slt.		
SWC 62	1567.4	Low	High	Low	Medium	Good	calc. slt		
SWC 58	1573.5	Medium	Low	Medium	Medium	Good	carb. slt		
SWC 57	1576.5	Medium	Medium	Medium	Medium	Good	dol. sh.		
SWC 55	1596	Medium	-	Medium	-	Good	coal		
SWC 54	1604.5	Medium	Low	Medium	Medium	Good	carb. slt.		

TABLE 3: SUMMARY OF BASIC PALYNOLOGICAL DATA

DIVERSITY -	low	medium	high
S & P	less than 10	10-30	greater than 30
D	1-3	3-10	10

SAMPLE NO.	DEPTH (m)	YIELD SPORE-POLLEN	YIELD DINOS	DIVERSITY SPORE-POLLEN	DIVERSITY DINOS	PRESERVATION	LITHOLOGY	PYRIZATION	COMMENTS
SWC 53	1611.5	Medium	Medium	Medium	Medium	Good	carb. sh		
SWC 51	1642	High	Low	High	Medium	Good	carb. sh.	Low	
SWC 50	1660.7	Medium	Low	Medium	Low	Good	carb. sh.	Low	
SWC 49	1675.5	Medium	Low	Medium	Low	Good	carb. sh.		
SWC 48	1686	Low	-	Medium	-	Good	sst.		
SWC 47	1703.4	Low	-	Low	-	Good	sst.		
SWC 46	1718.5	Low	-	Low	-	Good	sh.		
SWC 45	1736.9	Medium	Low	Medium	Medium	Good	carb. slt.	Medium	
SWC 44	1750.5	Medium	Medium	Medium	Medium	Good	carb. sh.	Medium	
SWC 43	1768.4	Low	Low	Medium	Low	Good	carb. sh.		
SWC 42	1777	Medium	Low	Medium	Low	Good	carb. sh.	Medium	
SWC 41	1785	High	-	Medium	-	Good	coal		
SWC 40	1796.5	High	Low	Medium	Low	Good	slt.		
SWC 39	1813	Medium	Medium	Medium	Low	Good	carb. sh.		
SWC 38	1837	Medium	High	Medium	Medium	Good	carb. sh.	Medium	
SWC 37	1868	Low	Low	Medium	Low	Good	carb. sh		
SWC 36	1888.9	Low	Medium	Medium	Low	Fair	carb. sh	Medium	
SWC 35	1926	Medium	Low	Medium	Low	Poor	carb. sh.	Medium	Contaminated sample

TABLE 3: SUMMARY OF BASIC PALYNOLOGICAL DATA

DIVERSITY -	low	medium	high
S & P	less than 10	10-30	greater than 30
D	1-3	3-10	10

SAMPLE NO.	DEPTH (m)	YIELD SPORE-POLLEN	YIELD DINOS	DIVERSITY SPORE-POLLEN	DIVERSITY DINOS	PRESERVATION	LITHOLOGY	PYRIZATION	COMMENTS
SWC 34	1963.5	High	Medium	Medium	Low	Fair	carb. sh	Medium	
SWC 33	1995	High	Low	Medium	Low	Poor	carb. sh	Medium	
SWC 32	2034	High	Low	Medium	Low	Fair	carb. sh	Medium	
SWC 31	2061	Medium	Low	Medium	Low	Fair	carb. sh	Medium	
SWC 30	2090	High	Low	Medium	Low	Fair	carb. sh.	Medium	
SWC 29	2127	Medium	High	Medium	Low	Fair	carb. sh.	Medium	
SWC 28	2157	Low	Low	Medium	Medium	Fair	sst.		
SWC 27	2158.4	Medium	Low	Medium	Low	Fair	slt.	Medium	
SWC 26	2158.4	Low	Low	Low	Low	Good	dol. sst.		
SWC 25	2162	Low	Low	Medium	Medium	Good	dol. sst.		
SWC 24	2166	Low	Low	Medium	Medium	Fair	dol. sst.		
SWC 23	2194.9	Medium	Medium	Medium	Low	Fair	carb. sh.	Medium	
SWC 22	2225.5	Medium	Low	Medium	Low	Fair	carb. slt.	Medium	
SWC 21	2261.9	Medium	Medium	Medium	Medium	Fair	carb. sh.	Medium	
SWC 20	2301	Low	Low	Low	Low	Fair	dol. sst.		
SWC 19	2323	Low	Low	Medium	Low	Poor	carb. slt.	Medium	
SWC 18	2327.3	Low	Low	Low	Low	Poor	carb. sst.		
SWC 16	2397	Low	Low	Medium	Low	Fair	dol.slt.	Low	

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TABLE 3: SUMMARY OF BASIC PALYNOLOGICAL DATA

DIVERSITY -	low	medium	high
S & P	less than 10	10-30	greater than 30
D	1-3	3-10	10

SAMPLE NO.	DEPTH (m)	YIELD		DIVERSITY		PRESERVATION	LITHOLOGY	PYRIZATION	COMMENTS
		SPORE-POLLEN	DINOS	SPORE-POLLEN	DINOS				
SWC 15	2399	High	-	Medium	-	Fair	coal		
SWC 14	2444	Low	-	Low	-	Poor	dol. slt.		
SWC 13	2485.9	Medium	-	Low	-	Poor	dol. slt.	High	
SWC 11	2562.9	Medium	Low	Low	Low	Fair	carb. slt.	Medium	
SWC 10	2571.9	Low	-	Low	-	Fair	coal		
SWC 9	2576.9	Low	-	Medium	-	Poor	carb. slt.	Medium	
SWC 6	2604	Low	-	Low	-	Poor	dol. sst.		
SWC 5	2614	Medium	Low	Medium	Medium	Poor	carb. slt.	High	
SWC 4	2647	Medium	Low	Medium	Medium	Poor	dol. slt.	High	
CTS	2700-05	Medium	Low	Medium	Low	Fair	carb. slt.		
CTS	2755-60	Low	?	Low	? Low	Poor	carb. slt.		
CTS	2805-10	Medium	-	Medium	-	Fair	carb. slt.		
CTS	2845-50	Low	-	Low	-	Poor	carb. slt.		
CTS	2870-75	Low	?	Low	? Low	Fair	carb. slt.		
CTS	2975-80	Medium	?	Low	? Low	Fair	carb. slt.		
CTS	2985-90	Low	?	Low	? Low	Poor	carb. slt.		
CTS	2990-95	Medium	-	Low	-	Fair	carb. slt.		

PE900492

This is an enclosure indicator page.
The enclosure PE900492 is enclosed within the container PE902424 at this location in this document.

The enclosure PE900492 has the following characteristics:

ITEM_BARCODE	= PE900492
CONTAINER_BARCODE	= PE902424
NAME	= Palynological Range Chart
BASIN	= GIPPSLAND
PERMIT	= VIC/L3
TYPE	= WELL
SUBTYPE	= DIAGRAM
DESCRIPTION	= Palynological Range Chart for Turrum-3
REMARKS	=
DATE_CREATED	=
DATE_RECEIVED	= 31/07/87
W_NO	= W899
WELL_NAME	= TURRUM-3
CONTRACTOR	=
CLIENT_OP_CO	= ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 3

TURRUM #3

QUANTITATIVE LOG ANALYSIS

Interval: 1570 - 2755m KB

Analyst : L.J. Finlayson

Date : August, 1986

TURRUM #3 QUANTITATIVE LOG ANALYSIS

Due to an EALOG software bug the Turrum #3 wireline logs have been re-analysed for effective porosity and water saturation over the interval 1570m to 2755m KB. Analysis was carried out using a reiterative technique which incorporates hydrocarbon correction to the porosity logs, density-neutron crossplot porosities, a Dual Water saturation relationship and convergence on a preselected grain density window by shale volume adjustment.

The results of this analysis differ from the previous analysis in gas zones where porosities are generally decreased and water saturations are therefore slightly lower.

Logs Used

LLD, LLS (DLTE), MSFL, RHOB (LDTC), CAL, GR, NPHI (CNTH).

The MSFL and neutron porosity logs were corrected for borehole and environmental effects. The borehole corrected MSFL was used with the LLD and LLS to derive Rt and invasion diameter logs.

Log Quality

Most of the logs appear to be of reasonable quality, however it is noted that the LLS appears to be reading too low in shale zones in comparison to the LLD and MSFL. NPHI appeared to be reading incorrectly over the interval 1575-1585m and therefore a linear shift of -0.06 was applied.

Analysis Parameters

a	1
m	2
N	2
Rmf @ 94.4° C (1850-3520m)	0.062 ohm.m
Grain Density - lower limit	2.65 gm/cc
Grain Density - upper limit	2.67 gm/cc
Mud Filtrate Density (RHOF)	1.00 gm/cc
Bottom Hole Temperature	94.4° C

Depth Interval (m)	RHOBSH (gm/cc)	NPHISH (gm/cc)	RSH (ohm-m)
1570 - 1700	2.40	0.33	8
1700 - 2100	2.50	0.36	6
2100 - 2555	2.55	0.30	15
2555 - 2755	2.58	0.24	25

Shale Volume

An initial estimate of VSH was calculated from density-neutron separation.

$$VSHND = \frac{NPHI - \left(\frac{2.65 - RHOB}{1.65}\right)}{NPHISH - \left(\frac{2.65 - RHOBSH}{1.65}\right)} \quad - 1$$

Total Porosities

Total porosity was initially calculated from a density-neutron logs using the following algorithms:

$$h = 2.71 - RHOB + NPHI\ (RHOF - 2.71) \qquad - 2$$

if h is greater than 0, then

$$\text{apparent matrix density, } RHOMa = 2.71 - h/2 \qquad - 3$$

if h is less than 0, then

$$\text{apparent matrix density, } RHOMa = 2.71 - 0.64h \qquad - 4$$

$$\text{Total porosity: } PHIT = \frac{RHOMa - RHOB}{RHOMa - RHOF} \qquad - 5$$

where RHOB = bulk density in gms/cc
NPHI = environ. corrected neutron porosity in limestone porosity units.
RHOF = fluid density (1.00 gms.cc)

Free Formation Water (Rw) and Bound Water (Rwb) Resistivities

Apparent water resistivity (Rwa) was derived as follows:

$$Rwa = Rt * PHIT^{m} \quad (m = 2) \qquad - 6$$

Free formation water resistivity (Rw) was taken from the clean, water sand Rwa. Bound water resistivity (Rwb) was calculated from the input shale resistivity value (RSH) read directly from the Rt log.

Listed below are the selected Rw and Rwb values.

Depth Interval (m)	Salinity (ppm NaCl eq.)
1570 - 1585	9,000
1585 - 1675	6,500
1675 - 1720	8,500
1720 - 2175	15,000
2175 - 2650	30,000
2650 - 2755	35,000

Water Saturations

Water saturations were determined from the Dual Water model which uses the following relationship:

$$\frac{1}{Rt} = SwT^{n} * \left(\frac{PHIT^{m}}{aRw}\right) + SwT^{(n-1)} \left[\frac{Swb * PHIT^{m}}{a}\left(\frac{1}{Rwb} - \frac{1}{Rw}\right)\right] \qquad - 7$$

or

$$\frac{1}{Rxo} = SxoT^{n} * \left(\frac{PHIT^{m}}{aRmf}\right) + SxoT^{(n-1)} \left[\frac{Swb * PHIT^{m}}{a}\left(\frac{1}{Rwb} - \frac{1}{Rmf}\right)\right] \qquad - 8$$

where: SwT and SxoT are "total" water saturations

$$\text{and Swb (bound water saturation)} = \frac{VSH * PHISH}{PHIT} \qquad - 9$$

where: PHISH = total porosity in shale derived from density-neutron crossplot.

with a = 1
m = 2
n = 2

Hydrocarbon Corrections

Hydrocarbon correction to the porosity logs utilised the following algorithms:

$$RHOB = RHOB(raw) + 1.07\ PHIT\ (1-SxoT)\ [(1.11-0.15P)RHOF - 1.15RHOH] \quad -10$$
(Hydrocarbon corrected)

$$NPHI = NPHI(raw) + 1.3\ PHIT\ (1-SxoT)\ \frac{RHOF(1-P)-1.5RHOH + 0.2}{RHOF(1-P)} \quad -11$$
(Hydrocarbon corrected)

where: P = mud filtrate salinity in parts per unity
RHOF = mud filtrate density
RHOH = hydrocarbon density (0.70 gm/cc for oil, 0.25 gm/cc for gas)

The calculated "grain density" was derived by removing the shale component from the rock using the following algorithms:

$$RHOBSC = \frac{RHOB\ (hydrocarbon\ corrected) - VSH * RHOBSH}{1-VSH} \quad -12$$

$$NPHISC = \frac{NPHI\ (hydrocarbon\ corrected) - VSH * NPHISH}{1-VSH} \quad -13$$

The shale corrected density and neutron values were then entered into the cross-plot algorithms (equations 2, 3 and 4) to derive grain density (RHOG).

If calculated RHOG fell inside the specified grain density window, then PHIE and Swe were calculated as follows:

$$PHIE = PHIT - VSH * PHISH \quad -14$$

$$Swe = 1 - \frac{PHIT}{PHIE}(1-SwT) \quad -15$$

If the calculated RHOG fell outside the specified grain density window, VSH was adjusted appropriately and the process repeated.

Comments

1. Several hydrocarbon and water zones are interpreted from the wireline logs in Turrum #3. They are as follows:

1578.25 - 1581.50m KB	Residual Oil	(3.25m net sand)
1582.00 - 1971.50m KB	Water	(43.75m net sand)
2008.25 - 2023.00m KB	Gas	(7.50m net sand)
2027.75 - 2031.00m KB	Water?	(1.50m net sand)
2049.25 - 2059.50m KB	Gas	(3.00m net sand)
2073.50 - 2074.25m KB	Water?	(0.75m net sand)
2104.75 - 2153.00m KB	Gas	(13.75m net sand)
2154.50 - 2157.00m KB	Oil	(2.50m net sand)
2160.50 - 2166.75m KB	Residual Oil?	(3.25m net sand)
2180.00 - 2596.25m KB	Gas	(55.75m net sand)
2609.25 - 2609.50m KB	Oil	(0.25m net sand)
2619.25 - 2620.25m KB	Oil	(1.00m net sand)
2620.25 - 2695.25m KB	Water	(57.50m net sand)

2. Several hydrocarbon zones are also identified in the low porosity interval 2597-2610.25m KB. This is a dolomitised sandstone interval and possibly contains fracture porosity. See Summary Table and Listing for details of these zones.

3. Hydrocarbon contacts are interpreted at the following depths:

   G.O.C. @ 2153.0 - 2154.5m KB
   G.O.C. @ 2604m KB (from RFT data)
   O.W.C. @ 2615m KB (from RFT data)
   O.W.C. @ 2620.5m KB

4. Hydrocarbons are confirmed by the following RFT recoveries:

   RFT 7/52 @ 2156.5m, 1.0 L oil
   RFT 4/45 @ 2551.5m, 1.0 L condensate
   RFT 3/44 @ 2609.5m, 5.25 L oil
   RFT 8/55 @ 2619.5m, 0.25 L oil

5. Turrum #3 was drilled to a total depth of 2996m KB however the interval 2755m to T.D. was not logged by wireline logs due to drill pipe and bottom hole assembly being stuck in the borehole.

6. Attached is a Porosity vs. Depth Crossplot, a Porosity/Saturation Depth Plot and a listing of results.

TURRUM #3

SUMMARY OF RESULTS

Interval Evaluated: 1570m to 2755m KB

Depth Interval (m KB)	Gross Thickness (m)	*Net Porous Thickness (m)	*Porosity Average	* Swe Average	Comments
1578.25 - 1581.50	3.25	3.25	0.214 ± 0.04	0.804	Residual Oil
1582.00 - 1584.75	3.25	3.25	0.223 ± 0.04	0.928	Water
1615.75 - 1618.50	2.75	2.00	0.203 ± 0.05	1.000	Water
1625.75 - 1637.75	12.00	10.75	0.258 ± 0.04	0.976	Water
1663.75 - 1664.75	1.00	1.00	0.201 ± 0.03	1.000	Water
1688.00 - 1695.25	7.25	7.25	0.238 ± 0.03	1.000	Water
1697.25 - 1699.50	2.25	2.25	0.216 ± 0.02	0.997	Water
1702.50 - 1704.25	1.75	1.75	0.185 ± 0.03	1.000	Water
1721.25 - 1727.75	6.50	6.00	0.162 ± 0.04	0.951	Water
1731.50 - 1736.00	4.50	4.50	0.191 ± 0.05	0.995	Water
1780.50 - 1781.50	1.00	1.00	0.165 ± 0.03	1.000	Water
1809.00 - 1811.00	2.00	2.00	0.205 ± 0.01	1.000	Water
1817.75 - 1819.00	1.25	1.00	0.159 ± 0.02	1.000	Water
1970.75 - 1971.75	1.00	1.00	0.187 ± 0.02	1.000	Water
2008.25 - 2009.25	1.00	1.00	0.211 ± 0.03	0.335	Gas
2016.50 - 2023.00	6.50	6.50	0.210 ± 0.02	0.465	Gas
2027.75 - 2028.50	0.75	0.75	0.122 ± 0.01	0.889	Water?
2030.50 - 2031.00	0.50	0.50	0.153 ± 0.01	0.846	Water?
2049.25 - 2050.75	1.50	1.50	0.148 ± 0.02	0.441	Gas
2056.00 - 2056.50	0.50	0.50	0.133 ± 0.02	0.665	Gas?
2058.50 - 2059.50	1.00	1.00	0.159 ± 0.01	0.560	Gas?
2073.50 - 2074.25	0.75	0.75	0.124 ± 0.01	0.928	Water?
2104.75 - 2106.50	1.75	1.75	0.146 ± 0.02	0.478	Gas
2113.75 - 2114.25	0.50	0.50	0.170 ± 0.01	0.240	Gas
2135.25 - 2136.00	0.75	0.75	0.191 ± 0.01	0.443	Gas
2139.25 - 2142.75	3.50	3.50	0.200 ± 0.03	0.450	Gas
2144.50 - 2149.75	5.25	5.25	0.214 ± 0.02	0.268	Gas
2151.00 - 2153.00	2.00	2.00	0.220 ± 0.03	0.532	Gas
2154.50 - 2157.00	2.50	2.50	0.228 ± 0.01	0.651	Oil
2160.50 - 2163.00	2.50	2.25	0.184 ± 0.03	0.957	Residual Oil?
2166.00 - 2166.75	0.75	0.75	0.161 ± 0.02	0.919	Residual Oil?
2180.00 - 2181.50	1.50	1.50	0.148 ± 0.03	0.249	Gas
2183.75 - 2185.75	2.00	1.75	0.147 ± 0.03	0.279	Gas
2188.75 - 2190.25	1.50	1.50	0.163 ± 0.03	0.308	Gas
2199.75 - 2202.50	2.75	2.75	0.252 ± 0.01	0.029	Gas
2209.75 - 2211.75	2.00	1.50	0.147 ± 0.02	0.278	Gas

Depth Interval (m KB)	Gross Thickness (m)	*Net Porous Thickness (m)	*Porosity Average	* Swe Average	Comments
2265.75 - 2267.00	1.25	0.75	0.148 ± 0.04	0.367	Gas
2302.00 - 2303.25	1.25	0.75	0.123 ± 0.02	0.274	Gas
2343.25 - 2344.50	1.25	1.25	0.148 ± 0.02	0.194	Gas
2391.25 - 2391.75	0.50	0.50	0.135 ± 0.02	0.159	Gas
2422.50 - 2424.25	1.75	1.75	0.164 ± 0.02	0.157	Gas
2426.25 - 2442.25	16.00	13.50	0.135 ± 0.02	0.222	Gas
2474.50 - 2475.75	1.25	1.25	0.178 ± 0.01	0.110	Gas
2490.50 - 2493.50	3.00	2.50	0.143 ± 0.04	0.147	Gas
2501.00 - 2508.00	7.00	7.00	0.205 ± 0.03	0.056	Gas
2509.75 - 2513.00	3.25	3.25	0.168 ± 0.04	0.157	Gas
2517.25 - 2521.50	4.25	3.50	0.143 ± 0.02	0.152	Gas
2546.25 - 2547.75	1.50	0.75	0.116 ± 0.01	0.205	Gas
2549.50 - 2553.00	3.50	3.25	0.129 ± 0.02	0.234	Gas
2586.00 - 2591.50	5.50	5.50	0.184 ± 0.02	0.111	Gas
2595.00 - 2596.25	1.25	1.25	0.138 ± 0.02	0.079	Gas
2597.00 - 2598.75	1.75	1.75	0.035 ± 0.02	0.459	Gas**
2600.50 - 2604.00	3.50	3.50	0.014 ± 0.01	0.660	Gas**
2604.25 - 2609.00	4.75	4.75	0.043 ± 0.02	0.510	Oil**
2609.25 - 2609.50	0.25	0.25	0.106 ± 0.01	0.324	Oil
2609.75 - 2610.25	0.50	0.50	0.062 ± 0.03	0.556	Oil**
2619.25 - 2620.25	1.00	1.00	0.170 ± 0.02	0.714	Oil
2620.50 - 2626.25	5.75	5.75	0.195 ± 0.01	1.000	Water
2628.75 - 2644.75	16.00	16.00	0.176 ± 0.02	1.000	Water
2652.50 - 2684.50	32.25	31.50	0.155 ± 0.02	0.966	Water
2689.50 - 2690.50	1.00	1.00	0.143 ± 0.02	0.917	Water
2692.00 - 2695.25	3.25	3.25	0.160 ± 0.03	0.972	Water

* Net porosity Thickness, Porosity Average and Swe Average refer to zones with calculated porosities in excess of 10%.

** Net Porosity Thickness, Porosity Average and Swe Average refer to all zones as this zone may be fractured and therefore the 10% net porosity cutoff does not apply.

PE603862

This is an enclosure indicator page.
The enclosure PE603862 is enclosed within the container PE902424 at this location in this document.

The enclosure PE603862 has the following characteristics:

ITEM_BARCODE = PE603862
CONTAINER_BARCODE = PE902424
NAME = CPI Quantitative Log
BASIN = GIPPSLAND
PERMIT = VIC/L3
TYPE = WELL
SUBTYPE = WELL_LOG
DESCRIPTION = CPI Quantitiative Log for Turrum-3
REMARKS =
DATE_CREATED = 31/08/86
DATE_RECEIVED = 31/07/87
W_NO = W899
WELL_NAME = TURRUM-3
CONTRACTOR =
CLIENT_OP_CO = ESSO AUSTRALIA LIMITED

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 4

APPENDIX 4

TURRUM-3 RFT RESULTS

SUMMARY

This report details the results of two suites of RFT's run in March/April 1985. Suite 1, run on March 29-31, 1985, investigated the interval 1575-2695 m KB, while Suite 2, run on April 15, 1985, re-tested the L-1.4.2 oil accumulation around 2620 m KB.

