

DEPT. NAT. RES & ENV

PE902063

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16 MAR 1993

GAS AND FUEL EXPLORATION N.L.

PE902063

PEP 100
OTWAY BASIN
VICTORIA

WELL COMPLETION REPORT

NALANGIL -1

TEXT

A.TABASSI
MARCH, 1993

NALANGIL NO. 1.

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SUMMARY

Nalangil No.1 was drilled as a wildcat exploration well in PEP100 Otway Basin, Victoria.

Gas and Fuel Exploration N.L. was operator and the only participant.

Nalangil No.1 was located 13 km west of the township of Colac.

The basal Tertiary Pebble Point Formation and the sandstone of Dilwyn Formation were primary objectives of the well.

Drilling commenced on 4th August, 1990 and reached a total depth of 363.0m (K.B.) on 7th August, 1990.

At total depth the following logs were run:

- Dual Laterolog/Micro-Laterolog
- Compensated Sonic Log
- Compensated Density/Neutron Log
- Velocity Survey
- Side Wall Cores.

A conventional bottom hole drill stem test was attempted, but due to industrial action by the drilling contractor it was aborted.

No conventional coring operations were performed.

No significant hydrocarbon shows were observed whilst drilling. The maximum background gas of 150ppm C₁ only was recorded at 358m.

Nalangil No.1 well was plugged and abandoned as a dry hole and the rig was released at 1500 hours on 10th August, 1990.

PEP100	OTWAY BASIN	NALANGIL NO.1	GAS & FUEL EXPLORATION NL
Status:	P. & A. Dry hole	Location:	Lat. 38° 21' 40.4"S
Hole Size:	12 1/4" to 68.78m		Long. 143° 26' 17.9"E
	8 1/2" to 363.00m	Seismic:	OHG86A-107, SP 255
Casing Shoe:	9 5/8" at 64.24m	Elevation:	143.00m GL asl
Plugs:	363.0 - 255.0m,		146.05m KB asl
	80.0 - 30.0m	Spudded:	4th August, 1991
	Surface	Rig Released:	10th August, 1991

ROCK UNIT	DEPTH (M)	SUBSEA (M)	THICKNESS (M)
Newer Volcanics (Decomposed)	Surface	146.0	26.0
Heytesbury Group	26.0	120.0	160.0
Nirranda Group Demons Bluff	186.0	-40.0	52.5
Wangerrip Group Eastern View	238.5	-92.5	51.5
Otway Group Eumeralla	290.0	-144.0	73.0+
Total Depth (Driller)	363.0	-217.0	
Total Depth (Logger)	352.0	-206.0	

Logs: DLS/MRS/GR/SP/CAL, CSS/GR/CAL, NCS/GR/CAL, Velocity Survey, SWC, Mud Log

Test: None

Core: 24 SWC, nil Conventional

CONCLUSION

- Nalangil No.1 was drilled in a fault independent Tertiary age reverse faulted anticline.
- The basal Tertiary Pebble Point Formation, one of the Primary target, was absent.
- The sandstone section of the Eastern View Formation of the Wangerrip Group was found to be water saturated.
- The Eumeralla Formation was entered 20m higher than prognosed.
- The Tertiary and the limited Lower Cretaceous sediments penetrated are generally considered too immature to generate significant quantity of hydrocarbons.
- The well appears to have been a valid test of the basal Tertiary play.
- The results of the well support a number of geological concepts in the area.

RECOMMENDATIONS

The following are recommended based on the above conclusions.

- Attempt to further evaluate the reservoir potential of the sandstones of the Eastern View Formation prior to targeting them as an objective.
- The Pebble Point Formation should not be targeted as a primary objective in PEP100.
- The sandstones of the Pretty Hill Formation should be considered the primary objective.
- Any possible sand development within the Eumeralla Formation may have reservoir potential and can be considered as secondary objective.

Prepared By: A. Tabassi

1. INTRODUCTION

Nalangil No.1 was primarily drilled to penetrate the entire Tertiary sequence and to verify the nature of the fluid and gas content within its sand reservoirs.

In the Otway Basin both the basal Tertiary Pebble Point Formation and the sandstones of the Dilwyn Formation exhibit good to excellent reservoir characteristics and many of the former have shown encouraging hydrocarbon shows. Significant recoveries of oil in Lindon No.1, good live oil show in Curdie No.1, strong wet gas show at Fahley No.1 and live marine oil show in Wilson No.1 were further encouraging criteria justifying the targeting of the Pebble Point Formation as the prime objective.

The Nalangil prospect was defined as the result of the 1985 Stoneyford and 1986 Tomahawk Creek Seismic Surveys. It is a fault independent faulted anticline in which the majority of the faults have been reversed in direction in mid to late Tertiary time. The vertical and lateral seals were expected to be the mudstone of the Eastern View Formation.

Although the lack of the Pebble Point Formation may have downgraded the reservoir potential of the Tertiary sequence in PEP100, the sandstones of the Pretty Hill Formation is still considered the primary objective. The latter is accessible for drilling within most part of PEP100.

2. WELL HISTORY

2.1 Location (see figures 1 and 2)

Co-ordinates: Latitude : 38° 21' 40.4"S
Longitude : 143° 26' 17.9"E

Geophysical Control: Shot Point : 255
Seismic Line : OHG 86A-107

Real Property: Section : Vol.7426 Fol. 032
Parish of Nalangil
Shire of Colac

Property Owner: Dick Underwood
RMB 4120
Pirron Yallock

2.2 General Data

Well Name and Number: Nalangil No. 1

Operator: Gas and Fuel Exploration N.L.
11th Floor, 151 Flinders Street
MELBOURNE, VIC. 3000.

Participants: None

Elevation: Ground level : 143.0m ASL
Kelly Bushing: 146.05m ASL
(Unless otherwise stated, all
depths refer to K.B.)

Total depth: Driller: 363.0m
Wireline Logger: 352.0m

Drilling Commencement: 4 August 1990 @ 0200 hours
Total Depth Reached: 7 August 1990 @ 1545 hours
Rig Released: 10 August 1990 @ 1500 hours
Drilling Time to T.D.: 3 days
Status: Plugged and abandoned, Dry hole.

2.3 Drilling Data: (See also Appendices 1 and 2)

2.3.1 Drilling Contractor

Fletcher Drilling Services Pty. Ltd.

2.3.2 Drilling Rig

F.D.S. Rig 1.

2.3.3 Casing and Cementing Details

A 16" Conductor Pipe was set at 6.0m prior to rig up.

GAS AND FUEL EXPLORATION N.L.