The objective of these tests was to investigate hydrocarbon shows seen in the logs and hence to delineate the Turrum L-1.4.2 oil reservoir and the overlying gas and oil reservoirs.

In general, comparison of the results of these tests with existing Turrum data confirms our current understanding of the Turrum field. Ten independent gas and gas/oil systems have been identified, seven of which have been intersected by previous wells. Figure 1 attached, shows the gas and oil systems identified using the RFT pressure data. The following is a brief summary of the hydrocarbon systems seen in the well logs and confirmed by RFT:-

1. L-1.1.1 (Gas/Oil)

   A 2.75m net oil sand in the interval 2153.5m-2157.25m KB with an estimated oil column of 10m and an overlying gas cap of 10.75m net sand and 14m column.

2. L-1.1.2, L-1.1.3, L-1.2.1, L-1.2.3, L-1.3 (Gas)

   Five independant gas systems in the interval 2180m-2521.5m KB with net sands varying between 1.00m and 17.00m and estimated gas columns varying between 51.5m and 125.5m.

3. L-1.4.2 (Gas/Oil)

   A 6.50m net oil sand in the interval 2604.25m-2611.0m KB with an estimated oil column of 11m and an overlying gas cap of 12.00m net sand and 19m column.

4. Accumulations A, B (Gas)

   Two independent gas systems in the interval 2008.25m-2114.25m KB with net sands of 7.50m and 2.25m and estimated gas columns of 33m and 47m.

5. Accumulation C (Oil)

   A 1.00m net oil sand in the interval 2619.25m-2620.25m KB with an oil column of 1m.

Note that accumulations A, B and C have not be intersected by previous wells drilled into Turrum.

RESULTS AND DISCUSSION

The results of these tests are documented in the following attachments:

Table 1	Hydrocarbon Accumulations Confirmed by RFT
Table 2	RFT Pretests
Table 3	RFT Samples
Figure 1	Turrum-3 RFT Plot (Overview)
Figures 2-8	Turrum-3 RFT Plots (By Accumulation)

Notes

1. A water line of gradient 1.43 psi/m has been drawn throughout pretests 1/1, 1/2, 1/3 and 1/28. This water line applies from 2000m KB to the bottom of the log interval. Above 2000m KB the pretest points stagger progressively further to the left. No hydrocarbons were found in this upper section of the well. The original Gippsland aquifer gradient of 1.42 psi/m plots between 20 and 25 psi to the right of the 1.43 gradient in the lower section of the well. Above 2000m KB the drawdown relative to the original gradient increases from 40 psi at 1950m KB to 110 psi at 1550m KB.

.../2

2. Unless otherwise stated, all contacts quoted in this report are based on RFT pressure data and the water line in (1) above.

3. The gas gradients used in this report are based on an average gas density of 0.1921 gm/cc reported in the reservoir data book, corrected for P, T and Z using the 'PYLD' program.

4. This report assumes that there are no oil legs at the base of the gas-only columns intersected by this well.

5. KB to SS is -21m.

Suite 1

Suite 1 investigated the interval 1575.0-2695.0 m KB. In the 9 RFT runs made, 54 pretests were successful and 7 sampling runs were completed. Run 2 was aborted because of poor hole conditions and a wiper trip carried out prior to starting run 3.

The main results are illustrated in Figure 1. A discussion of these results follows:

1. L-1.1.1 (Gas/Oil) - Figure 2

   This accumulation has a GOC at 2153.5 m KB and an OWC at 2163.5 m KB. The GOC is interpreted from logs. This, in turn, implies a gas column of 14.25m and an oil column of 10m. RFT 7/52 taken at 2156.5m KB, sampled one litre of oil from the 10.4 litre container.

   The above quoted GOC and OWC are in some doubt as only one pretest was taken in each of the gas, oil and water zones at this depth. Using an oil gradient of 0.90 psi/m through pretest 1/29 gives the quoted OWC at 2163.5m KB. Log interpretation indicates water as high as 2160.3m KB. Given that pretest 1/29 is valid, it is concluded that the OWC for this oil leg is down-structure from the well location and that pretests 1/28 and 1/29 are not in direct communication. Should pretest 1/29 be invalid the OWC would then be inferred from the logs at between 2157.3 and 2160.0m KB and the oil column reduced to between 3.8m and 6.5m. The GOC is arbitrarily picked at 2153.5m KB (in the middle of a dolomite) from the logs given that gas is interpreted as low as 2153.0m KB and oil as high as 2154.2m KB. This interpretation is in conflict with pretest 1/30 in the gas. Assuming the log interpretation is correct, this puts pretest 1/30 1.5psi to the right of the gas line.

2. L-1.1.2 (Gas) - Figure 3

   Pretests 1/25, 1/26 and 1/27 lie roughly on the same 0.28 psi/m gas gradient and are therefore reported as being in the same system with a single GWC at 2272 m KB. The well intersected 8.50m of net sand and the column is estimated at 93.25m.

   The dolomitic sections seen in the logs appear to be contributing to the spread of pressure data and hence also to the difficulties in interpreting that data. The sands in which the above three pretests were taken could be independent resulting in three gas columns with separate GWC's.

3. L-1.1.3 (Gas) - Figure 4

   Again, assuming pretests points 1/21 and 1/23 are part of the same system, a GWC is interpreted at 2408 m KB. The well intersected only 1.00m of net sand although the gas column is estimated at 109.5m.

   Both tests 1/21 and 1/22 were taken in a siltstone and 1/22 has been neglected as tight. A gas gradient of 0.29 psi/m can be drawn through 1/21 and 1/23 hence the assumption of a single system. Four attempts were made to obtain a sample in the siltstone between 2319m and 2332m KB, but each of these attempts was unsuccessful because of the tight formation.

.../3

4. L-1.2.1 (Gas) - Figure 4

Using a gas gradient of 0.29 psi/m through pretests 1/19 and 1/20 gives a GWC at 2431.0m KB. The well intersected 1.25m of L-1.2.1 net sand and the gas column is estimated at 91.0m.

5. L-1.2.3 (Gas) - Figure 5

Pretests 1/15, 1/16 and 1/17 define a gas system with a GWC at 2474.0m KB; assuming a gradient of 0.30 psi/m. 15.50m of L-1.2.3 net sand was intersected with an estimated 51.5m gas column. Sample 5/46 at 2442.0m KB recovered 43.4cf of gas in the 10.4 litre chamber after the contents of the 22.7 litre chamber were lost while opening.

6. L-1.3 (Gas) - Figure 6

This gas system, identified by a 0.31 psi/m gas gradient through pretests 1/11, 1/12 and 1/13 has a GWC at 2615 m KB and a 125.25m gas column. 17m of L-1.3 net sand was intersected.

Pretests 1/8, 1/9 and 1/10 may be in gas sands which are in communication with this system but this conclusion cannot be confidently drawn because the pressure data from these pretests has been affected by the dolomitic sands with possible supercharging. These sands are protected above and below a series of coals further decreasing the possibility of communication. Sample 4/45, taken from the same sand as pretest 1/8, recovered 138.5 cf of gas and one litre of condensate. The 10.4 litre chamber was preserved for analysis of the gas.

7. L-1.4.2 (Gas/Oil) - Figure 7

The L-1.4.2 is the major Turrum oil reservoir. The RFT pressure data for this system indicates a GOC at 2604.0m KB and an OWC at 2615.0m KB. The well logs indicate a dolomitised section from 2597 to 2611m KB and a shale section from 2611 to 2619m KB and consequently provide no useful contact information. The GOC is in agreement with interpretation of previous Turrum wells. The L-1.4.2 OWC has not been positively logged in any of the wells drilled into Turrum. The predrill prediction of between 2617 and 2625m TVDKB was based on low proved oil and high proved water in the previous wells. The RFT interpreted OWC at 2615m TVDKB is 2m shallow of this range and may indicate an areal variation in OWC. Note that pretest 1/4 at 2621.5m TVDKB was taken in the small independent oil sand discussed in 10. below.

The well intersected 6.5m of net oil sand and 12m of net gas sand. The oil and gas columns are estimated at 11 and 18m respectively. Sample 3/44, taken at 2609.5m KB, recovered 5.25 litres of 38° API oil and 25.2cf of gas. The 3.7 litre chamber was preserved for analysis.

8. Accumulation A (Gas) - Figure 8

Pretests 34 and 35 are in net gas sands of 1.0 and 1.0m respectively. Assuming the two sands are in communication and conservatively drawing a gas gradient through the shallow pretest point (35) yields a GWC at 2041m KB.

9. Accumulation B (Gas) - Figure 2

Pretests 32 and 33 are in small net gas sands of 1.75 and 6.5m respectively. As for Accumulation A above the sands are assumed in communication and a gas gradient of 0.27 psi/m through 33 results in a GWC at 2150m KB.

.../4

10. Accumulation C (Oil)

A 1.00m net oil sand is interpreted from log and sample information. The OWC is interpreted from logs at 2620.25m KB with a 1m oil column. RFT pressure data infers the presence of hydrocarbons but provides conflicting contact information. Pretest 1/4 is therefore ignored in the OWC interpretation.

Sample 8/55 at 2619.5m KB recovered a scum of oil in the 22.7 litre containers and 0.1 litres of oil in the 10.4 litre container. Sample 9/56 at 2619.8m KB recovered 21.4 and 9.4 litres of filtrate and scums of oil in the 22.7 and 10.4 litre containers respectively. Sample 9/56 was the only run of Suite 2, and was used to check the results of sample 8/55.

Suite 2

Suite 2 was used to re-sample the possible oil column at 2619-2621 m KB following the confusing data obtained from sample 8/55 at 2619.6 m KB. The results of this re-sample are discussed in Suite 1 above under heading 10 - Accumulation C (Oil).

TABLE 1

TURRUM-3

HYDROCARBON ACCUMULATIONS CONFIRMED BY RFT

Accumulation	Top of Accumulation (m KB)	Base of Accumulation (m KB)	GOC (m KB)	GWC (m KB)	OWC (m KB)	Column (m)	Net Sand (m)	Comments
L-1.1.1 (a) Gas	2139.25	-	2153.5	-	-	14.25	11.25	GOC by logs.
(b) Oil	-	2157.25	2153.5	-	2163.5	10.00	2.75	OWC by RFT
L-1.1.2	2178.75	2202.75	-	2272.00	-	93.25	8.50	)
L-1.1.3	2298.50	2332.00	-	2408.00	-	109.50	1.00	)
L-1.2.1	2340.00	2353.50	-	2431.00	-	91.00	1.25	) GWC by RFT
L-1.2.3	2422.00	2442.50	-	2474.00	-	51.50	15.50	)
L-1.3	2489.75	2521.75	-	2615.00	-	125.25	17.00	)
L-1.4.2 (a) Gas	2586.00	-	2604.00	-	-	18.00	12.00	GWC by RFT
(b) Oil	-	2611.00	2604.00	-	2615.00	11.00	6.50	OWC by RFT
A. Gas	2008.25	2023.00	-	2041.00	-	32.75	7.50	GWC by RFT
B. Gas	2104.75	2114.25	-	2150.00	-	45.25	2.25	GWC by RFT
C. Oil	2619.25	2620.25	-	-	2620.25	1.00	1.00	OWC by logs

*Accumulations A, B and C have not been correlated with units seen by previous wells.

(2477f)

TABLE 2
TURRUM-3 RFT PRETEST RESULTS
(KB 21 m Above Sea Level)

Suite 1, 29/3/85-31/3/85, 1575-2695 m KB

Run/Pretest	Depth (m KB)	Pressure HP (psig)	Comments
1/1	2695.2	3843.2	
1/2	2644.3	3770.9	
1/3	2635.0	3757.7	
1/4	2621.5	3740.4	
1/5	2609.5	3723.1	
1/6	2595.2	3714.4	
1/7	2587.7	3712.9	
1/8	2551.5	3719.4	Supercharged
1/9	2547.5	3719.7	Supercharged
1/10	2526.2	3716.3	Supercharged
1/11	2518.0	3699.1	
1/12	2502.8	3692.6	
1/13	2491.5	3690.2	
1/14	2475.5	3579.7	
1/15	2442.0	3519.5	
1/16	2435.9	3517.0	
1/17	2423.2	3511.5	
1/18	2377.0	3472.1	
1/19	2350.4	3441.8	
1/20	2343.9	3439.3	
1/21	2331.1	3410.5	Tight, Valid
1/22	2320.0	3415.1	Tight
1/23	2301.3	3403.2	
1/24	2266.8	3348.4	
1/25	2201.0	3218.9	
1/26	2189.9	3213.2	
1/27	2181.2	3216.0	
1/28	2162.5	3082.6	
1/29	2156.5	3077.8	
1/30	2152.5	3076.6	
1/31	2114.0	3064.5	
1/32	2105.0	3052.9	
1/33	2021.0	2907.4	
1/34	2008.4	2899.7	
1/35	1971.4	2828.4	
1/36	1810.0	2559.7	
1/37	1694.5	2362.5	
1/38	1631.0	2254.4	
1/39	1585.0	2176.0	
1/40	1582.5	2172.5	
1/41	1579.0	2167.9	
1/42	1575.5	2162.4	
2/--	-	-	Aborted for Wiper Trip
3/43	2606.5	3721.5	
3/44	2609.5	3722.5	Sample
4/45	2551.5	3721.5	Sample
5/46	2442.0	3518.3	Sample
6/47	2331.0	3406.1	Tight, Sample Attempted
6/48	2330.7	3401.8	Tight, Sample Attempted
6/49	2331.2	3435.3	Tight
6/50	2319.5	3401.1	Tight, Sample Attempted
6/51	1579.0	2164.9	Sample
7/52	2156.5	3078.2	Sample
8/53	2618.4	-	Tight
8/54	2604.3	3729.9	Tight, Sample Attempted
8/55	2619.6	3742.4	Sample, Supercharged?
Suite 2			
9/56	2619.8	3738.8	Sample

TABLE 3

TURRUM-3 RFT SAMPLES

RFT No.	Depth (m KB)	Temperature (°C)	Chamber Size (L)	Choke Size (mm)	Fill Time (min)	Sample SI Pressure (psia)	Sample Surface Pressure (psig)	Sample Contents: Gas (ft³)	Oil (L)	Water (L)	Cond. (L)	Comments
Suite 1, 29/3/85-31/3/85, 1575-2695 m KB												
3/44	2609.5	85.0	22.7	0.76	8	3737.2	1500	25.2	5.25	13.50	0	38° API @ 15°C. GOR 760 scf/STB
			3.8	0.76	2	3734.4	--------	Sample Preserved			--------	RFS - AD 1116
4/45	2551.5	86.1	22.7	0.76	7	3736.1	2150	138.5	0	3.20	1.0	Filtrate. Cond. 58.3° API @ 15°C
			10.4	0.76	3	3734.4	--------	Sample Preserved			--------	RFS - AE 1222
5/46	2442.0	88.9	22.7	0.76	45[1]	3533.0	1250	Lost[2]	0	6.0	0.2	Filtrate. Cond. 51.0° API @ 15°C
			10.4	0.76	24[1]	3529.6	1500	43.4	0	1.0	0.2	Filtrate. Cond. 54.6° API @ 15°C
6/51	1579.0	75.0	22.7	0.76	2	2179.6	1450	22.4[3]	0	18.0	0	Filtrate
			10.4	0.76	3	2181.8	100[4]	1.4[4]	0	9.25	0	Formation water
7/52	2156.5	87.2	22.7	0.76	10	3092.9	1400	14.5	0	19.4	Film	Filtrate
			10.4	0.76	4	3091.9	1600	18.4	1.0	6.0	0	45.3° API @ 15°C. GOR 2920 scf/STB
8/55	2619.6	105.6	22.7	0.76	6	3757.3	500	3.2[5]	Skum	21.25	0	Filtrate
			10.4	0.76	5	3753.3	400	1.3	0.1	9.4	0	38° API @ 15°C[6]
Suite 2, 15/4/85, 2619.8 m KB												
9/56	2619.8	91.0	22.7		6	3753.5	300	0.55	Skum	21.4	0	Filtrate
			10.4		3	3751.9	250	TR	Skum	9.4	0	Filtrate

Notes:

1. Chamber not filled.
2. Gas lost to atmosphere during surface opening of chamber.
3. 22.7 L chamber was also opened at 2331.0, 2330.7 and 2319.5 m KB. The gas seen in this chamber probably came from the sampling attempt at 2319.5 m KB.
4. Surface sample pressure estimated to be 100 psi. Incorrect opening of valve resulted in gas volume being measured, but no sample taken.
5. 22.7 L chamber was also opened for five minutes at 2604.3 m KB. The pretest indicated a tight zone.
6. The measured gravity of 38° API is probably low. The gravity was measured two days after the sample was taken and the light ends would be largely lost from the sample in that time.

(2477f)

FIGURE 1: TURRUM-3 RFT SURVEY

OVERVIEW

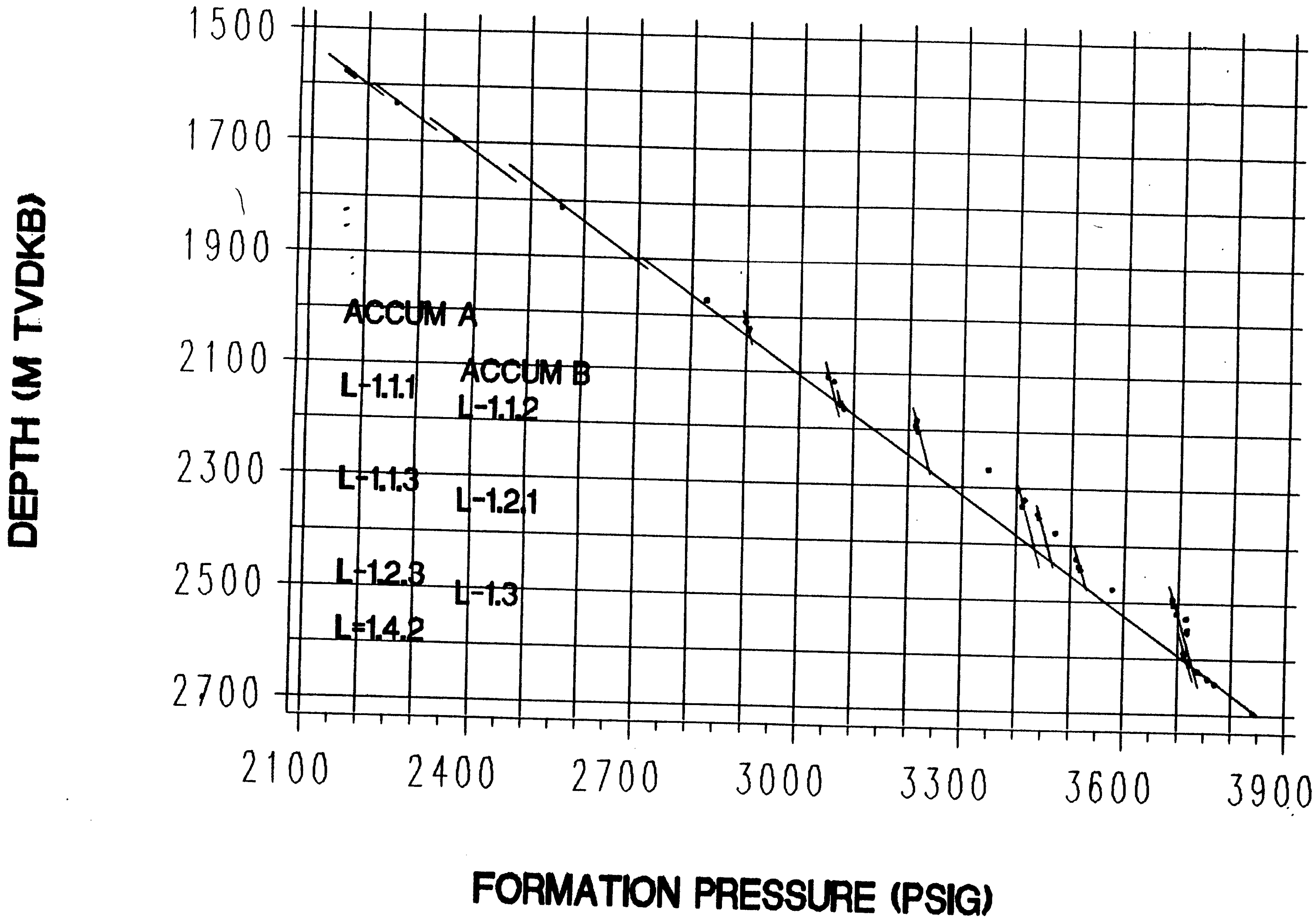


FIGURE 2: TURRUM-3 RFT SURVEY

RESERVOIR: L-1.1.1 & ACCUMALATION B

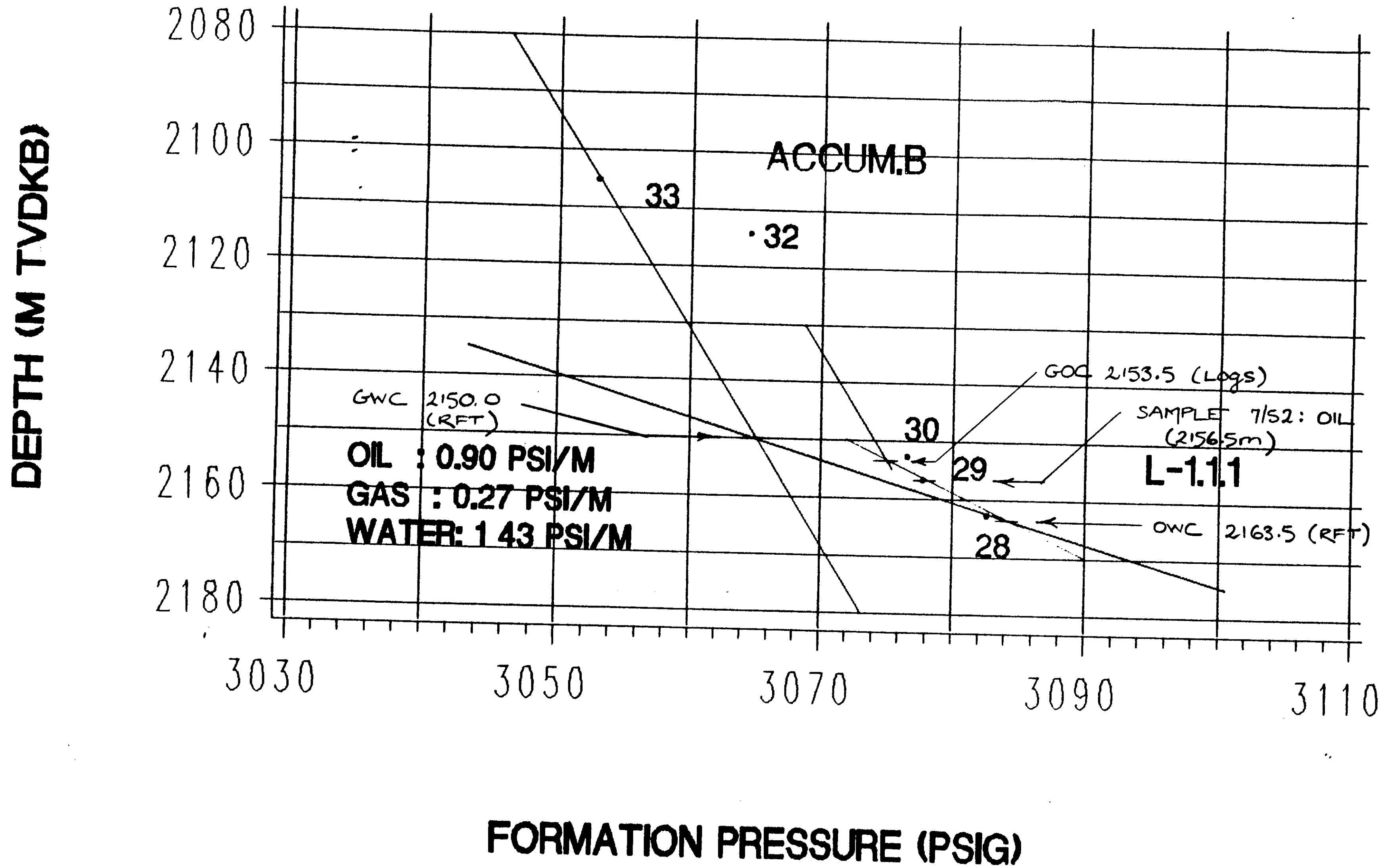


FIGURE 3: TURRUM-3 RFT SURVEY

RESERVOIR: L-1.1.2

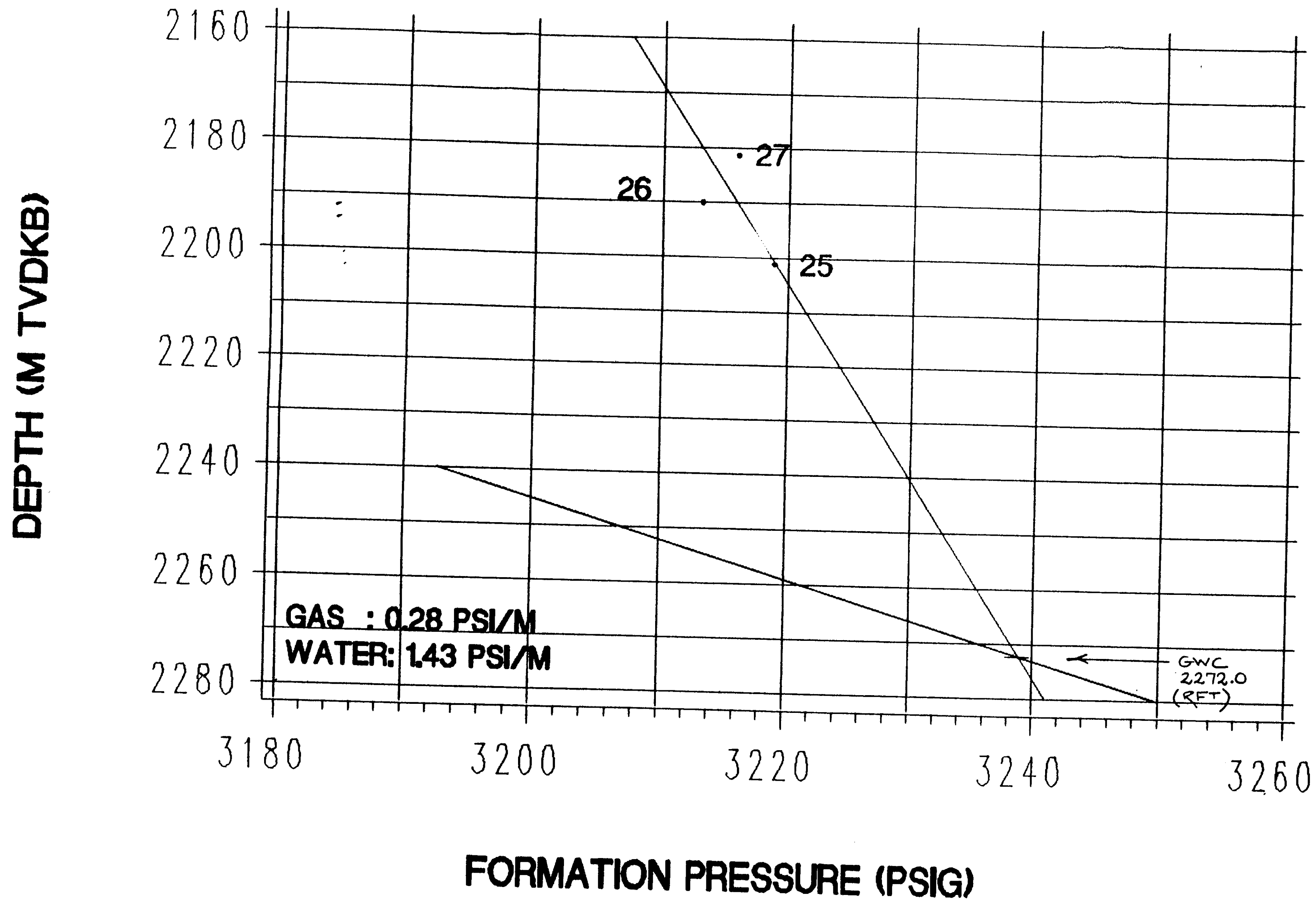


FIGURE 4: TURRUM-3 RFT SURVEY

RESERVOIR: L-1.1.3 & L-1.2.1

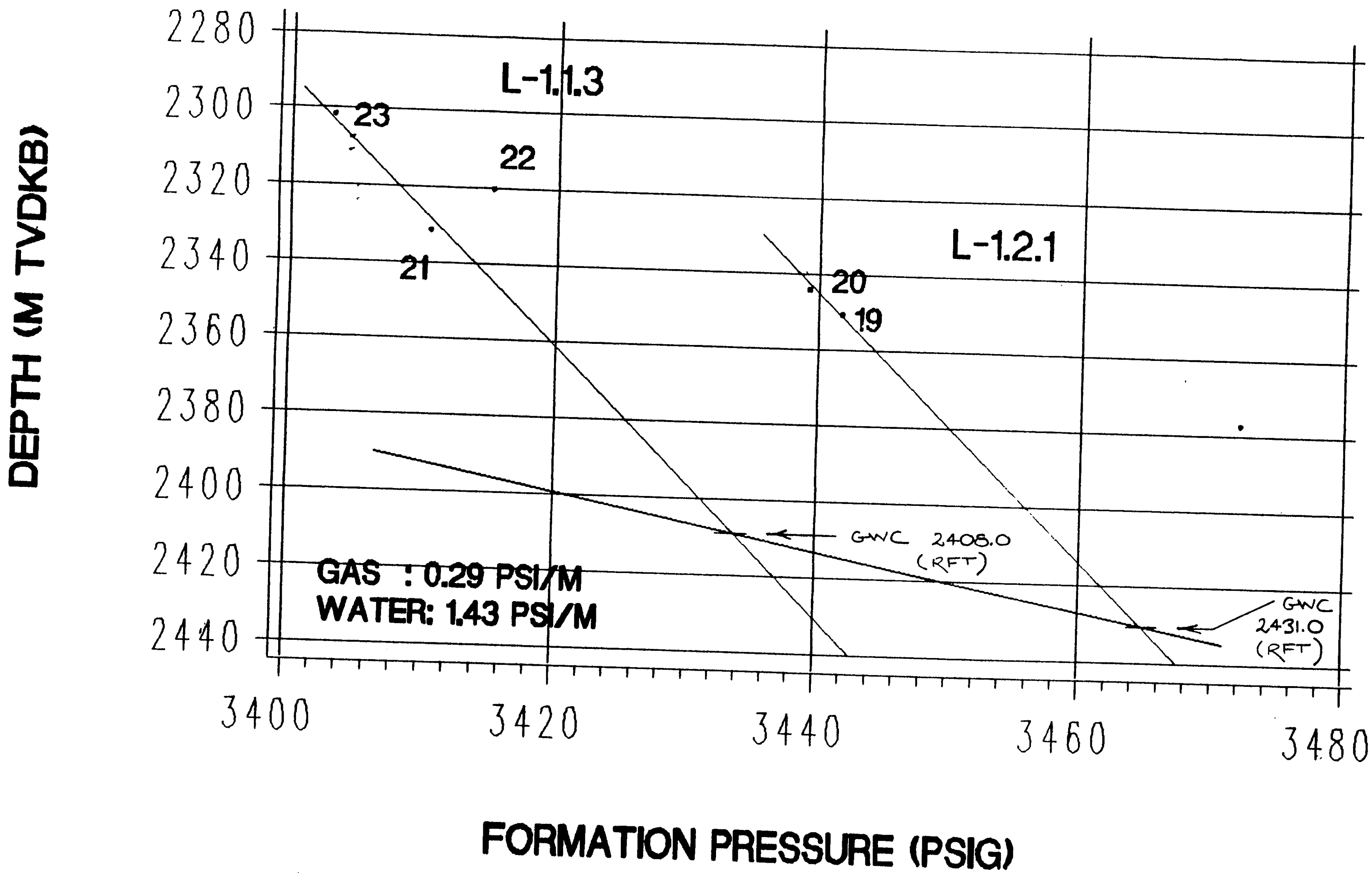


FIGURE 5: TURRUM-3 RFT SURVEY

RESERVOIR: L-1.2.3

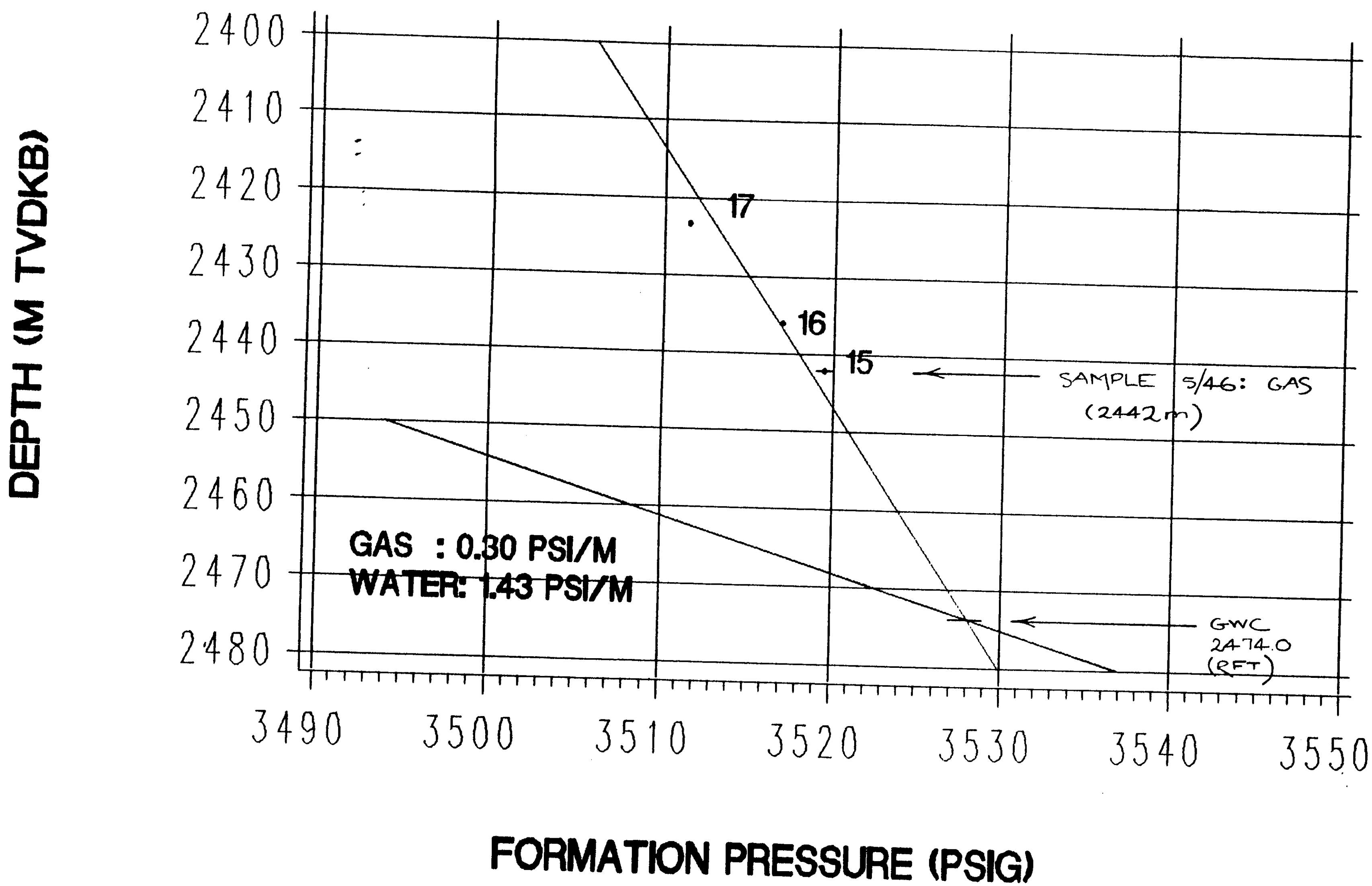


FIGURE 6: TURRUM-3 RFT SURVEY

RESERVOIR: L-1.3

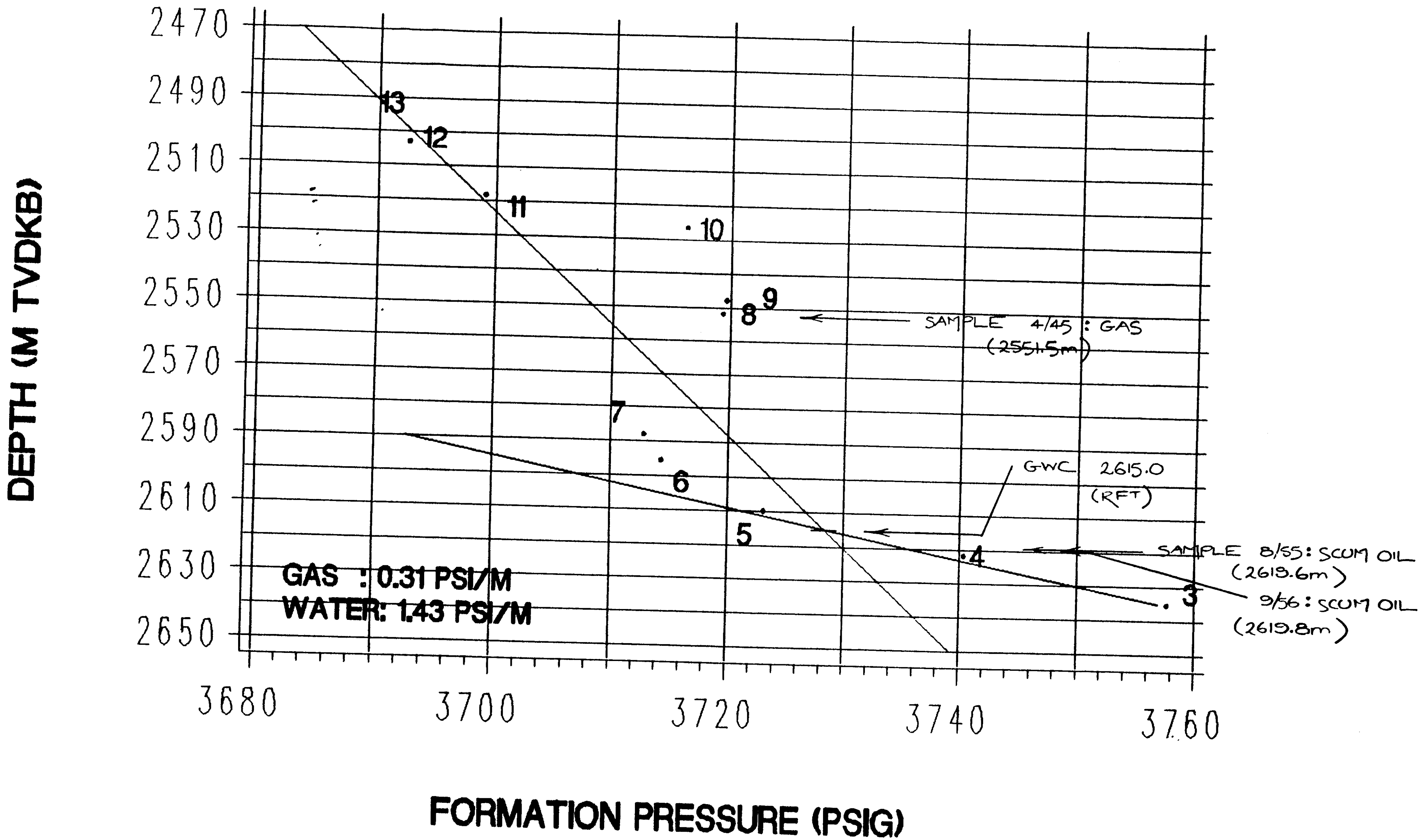


FIGURE 7: TURRUM-3 RFT SURVEY

RESERVOIR: L-1.4.2

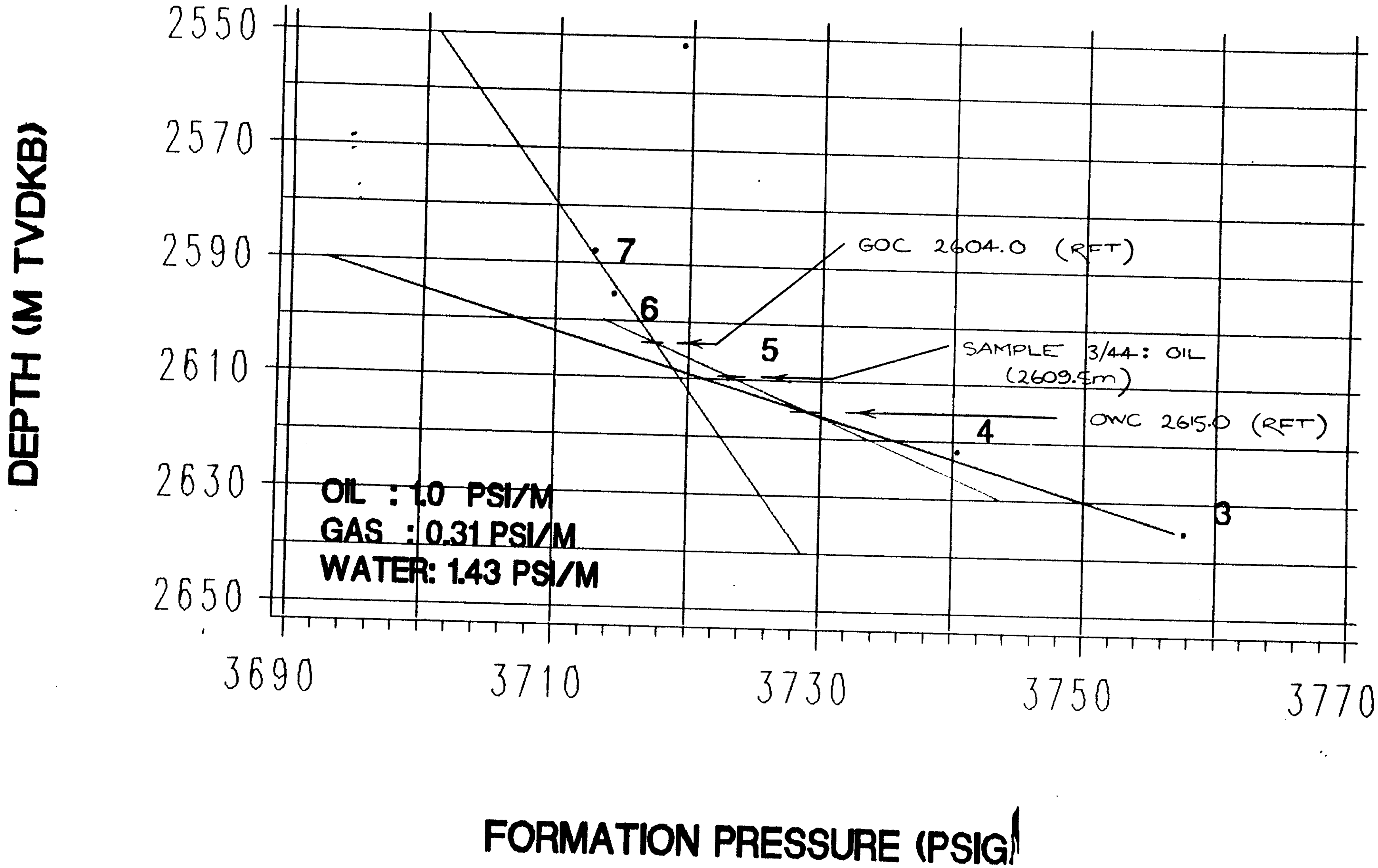
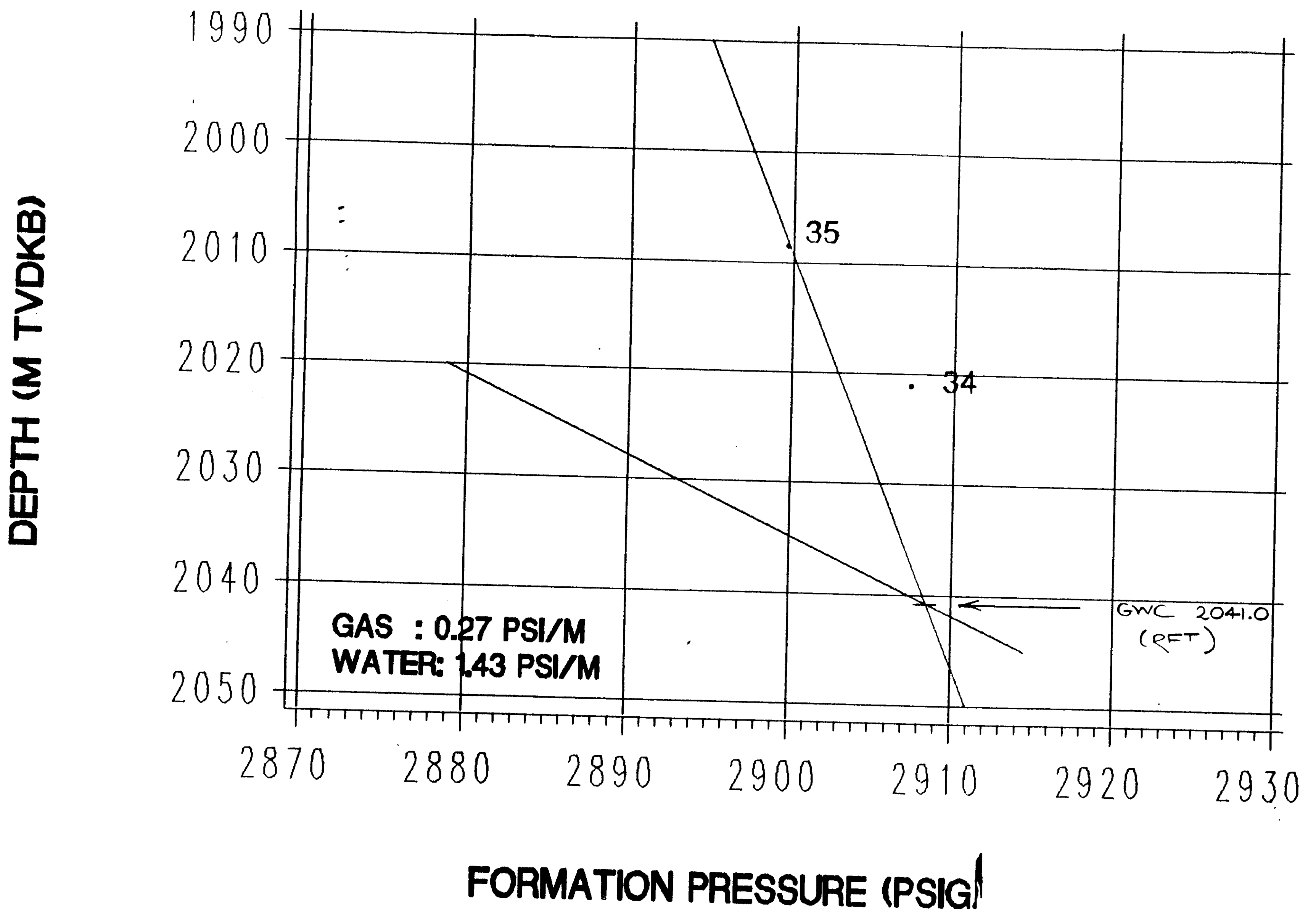