OTWAY BASIN

TENEMENT LOCATION MAP

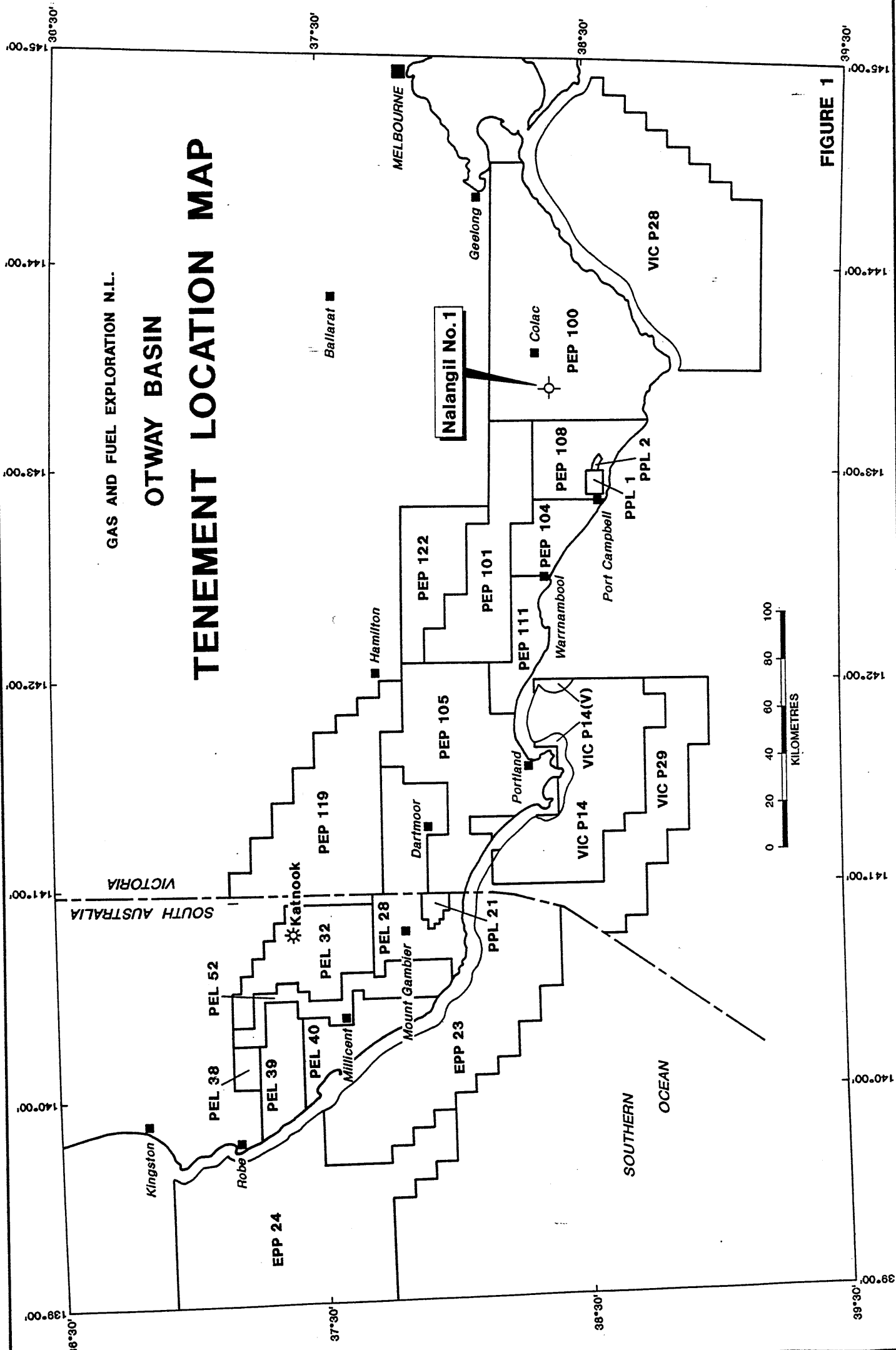
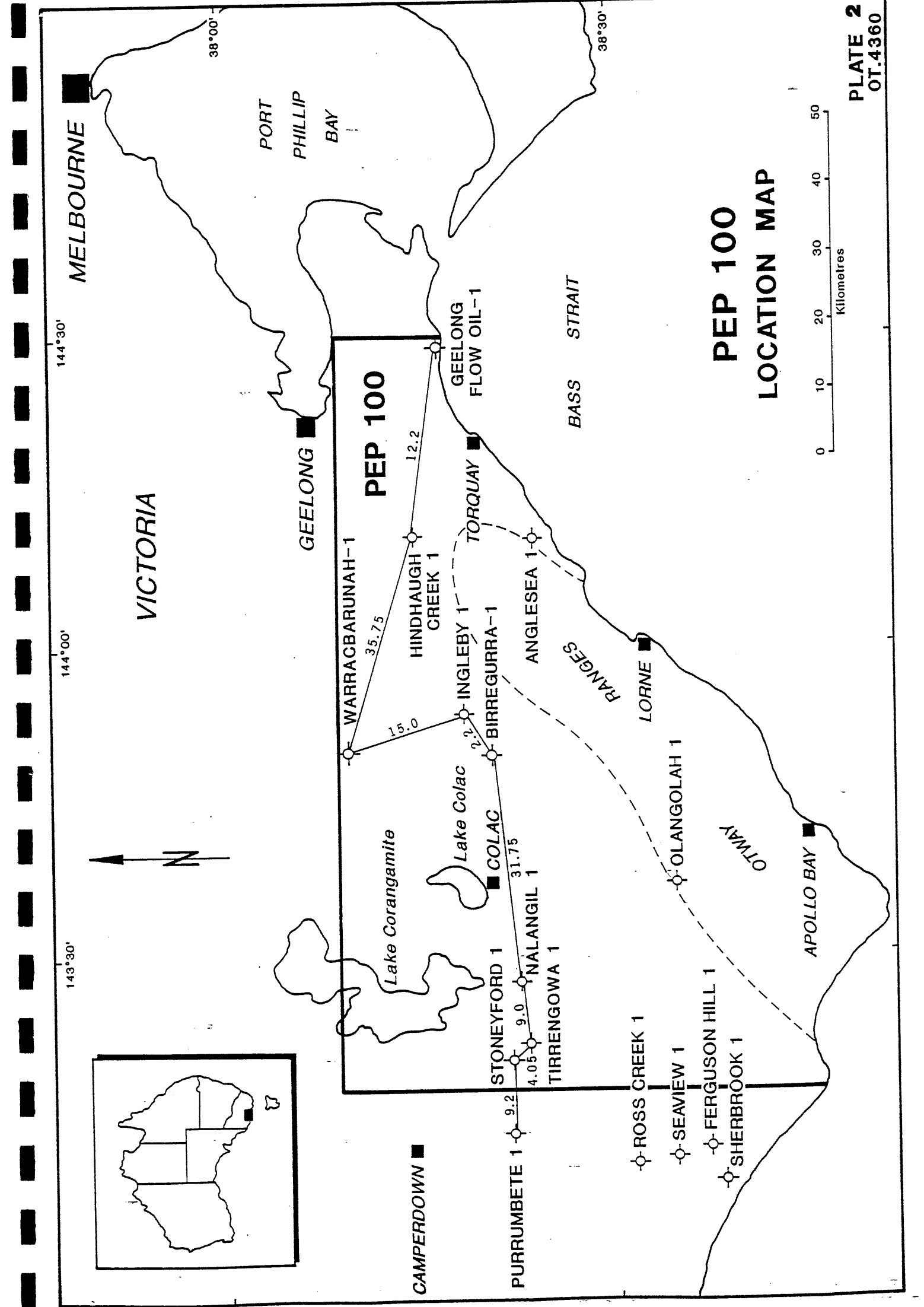


FIGURE 1



MELBOURNE

PORT
PHILLIP
BAY

VICTORIA

GEELONG

PEP 100

GEELONG
FLOW OIL-1

BASS
STRAIT

TORQUAY

WARRACBARUNAH-1

HINDHAUGH
CREEK 1

INGLEBY 1

BIRREGURRA-1

ANGLESEA 1

RANGES

LORNE

Lake Corangamite

Lake Colac

COLAC

STONEYFORD 1

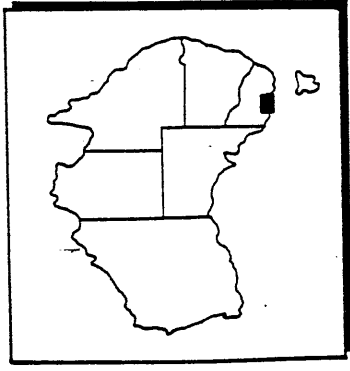
NALANGIL 1

TIRRENGOWA 1

OLANGOLAH 1

OTWAY

APOLLO BAY



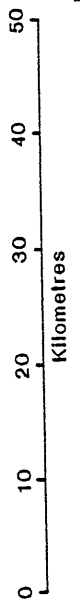
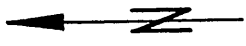
143°30'

144°00'

144°30'

38°00'

38°30'



PEP 100
LOCATION MAP

Surface Casing

Size: 9⁵/₈"
Weight and Grade: 36 lb/ft, STC 8rd J55
Centralisers: None
Float Collar: 51.53m
Shoe: 64.24m
Cement: 129 sacks Class "A" with 2% CaCl₂
Method: Single plug displacement (top plug only)
Equipment: Halliburton Services

Cement Plugs

Plug No. 1 (Set prior to attempted DST No.1)

Interval: 363.0 - 255.0m
Cement: 95 sacks Class "A" with 1% CaCl₂
Method: Balanced
Tested: 10,000 lbs.

Plug No. 2

Interval: 80.0 - 30.0m
Cement: 60 sacks Class "A" neat
Method: Balanced
Tested: 10,000 lbs.

Plug No. 3

Interval: Surface
Cement: 10 sacks Class "A" neat

2.3.4 Drilling Fluid

The hole was spudded using a high viscosity prehydrated AQUAGEL - Lime spud mud. Drilling proceeded without any problems with the maintained viscosity of 45-55 seconds to the 9⁵/₈" casing point @ 68.0m. The old mud was used to drill the cement and casing shoe, by adding water to maintain viscosity. From about 275m the filtration control was rapidly reduced by addition of CMC-HV and DEXTRID while simultaneously replacing 50 bbls of active mud with water to reduce solids content and control viscosity. Drilling continued to the total depth without experiencing any problem. Wireline logging was completed at total depth without any incident. The caliper log showed a minor wash-out below the casing shoe and at the interval of 249.0-257.0m. The rest of the hole was found to be very close to the gauge. (See Appendix 3 for details)

2.3.5 Water Supply

Drilling water was obtained and transported from water supply bore which was some 20 kilometers from the well location.