FIGURE 8: TURRUM-3 RFT SURVEY

RESERVOIR: ACCUMULATION A



APPENDIX 5

GEOCHEMICAL REPORT

TURRUM 3, GIPPSLAND

VICTORIA

by

T.R. BOSTWICK

Sample handling and Analyses by:

- D.M. Hill	)	
- D.M. Ford	)	
- J. McCardle	)	ESSO AUSTRALIA LTD.
- H. Schiller	)	
- M.A. Sparke	)	
- A.C. Cook	)	UNIVERSITY OF WOLLONGONG

Esso Australia Ltd.
Geochemical Report

March, 1986

2115L

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INTRODUCTION

Canned cuttings and sidewall cores from the Turrum-3 well, Gippsland Basin, have been geochemically analyzed to determine the hydrocarbon source potential of the drilled section. Canned cuttings were collected at 15-metre intervals from 235 mKB to 2996 mKB (Total Depth). Alternate 15-metre cuttings samples were analyzed for C_{1-4} headspace cuttings gas. Selected sidewall cores were analyzed for total organic carbon (TOC), Rock-Eval pyrolysis yields, kerogen isolation and elemental analysis, and vitrinite reflectance.

Two hydrocarbon liquids recovered by RFT 3/44 at 2609.5 mKB and RFT 8/55 at 2619.6 mKB respectively were analyzed by 'whole oil' gas chromatography and for API gravities.

The results of these analyses are recorded in Figures 1 through 7 and Tables 1 through 6. Detailed vitrinite reflectance and exinite fluorescence data are recorded in Appendix 1.

Discussion of Results and Interpretations

Richness

Headspace cutting gas (C_{1-4}) yields are recorded in Table 1 and graphically displayed in Figure 1a. Gas yields are "poor" in the Gippsland Limestone and Lakes Entrance Formations and "good" in the Latrobe Group sediments reflecting the differing potentials within the sedimentary section to source hydrocarbons.

The good source potential of the Latrobe group sediments is also indicated by the high total organic carbon (TOC) measurements (Table 2, Figure 2) and the moderate to good pyrolysis S_2 yields (Table 3). Excellent S_2 yields (in excess of 10 mg/gm) were obtained from coals or very carbonaceous sediments with the Latrobe section.

Organic Matter Types

Wet gas (C_{2-4}) yields on average account for 30-40 percent of the total (C_{1-4}) gas in the Latrobe section (Figure 1b). If indigenous, the presence of these light hydrocarbon gases suggests that the section is oil and/or condensate-prone.

The Rock-Eval hydrogen indices (HI) indicate that most of the Latrobe sediments contain Type III, terrestrial organic matter (Figure 3). Traditionally, Type III kerogen is considered gas-prone, but some condensate and oil potential appears possible in the richer carbonaceous sediments of Early Eocene and Paleocene age.

The elemental analysis of selected kerogen samples isolated from sidewall cores are listed in Table 4a. Approximate hydrogen: carbon (H/C), oxygen: carbons (O/C), and nitrogen: carbon (N/C) atomic ratios for these analyses are given in Table 4b. These ratios are "approximate" since the oxygen value is calculated by difference and the naturally occurring sulphur percent, which may be up to a few percent, was not determined. The atomic ratios of H/C are plotted against atomic O/C ratios in the Van Krevelen type diagram in Figure 4. With the exception of two Paleocene samples all of the kerogens plot within the Type III, portion of the diagram. The two Paleocene kerogen samples (2399 mKB, 2323 mKB) which plot above the Type III envelope most likely contain a mixed Type III + Type II kerogen assemblage. Type III kerogens are equivalent to vitrinite or woody (essentially terrestrial) kerogen, while Type II kerogens consist of "marine" organic matter and exinitic macerals of sporinite (from spores), cutinite (from leaves) and resinite (from tree resins).

Most of the hydrogen-poor (H/C less than 0.80) kerogens encountered by the Turrum 3 well should yield predominantly gaseous hydrocarbons. The more hydrogen-rich (H/C greater than 0.85) kerogens may have some waxy oil/condensate potential.

<u>Maturity</u>

TMAX measurements (Table 3a) from Rock-Eval pyrolysis indicate that the section approaches early maturity (TMAX about 435^{0}) in the 2399-2576.5 mKB interval. This is consistent with Thermal Alteration Indicies (TAI) of 2.0 - 2.1 encountered between 2399 mKB and 2705 mKB (Table 6). Below 2850 mKB the TAI measurements of 2.3 indicate full maturity.

The vitrinite reflectance data (Table 5) are plotted against depth in Figure 5. The trend indicated by the solid line through the three coal samples points to an early mature zone between 2350 mKB (R_v^{max} = 0.60) and 2750 mKB (R_v^{max} = 0.75), and full maturity below 2750 mKB. This is consistent with the TMAX and TAI determinations. Also shown in Figure 5 is a dashed best fit line through most of the data (from siltstones, claystones and shales) which suggests that at 2996 mKB (T.D., R_v^{max} = 0.63) the section is still not fully mature. This less optimistic view of maturity is at odds with the other indications (TAI, TMAX) and may be a consequence of the observed lithology effect (at the same level of maturity the reflectance of vitrinite increases from sandstone to siltstone to shale to coal) on reflectance values. By convention, maturity is measured by the same vitrinite reflectance scale as used in coal petrology, therefore the maturity interpretation using the coal data is most likely quite reliable. The interpretation from the detrital vitrinites in the siltstones, claystones, and shales is at best a minimum maturity determination.

Thus, the section is rated as immature to 2350 mKB, early mature between 2350 mKB and 2750 mKB, and fully mature from 2750 mKB to T.D. at 2996 mKB.

Hydrocarbons

Two liquid hydrocarbon samples recovered by RFT 3/44 at 2609.5 mKB and RFT 8/55 at 2619.6 mKB were analyzed by 'whole oil' gas chromatography and for API gravities. The liquids are waxy oils with API gravities of 38.9^{0} and 37.8^{0} respectively. The chromatograms of the oils are dominated by $C_{15}+$ paraffins with a relatively small gasoline-range component. This is similar to the patterns seen in other medium-gravity Gippsland oils. These hydrocarbons have been sourced from terrestrial (probably biodegraded) organic matter.

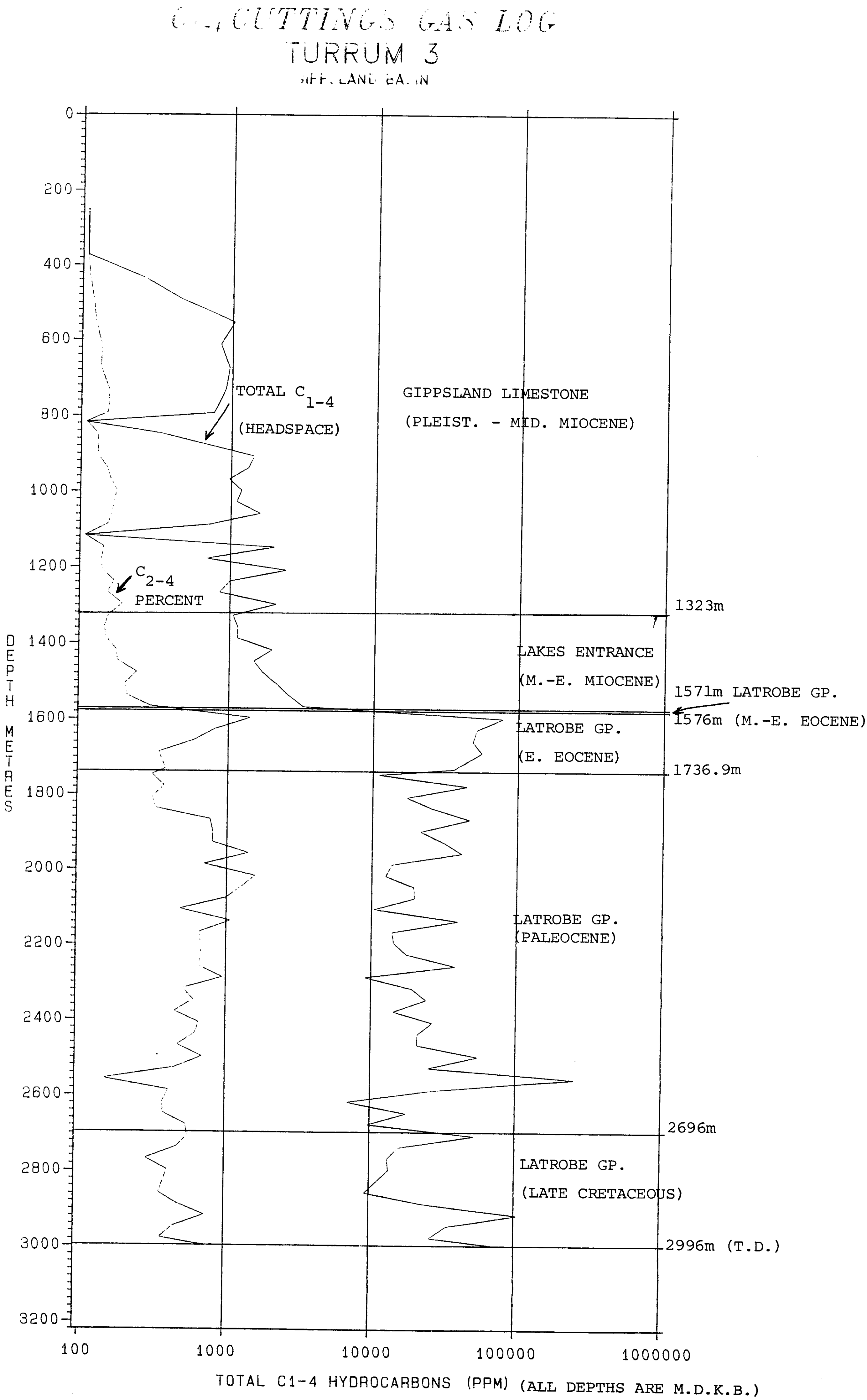
Conclusions

1. Latrobe Group sediments of Eocene, Paleocene, and Cretaceous age encountered by the Turrum-3 well have very good potential to source waxy oil, gas, and condensate when mature.

2. The section is immature to 2350 mKB, early mature between 2350 mKB and 2750 mKB, and fully mature from 2750 mKB to T.D. at 2996 mKB.

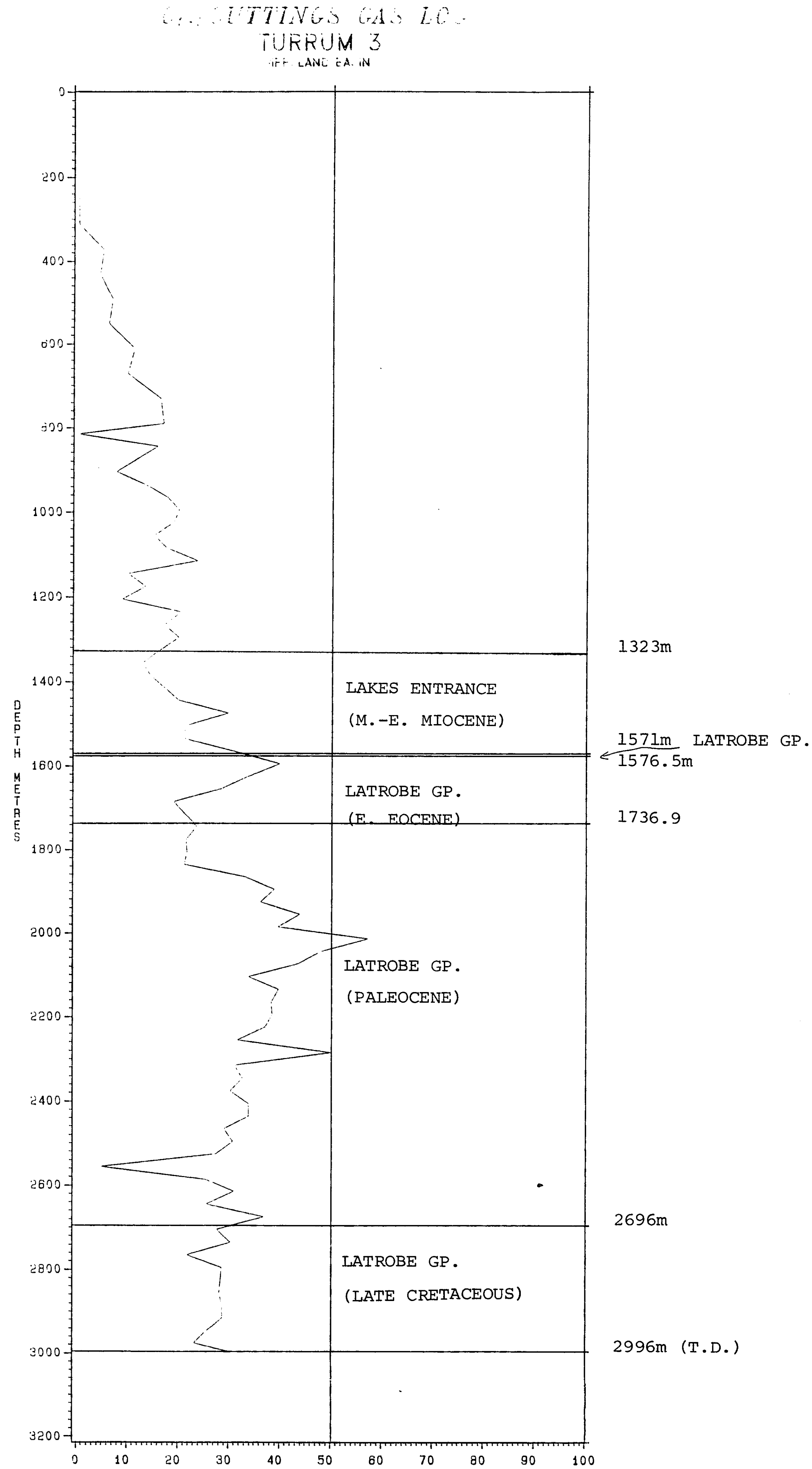
3. Medium gravity, paraffinic oils were recovered by RFT's 3/44 (2609.5 mKB) and 8/55 (2619 mKB). These hydrocarbons like other Gippsland oils have been sourced from terrestrial organic matter.

Figure 1a.



CUTTINGS GAS LOG
TURRUM 3
GIPPSLAND BASIN
DEPTH METRES
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
TOTAL C_{1-4} (HEADSPACE)
C_{2-4} PERCENT
GIPPSLAND LIMESTONE (PLEIST. - MID. MIOCENE)
1323m
LAKES ENTRANCE (M.-E. MIOCENE)
1571m LATROBE GP.
1576m (M.-E. EOCENE)
LATROBE GP. (E. EOCENE)
1736.9m
LATROBE GP. (PALEOCENE)
2696m
LATROBE GP. (LATE CRETACEOUS)
2996m (T.D.)
100
1000
10000
100000
1000000
TOTAL C1-4 HYDROCARBONS (PPM) (ALL DEPTHS ARE M.D.K.B.)

Figure 1b.



(ALL DEPTHS ARE M.D.K.B.)

FIGURE 2

TOTAL ORGANIC CARBON
TURRUM 3

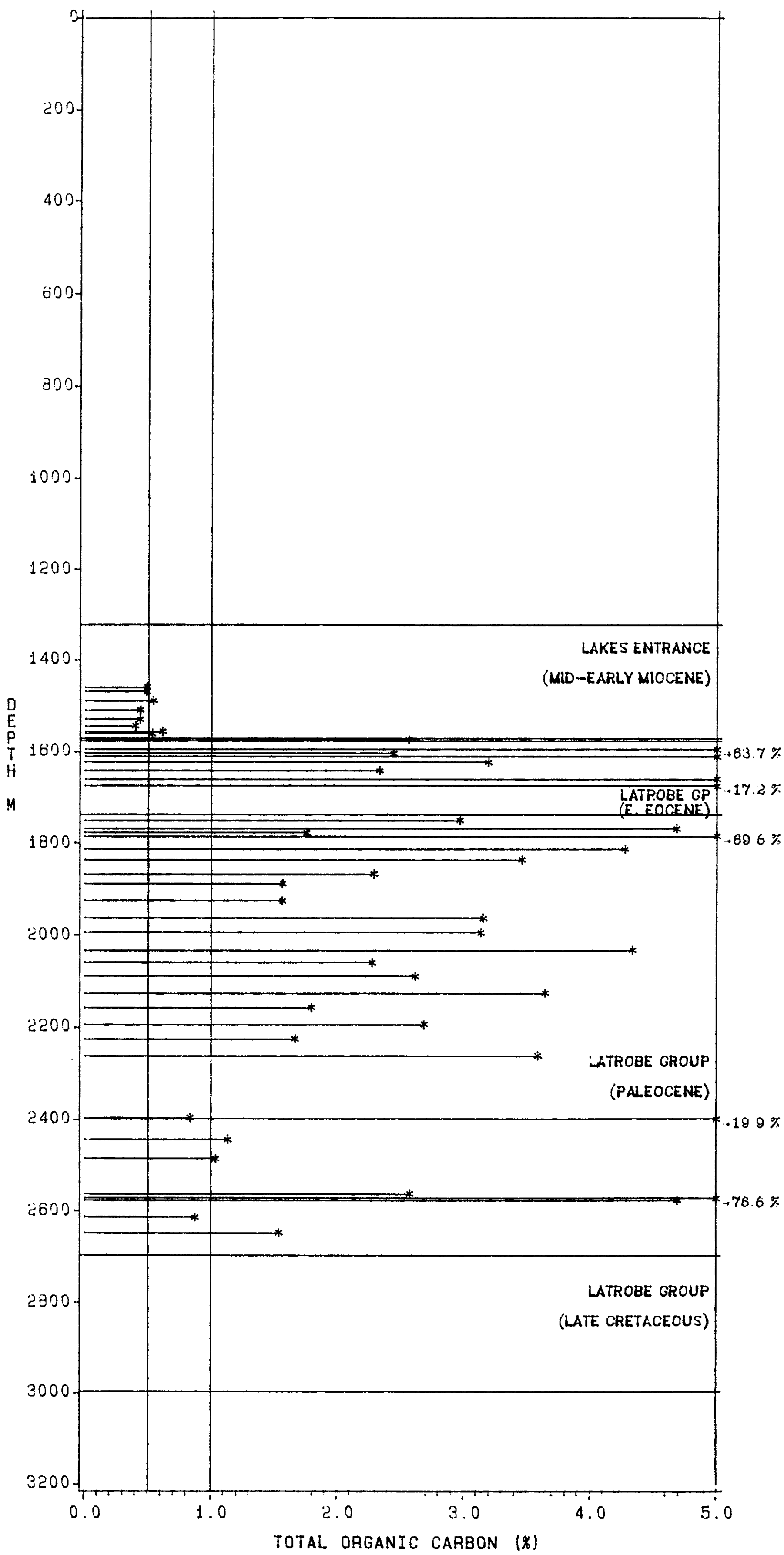
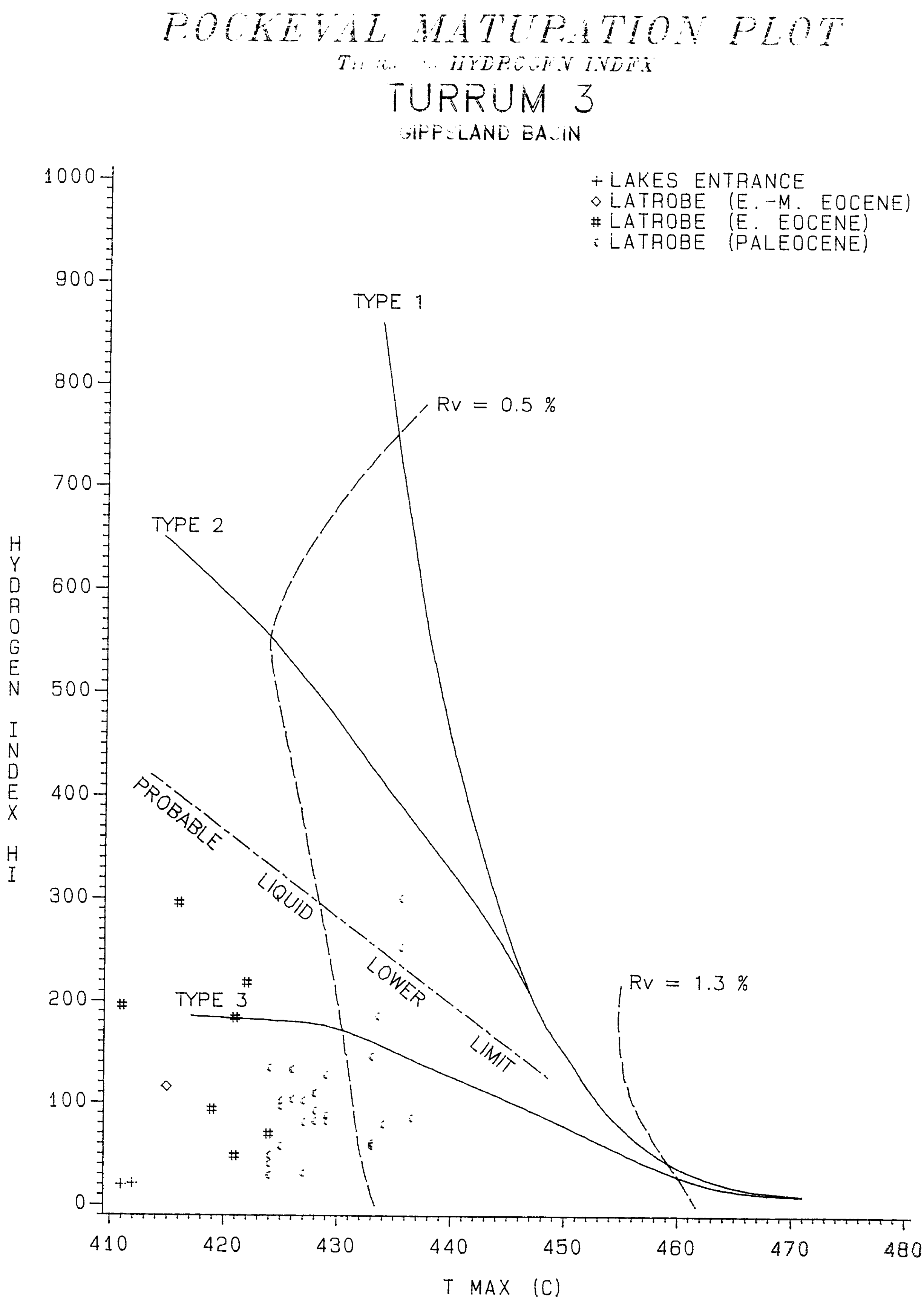


Figure 3



ROCKEVAL MATURATION PLOT
HYDROGEN INDEX
TURRUM 3
GIPPSLAND BASIN
+ LAKES ENTRANCE
◇ LATROBE (E.-M. EOCENE)
LATROBE (E. EOCENE)
LATROBE (PALEOCENE)
TYPE 1
TYPE 2
TYPE 3
Rv = 0.5 %
Rv = 1.3 %
PROBABLE LIQUID LOWER LIMIT
HYDROGEN INDEX HI
T MAX (C)
0
100
200
300
400
500
600
700
800
900
1000
410
420
430
440
450
460
470
480

Figure 4

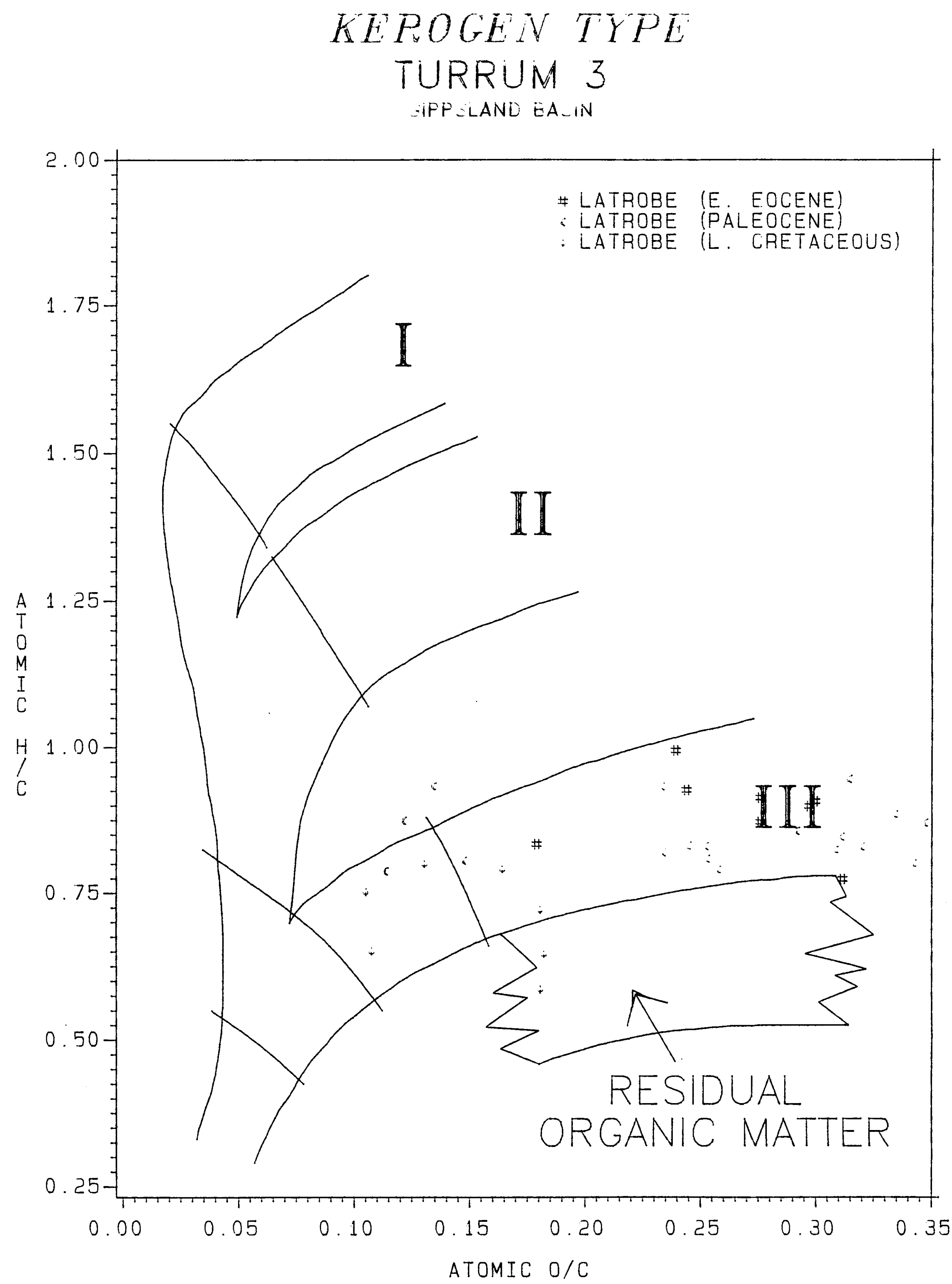
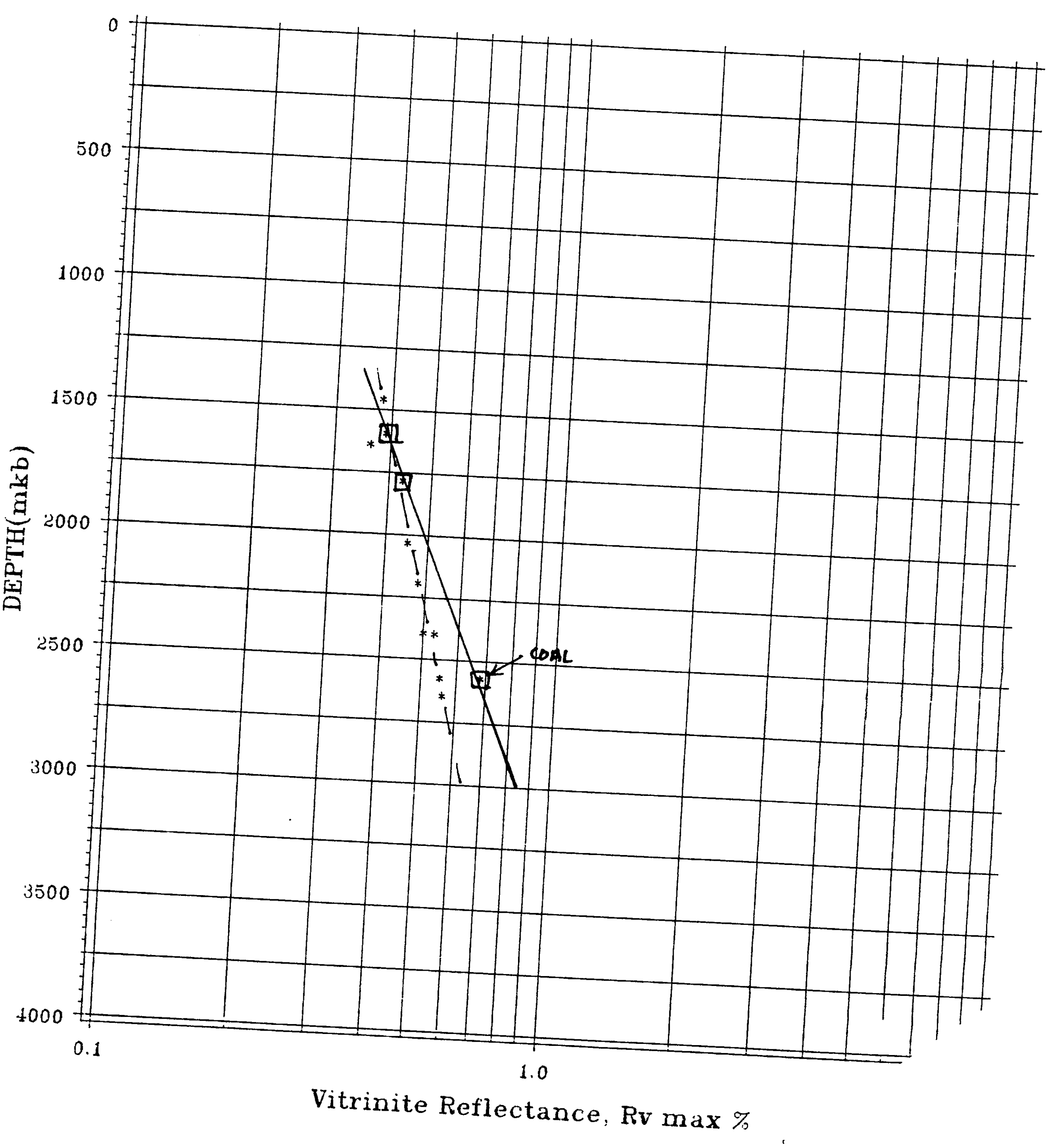

KEROGEN TYPE
TURRUM 3
GIPPSLAND BASIN
LATROBE (E. EOCENE)
LATROBE (PALEOCENE)
LATROBE (L. CRETACEOUS)
I
II
III
RESIDUAL ORGANIC MATTER
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
ATOMIC H/C
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
ATOMIC O/C

FIGURE 5.

VITRINITE REFLECTANCE VS. DEPTH
TURRUM 3



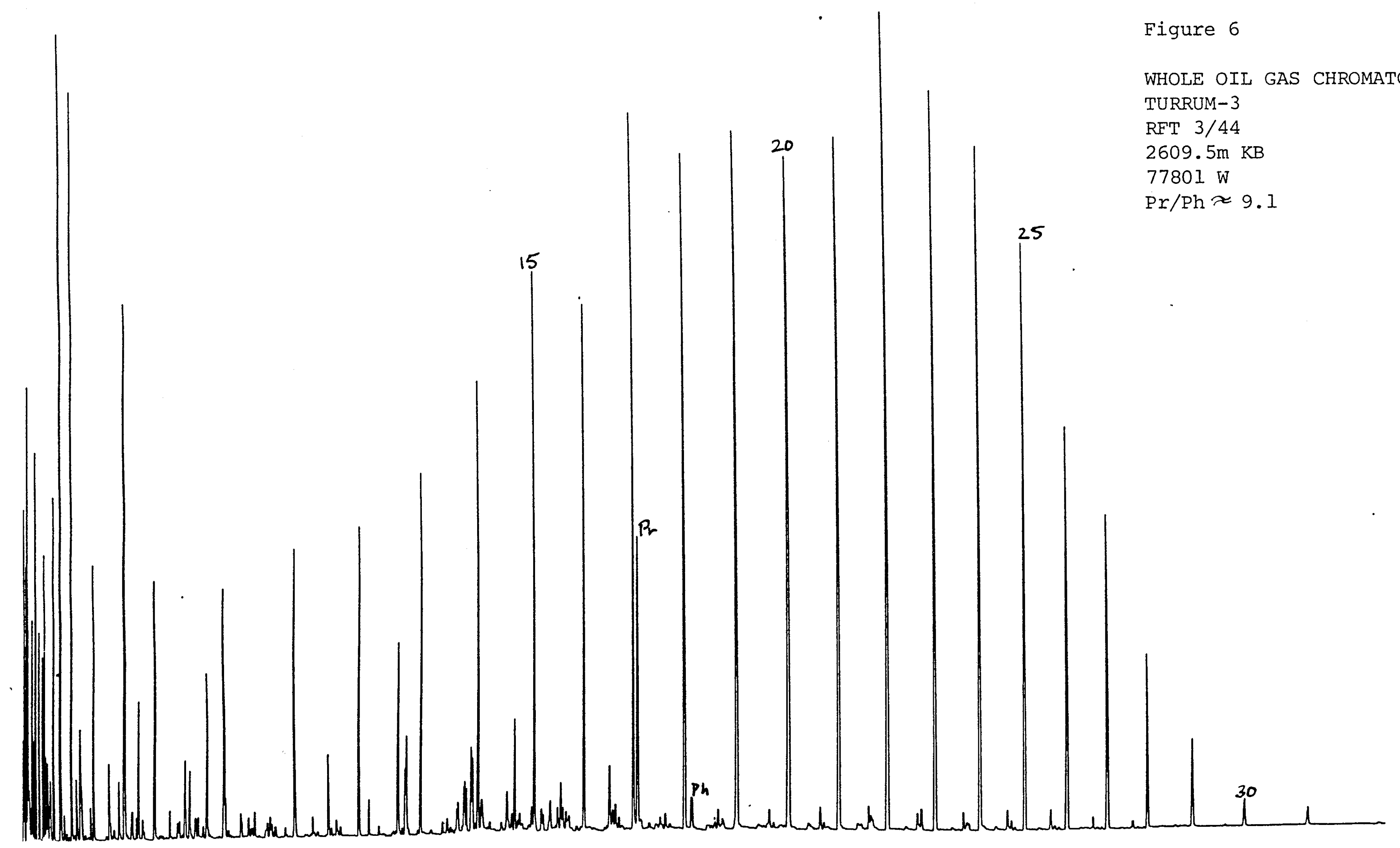
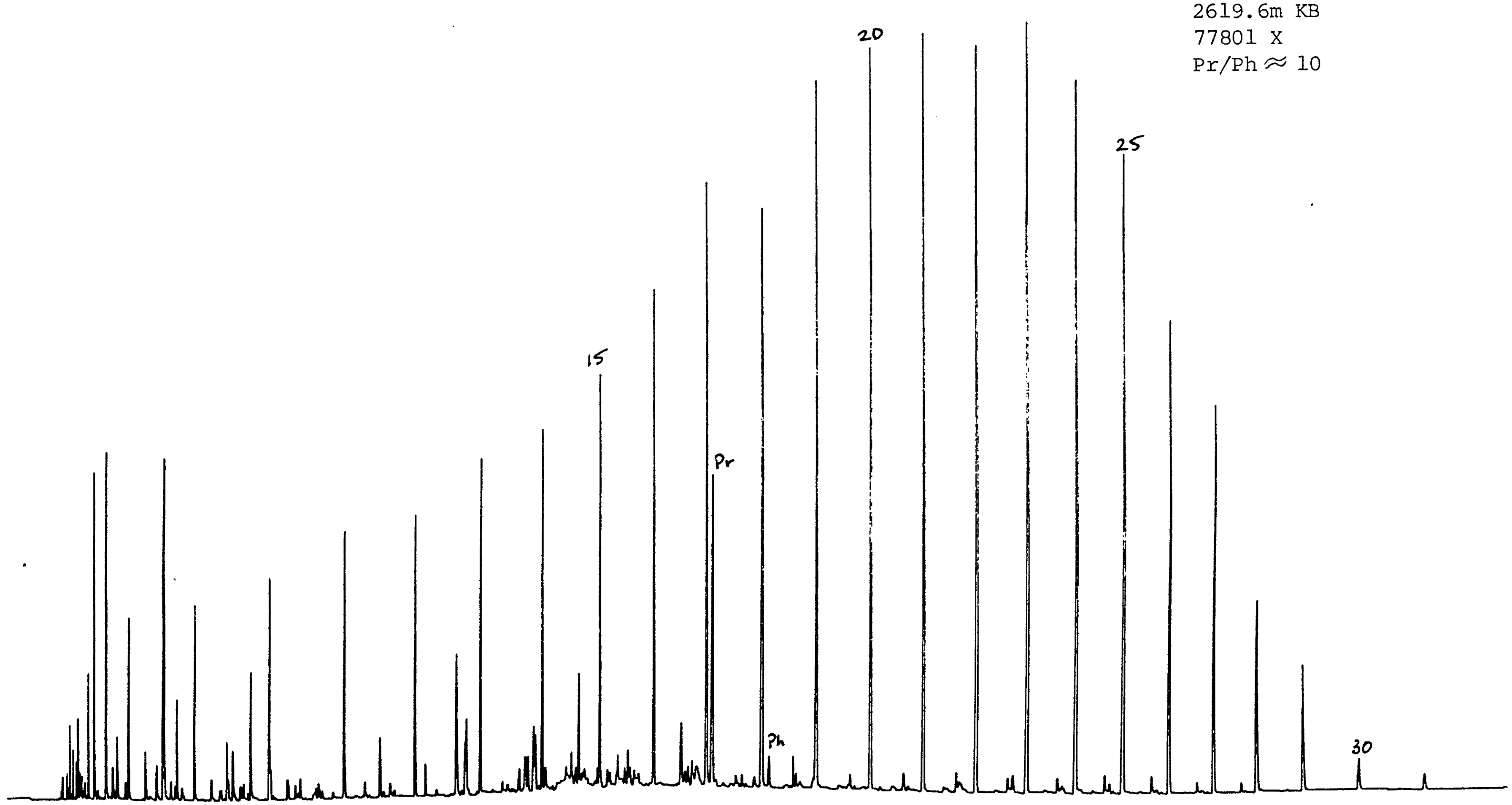


Figure 6

WHOLE OIL GAS CHROMATOGRAM
TURRUM-3
RFT 3/44
2609.5m KB
77801 W
Pr/Ph ≈ 9.1

Figure 7

WHOLE OIL GAS CHROMATOGRAM
TURRUM-3
RFT 8/55
2619.6m KB
77801 X
Pr/Ph ≈ 10



APPENDIX

Detailed Vitrinite Reflectance and
Exinite Fluorescence Data - Report by
A.C. Cook

TURRUM NO. 3

KK No.	Esso No.	Depth m	$\bar{R}_v$ max %	Range R_v max %	N	Exinite fluorescence (Remarks)
x2049	77762 -N	1460 SWC81	0.38	0.27-0.48	7	Rare sporinite, yellow orange. (Calcareous siltstone. Dom rare, V>I>E. All macerals rare.
		$\bar{R}_I$	1.23	1.00-1.46	2	Common foraminifer tests. Abundant pyrite.)
x2050	77761 -W	1596 SWC55	0.39	0.32-0.45	29	Abundant sporinite and litodetrinite, yellow to dull orange, abundant cutinite and common resinite, yellow to brown, rare exsudatinite, dull orange. Weak live and dead green oil cuts. (Coal, V>E>I. Clarite>duroclarite>>fusite.)
x2051	77761 -S	1642 SWC51	0.36	0.25-0.56	29	Sparse sporinite, yellow to orange, sparse cutinite, orange to dull orange, sparse resinite, dull yellow, rare suberinite, brown. (Siltstone. Dom common, V>I>E. Vitrinite common, inertinite and exinite sparse. Abundant pyrite.)
x2052	77761 -I	1785 SWC41	0.43	0.37-0.49	28	Abundant sporinite, yellow to orange, abundant cutinite, yellow to brown, abundant suberinite, brown, common resinite, dull yellow to orange, sparse fluorinite, green, sparse exsudatinite, orange. Weak green dead oil cut. (Coal, V>E>I. Clarite>vitrite>>fusite.)
x2053	77760 -Z	2034 SWC32	0.45	0.38-0.54	28	Sparse sporinite, yellow to orange, sparse cutinite, yellow to dull orange. (Silty claystone. Dom abundant, V>I>E. Vitrinite abundant, inertinite common, exinite sparse. Abundant pyrite.)
x2054	77760 -Q	2194.9 SWC23	0.48	0.38-0.61	28	Sparse sporinite, yellow to orange, sparse cutinite, orange. (Claystone. Dom abundant, V>E>I. Vitrinite abundant, exinite and inertinite sparse. Abundant pyrite.)
x2055	77760 -K	2397 SWC16	0.50	0.37-0.62	14	Sparse sporinite, orange, rare resinite, bright yellow. (Siltstone. Dom common, I>E>or=V.
		$\bar{R}_I$	1.24	0.98-1.46	18	Inertinite common, exinite and vitrinite sparse.)
x2056	77760 -J	2399 SWC15	0.53	0.44-0.62	28	Abundant sporinite, yellow to orange, sparse cutinite, orange, rare suberinite, brown. (Claystone and shaly coal. Shaly coal is related to clarite, some of vitrinite is mineralized with chalcedony. Dom abundant, E>V>I. Exinite and vitrinite abundant, inertinite sparse. Sparse pyrite.)
x2057	77760 -E	2571.9 SWC	0.68	0.56-0.81	29	Abundant sporinite and cutinite, yellow to orange, abundant resinite, bright yellow to dull orange. (Coal. V>I>E. Duroclarite>clarite>vitrite>> fusite. Micrinite common to abundant. Vitrinite has brown fluorescence. Weak live and dead green oil cuts. Sparse pyrite.)
x2058	77760 -D	2576.9 SWC9	0.55	0.39-0.69	36	Sparse sporinite, orange, rare resinite, yellow, rare cutinite, orange to dull orange. (Siltstone. Dom common, V>I>E. Vitrinite and inertinite common, exinite sparse. Rare carbonate. Abundant pyrite.)
x2059	77760 -A	2647 SWC4	0.56	0.46-0.69	25	Sparse sporinite, yellow to orange, sparse cutinite, yellow orange to dull orange. (Siltstone. Dom common, V>I>E. Vitrinite and inertinite common,
		$\bar{R}_I$	1.34	1.02-1.60	12	exinite sparse. Sparse carbonate. Abundant pyrite.)