2.4 Formation Sampling and Testing

2.4.1 Cuttings

Cutting samples were collected at 5m intervals from surface to total depth. Each sample was washed, air dried and divided into four splits, three of which were stored in labelled polythene bags and the fourth one was stored in a plastic sample tray. In addition, from surface casing to total depth unwashed samples were collected at 10m intervals. These samples were stored in labelled cloth bags. One set of the washed and air dried samples in the polythene bags was dispatched to DMID (Petroleum Group) and the rest were retained by the Operator. (See Appendix 4 for descriptions)

2.4.2 Cores

- (i) A conventional core was planned to be taken over the Pebble Point Formation interval. However due to absence of this formation and/or other desirable lithology no conventional coring operations were carried out.
- (ii) Twenty four sidewall cores were attempted of which twenty two were recovered. These samples were used for a number of studies as indicated below (See also Appendix 5 for descriptions):

The depth, recovery and analysis carried out on sidewall cores are as follows:-

No.	Depth (m)	Recovery (cm)	Analysis	
			Palynology	Vitrinite Reflectance
1	345.0	2.5	*	*
2	327.5	2.0		
3	311.5	2.5	*	*
4	304.5	2.5		
5	296.5	3.0	*	
6	291.0	3.5	*	
7	288.5	2.0	*	
8	286.5	3.0		
9	282.5	3.5	*	
10	261.0	2.5	*	*
11	255.5	3.0		
12	254.0	3.5		
13	251.5	4.0		
14	249.0	3.0		
15	247.0	4.0		
16	245.5	None		
17	244.0	None		
18	241.5	3.0		
19	239.5	2.0		
20	236.0	3.5	*	*
21	202.0	4.0	*	*
22	163.0	1.5	*	
23	107.5	4.0	*	*
24	72.0	3.0		

2.4.3 Tests

A conventional bottom hole drill stem test was attempted after the completion of the wireline logging. However, due to industrial action (contractual dispute) by the drilling contractor, the test was aborted.

2.5 Logging and Surveys (See Enclosures 1 to 3)

2.5.1 Mud Logging

A standard skid-mounted Gearhart (Geodata Division) unit was used to record penetration rate, continuous mud gas monitoring, intermittent mud and cutting gas analysis, pump rate, and mud volume data. The mud log is included as Enclosure 2.

2.5.2 Wireline Logging

Wireline logging was performed by BPB Instruments Limited, using a standard truck mounted unit. One logging suite consisting of the following logs was carried out at total depth;

<u>Logging Suite</u>	<u>Interval (m)</u>
Dual Laterolog/Micro-Laterolog Gamma Ray, Spontaneous Potential and Laterolog Caliper (DLS-MRS-GR-SP-Cal)	352.0 - 64.0 (GR to surface)
Compensated Density/Neutron Gamma Ray and Capiler (NCS-GR-Cal)	352.0 - 64.0
Compensated Sonic Log, Gamma Ray and Caliper (CSS-GR-Cal)	352.0 - 64.0
Sidewall Core-Gamma Ray (SCG-GR)	1 Gun

2.5.3 Velocity Survey

A velocity survey was carried out by Velocity Data Pty. Ltd. the result of which is included as Appendix 6.

2.5.4 Deviation Surveys

Hole deviation surveys were conducted regularly with the following results;

<u>Depth (m)</u>	<u>Deviation (Deg.)</u>
31.0	1/2
61.0	1/2
178.0	1/2
355.0	1/2

3. RESULTS OF DRILLING

3.1 Stratigraphy

The following stratigraphic intervals have been delineated using penetration rate, cutting analysis, wireline log interpretation and palynology (see Figures 3 & 4 and Appendix 7).

GROUP	FORMATION	DEPTH (m) KB	DEPTH (m) SS	THICKNESS (m)
Newer Volcanics	(Decomposed)	Surface	146.0	26.0
Heytesbury	(Northern Equivalent)	26.0	120.0	160.0
Nirranda	Demons Bluff	* 186.0	- 40.0	52.5
Wangerrip	Eastern View	* 238.5	- 92.5	51.5
Otway	Eumeralla	* 290.0	- 144.0	73.0+
Total Depth (Driller)		363.0	- 217.0	
Total Depth (Logger)		352.0	- 206.0	

*Palynology

3.2 Lithological Description

3.2.1 Post Heytesbury Group (Surf. - 26.0m)

Newer Volcanics (Decomposed) 0.0 - 26.0m

Claystone, light yellowish brownish, medium pinkish red, light reddish brownish in part, soft, sticky, rarely dispersive, moderately silty, abundant multi-coloured very fine to fine sand grains/lithics, commonly reddish, trace to common fine mica flecks.

3.2.2 Heytesbury Group (Northern Equivalent) 26.0-186.0

Claystone, light to dark grey, medium to dark green grey in part, becoming dominantly medium brownish grey with depth, soft, becoming soft to firm with depth, sticky becoming dispersive with depth, trace to common glauconite pellets, rare chlorite (?), commonly, occasionally abundantly fossiliferous, occasionally moderately calcareous (possibly due to ground shell fragments), rarely silty, interbedded with minor:

Sandstone, light to medium grey, light green grey in part, becoming dominantly light to medium brownish grey, loose becoming friable to firm with depth, very fine to fine subangular to subrounded, moderate to well sorted quartz and common lithic fragments, common to abundant dispersive medium grey and light green grey agillaceous matrix, very slightly calcareous, trace fossil fragments, trace medium strong calcite cement, rare pyrite and mica, rare amber (?). Very poor visual porosity.