TABLE 6

Thermal Alteration Indicies (TAI)

Basin - Gippsland
Well - Turrum 3

Sample No.	Sample Type	Depth mKB	TAI
77760J	SWC	2399	2.0
77760F	SWC	2562.9	2.1
77797A	CTS	2705	2.1
77797D	CTS	2850	2.3
77797F	CTS	2980	2.3
77797H	CTS	2995	?2.3

C1-C4 HYDROCARBON ANALYSES

REPORT A - HEADSPACE GAS

BASIN - GIPPSLAND
WELL - T[illegible]

SAMPLE NO.	DEPTH	METHANE C1	ETHANE C2	PROPANE C3	IBUTANE IC4	NBUTANE C4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	TOTAL GAS M	TOTAL GAS E	TOTAL GAS P	TOTAL GAS IB	TOTAL GAS NB	WET GAS E	WET GAS P	WET GAS IB	WET GAS NB
		GAS CONCENTRATION (VOLUME GAS PER MILLION VOLUMES CUTTINGS)								GAS COMPOSITION (PERCENT)								
77774 A	250.00	11	0	0	0	0	0	11	.00	100.	0.	0.	0.	0.	0.	0.	0.	0.
77774 C	310.00	0	1	0	0	0	1	1	100.00	0.	100.	0.	0.	0.	100.	0.	0.	0.
77774 E	370.00	78	4	0	0	0	4	82	4.88	95.	5.	0.	0.	0.	100.	0.	0.	0.
77774 G	450.00	231	7	2	1	0	10	241	4.15	96.	3.	1.	0.	0.	70.	20.	10.	0.
77774 I	490.00	416	24	4	2	0	30	446	6.73	93.	5.	1.	0.	0.	80.	13.	7.	0.
77774 K	550.00	966	50	7	3	1	61	1027	5.94	94.	5.	1.	0.	0.	82.	11.	5.	2.
77774 M	610.00	734	76	10	5	1	92	826	11.14	89.	9.	1.	1.	0.	83.	11.	5.	1.
77774 O	670.00	868	72	13	6	2	93	961	9.68	90.	7.	1.	1.	0.	77.	14.	6.	2.
77774 Q	730.00	751	120	17	5	3	145	896	16.18	84.	13.	2.	1.	0.	83.	12.	3.	2.
77774 S	790.00	624	99	21	5	2	127	751	16.91	83.	13.	3.	1.	0.	78.	17.	4.	2.
77774 U	815.00	0	0	0	0	0	0	0	.00	0.	0.	0.	0.	0.	0.	0.	0.	0.
77774 W	845.00	275	24	18	5	4	51	326	15.64	84.	7.	6.	2.	1.	47.	35.	10.	8.
77775 A	905.00	1329	80	16	7	4	107	1436	7.45	93.	6.	1.	0.	0.	75.	15.	7.	4.
77775 C	935.00	1138	56	71	32	14	173	1311	13.20	87.	4.	5.	2.	1.	34.	41.	17.	8.
77775 E	965.00	798	46	78	32	15	171	969	17.65	82.	5.	8.	3.	2.	28.	46.	18.	9.
77775 G	995.00	943	96	85	36	17	234	1177	19.88	80.	8.	7.	3.	1.	41.	36.	15.	7.
77775 I	1025.00	888	59	87	40	20	206	1094	18.83	81.	5.	8.	4.	2.	29.	42.	19.	10.
77775 K	1055.00	1363	73	100	46	21	240	1603	14.97	85.	5.	6.	3.	1.	30.	42.	19.	9.
77775 M	1085.00	590	29	55	27	14	125	715	17.48	83.	4.	8.	4.	2.	23.	44.	22.	11.
77775 O	1115.00	55	7	7	2	1	17	72	23.61	76.	10.	10.	3.	1.	41.	41.	12.	6.
77775 Q	1145.00	1805	68	75	35	17	195	2000	9.75	90.	3.	4.	2.	1.	35.	38.	18.	9.
77775 S	1175.00	593	48	26	13	5	92	685	13.43	87.	7.	4.	2.	1.	52.	28.	14.	5.
77775 U	1205.00	2220	119	55	24	11	209	2429	8.60	91.	5.	2.	1.	0.	57.	26.	11.	5.
77775 W	1235.00	788	87	68	32	14	201	989	20.32	80.	9.	7.	3.	1.	43.	34.	16.	7.
77775 Y	1265.00	696	55	48	27	12	142	838	16.95	83.	7.	6.	3.	1.	39.	34.	19.	8.
77776 A	1295.00	1663	192	128	66	27	413	2076	19.89	80.	9.	6.	3.	1.	46.	31.	16.	7.
77776 C	1325.00	884	67	56	32	14	169	1053	16.05	84.	6.	5.	3.	1.	40.	33.	19.	8.
77776 E	1355.00	990	56	50	26	13	145	1135	12.78	87.	5.	4.	2.	1.	39.	34.	18.	9.
77776 G	1385.00	966	61	53	32	17	163	1129	14.44	86.	5.	5.	3.	2.	37.	33.	20.	10.
77776 I	1415.00	1630	125	128	55	28	336	1966	17.09	83.	6.	7.	3.	1.	37.	38.	16.	8.
77776 K	1445.00	1183	125	99	47	24	295	1478	19.96	80.	8.	7.	3.	2.	42.	34.	16.	8.
77776 M	1475.00	1196	187	207	75	36	505	1701	29.69	70.	11.	12.	4.	2.	37.	41.	15.	7.
77776 O	1505.00	1671	222	156	43	28	449	2120	21.18	79.	10.	7.	2.	1.	49.	35.	10.	6.
77776 Q	1535.00	2045	271	199	42	31	543	2588	20.98	79.	10.	8.	2.	1.	50.	37.	8.	6.
77776 S	1565.00	2276	387	439	82	99	1007	3283	30.67	69.	12.	13.	2.	3.	38.	44.	8.	10.
77801 Q	1595.00	46971	21575	7931	702	902	31110	78081	39.84	60.	28.	10.	1.	1.	69.	25.	2.	3.
77801 O	1625.00	34114	12320	4285	331	307	17243	51357	33.57	66.	24.	8.	1.	1.	71.	25.	2.	2.
77801 M	1655.00	34832	10164	3052	238	181	13635	48467	28.13	72.	21.	6.	0.	0.	75.	22.	2.	1.
77801 K	1685.00	45640	8511	1923	130	75	10639	56279	18.90	81.	15.	3.	0.	0.	80.	18.	1.	1.
77801 I	1730.00	27623	6180	1591	159	74	8004	35627	22.47	78.	17.	4.	0.	0.	77.	20.	2.	1.
77801 G	1745.00	8309	2037	437	53	23	2550	10859	23.48	77.	19.	4.	0.	0.	80.	17.	2.	1.
77801 E	1775.00	35416	8512	915	140	32	9599	45015	21.32	79.	19.	2.	0.	0.	89.	10.	1.	0.
77801 C	1805.00	13509	3359	314	39	9	3721	17230	21.60	78.	19.	2.	0.	0.	90.	8.	1.	0.
77801 A	1835.00	20822	4519	871	91	29	5510	26332	20.93	79.	17.	3.	0.	0.	82.	16.	2.	1.
77800 Y	1865.00	31345	12044	2951	298	192	15485	46830	33.07	67.	26.	6.	1.	0.	78.	19.	2.	1.
77800 W	1895.00	13046	3704	3071	729	772	8276	21322	38.81	61.	17.	14.	3.	4.	45.	37.	9.	9.
77800 U	1925.00	19978	5154	4150	835	1089	11228	31206	35.98	64.	17.	13.	3.	3.	46.	37.	7.	10.

C1-C4 HYDROCARBON ANALYSES

REPORT A - HEADSPACE GAS

BASIN - GIPPSLAND
WELL - TURRUM 3

SAMPLE NO.	DEPTH	METHANE C1	ETHANE C2	PROPANE C3	IBUTANE IC4	NBUTANE C4	WET C2-C4	TOTAL C1-C4	WET/TOTAL PERCENT	TOTAL GAS M	TOTAL GAS E	TOTAL GAS P	TOTAL GAS IB	TOTAL GAS NB	WET GAS E	WET GAS P	WET GAS IB	WET GAS NB
		GAS CONCENTRATION (VOLUME GAS PER BILLION VOLUMES CUTTINGS)								GAS COMPOSITION (PERCENT)								
77800 S	1955.00	23447	10160	6221	810	1052	18243	41690	43.76	56.	24.	15.	2.	3.	56.	34.	4.	6.
77800 Q	1985.00	8251	2613	2016	352	368	5369	13620	39.42	61.	19.	15.	3.	3.	49.	38.	7.	7.
77800 O	2015.00	5284	2925	2934	551	651	7061	12345	57.20	43.	24.	24.	4.	5.	41.	42.	8.	9.
77800 M	2045.00	10091	4149	3617	657	899	9322	19413	48.02	52.	21.	19.	3.	5.	45.	39.	7.	10.
77800 K	2075.00	11137	3309	3477	702	1015	8503	19640	43.29	57.	17.	18.	4.	5.	39.	41.	8.	12.
77800 I	2105.00	6820	1864	1161	195	232	3452	10272	33.61	66.	18.	11.	2.	2.	54.	34.	6.	7.
77800 G	2135.00	23718	10123	4469	472	569	15633	39351	39.73	60.	26.	11.	1.	1.	65.	29.	3.	4.
77800 E	2165.00	8557	2736	1874	283	377	5270	13827	38.11	62.	20.	14.	2.	3.	52.	36.	5.	7.
77800 C	2195.00	8794	3208	1798	215	265	5486	14280	38.42	62.	22.	13.	2.	2.	58.	33.	4.	5.
77800 A	2225.00	11172	3714	2178	276	353	6521	17693	36.86	63.	21.	12.	2.	2.	57.	33.	4.	5.
77799 Y	2255.00	26076	7387	3624	405	564	11980	38056	31.48	69.	19.	10.	1.	1.	62.	30.	3.	5.
77799 W	2285.00	4553	2468	1695	175	205	4543	9096	49.95	50.	27.	19.	2.	2.	54.	37.	4.	5.
77799 U	2315.00	13181	3787	1686	199	224	5896	19077	30.91	69.	20.	9.	1.	1.	64.	29.	3.	4.
77799 S	2345.00	16264	5899	1682	143	159	7883	24147	32.65	67.	24.	7.	1.	1.	75.	21.	2.	2.
77799 Q	2375.00	9939	3099	970	104	102	4275	14214	30.08	70.	22.	7.	1.	1.	72.	23.	2.	2.
77799 O	2405.00	17603	6547	1997	211	219	8974	26577	33.77	66.	25.	8.	1.	1.	73.	22.	2.	2.
77799 M	2435.00	13975	3908	2367	383	485	7143	21118	33.82	66.	19.	11.	2.	2.	55.	33.	5.	7.
77799 K	2465.00	14778	4576	1200	109	111	5998	20776	28.87	71.	22.	6.	1.	1.	76.	20.	2.	2.
77799 I	2495.00	37980	13751	2700	225	163	16839	54819	30.72	69.	25.	5.	0.	0.	82.	16.	1.	1.
77799 G	2525.00	18026	5307	1194	117	111	6729	24755	27.18	73.	21.	5.	0.	0.	79.	18.	2.	2.
77799 E	2555.00	242444	8996	2376	267	211	11852	254296	4.66	95.	4.	1.	0.	0.	76.	20.	2.	2.
77799 C	2585.00	19695	5473	1002	112	69	6656	26351	25.26	75.	21.	4.	0.	0.	82.	15.	2.	1.
77799 A	2615.00	4757	1171	698	100	158	2127	6884	30.90	69.	17.	10.	1.	2.	55.	33.	5.	7.
77798 Y	2645.00	13339	3111	1184	105	159	4559	17898	25.47	75.	17.	7.	1.	1.	68.	26.	2.	3.
77798 W	2675.00	6068	2090	1128	129	188	3535	9603	36.81	63.	22.	12.	1.	2.	59.	32.	4.	5.
77798 U	2705.00	38101	10561	3248	298	355	14462	52563	27.51	72.	20.	6.	1.	1.	73.	22.	2.	2.
77798 S	2735.00	10924	2408	1859	197	279	4743	15667	30.27	70.	15.	12.	1.	2.	51.	39.	4.	6.
77798 Q	2765.00	10325	1853	833	78	81	2845	13170	21.60	78.	14.	6.	1.	1.	65.	29.	3.	3.
77798 O	2795.00	9701	2850	858	77	83	3868	13569	28.51	71.	21.	6.	1.	1.	74.	22.	2.	2.
77798 K	2855.00	6662	1799	655	56	76	2588	9250	27.98	72.	19.	7.	1.	1.	70.	25.	2.	3.
77798 I	2885.00	16965	4574	1849	165	213	6801	23766	28.62	71.	19.	8.	1.	1.	67.	27.	2.	3.
77798 G	2915.00	74604	20028	8337	629	983	29977	104581	28.66	71.	19.	8.	1.	1.	67.	28.	2.	3.
77798 E	2945.00	25438	5779	2432	224	329	8764	34202	25.62	74.	17.	7.	1.	1.	66.	28.	3.	4.
77798 C	2975.00	19916	3713	1839	189	225	5966	25882	23.05	77.	14.	7.	1.	1.	62.	31.	3.	4.
77798 A	2996.00	54211	13949	7595	682	1116	23342	77553	30.10	70.	18.	10.	1.	1.	60.	33.	3.	5.

TOTAL ORGANIC CARBON REPORT

BASIN - GIPPSLAND
WELL - TURRUM [illegible]

SAMPLE NO	DEPTH	AGE	FORMATION	AN	TOC%	AN	TOC%	AN	TOC%	DESCRIPTION
77762 N	1460.00	MID-EARLY MIOCENE	LAKES ENTRANCE	1	.49					LT-M GY SLTST, V CALC, QTZ
77762 M	1470.00	MID-EARLY MIOCENE	LAKES ENTRANCE	1	.48					LT GY SLTST, V CALC
77762 K	1489.90	MID-EARLY MIOCENE	LAKES ENTRANCE	1	.54					LT GY SLTST, CALC
77762 J	1510.00	MID-EARLY MIOCENE	LAKES ENTRANCE	1	.43					LT GY SH, CALC, QTZ
77762 H	1530.00	MID-EARLY MIOCENE	LAKES ENTRANCE	1	.43					LT GY-BRN SH, V CALC
77762 F	1545.00	MID-EARLY MIOCENE	LAKES ENTRANCE	1	.39					LT GY-BRN SLTST, V CALC
77762 D	1557.00	MID-EARLY MIOCENE	LAKES ENTRANCE	1	.61					LT GY SH, V CALC, QTZ
77762 B	1561.00	MID-EARLY MIOCENE	LAKES ENTRANCE	1	.53					LT-M GY SH, CALC, QTZ
77761 Y	157[illegible].50	MID-EARLY EOCENE	LATROBE GROUP	1	2.56					M GY SLTST, CALC, SL CARB
77761 W	1596.00	EARLY EOCENE	LATROBE GROUP	1	63.69					COAL
77761 V	1604.50	EARLY EOCENE	LATROBE GROUP	1	2.44					M-DK GY SLTST, CALC, CARB
77761 U	1611.50	EARLY EOCENE	LATROBE GROUP	1	8.40					M-DK GY SH, SL CALC, CARB
77761 T	162[illegible].40	EARLY EOCENE	LATROBE GROUP	1	3.19					M GY-BRN SLTST, CARB, QTZ
77761 S	1642.00	EARLY EOCENE	LATROBE GROUP	1	2.33					M-DK GY SH, CARB, SL CALC
77761 R	1660.70	EARLY EOCENE	LATROBE GROUP	1	5.12					LT-M GY SH, SL CALC
77761 Q	1675.50	EARLY EOCENE	LATROBE GROUP	1	17.19					M-DK GY SH, V CARB, CALC
77761 L	1750.50	PALEOCENE	LATROBE GROUP	1	2.96					M GY-BRN SH, CARB, SL CALC
77761 K	1768.40	PALEOCENE	LATROBE GROUP	1	4.68					M BRN SH, V CARB, CALC, QTZ
77761 J	1777.00	PALEOCENE	LATROBE GROUP	1	1.75					M BRN SH, CARB, CALC
77761 I	1785.00	PALEOCENE	LATROBE GROUP	1	69.59					COAL
77761 G	1813.00	PALEOCENE	LATROBE GROUP	1	4.27					M GY SH, CARB, SL CALC
77761 F	1837.00	PALEOCENE	LATROBE GROUP	1	3.45					M-DK GY SH, SL CALC, CARB
77761 E	1868.00	PALEOCENE	LATROBE GROUP	1	2.28					M GY SH, CARB, CALC LAM
77761 D	1888.90	PALEOCENE	LATROBE GROUP	1	1.56					LT-M GY SH, CALC LAM, QTZ
77761 C	192[illegible].00	PALEOCENE	LATROBE GROUP	1	1.56					M-DK GY SH, CARB, FINE GRN
77761 B	1963.50	PALEOCENE	LATROBE GROUP	1	3.15					DK GY SH, CARB, QTZ
77761 A	1995.00	PALEOCENE	LATROBE GROUP	1	3.13					M-DK GY SH, CALC LAMINAE
77760 Z	2034.00	PALEOCENE	LATROBE GROUP	1	4.33					DK GY-BLK SH, CALC
77760 Y	2061.00	PALEOCENE	LATROBE GROUP	1	2.27					DK GY SH, CARB LAM, QTZ
77760 X	2090.00	PALEOCENE	LATROBE GROUP	1	2.61					DK GY SH, SL CALC, CARB
77760 W	2127.00	PALEOCENE	LATROBE GROUP	1	3.64					DK GY-BLK SH, CALC
77760 U	2158.40	PALEOCENE	LATROBE GROUP	1	1.79					M GY-BRN SLTST, 50% QTZ
77760 Q	2194.90	PALEOCENE	LATROBE GROUP	1	2.68					DK GY SH, CARB, QTZ
77760 P	2225.50	PALEOCENE	LATROBE GROUP	1	1.66					DK GY SLTST, CARB, 50% QTZ
77760 O	2261.90	PALEOCENE	LATROBE GROUP	1	3.58					DK GY SH, CARB, QTZ
77760 K	2397.00	PALEOCENE	LATROBE GROUP	1	.83					LT GY SLTST, CALC
77760 J	2399.00	PALEOCENE	LATROBE GROUP	1	19.90					COAL
77760 I	2444.00	PALEOCENE	LATROBE GROUP	1	1.13					LT GY SLTST, SOME QTZ
77760 H	2485.90	PALEOCENE	LATROBE GROUP	1	1.03					LT-M GY SLTST
77760 F	2562.90	PALEOCENE	LATROBE GROUP	1	2.57					DK GY SLTST, CARB, QTZ
77760 E	2571.90	PALEOCENE	LATROBE GROUP	1	76.56					COAL
77760 D	2576.90	PALEOCENE	LATROBE GROUP	1	4.69					M GY SLTST, CARB, QTZ
77760 B	2614.00	PALEOCENE	LATROBE GROUP	1	.87					DK GY SLTST, CARB, QTZ
77760 A	2647.00	PALEOCENE	LATROBE GROUP	1	1.54					DK GY SLTST, QTZ

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ROCK EVAL ANALYSES

BASIN - GIPPSLAND
WELL - TURRUM 3

REPORT A - SULPHUR & PYROLYZABLE CARBON

SAMPLE NO.	DEPTH	SAMPLE TYPE	AGE	TMAX	S1	S2	S3	PI	S2/S3	PC	COMMENTS
77762 K	1469.9	SWC	MID-EARLY MIOCENE	407.	.08	.32	.47	.20	.68	.03	
77762 D	1537.0	SWC	MID-EARLY MIOCENE	412.	.04	.19	.49	.18	.38	.01	
77762 B	1561.0	SWC	MID-EARLY MIOCENE	411.	.06	.16	.40	.27	.40	.01	
77761 Y	1573.5	SWC	MID-EARLY EOCENE	415.	.43	3.07	.87	.12	3.52	.29	
77761 W	1596.0	SWC	EARLY EOCENE	422.	3.83	139.06	10.34	.03	13.44	11.90	
77761 V	1604.5	SWC	EARLY EOCENE	424.	.15	1.74	.68	.08	2.55	.15	
77761 U	1611.5	SWC	EARLY EOCENE	411.	.94	17.16	1.56	.05	11.00	1.50	
77761 T	1623.4	SWC	EARLY EOCENE	419.	.17	3.04	.74	.05	4.10	.26	
77761 S	1642.0	SWC	EARLY EOCENE	421.	.13	1.17	.81	.10	1.44	.10	
77761 P	1660.7	SWC	EARLY EOCENE	421.	.63	9.68	1.14	.06	8.49	.85	
77761 O	1675.5	SWC	EARLY EOCENE	416.	3.05	51.57	6.31	.06	8.17	4.55	
77761 L	1750.5	SWC	PALEOCENE	425.	.24	3.22	.81	.07	3.97	.28	
77761 K	1768.4	SWC	PALEOCENE	424.	.30	6.40	1.01	.04	6.33	.55	
77761 J	1777.0	SWC	PALEOCENE	425.	.15	1.72	.55	.08	3.12	.15	
77761 I	1765.0	SWC	PALEOCENE	429.	2.57	88.85	11.14	.03	7.97	7.61	
77761 G	1813.0	SWC	PALEOCENE	426.	.27	5.85	.54	.04	10.83	.51	
77761 F	1837.0	SWC	PALEOCENE	427.	.20	2.97	.60	.06	4.95	.26	
77761 E	1868.0	SWC	PALEOCENE	424.	.10	1.15	.56	.08	2.05	.10	
77761 D	1868.9	SWC	PALEOCENE	424.	.08	.48	.40	.14	1.20	.04	
77761 C	1926.0	SWC	PALEOCENE	424.	.16	.89	.44	.15	2.02	.08	
77761 B	1963.5	SWC	PALEOCENE	425.	.19	1.88	.49	.09	3.83	.17	
77761 A	1995.0	SWC	PALEOCENE	429.	.25	2.85	.52	.08	5.48	.25	
77760 Z	2034.0	SWC	PALEOCENE	428.	.34	4.88	.63	.07	7.74	.43	
77760 Y	2061.0	SWC	PALEOCENE	426.	.40	2.41	.46	.14	5.23	.23	
77760 X	2090.0	SWC	PALEOCENE	428.	.29	3.00	.44	.09	6.81	.27	
77760 W	2127.0	SWC	PALEOCENE	427.	.26	3.84	.46	.06	8.34	.34	
77760 U	2158.4	SWC	PALEOCENE	428.	.19	1.51	.21	.11	7.19	.14	
77760 Q	2194.9	SWC	PALEOCENE	428.	.28	2.52	.39	.10	6.46	.23	
77760 P	2225.5	SWC	PALEOCENE	433.	.40	1.00	.40	.29	2.50	.11	
77760 O	2261.9	SWC	PALEOCENE	429.	.44	3.10	.43	.12	7.20	.29	
77760 K	2397.0	SWC	PALEOCENE	433.	.14	.52	.19	.21	2.73	.05	
77760 J	2399.0	SWC	PALEOCENE	436.	1.77	59.85	1.03	.03	58.13	5.05	
77760 I	2444.0	SWC	PALEOCENE	437.	.33	1.34	.00	.20	.00	.14	
77760 H	2465.9	SWC	PALEOCENE	433.	.30	1.55	.00	.16	.00	.15	
77760 F	2562.9	SWC	PALEOCENE	434.	.43	2.19	.05	.16	43.70	.21	
77760 E	2571.9	SWC	PALEOCENE	436.	11.13	193.78	4.38	.05	44.52	16.80	
77760 D	2576.9	SWC	PALEOCENE	434.	1.02	9.10	.24	.10	36.68	.83	
77760 B	2614.0	SWC	PALEOCENE	287.	.11	.15	.12	.41	1.58	.02	
77760 A	2647.0	SWC	PALEOCENE	427.	.18	.54	.00	.25	.00	.06	

PI=PRODUCTIVITY INDEX PC=PYROLYZABLE CARBON TC=TOTAL CARBON. HI=HYDROGEN INDEX OI=OXYGEN INDEX

ROCK EVAL ANALYSES

BASIN - GIPPSLAND
WELL - TURRUM 3

PEPORT B - TOTAL CARBON,H/O INDICES

SAMPLE NO.	DEPTH	SAMPLE TYPE	FORMATION	TC	HI	OI	HI/OI	COMMENTS
77762 K	1469.9	SWC	LAKES ENTRANCE	.54	59.	87.	.68	
77762 D	1557.0	SWC	LAKES ENTRANCE	.61	31.	80.	.39	
77762 B	1561.0	SWC	LAKES ENTRANCE	.53	30.	75.	.40	
77761 Y	1573.5	SWC	LATROBE GROUP	2.56	119.	33.	3.61	
77761 W	1596.0	SWC	LATROBE GROUP	63.69	218.	16.	13.63	
77761 V	1604.5	SWC	LATROBE GROUP	2.44	71.	27.	2.63	
77761 U	1611.5	SWC	LATROBE GROUP	8.40	204.	18.	11.33	
77761 T	1623.4	SWC	LATROBE GROUP	3.19	95.	23.	4.13	
77761 S	1642.0	SWC	LATROBE GROUP	2.33	50.	34.	1.47	
77761 R	1660.7	SWC	LATROBE GROUP	5.12	189.	22.	8.59	
77761 O	1675.5	SWC	LATROBE GROUP	17.19	300.	36.	8.33	
77761 L	1750.5	SWC	LATROBE GROUP	2.96	108.	27.	4.00	
77761 K	1768.4	SWC	LATROBE GROUP	4.68	136.	21.	6.48	
77761 J	1777.0	SWC	LATROBE GROUP	1.75	98.	31.	3.16	
77761 I	1785.0	SWC	LATROBE GROUP	69.59	127.	16.	7.94	
77761 G	1813.0	SWC	LATROBE GROUP	4.27	137.	12.	11.42	
77761 F	1837.0	SWC	LATROBE GROUP	3.45	86.	17.	5.06	
77761 F	1868.0	SWC	LATROBE GROUP	2.28	50.	24.	2.08	
77761 D	1868.9	SWC	LATROBE GROUP	1.56	30.	25.	1.20	
77761 C	1926.0	SWC	LATROBE GROUP	1.56	57.	28.	2.04	
77761 B	1963.5	SWC	LATROBE GROUP	3.15	59.	15.	3.93	
77761 A	1995.0	SWC	LATROBE GROUP	3.13	91.	16.	5.69	
77760 Z	2034.0	SWC	LATROBE GROUP	4.33	112.	14.	8.00	
77760 Y	2061.0	SWC	LATROBE GROUP	2.27	106.	20.	5.30	
77760 X	2090.0	SWC	LATROBE GROUP	2.61	114.	16.	7.13	
77760 W	2127.0	SWC	LATROBE GROUP	3.64	105.	12.	8.75	
77760 U	2158.4	SWC	LATROBE GROUP	1.79	84.	11.	7.64	
77760 Q	2194.9	SWC	LATROBE GROUP	2.68	94.	14.	6.71	
77760 P	2225.5	SWC	LATROBE GROUP	1.66	60.	24.	2.50	
77760 O	2261.9	SWC	LATROBE GROUP	3.58	86.	12.	7.17	
77760 K	2397.0	SWC	LATROBE GROUP	.83	62.	22.	2.82	
77760 J	2399.0	SWC	LATROBE GROUP	19.90	301.	5.	58.06	
77760 I	2444.0	SWC	LATROBE GROUP	1.13	118.	0.	.00	
77760 H	2465.9	SWC	LATROBE GROUP	1.03	150.	0.	.00	
77760 F	2562.9	SWC	LATROBE GROUP	2.57	85.	2.	43.60	
77760 F	2571.9	SWC	LATROBE GROUP	76.56	253.	6.	44.25	
77760 D	2576.9	SWC	LATROBE GROUP	4.69	194.	5.	38.71	
77760 B	2614.0	SWC	LATROBE GROUP	.87	17.	13.	1.31	
77760 A	2647.0	SWC	LATROBE GROUP	1.54	35.	0.	.00	

PI=PRODUCTIVITY INDEX PC=PYRULYZABLE CARBON TC=TOTAL CARBON HI=HYDROGEN INDEX OI=OXYGEN INDEX

KEROGEN ELEMENTAL ANALYSIS REPORT

BASIN - GIPPSLAND
WELL - TURRUM 3

SAMPLE NO.	DEPTH	SAMPLE TYPE	N%	C%	H%	S%	O%	ASH%	COMMENTS
			--- ELEMENTAL % (ASH FREE) ---						
77761 Y	1575.50	SWC	.81	56.34	4.70	.00	38.16	.78	
77761 X	1576.50	SWC	.86	62.48	5.07	.00	31.59	3.19	
77601 J	1577.12	COR	1.10	67.03	5.06	.00	26.80	6.89	
77601 S	1578.36	COR	.91	68.62	5.24	.00	25.24	4.31	
77601 T	1578.70	COR	.85	67.38	5.06	.00	26.70	1.61	
77761 V	1604.50	SWC	.50	31.12	3.10	.00	65.27	6.90	
77761 U	1611.50	SWC	1.13	68.63	5.00	.00	25.24	5.36	
77761 T	1625.40	SWC	.95	66.92	4.33	.00	27.80	3.38	
77761 S	1642.00	SWC	.97	59.67	4.26	.00	35.09	6.61	
77761 R	1660.70	SWC	.99	59.68	4.27	.00	35.05	15.55	HIGH ASH
77761 Q	1675.50	SWC	.89	70.68	5.87	.00	22.56	5.77	
77761 P	1686.00	SWC	1.16	70.45	5.45	.00	22.94	2.99	
77761 O	1716.50	SWC	1.54	75.25	5.24	.00	17.97	3.66	
77761 N	1736.90	SWC	1.81	65.54	5.17	.00	27.48	6.07	
77761 L	1750.50	SWC	1.57	65.97	4.95	.00	27.51	12.55	HIGH ASH
77761 K	1760.40	SWC	.91	66.25	4.59	.00	28.26	.87	
77761 J	1777.00	SWC	.75	65.31	4.83	.00	29.11	4.32	
77761 H	1796.50	SWC	1.42	70.96	5.53	.00	22.09	7.70	
77761 G	1815.00	SWC	1.54	71.32	4.88	.00	22.25	8.67	
77761 F	1837.00	SWC	1.19	67.65	4.84	.00	26.32	8.44	
77761 E	1860.00	SWC	.94	70.46	4.88	.00	23.72	7.46	
77761 D	1886.90	SWC	1.93	69.47	4.80	.00	23.80	11.33	HIGH ASH
77761 C	1920.90	SWC	1.45	70.34	4.91	.00	23.30	11.12	HIGH ASH
77761 B	1965.50	SWC	1.22	70.22	4.64	.00	23.91	12.31	HIGH ASH
77761 A	1995.00	SWC	1.05	70.20	4.63	.00	24.13	8.27	
77760 Z	2034.00	SWC	1.12	70.39	4.75	.00	23.74	8.07	
77760 Y	2061.00	SWC	.85	65.09	4.35	.00	29.71	4.68	
77760 X	2090.00	SWC	1.02	66.66	4.60	.00	27.52	1.84	
77760 W	2127.00	SWC	.53	66.32	4.72	.00	28.42	19.35	HIGH ASH
77760 U	2156.40	SWC	.56	71.85	4.64	.00	22.95	12.21	HIGH ASH
77760 S	2162.00	SWC	1.35	75.08	5.87	.00	17.70	28.98	HIGH ASH,SMALL SAMPLE
77760 Q	2194.90	SWC	1.32	71.66	5.34	.00	21.48	20.99	HIGH ASH
77760 P	2225.50	SWC	1.24	66.49	4.70	.00	27.57	7.05	
77760 O	2261.90	SWC	1.34	64.24	4.67	.00	29.75	7.70	
77760 N	2325.00	SWC	1.42	77.99	5.25	.00	15.34	3.34	
77760 K	2397.00	SWC	1.47	82.52	5.22	.00	10.79	11.50	HIGH ASH
77760 J	2399.00	SWC	1.34	78.48	6.11	.00	14.06	2.51	
77760 I	2444.00	SWC	1.69	80.75	5.31	.00	12.24	6.07	
77760 H	2485.90	SWC	1.50	80.37	6.44	.00	11.69	21.55	HIGH ASH
77760 F	2562.90	SWC	1.15	70.82	4.92	.00	23.11	6.42	
77760 D	2576.90	SWC	1.10	80.08	5.84	.00	12.98	6.89	
77760 A	2647.00	SWC	1.56	92.45	5.99	.00	.00	26.25	HIGH ASH
77797 A	2705.00	CTS	1.23	76.16	4.11	.00	18.50	5.75	
77797 B	2760.00	CTS	1.57	81.84	5.14	.00	11.45	5.83	
77797 C	2810.00	CTS	1.33	76.79	5.07	.00	16.80	6.15	

KEROGEN ELEMENTAL ANALYSIS REPORT

BASIN - GIPPSLAND
WELL - TURRUM 3

SAMPLE NO.	DEPTH	SAMPLE TYPE	N%	C%	H%	S%	O%	ASH%	COMMENTS
			ELEMENTAL % (ASH FREE)						
77797 D	2656.00	CTS	1.46	82.28	4.47	.00	11.79	3.84	
77797 E	2675.00	CTS	1.45	75.77	6.56	.00	18.24	5.74	
77797 F	2980.00	CTS	1.34	76.49	3.74	.00	18.43	4.59	
77797 G	2990.00	CTS	1.38	79.49	5.31	.00	13.82	3.24	
77797 H	2995.00	CTS	1.44	74.07	3.92	.00	20.57	5.44	

KEROGEN ELEMENTAL ANALYSIS REPORT

BASIN - GIPPSLAND
WELL - [illegible]

SAMPLE NO.	DEPTH	SAMPLE TYPE	AGE	FORMATION	ATOMIC RATIOS H/C	ATOMIC RATIOS O/C	ATOMIC RATIOS N/C	COMMENTS
77761 Y	157[illegible].50	SWC	MID-EARLY EOCENE	LATROBE GROUP	1.00	.51	.01	
77761 X	1[illegible]76.[illegible]0	SWC	EARLY EOCENE	LATROBE GROUP	.97	.38	.01	
77601 W	1577.12	COR	EARLY EOCENE	LATROBE GROUP	.91	.30	.01	
77601 V	157[illegible].56	COR	EARLY EOCENE	LATROBE GROUP	.92	.28	.01	
77601 T	157[illegible].70	COR	EARLY EOCENE	LATROBE GROUP	.90	.30	.01	
77761 V	160[illegible].50	SWC	EARLY EOCENE	LATROBE GROUP	1.20	1.57	.01	
77761 U	1611.50	SWC	EARLY EOCENE	LATROBE GROUP	.87	.28	.01	
77761 T	1625.40	SWC	EARLY EOCENE	LATROBE GROUP	.78	.31	.01	
77761 S	1642.00	SWC	EARLY EOCENE	LATROBE GROUP	.86	.44	.01	
77761 R	1660.70	SWC	EARLY EOCENE	LATROBE GROUP	.86	.44	.01	HIGH ASH
77761 Q	1675.50	SWC	EARLY EOCENE	LATROBE GROUP	1.00	.24	.01	
77761 P	1685.00	SWC	EARLY EOCENE	LATROBE GROUP	.93	.24	.01	
77761 O	171[illegible].50	SWC	EARLY EOCENE	LATROBE GROUP	.84	.18	.02	
77761 N	1736.90	SWC	PALEOCENE	LATROBE GROUP	.95	.31	.02	
77761 L	175[illegible].50	SWC	PALEOCENE	LATROBE GROUP	.90	.31	.02	HIGH ASH
77761 K	1766.40	SWC	PALEOCENE	LATROBE GROUP	.83	.32	.01	
77761 J	1777.00	SWC	PALEOCENE	LATROBE GROUP	.89	.33	.01	
77761 H	179[illegible].50	SWC	PALEOCENE	LATROBE GROUP	.93	.23	.02	
77761 G	1815.00	SWC	PALEOCENE	LATROBE GROUP	.82	.23	.02	
77761 F	1837.00	SWC	PALEOCENE	LATROBE GROUP	.86	.29	.02	
77761 E	1866.00	SWC	PALEOCENE	LATROBE GROUP	.83	.25	.01	
77761 D	1886.90	SWC	PALEOCENE	LATROBE GROUP	.83	.26	.02	HIGH ASH
77761 C	1926.00	SWC	PALEOCENE	LATROBE GROUP	.84	.25	.02	HIGH ASH
77761 B	1963.50	SWC	PALEOCENE	LATROBE GROUP	.79	.26	.01	HIGH ASH
77761 A	1995.00	SWC	PALEOCENE	LATROBE GROUP	.79	.26	.01	
77760 Z	2034.00	SWC	PALEOCENE	LATROBE GROUP	.81	.25	.01	
77760 Y	2061.00	SWC	PALEOCENE	LATROBE GROUP	.80	.34	.01	
77760 X	2090.00	SWC	PALEOCENE	LATROBE GROUP	.83	.31	.01	
77760 W	2127.00	SWC	PALEOCENE	LATROBE GROUP	.85	.32	.01	HIGH ASH
77760 U	215[illegible].40	SWC	PALEOCENE	LATROBE GROUP	.77	.24	.01	HIGH ASH
77760 S	216[illegible].00	SWC	PALEOCENE	LATROBE GROUP	.94	.18	.02	HIGH ASH,SMALL SAMPLE
77760 [illegible]	219[illegible].40	SWC	PALEOCENE	LATROBE GROUP	.89	.22	.02	HIGH ASH
77760 P	22[illegible]5.50	SWC	PALEOCENE	LATROBE GROUP	.85	.31	.02	
77760 [illegible]	2261.90	SWC	PALEOCENE	LATROBE GROUP	.87	.35	.02	
77760 [illegible]	23[illegible].00	SWC	PALEOCENE	LATROBE GROUP	.81	.15	.02	
77760 K	2397.00	SWC	PALEOCENE	LATROBE GROUP	.76	.10	.02	HIGH ASH
77760 J	2[illegible].00	SWC	PALEOCENE	LATROBE GROUP	.93	.13	.01	
77760 I	244[illegible].00	SWC	PALEOCENE	LATROBE GROUP	.79	.11	.02	
77760 [illegible]	2[illegible].40	SWC	PALEOCENE	LATROBE GROUP	.96	.11	.02	HIGH ASH
77760 F	2562.90	SWC	PALEOCENE	LATROBE GROUP	.83	.24	.01	
77760 D	2576.90	SWC	PALEOCENE	LATROBE GROUP	.88	.12	.01	
77760 A	2647.00	SWC	PALEOCENE	LATROBE GROUP	.78	.00	.01	HIGH ASH
77797 A	2705.00	CTS	LATE CRETACEOUS	LATROBE GROUP	.65	.18	.01	
77797 B	2760.00	CTS	LATE CRETACEOUS	LATROBE GROUP	.75	.10	.02	
77797 C	2[illegible]10.00	CTS	LATE CRETACEOUS	LATROBE GROUP	.79	.16	.01	

KEROGEN ELEMENTAL ANALYSIS REPORT

BASIN - GIPPSLAND
WELL - [illegible]

SAMPLE NO.	DEPTH	SAMPLE TYPE	AGE	FORMATION	ATOMIC RATIOS H/C	ATOMIC RATIOS O/C	ATOMIC RATIOS N/C	COMMENTS
77797 [illegible]	2[illegible]5[illegible].00	CTS	LATE CRETACEOUS	LATROBE GROUP	.65	.11	.02	
77797 [illegible]	2[illegible]7[illegible].00	CTS	LATE CRETACEOUS	LATROBE GROUP	.72	.18	.02	
77797 [illegible]	298[illegible].[illegible]0	CTS	LATE CRETACEOUS	LATROBE GROUP	.59	.18	.02	
77797 [illegible]	299[illegible].00	CTS	LATE CRETACEOUS	LATROBE GROUP	.80	.13	.01	
77797 [illegible]	299[illegible].00	CTS	LATE CRETACEOUS	LATROBE GROUP	.64	.21	.02	

[illegible] Table 5

ESSO AUSTRALIA LTD.

VITRINITE REFLECTANCE REPORT

BASIN - GIPPSLAND
[illegible] TURRUM 3

SAMPLE NO	DEPTH	AGE	FORMATION	AN	MAX. RO	FLUOR. COLOUR	NO. CNTS.	MACERAL TYPE
77762 H	1460.00	MID-EARLY MIOCENE	LAKES ENTRANCE	5	.38	YEL OR	7	V>I>E, DOM RARE
77761 W	1596.00	EARLY EOCENE	LATROBE GROUP	5	.39	YEL-BRN	29	V>E>I, COAL
77761 S	1642.00	EARLY EOCENE	LATROBE GROUP	5	.36	YEL-BRN	29	V>I>E, DOM COMMON
77761 J	1785.00	PALEOCENE	LATROBE GROUP	5	.43	YEL-BRN	28	V>E>I, COAL
77760 Z	2034.00	PALEOCENE	LATROBE GROUP	5	.45	YEL-DULL OR	28	V>I>E, DOM ABUNDANT
77760 Q	2194.90	PALEOCENE	LATROBE GROUP	5	.48	YEL-OR	28	V>E>I, DOM ABUNDANT
77760 K	2397.00	PALEOCENE	LATROBE GROUP	5	.50	YEL-OR	14	I>E>OR=V, DOM COMMON
77760 J	2399.00	PALEOCENE	LATROBE GROUP	5	.53	YEL-OR-BRN	28	E>V>I, DOM ABUNDANT
77760 E	2571.90	PALEOCENE	LATROBE GROUP	5	.68	YEL-DULL OR	29	V>I>E, COAL
77760 D	2576.90	PALEOCENE	LATROBE GROUP	5	.55	YEL-DULL OR	36	V>I>E, DOM COMMON
77760 A	2647.00	PALEOCENE	LATROBE GROUP	5	.56	YEL-DULL OR	25	V>I>E, DOM COMMON

[illegible] Table 7

ESSO AUSTRALIA LTD.

OIL - API GRAVITY,POUR POINT & SULPHUR %

BASIN = GIPPSLAND
WELL = [illegible]

SAMPLE NO.	DEPTH	AGE	FORMATION	API GRAVITY	POUR PT.(OF)	SULPHUR %	COMMENTS
[illegible]	[illegible]	[illegible]	LATROBE GROUP	38.89	.00	.00	RFT 3/44
[illegible]	[illegible]	[illegible]	LATROBE GROUP	37.78	.00	.00	RFT 8/55

APPENDIX 6

APPENDIX 6

SYNTHETIC SEISMIC TRACE

PARAMETERS

Well	:	Turrum-3
TD	:	2996m KB
KB	:	21m
Water Depth	:	60m
Polarity	:	A positive acoustic impedence is represented as a trough on the trace.
Pulse type	:	Zero phase second derivative, Gaussian Function.
Peak Frequency	:	25 HZ
Sample Interval	:	3M
Checkshot Corrected	:	Yes
Comments	:	Sonic Log 56.0 - 2695m KB
	:	Density Log 1515 - 2763m KB
		All logs filtered and edited.

PE902427

This is an enclosure indicator page.
The enclosure PE902427 is enclosed within the container PE902424 at this location in this document.

The enclosure PE902427 has the following characteristics:

ITEM_BARCODE = PE902427
CONTAINER_BARCODE = PE902424
NAME = Synthetic seismic Trace
BASIN = GIPPSLAND
PERMIT = VIC/L3
TYPE = WELL
SUBTYPE = SYNTH_SEISMOGRAM
DESCRIPTION = Synthetic seismic Trace for Turrum-3
REMARKS =
DATE_CREATED = 4/02/86
DATE_RECEIVED = 31/07/87
W_NO = W899
WELL_NAME = Turrum-3
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

APPENDIX 7

APPENDIX 7

1. INTRODUCTION

This part report gives porosity, permeability and density data for twenty-one core plugs received from Turrum-3, core 4.

2. PROCEDURES

All core plugs and off-cuts were cleaned in a 3:1 mixture of chloroform and methanol, then stored at 50°C/50% relative humidity. Air permeability and porosity by helium injection were measured at an ambient, confining pressure of 1,000 kPa and at a net overburden pressure of 4,580 psi (31,580 kPa).