NALANGIL No.1

PROGNOSSED AND ACTUAL STRATIGRAPHY

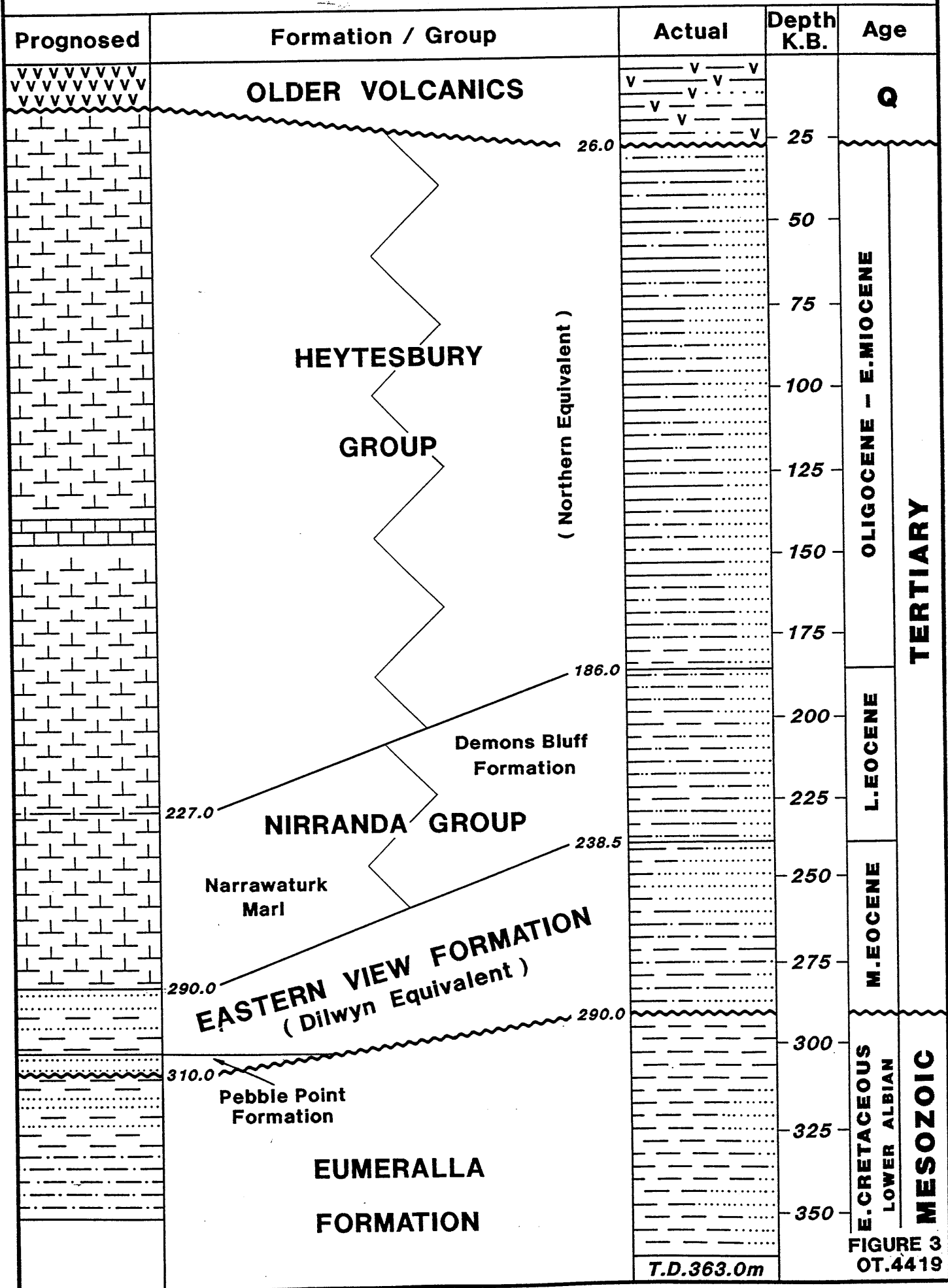


FIGURE 3
OT.4419

GENERALISED STRATIGRAPHIC COLUMN

PEP 100 - COLAC TROUGH

OTWAY BASIN

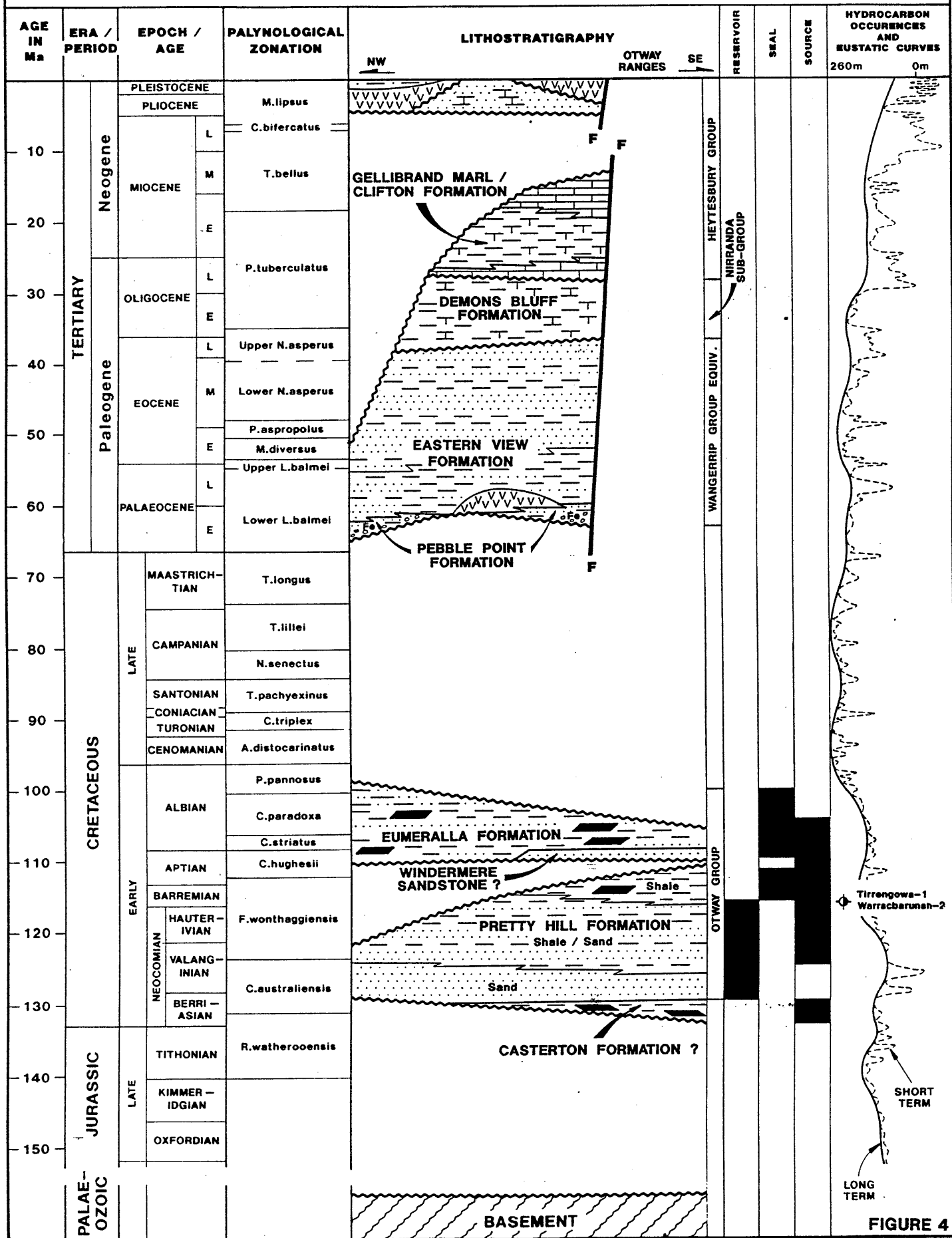


FIGURE 4

3.2.3 Nirranda Group (Demons Bluff Formation) 186.0-238.5

Claystone, medium to dark brownish grey, rare medium greenish grey in part, soft, sticky in part, dispersive in part, slightly glauconitic, very slightly calcareous and carbonaceous, commonly fossiliferous, moderately silty, interbedded with Sandstone and inter-laminated with minor Siltstone.

Sandstone, light brown, light to medium brownish grey, light green grey in part, loose in part, friable to hard in part, very fine to fine, occasionally medium grained, subangular to subrounded, moderately sorted quartz and minor lithics, common medium brown dispersive argillaceous matrix, rare to trace calcareous and pyrite cement, trace pyrite nodules and pyritized fossil fragments, trace glauconite, trace coarse quartz overgrowth, poor to none visual porosity;

Siltstone, medium to dark brown, soft to firm, extremely argillaceous, dispersive in part.

3.2.4 Wangerrip Group (Eastern View Formation) 238.5-290.0

Claystone, medium brownish grey, becoming dark brownish grey with depth, occasionally light to medium greenish grey, soft, dispersive, interbedded with;

Sandstone, clear to off-white, light to medium brown in part, loose to occasionally friable, coarse to very coarse, rarely medium grained, subangular to rounded, dominantly subrounded, moderately sorted quartz, common dispersive argillaceous matrix, rare pyrite cement, slightly calcareous, rare calcite cement, rare glauconite, rare coarse lithic fragments, good visual porosity, also interbedded with;

Sandstone, medium brownish grey, firm to friable, fine, occasionally very fine, subangular to subrounded, well sorted quartz, trace to common medium brownish argillaceous matrix, trace glauconite and lithic fragments, rare very weak calcite cement, trace pyrite cement, poor visual porosity, inter-laminated with minor;

Siltstone, medium to dark brown, soft, firm in part, very argillaceous, dispersive in part, interbedded with minor

Coal, very dark brown to black, firm, brittle, dull in part, argillaceous in part, subfissile in part, no fluorescent cut or crush cut.

3.2.5 Otway Group 290.0-363.0
Eumeralla Formation 290.0-363.0

Claystone, off-white to very light grey and occasionally pale green grey at the top, becoming dominantly medium grey, medium greenish grey and medium brownish grey with depth, soft, sticky, occasionally dispersive in part, trace to common Volcanogenic lithic fragments, trace partially altered feldspar, moderately silty, in part grading into;

Siltstone, medium grey, medium greenish grey, firm, occasionally soft, moderately argillaceous in part, trace multi-coloured lithic fragments, rare fine carbonaceous flecks, rare fine mica, interbedded/inter-laminated with minor;

Sandstone, light to medium grey, light greenish grey, occasionally off-white, firm, friable in part, fine, subangular to subrounded, well sorted quartz and volcanolithics, trace biotite, trace altered feldspar, trace dispersing kaolinitic and rare chloritic clay matrix, trace weak calcite cement, no visual porosity.

3.3 Hydrocarbon Indications

3.3.1 Mud Gas Reading

The mud gas detection equipment was operational from surface to 363.0 metres (Total Depth).

Levels of gas in the drilling mud from surface to the base of the Heytesbury Group (186.0m) were below the detection capabilities of the system.

The level of background gas rose to a maximum of 14 PPM C₁ only in the Nirranda Group.

The background mud gas reading rose further in the Wangerrip Group to the maximum of 25 PPM C₁ only. No gas associated with a coal seam in the middle of the Wangerrip Group was recorded as the gas trap was then blocked.