The precision of permeability values greater than 10,000 md is likely to be less than for lower permeabilities since the differential pressure between the inlet and outlet faces of the core (on which the results depend) is extremely small.

Apparent grain densities were calculated in conjunction with porosity measurements. Absolute grain densities were measured by pycnometry of the ground off-cuts.

3. RESULTS

Tables 1 to 4 give results of all determinations.

TABLE 1

AMDEL CORE ANALYSIS

Furrum 3 Core 4 - Ambient Pressure.

SAMPLE		PERMEABILITY (md)	POROSITY (%)
66	2618.16	0.661	9.3
67	2618.44	1190	17.5
70	2618.75	2580	20.4
71	2619.05	4730	18.6
74	2619.35	2390	19.5
76	2619.54	4430	21.1
78	2619.79	3550	20.6
80	2619.94	2230	22.2
81	2620.23	2180	15.8
84	2620.53	204	16.9
86	2620.73	998	21.6
88	2620.98	1380	22.3
90	2621.14	2020	22.6
91	2621.34	2240	22.7
93	2621.55	790	20.6
95	2621.81	1540	21.4
97	2621.97	19080	21.7
99	2622.21	347	18.5
101	2622.37	16080	22.9
103	2622.62	7380	22.3
105	2622.85	17030	23.4

TABLE 2

AMDEL CORE ANALYSIS

Turrum 3 Core 4 - Ambient Pressure.

SAMPLE		BULK VOL	BULK DRY DENS	APPARENT GN DENS	ABSOLUTE GN DENS
66	2618.16	24.25	2.47	2.72	2.71
67	2618.44	23.96	2.21	2.68	2.66
70	2618.75	19.84	2.09	2.62	2.67
71	2619.05	23.61	2.17	2.67	2.69
74	2619.35	24.43	2.15	2.67	2.66
76	2619.54	24.07	2.11	2.67	2.65
78	2619.79	24.66	2.11	2.66	2.65
80	2619.94	24.50	2.07	2.66	2.64
81	2620.23	24.25	2.24	2.66	2.66
84	2620.53	24.04	2.22	2.67	2.66
86	2620.73	24.02	2.10	2.67	2.71
88	2620.98	24.15	2.06	2.66	2.67
90	2621.14	24.05	2.06	2.67	2.65
91	2621.34	24.18	2.06	2.66	2.66
93	2621.55	24.12	2.12	2.67	2.65
95	2621.81	24.52	2.10	2.66	2.65
97	2621.97	20.05	2.08	2.66	2.66
99	2622.21	24.40	2.18	2.68	2.66
101	2622.37	24.42	2.05	2.66	2.65
103	2622.62	24.35	2.07	2.67	2.65
105	2622.85	24.38	2.05	2.68	2.67

TABLE 3

AMDEL CORE ANALYSIS

Turrum 3 Core 4 - 31580 kPa.

SAMPLE		PERMEABILITY (md)	POROSITY (%)
66	2618.16	0.015	8.2
67	2618.44	857	10.7
70	2618.75	1340	19.1
71	2619.05	3340	17.1
74	2619.35	1480	17.0
76	2619.54	1720	17.2
78	2619.79	2070	17.1
80	2619.94	1350	19.1
81	2620.23	899	13.4
84	2620.53	151	15.7
86	2620.73	557	10.9
88	2620.98	779	20.1
90	2621.14	1110	20.2
91	2621.34	1530	20.5
93	2621.55	574	12.2
95	2621.81	960	15.4
97	2621.97	4990	17.4
99	2622.21	192	16.2
101	2622.37	6810	18.9
103	2622.62	3330	18.3
105	2622.85	3120	19.0

TABLE 4

AMDEL CORE ANALYSIS

Turrum 3 Core 4 - 31500 kPa.

SAMPLE		BULK VOL	BULK DRY DENS	APPARENT GN DENS
66	2618.16	23.99	2.50	2.72
67	2618.44	23.71	2.23	2.68
70	2618.75	19.53	2.12	2.62
71	2619.05	23.25	2.21	2.67
74	2619.35	23.70	2.22	2.67
76	2619.54	23.13	2.20	2.67
78	2619.79	23.62	2.21	2.66
80	2619.94	23.57	2.15	2.66
81	2620.23	23.47	2.31	2.66
84	2620.53	23.68	2.25	2.67
86	2620.73	23.24	2.17	2.67
89	2620.98	23.48	2.12	2.56
90	2621.14	23.33	2.13	2.67
91	2621.34	23.50	2.12	2.66
93	2621.55	23.39	2.18	2.67
95	2621.81	23.63	2.17	2.66
97	2621.97	19.01	2.20	2.66
99	2622.21	23.83	2.23	2.58
101	2622.37	23.22	2.16	2.66
103	2622.62	23.31	2.17	2.67
105	2622.85	23.24	2.15	2.69

1. INTRODUCTION

This part report gives fluid saturation, porosity, permeability and density data for nineteen core plugs received from Turrum-3, Core 1.

2. PROCEDURES

2.1 Fluid Saturation (Oil and Water)

Using Dean-Stark apparatus, toluene (boiling point 110°C) vapour is condensed and continually dripped onto the core plug to extract both oil and water.

The water is collected in a calibrated receiver and after drying the extracted core plug, the oil present is determined as the difference between the core plug weight loss and the weight of accumulated water.

2.2 Porosity and Permeability

After drying the core plugs at 100°C to complete Dean-Stark results, all plugs were stored at 50°C/50% relative humidity, prior to determination of air permeability and porosity by helium injection. These measurements were taken at a confining pressure of 1,000 kPa and at a net overburden pressure of 2,700 psi (18,616 kPa).

The precision of permeability values greater than 10,000 md is likely to be less than for lower permeabilities since the differential pressure between the inlet and outlet faces of the core (on which the results depend) is extremely small.

2.3 Densities

Apparent grain densities were calculated in conjunction with porosity measurements.

Absolute grain densities were determined by pycnometry of the ground off-cuts, which had been cleaned in a Soxhlet extractor using dichloromethane as the solvent.

3. RESULTS

Results for fluid saturations are given in Table 1. Two figures are given for water saturation as a % of pore space. As the core plugs were drilled using liquid nitrogen as the lubricant and then lead sleeved, possible condensation from the atmosphere makes precise determination of the amount of water held in the plug and steel screens difficult. One figure assumes that the steel screens hold no water, while the other assumes that the steel screens are filled with 0.6 cc of water. The actual water saturation lies within these limits.

Porosity, permeability and density results are given in Tables 2 to 5.

TABLE 1: TURRUM-3 CORE 1 FLUID SATURATIONS

Sample	Weight Loss on Extraction (g)	Volume of Water Collected (cc)	Weight of Oil Extracted (g)	Volume of Oil Extracted Δ (cc)	N.O.B.P. Pore Volume (Corrected for steel screens) (cc)	Oil Satn (% Pore Space)	Water Satn (% Pore Space) *	Water Satn (% Pore Space) †
3	1.409	1.40	0.009	0.01	2.41	0.4	58.1	N/A
11	1.031	0.80	0.231	0.27	5.07	5.3	15.8	3.9
13	1.497	1.30	0.197	0.23	3.62	6.4	35.9	19.3
15	1.334	1.20	0.134	0.16	3.18	5.0	37.7	18.9
17	1.411	1.40	0.011	0.01	3.12	0.3	44.9	25.6
19	2.589	2.40	0.189	0.22	4.81	4.6	49.9	37.4
22	1.350	1.25	0.100	0.12	3.05	3.9	41.0	21.3
23	2.392	2.20	0.192	0.23	2.72	8.5	80.9	58.8
26	1.148	1.00	0.148	0.17	4.42	3.9	22.6	9.1
28	1.677	1.62	0.057	0.07	5.01	1.4	32.3	20.4
30	3.526	3.50	0.026	0.03	4.90	0.6	71.4	59.2
32	3.839	3.70	0.139	0.16	4.90	3.3	75.5	63.3
33	3.601	3.60	0.001	0.00	4.35	<0.01	82.8	69.0
36	3.623	3.50	0.123	0.15	5.30	2.8	66.0	54.7
37	4.130	3.94	0.190	0.22	6.29	3.5	62.6	53.1
39	3.965	3.95	0.015	0.02	5.56	0.4	71.0	60.3
41	4.182	4.05	0.132	0.16	4.90	3.3	82.7	70.4
42	3.821	3.80	0.021	0.03	4.75	0.6	80.0	67.4
43	3.965	3.90	0.065	0.08	4.90	1.6	79.6	67.4

Δ Assumes an oil density of 0.85.

* Assumes hold-up volume in steel screens is empty.

† Assumes hold-up volume in steel screens is filled with 0.6 cc water.

TABLE 2

AMDEL CORE ANALYSIS

Turrum 3 Core 1 - Ambient Pressure.

SAMPLE		PERMEABILITY (md)	POROSITY (%)
3	1578.42	17.5	19.4
11	1579.50	294270	31.5
13	1579.75	606	26.2
15	1580.14	3060	17.9
17	1580.42	19740	21.3
19	1580.73	16650	28.3
22	1581.10	7530	24.4
23	1581.30	173	20.2
26	1581.88	14410	28.1
28	1582.13	5980	29.2
30	1582.39	3450	30.8
32	1582.65	6340	31.3
33	1582.84	1630	27.6
36	1583.13	6270	32.1
37	1583.33	7610	34.7
39	1583.62	7290	33.5
41	1583.87	1590	29.2
42	1584.14	3340	27.7
43	1584.31	2240	29.5

TABLE 3

AMDEL CORE ANALYSIS

Turrum 3 Core 1 - Ambient Pressure.

SAMPLE		BULK VOL	BULK DRY DENS	APPARENT GN DENS	ABSOLUTE GN DENS
3	1578.42	17.81	2.13	2.65	Sample not received
11	1579.50	18.93	1.80	2.63	2.68
13	1579.75	19.13	1.96	2.65	2.67
15	1580.14	18.51	2.18	2.66	2.68
17	1580.42	18.96	2.10	2.67	2.68
19	1580.73	18.98	1.91	2.67	2.67
22	1581.10	18.82	2.07	2.74	2.72
23	1581.30	18.84	2.14	2.68	2.70
26	1581.88	19.16	1.95	2.72	2.72
28	1582.13	19.06	1.89	2.66	2.68
30	1582.39	18.63	1.87	2.71	2.68
32	1582.65	18.72	1.85	2.69	2.68
33	1582.84	18.24	1.95	2.70	2.69
36	1583.13	19.35	1.81	2.67	2.68
37	1583.33	19.58	1.76	2.70	2.73
39	1583.62	18.89	1.81	2.72	2.74
41	1583.87	19.26	1.92	2.71	2.70
42	1584.14	18.98	1.96	2.71	2.71
43	1584.31	19.24	1.90	2.69	2.72

TABLE 4

AMDEL CORE ANALYSIS

Turrum 3 Core 1 - 18600 kPa.

SAMPLE		PERMEABILITY (md)	POROSITY (%)
3	1578.42	0.197	14.4
11	1579.50	114140	28.1
13	1579.75	51	20.4
15	1580.14	2740	17.3
17	1580.42	3170	17.3
19	1580.73	16650	26.1
22	1581.10	4590	17.7
23	1581.30	7.2	15.3
26	1581.88	23160	24.3
28	1582.13	2030	27.1
30	1582.39	2200	27.5
32	1582.65	2670	27.6
33	1582.84	438	24.8
36	1583.13	4220	28.7
37	1583.33	5330	33.0
39	1583.62	4940	30.7
41	1583.87	1070	26.4
42	1584.14	2260	25.7
43	1584.31	1410	26.5

TABLE 5

AMDEL CORE ANALYSIS

Turrum 3 Core 1 - 18600 kPa.

SAMPLE		BULK VOL	BULK DRY DENS	APPARENT GN DENS
3	1578.42	16.77	2.27	2.65
11	1579.50	18.03	1.89	2.63
13	1579.75	17.74	2.11	2.65
15	1580.14	18.38	2.20	2.66
17	1580.42	18.05	2.21	2.67
19	1580.73	18.41	1.97	2.67
22	1581.10	17.27	2.25	2.74
23	1581.30	17.76	2.27	2.68
26	1581.88	18.20	2.06	2.72
28	1582.13	18.51	1.94	2.66
30	1582.39	17.79	1.96	2.71
32	1582.65	17.77	1.95	2.69
33	1582.84	17.56	2.03	2.70
36	1583.13	18.44	1.90	2.67
37	1583.33	19.07	1.81	2.70
39	1583.62	18.12	1.89	2.72
41	1583.87	18.54	1.99	2.71
42	1584.14	18.47	2.01	2.71
43	1584.31	18.46	1.98	2.69

1. INTRODUCTION

This final part report gives porosity, permeability and density data for seventeen core plugs from Turrum-3, cores 2, 3 and 5.

2. PROCEDURE

All core plugs and off-cuts were cleaned in a 3:1 mixture of chloroform and methanol, then stored at 50°C/50% relative humidity. Air permeability and porosity by helium injection were measured at an ambient, confining pressure of 1,000 kPa for cores 2 and 3 only and at net overburden pressures of 4,450 psi (31,280 kPa) for cores 2 and 3 and 5110 psi (35,200 kPa) for core 5.

Apparent grain densities were calculated in conjunction with porosity measurements. Absolute grain densities were measured by pycnometry of the ground off-cuts.

3. RESULTS

Tables 1 to 10 give results of all determinations.

TABLE 1

AMDEL CORE ANALYSIS

Turrum 3 Core 2 - Ambient.

SAMPLE	PERMEABILITY (md)	POROSITY (%)
45 2597.36	0.416	4.0
47 2597.60	0.593	4.5
49 2597.86	0.234	4.4
51 2598.10	394	8.8
53 2598.32	2.0	4.6

TABLE 2

AMDEL CORE ANALYSIS

Turrum 3 Core 2 - Ambient.

SAMPLE	BULK VOL	BULK DRY DENS	APPARENT GN DENS	ABSOLUTE GN DENS
45 2597.36	24.22	2.60	2.71	2.71
47 2597.60	24.89	2.57	2.70	2.70
49 2597.86	21.25	2.58	2.70	2.71
51 2598.10	24.34	2.46	2.70	2.70
53 2598.32	24.37	2.58	2.70	2.70

TABLE 3

AMDEL CORE ANALYSIS

Turrum 3 Core 2 - 31280 kPa.

SAMPLE	PERMEABILITY (md)	POROSITY (%)
45 2597.36	0.015	2.7
47 2597.60	.057	3.8
49 2597.86	..010	3.1
51 2598.10	312	7.5
53 2598.32	0.088	3.1

TABLE 4

AMDEL CORE ANALYSIS

Turrum 3 Core 2 - 31280 kPa.

SAMPLE	BULK VOL	BULK DRY DENS	APPARENT GN DENS
45 2597.36	23.88	2.64	2.71
47 2597.60	24.70	2.59	2.70
49 2597.86	20.95	2.62	2.70
51 2598.10	24.00	2.50	2.70
53 2598.32	23.98	2.62	2.70

TABLE 5

AMDEL CORE ANALYSIS

Turrum 3 Core 3 - Ambient.

SAMPLE	PERMEABILITY (md)	POROSITY (%)
54 2599.54	1.3	3.4
56 2599.79	0.541	2.9
57 2599.93	0.313	3.2
60 2600.33	26.6	6.5
61 2600.58	3.4	5.1
64 2600.87	1.1	4.7

TABLE 6

AMDEL CORE ANALYSIS

Turrum 3 Core 3 - Ambient.

SAMPLE	BULK VOL	BULK DRY DENS	APPARENT GN DENS	ABSOLUTE GN DENS
54 2599.54	17.39	2.62	2.71	2.73
56 2599.79	17.38	2.64	2.71	2.74
57 2599.93	16.74	2.63	2.72	2.70
60 2600.33	16.97	2.54	2.72	2.74
61 2600.58	14.20	2.57	2.71	2.72
64 2600.87	16.28	2.57	2.69	2.75

TABLE 7

AMDEL CORE ANALYSIS

Turrum 3 Core 3 - 31280 kPa.

SAMPLE	PERMEABILITY (md)	POROSITY (%)
54 2599.54	0.051	2.2
56 2599.79	0.030	1.9
57 2599.93	0.010	1.9
60 2600.33	18.8	4.9
61 2600.58	0.278	2.3
64 2600.87	0.081	3.1

TABLE 8

AMDEL CORE ANALYSIS

Turrum 3 Core 3 - 31280 kPa.

SAMPLE	BULK VOL	BULK DRY DENS	APPARENT GN DENS
54 2599.54	17.17	2.65	2.71
56 2599.79	17.20	2.66	2.71
57 2599.93	16.52	2.67	2.72
60 2600.33	16.67	2.58	2.72
61 2600.58	13.80	2.65	2.71
64 2600.87	16.02	2.61	2.69

TABLE 9

AMDEL CORE ANALYSIS

Turrum 3 Core 5 - 35200 kPa.

SAMPLE		PERMEABILITY (md)	POROSITY (%)
120	2914.87	0.001	2.9
122	2915.93	0.005	5.5
124	2917.05	0.001	2.9
130	2920.39	0.004	4.5
131	2921.26	0.005	5.2
135	2923.75	0.001	4.9

TABLE 10

AMDEL CORE ANALYSIS

Turrum 3 Core 5 - 35200 kPa.

SAMPLE	BULK VOL	BULK DRY DENS	APPARENT GN DENS	ABSOLUTE GN DENS
120 2914.87	17.47	2.69	2.77	2.79
122 2915.93	16.32	2.62	2.77	2.90
124 2917.05	17.38	2.55	2.63	2.6[illegible]
130 2920.39	16.36	2.53	2.65	2.69
131 2921.26	16.66	2.54	2.69	2.77
135 2923.75	14.78	2.66	2.80	2.84

NOTE: Both apparent and absolute grain densities were repeated for sample 122 (2915.93 m), the same values being obtained each time. Plug 122 is a light grey siltstone with less than 1% organic matter. The ground off-cut is dark grey, carbonaceous material. It appears that the off-cut sent does not match the plug received.

ENCLOSURES

ENCLOSURES

PE902425

This is an enclosure indicator page.
The enclosure PE902425 is enclosed within the container PE902424 at this location in this document.

The enclosure PE902425 has the following characteristics:

ITEM_BARCODE =	PE902425
CONTAINER_BARCODE =	PE902424
NAME =	Geological Cross Section
BASIN =	GIPPSLAND
PERMIT =	VIC/L3
TYPE =	WELL
SUBTYPE =	CROSS_SECTION
DESCRIPTION =	Geological Cross Section for Turrum-3
REMARKS =	
DATE_CREATED =	31/08/84
DATE_RECEIVED =	4/10/84
W_NO =	W899
WELL_NAME =	Turrum-3
CONTRACTOR =	ESSO
CLIENT_OP_CO =	ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902426

This is an enclosure indicator page.
The enclosure PE902426 is enclosed within the container PE902424 at this location in this document.

The enclosure PE902426 has the following characteristics:

ITEM_BARCODE = PE902426
CONTAINER_BARCODE = PE902424
NAME = Structure Map Top Latrobe
BASIN = GIPPSLAND
PERMIT = VIC/L3
TYPE = SEISMIC
SUBTYPE = HRZN_CNTR_MAP
DESCRIPTION = Structure Map Top Latrobe for Turrum-3
REMARKS =
DATE_CREATED = 30/06/85
DATE_RECEIVED = 31/07/87
W_NO = W899
WELL_NAME = Turrum-3
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE902428

This is an enclosure indicator page.
The enclosure PE902428 is enclosed within the container PE902424 at this location in this document.

The enclosure PE902428 has the following characteristics:

ITEM_BARCODE =	PE902428
CONTAINER_BARCODE =	PE902424
NAME =	Structure Map Lower L.balmei
BASIN =	GIPPSLAND
PERMIT =	VIC/L3
TYPE =	SEISMIC
SUBTYPE =	HRZN_CNTR_MAP
DESCRIPTION =	Structure Map Lower L.balmei for Turrum-3
REMARKS =	
DATE_CREATED =	30/06/85
DATE_RECEIVED =	29/01/88
W_NO =	W899
WELL_NAME =	Turrum-3
CONTRACTOR =	ESSO
CLIENT_OP_CO =	ESSO

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PE902429

This is an enclosure indicator page.
The enclosure PE902429 is enclosed within the container PE902424 at this location in this document.

The enclosure PE902429 has the following characteristics:

ITEM_BARCODE	=	PE902429
CONTAINER_BARCODE	=	PE902424
NAME	=	Structure Map L1.4.2 Reservoir
BASIN	=	GIPPSLAND
PERMIT	=	VIC/L3
TYPE	=	SEISMIC
SUBTYPE	=	HRZN_CNTR_MAP
DESCRIPTION	=	Structure Map L1.4.2 Reservoir for Turrum-3
REMARKS	=	
DATE_CREATED	=	30/06/85
DATE_RECEIVED	=	29/01/88
W_NO	=	W899
WELL_NAME	=	Turrum-3
CONTRACTOR	=	ESSO
CLIENT_OP_CO	=	ESSO

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PE902430

This is an enclosure indicator page.
The enclosure PE902430 is enclosed within the container PE902424 at this location in this document.

The enclosure PE902430 has the following characteristics:

ITEM_BARCODE = PE902430
CONTAINER_BARCODE = PE902424
NAME = D-Function Map P asperopolus
BASIN = GIPPSLAND
PERMIT = VIC/L3
TYPE = WELL
SUBTYPE = MAP
DESCRIPTION = DFunction Map P asperopolus for Turrum-3
REMARKS =
DATE_CREATED = 30/11/84
DATE_RECEIVED = 31/07/87
W_NO = W899
WELL_NAME = Turrum-3
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)

PE601183

This is an enclosure indicator page.
The enclosure PE601183 is enclosed within the container PE902424 at this location in this document.

The enclosure PE601183 has the following characteristics:

ITEM_BARCODE = PE601183
CONTAINER_BARCODE = PE902424
NAME = Well Completion Log
BASIN = GIPPSLAND
PERMIT = VIC/L3
TYPE = WELL
SUBTYPE = COMPLETION_LOG
DESCRIPTION = Well Completion Log for Turrum-3
REMARKS =
DATE_CREATED = 22/04/85
DATE_RECEIVED = 31/07/87
W_NO = W899
WELL_NAME = Turrum-3
CONTRACTOR = ESSO
CLIENT_OP_CO = ESSO

(Inserted by DNRE - Vic Govt Mines Dept)