From 290.0m (Top Eumeralla Formation), background mud gas readings gradually increased to a maximum of 150ppm C₁ only towards the total depth.

3.3.2 Sample Fluorescence

Cutting samples were routinely inspected for fluorescence at 5 metre intervals from surface to the total depth.

No fluorescence or oil staining were reported in any of the cutting samples or sidewall cores cut.

4. GEOLOGY

4.1 Structure

Nalangil prospect was defined as a result of the Stoneyford Seismic Survey (1985) and Tomahawk Creek Seismic Survey (1986). It was interpreted as a fault independent Tertiary age reverse faulted anticline.

Age of the faulting and folding which has resulted in forming the Nalangil Prospect is Late Tertiary and coincident with uplift of the Otway Ranges. Structural intensity associated with this Late Tertiary compressional structure decrease away from the Otway Ranges. It is believed that the reverse faulting appears to have rejuvenated pre-existing east-west trending normal faults although the sense of movement has been reversed.

Nalangil No.1 was located on seismic line OHG 86A-107, shot point 255 and was drilled to test the sandstones of the Pebble Point/Dilwyn Formations at crestal position (see Figures 5 & 6).

4.2 Discussion

The well results indicated that:- (See Figure 6)

- No major unconformity and/or discomformity was recognised between the undifferentiated Tertiary Groups.
- The Heytesbury Group differs lithologically to those penetrated in the deeper part of the basins. The restricted marine environment for this group suggested by palynological analysis may be indicative of the proximity of the prospect area to the basin margin. Hence the change in the lithology.
- The term "Heytesbury Group - Northern Equivalent" is suggested here.
- A similar hypothesis may apply to the Nirranda Group lithology. No typical marl and ferruginous sands generally associated with this group was present at this location.
- Although no Wangerrip Group was recognised by the palynological study and the entire interval of 186.0 to 290.0m was assigned to the Nirranda Group. However, this report tends to believe that the interval 238.5 to 290.0m is more likely to be of the Wangerrip Group.
- The Nirranda and Wangerrip Groups are palynologically diachronous. The Nirranda Group spanning from Upper Eocene to cover most Oligocene whilst Wangerrip Group has been reported from Palaeocene to Late Eocene or perhaps to very Early Oligocene.
- In the southern part of the basin where these two groups have different lithologies their contact can be easily recognised. However, in Nalangil No.1, the Nirranda Group lithologies are similar to that of Wangerrip Group and recognition of the two on lithology alone should be considered subjective.
- The interval of 186.0m to 238.5m is assigned here to the more marginal marine Demons Bluff Formation of the Nirranda Group.
- Based on the lithology and type of environment of deposition recognised by the palynological analysis, this report assigns the interval 238.0 to 290.0m to the Eastern View Formation of the Wangerrip Group.
- The sandstone of the Pebble Point Formation, the primary objective was not present. This can be interpreted as either lack of deposition and/or erosion prior to the deposition of the remainder of the Wangerrip Group. The latter can not be proved as there is already a major unconformity between Tertiary and Lower Cretaceous.

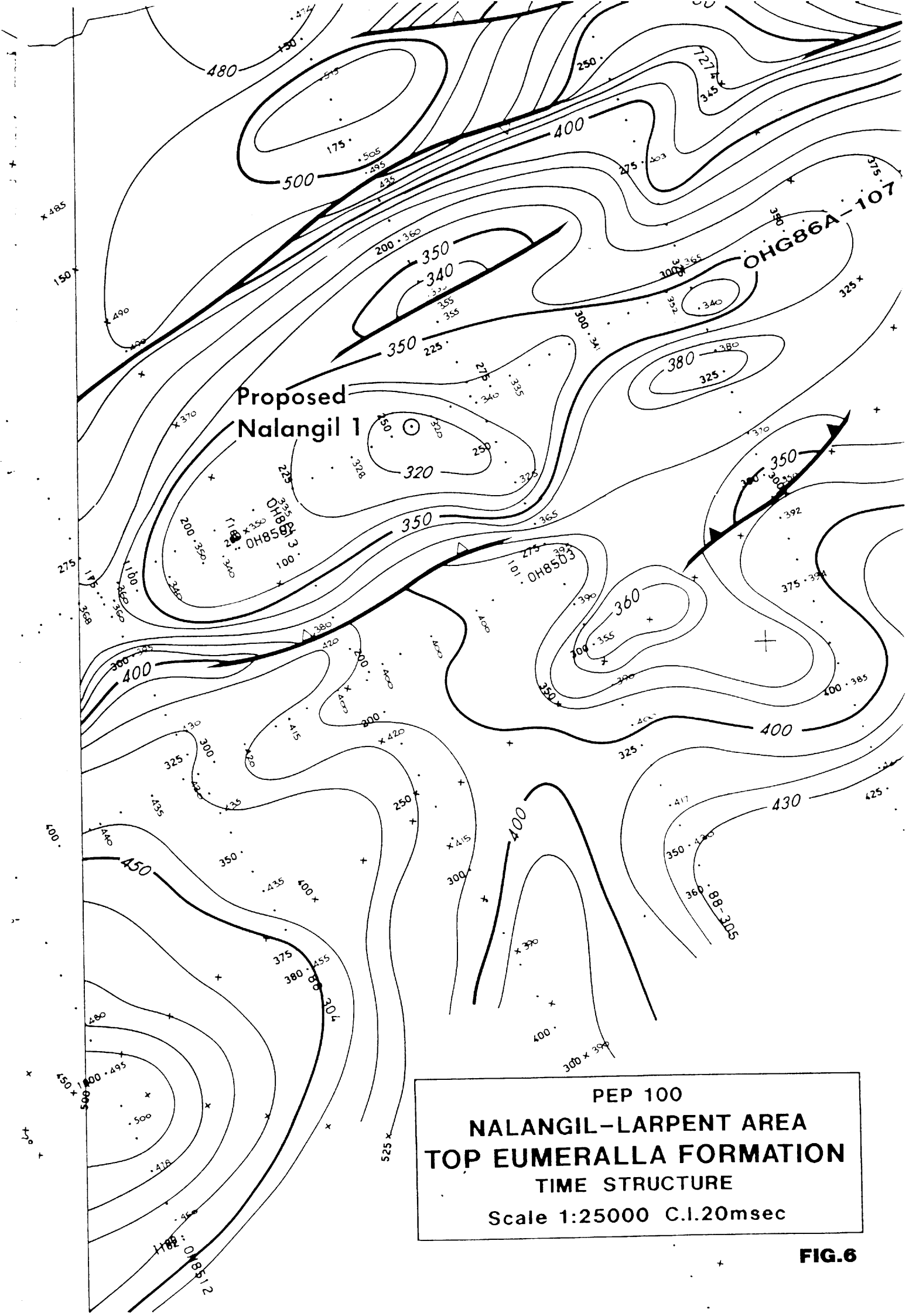
PE902065

This is an enclosure indicator page.
The enclosure PE902065 is enclosed within the
container PE902063 at this location in this
document.

The enclosure PE902065 has the following characteristics:

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NAME = Seismic Section Line OHG86A-107
BASIN =
PERMIT = PEP 100
TYPE = SESISMIC
SUBTYPE = INTERP_SECTION
DESCRIPTION = Seismic Interpreted Section, Line
OHG86A-107, Tomahawk Creek Survey,
(enclosure from WCR-text) for
Nalangil-1
REMARKS = This item has a seismic section and a
log
DATE_CREATED = 26/06/86
DATE_RECEIVED =
W_NO = W1035
WELL_NAME = Nalangil-1
CONTRACTOR = Hartogen Energy Ltd
CLIENT_OP_CO = Gas and Fuel Exploration NL

(Inserted by DNRE - Vic Govt Mines Dept)



Proposed
Nalangil 1

PEP 100
NALANGIL-LARPENT AREA
TOP EUMERALLA FORMATION
TIME STRUCTURE
 Scale 1:25000 C.I.20msec

FIG.6

- The only recognizable Unconformity was at the top of the Lower Cretaceous Eumeralla Formation. Palynology suggests that this unconformity is probably associated with a major peneplanation as *C. striatus* was the first palynological zone to be encountered. This is particularly true if we assume that the prospect has been uplifted by more than 300m. and consequently folded during mid to late Tertiary.

The overall thickness of the Tertiary sediments was found to be 20 metres thicker than prognosed.

4.3 Porosity and Water Saturation

Two zones were selected for log analysis using the Crocker Data Processing (CDP) Petrophysical Package. Both zones proved to be water saturated with no significant hydrocarbon. See Enclosure 4 for details.

4.4 Contribution to Geology and Relevance to occurrence of Hydrocarbon

Nalangil No.1 was the fourth exploration well drilled in PEP100.

The prospect was tested on the basis of significant reservoir sand expected to have been developed at the base Tertiary Pebble Point Formation and the overlying Dilwyn Formation. The former was reported to have excellent reservoir sand with live oil shows in Curdie No.1 in the Port Campbell Embayment and elsewhere within the basin.

Post drilling analysis failed to prove the presence of the Pebble Point Formation and revealed that the Wangerrip Group contains the sedimentary sequence of the Eastern View Formation not the Dilwyn Formation (the lateral equivalent of the former). See Figure 7.

The recent studies being carried out by the Geological Survey of Victoria indicates that the Torquay Embayment extends to the west and possibly covers the entire PEP100. Hence the usage of relevant stratigraphic nomenclature equivalents.

On the basis of the above ongoing studies, the tectonic history of the Torquay Embayment since mid Cretaceous time follows a different path to that of the remainder of the basin. By the end of the Lower Cretaceous, rifting appears to have ceased in this area whilst uplift and erosion were the order of the day. The absence of the Upper Cretaceous Sherbrook Group sediments in the entire, nearly redefined, Torquay Subbasin may support this hypothesis.

The tectonic and sedimentation history of the Torquay Subbasin is also different to that of its neighbouring Port Campbell Embayment. The marine to marginal marine base Tertiary sedimentary sequences (Pebble Point Formation, Pember Mudstone and Dilwyn Formation) give way to its largely non-marine lateral equivalent Eastern View Formation.

The marine Nirranda Group in the Port Campbell Embayment becomes more restricted and/or shallow marine and consequently the marl of the Narrawaturk Formation laterally changes into siltstone, claystone and very fine sandstone of the Demons Bluff Formation.

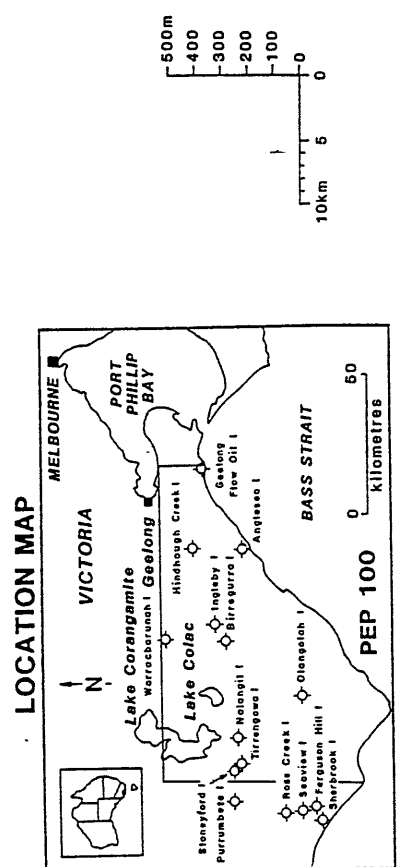
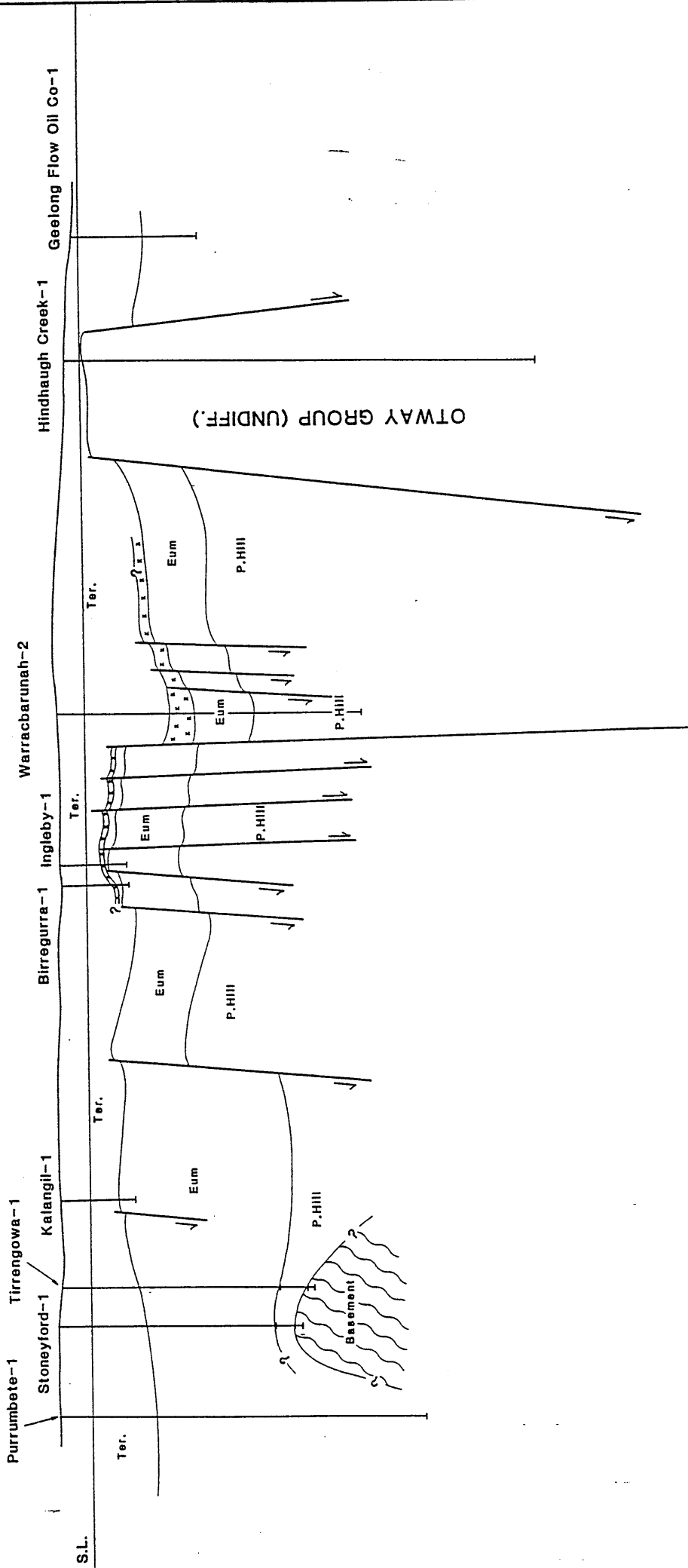


Fig. 7 Schematic Geological Cross Section across PEP 100

Similarly the undifferentiated Heytesbury Group becomes more marginal marine, and silt, fine sand and clay replaces the marl and calcarenite, the dominant lithology of this group, in the Port Campbell Embayment.

The results of the Nalangil No.1 drilling confirm all the above.

The vitrinite reflectance evaluation suggests that the entire Tertiary sequence is immature. It further suggests that the penetrated section of the Lower Cretaceous Otway Group might have just reached the early stage of maturation. It does not, however, suggest that the drilled section has generated any significant quantity of hydrocarbons.

The vitrinite reflectance profile (Fig. 8) reveals;

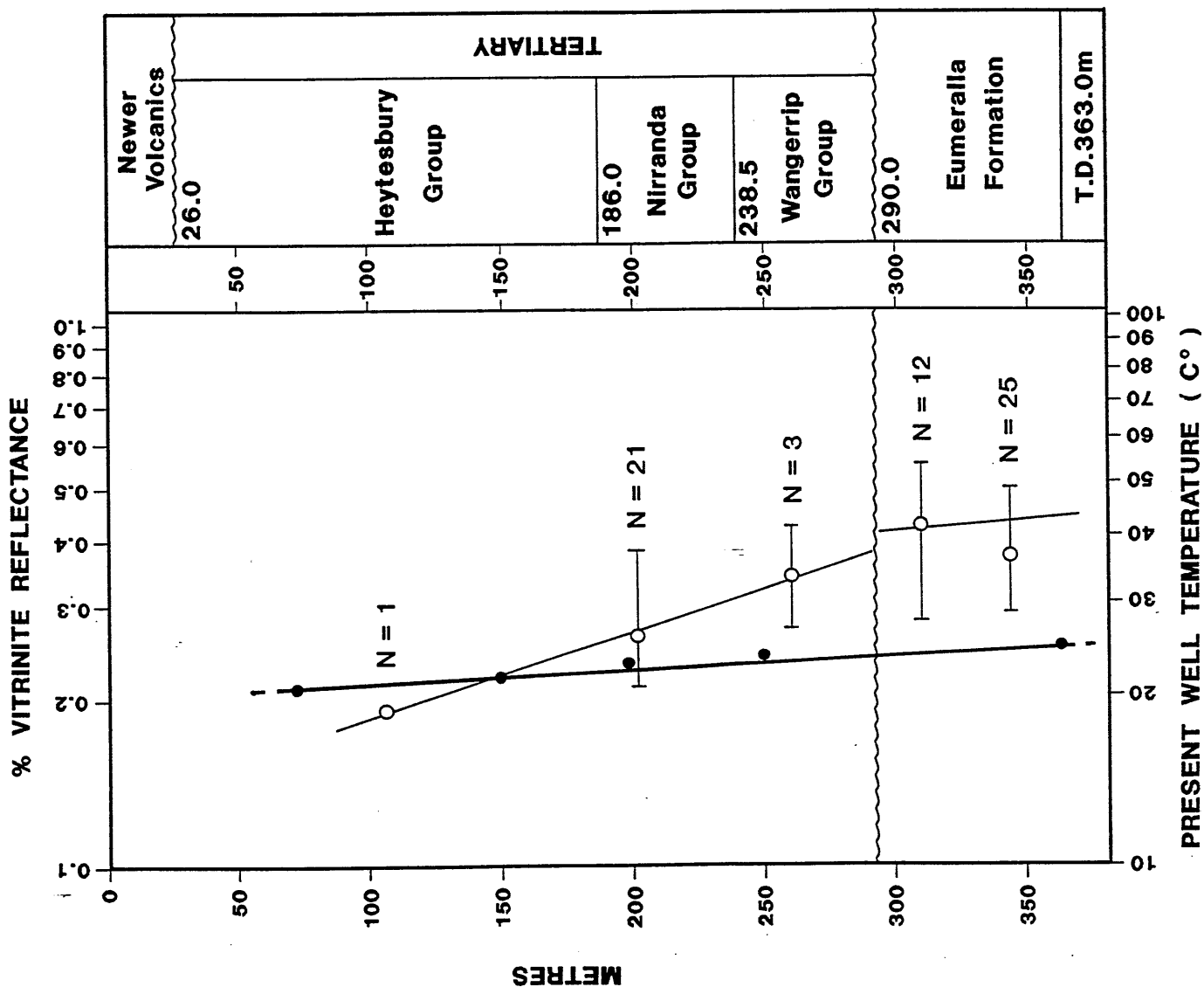
- (a) - a major unconformity between Tertiary and Lower Cretaceous, and
- (b) - the vitrinite reflectance value of the sample close to the top of the Eumeralla Formation is higher than the deeper sample.

There is no immediate explanation for (b). It is however, not unreasonable to assume that this higher Rv% could be due to the presence of Older Volcanics, overlying the Eumeralla Formation, which has been reported in nearby wells.

NALANGIL NO.1 VITRINITE REFLECTANCE PROFILE

LEGEND

- Rv Max-Range
- Reflectance Profile
- N Number of Vitrinite
- Present Well Temperature
- Present Well Temperature Profile
- Sidewall Core



APPENDIX 1



5th Cut
A4 Dividers
Re-order code 97052

FLETCHER DRILLING SERVICES PTY. LTD.

SPECIFICATIONS RIG NO. 1

DRILLING RIG

GARDNER DENVER 2500DD MOUNTED ON CRANE CARRIER POWERED BY CUMMINS NTC 400HP ENGINE WITH ALLISON HT 750-5 SPEED TRANSMISSION AND TC 477 TORQUE CONVERTOR TWIN STEER, QUAD REAR AXLES, TRI-DRIVE.
5 HYDRAULIC LEVELLING JACKS.
40' FOLDING WALKWAYS EACH SIDE.
STAIRWAYS TO GROUND LEVEL.
WEIGHT 48 TONNE.

DRAWWORKS

GARDNER DENVER 2500DD TRIPLE DRUM LEBUS GROOVED 3/4" CABLE.
SINGLE LINE PULL - 18,000LB.
MASTER CLUTCH - TWIN DISC 18".
MAIN DRIVE - ALLISON HT 750-5 SPEED.
TORQUE CONVERTOR - ALLISON TC 477.
NET BRAKING AREA - 1,390 SQ INS.
PARKERSBURG HYDRAMATIC BRAKE.
HYDRAULIC HOLD BACK - PULLDOWN INFINITELY ADJUSTABLE.
SANDLINE UNIT (THIRD DRUM) TWIN DISC 11" CLUTCH. 5000' 1/2" CABLE.
CATHEADS - FOSTER 35 AND 36 SERIES AIR OPERATED SPIN UP MAKE UP AND BREAK OUT.

DERRICK

GARDNER DENVER SINGLE PIECE STRUCTURAL STEEL, FREE STANDING.
HYDRAULICALLY RAISED / LOWERED BY TWO DOUBLE ACTING THREE STAGE RAMS
HEIGHT 70FT, BASE 8'6".
CAPACITY - 140,000LB, SET BACK 150,000LB.
RACKING BOARD FOR R1 DOUBLES.
HYDRAULIC FEED CHAIN PULLDOWN SYSTEM.
CROWN STOPPER - AIR ACTIVATED FITTED TO BRAKE ON DRILLING LINE.
3 1/2" ID KELLY HOSE.
3" ID STANDPIPE.

TRAVELLING BLOCKS (TWO OF)

GARDNER DENVER TB40 - 321 (KELLY LINE).
GARDNER DENVER TWW 40 - 321 BLOCK WITH WEB WILSON HYDRA HOOK ON HOISTING LINE.

SWIVEL

GARDNER DENVER SW 75 OILBATH WITH YOKE ASSEMBLY RATED 75 TONNE.

KELLY

1 4 1/4" SQ X 28' LONG KELLY WITH 4 1/2" IF PIN AND 4 1/2" REG LH BOX SQUARE SPLIT DRIVE BUSHING.
LOWER KELLY COCK.
UPPER KELLY COCK (OPTIONAL).

SUBSTRUCTURE

GARDNER DENVER - HEIGHT 9'3" X WIDTH 14' LENGTH 8'.
SET BACK 250,000LB, HANDRAILS AND STAIRWAYS.
BACK ON BASE WHICH IS HYDRAULICALLY RAISED TO DRILLING POSITION.
HEIGHT 5' WIDTH 9'5" LENGTH 51'.
CAPACITY 400,000LB.

ROTARY TABLE

GARDNER DENVER RT 18 - 18" OPENING, HINGED TO ALLOW UP TO 30" CASING
TO PASS THROUGH SUBSTRUCTURE.
DEAD LOAD 114 TON.
SPLIT MASTER BUSHING.
TYPICAL RPM - 43 TO 200.

DRILLPIPE

165 JOINTS 20' X 3 1/2" EXTERNAL UPSET 13.5LB/FT GRADE E PREMIUM
WITH 3 1/2" IF TOOL JOINTS.

DRILL COLLARS

15 X 6" OD X 20FT 2 11/16" ID 3 1/2" IF CONNECTIONS.
5 X 6 1/2" OD X 20FT 2 11/16" ID 4 1/2" IF CONNECTIONS.

PIPE HANDLING EQUIPMENT

1 SET BJ TYPE C TONGS, JAWS TO SUIT 2 7/8" TO 9 5/8".
1 SET 72" LINKS
1 SET 3 1/2" CENTRE LATCH SAFETY ELEVATORS.
1 SET 3 1/2" PIPE SLIPS.
1 SET 6" - 6 1/2" DRILL COLLAR SLIPS.

STOREHOUSE/WORKSHOP

20' X 8' X 8' CONTAINER WITH VICE, ELECTRIC WELDER, MECHANICS AND
BOILERMAKERS TOOLS, GAS SET.

DOGHOUSE

LINED AND INSULATED BUILDING CONTAINING DRILLING RECORDER, DRILLERS
DESK, TOOL RACKS AND BOP REMOTE CONTROLS.

CATWALK

40FT X 4FT AND SET OF PIPE RACKS.

INSTRUMENTATION

MARTIN DECKER WEIGHT INDICATOR, CLIPPER MODEL ATAS.
TOTCO 6 PEN DRILLING RECORDER.
TONG TORQUE GAUGE.
TOTCO 8 DEGREE DEVIATION RECORDER WITH CLOCKS AND CHARTS.
2 MUD PUMP PRESSURE GAUGES.

BOP AND WELL CONTROL EQUIPMENT

1 HYDRIL 3000 PSI ANNULAR PREVENTOR.
1 CAMERON 3000 PSI DOUBLE GATE BLOWOUT PREVENTOR TYPE SS FITTED WITH 3 1/2" RAMS AND BLIND RAMS.
BORE SIZE: 11", FLANGED FOR 9 5/8" CASING.
1 DRILLING SPOOL 11" X 3000 PSI AND 2" AND 3" OUTLET.
1 80 GAL HYDRIL VALVCON MODEL ACCUMULATOR, TWO AIR PUMPS.
160 GAL RESERVOIR 5 VALVE PLUMBED FOR REMOTE OPERATION.
REMOTE PANEL 5 VALVE.
1 RIG MOUNTED 65 CFM COMPRESSOR.
1 SKID MOUNTED 20 CFM COMPRESSOR.
1 3000 PSI CHOKE MANIFOLD AND FLARE LINE.

MUD SYSTEM

TOTAL CAPACITY 250 BARRELS IN FOUR COMPARTMENTS.
SAND TRAP 37.5 BARRELS.
SETTLING PIT 37.5 BARRELS.
SUCTION 50 BARRELS.
MIXING 50 BARRELS.
TRIP 25 BARRELS.
MIXING PUMP-- MISSION CENTRIFUGAL 6" X 5" DRIVEN BY 3 CYLINDER DEUTZ MOTOR 50 HP.
DESILTER - PIONEER GEOLOGRAPH MODEL 710 E4 10 X 4 CONES, 500 GPM.
SHALE SHAKER MODEL 4SH - PIONEER GEOLOGRAPH SIDE BY SIDE 4' X 5' SHAKER WITH TWO 3 HP ELECTRIC MOTORS.
MUD MIXER - PIONEER GEOLOGRAPH "SIDEWINDER" S-200.
2 X 11,000 LITRE WATER TANKS.

AUXILLARY EQUIPMENT

1 20' X 10 TOOLPUSHERS SHACK.
1 20' X 10' COMPANY MAN SHACK.
1 X 60 KVA GENSET.
2 X 30 KVA GENSETS.
1 X POLE TRUCK
1 X SERVICE VEHICLE
SSB RADIO SYSTEM
2 X GD MUD PUMPS
SET FISHING TOOLS FOR CONTRACTORS EQUIPMENT
1 X ONSITE FUEL STORAGE TANK

APPENDIX 2



5th Cut
A4 Dividers
Re-order code 97052

APPENDIX 2

Summary of Wellsite Operation

The Nalangil No.1 drill site was prepared by Gordon Rudolf.

Prior to rig arrival, a 16" conductor pipe had been installed and cemented.

The F.D.S. Rig No.1 was rigged up and Nalangil No.1 was spudded at 0200 hours on 4th August, 1990.

Drilling 12 1/4" hole continued to 68.78m where the 9 5/8" casing was run and cemented with float at 51.53m and shoe at 64.24m.

The B.O.P.'s, choke manifold and flareline were installed and the B.O.P.'s were successfully tested to the following pressures;

Blind Rams	1000 PSI
Pipe Rams	1000 PSI
Hydrill	1000 PSI

The float, cement and shoe were drilled out and after drilling five metres of new hole, a formation integrity test was established having 8.7 lb/gal mud in the hole. The formation held 16.9 lb/gal equivalent.

Drilling 8 1/2" hole continued uneventfully and reached the total depth of 363.0m at 1545 hours on 7th August, 1990.

The following logs were then run by BPB Instrument Limited;

- DLS/MRS/GR/SP/CAL
- CSS/GR/CAL
- NCS/GR/CAL
- SWC
- Velocity Survey

The well was then plugged back to 255.0m an attempt to run a conventional bottom hole drill stem test was made. The DST was aborted due to industrial action by the drilling contractor.

Two further cement plugs were set over the interval 80.0m - 30.0m and at the surface to abandon the well.

The rig was released at 1500 hours, on 10th August 1990.

NALANGIL No.1

PROPOSED AND ACTUAL DRILLING TIMES

CO-ORDINATES: LAT: 38°21'40.4"S
 LONG: 143°26'17.9"E

ELEVATION: GL.143.0m KB.146.05m

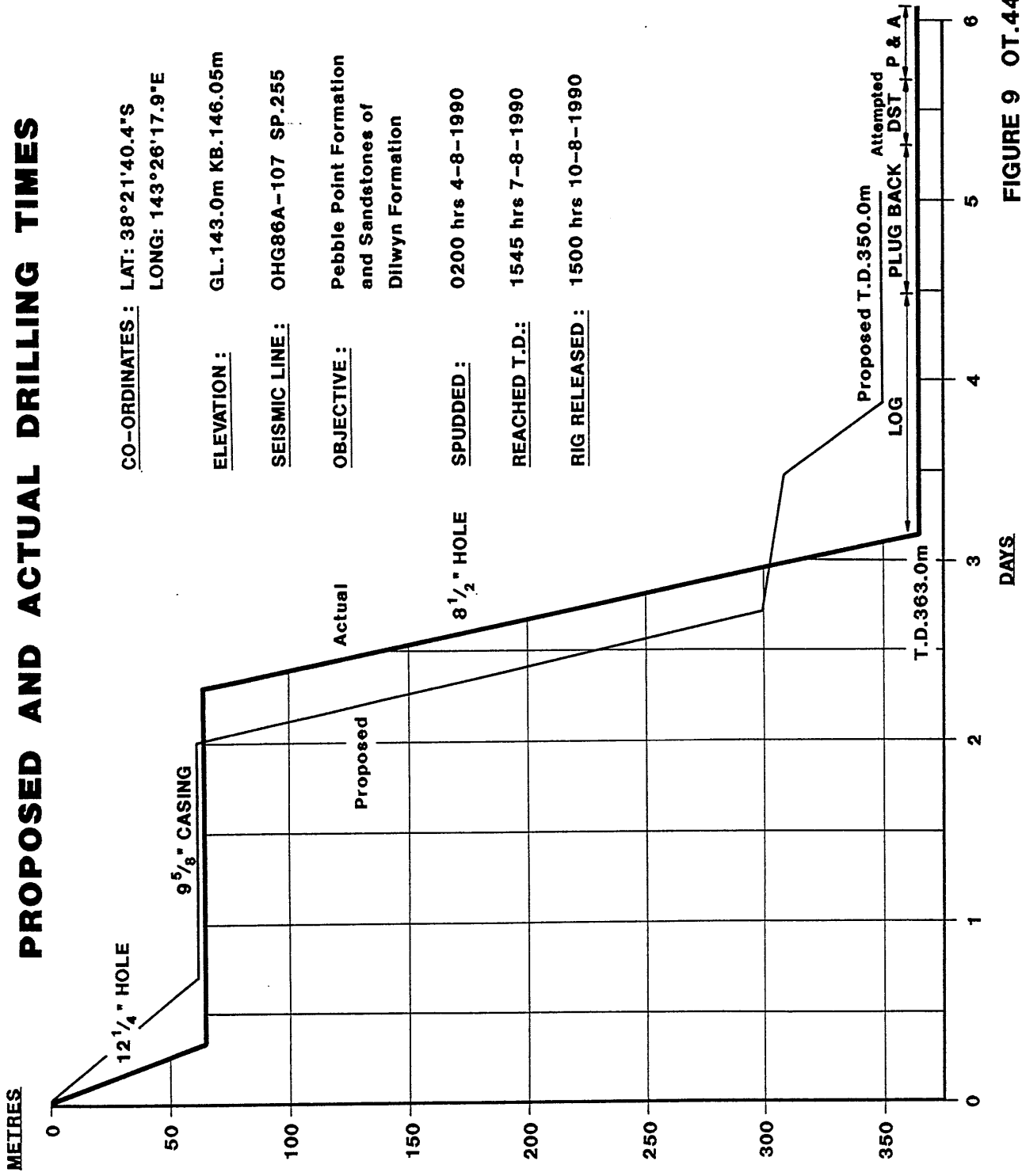
SEISMIC LINE: OHG86A-107 SP.255

OBJECTIVE: Pebble Point Formation and Sandstones of Dilwyn Formation

SUDDDED: 0200 hrs 4-8-1990

REACHED T.D.: 1545 hrs 7-8-1990

RIG RELEASED: 1500 hrs 10-8-1990



CASING	FORMATION	TEST	RESULTS
16" Conductor	Newer Volcanics		
9 5/8" Casing at 64.2m	Group		
Plugs 1/ 363-266 2/ 80-30 3/ Surface	Heytesbury		
	Niranda Group		Attempted DST.No.1 was aborted due to contractual disputation
	Wangerrip Group	"1"	
	Eumeralla Formation		Plug back 363m to 266m
	T.D.363.0m		